Paul Lever kühn: Ein Flug durch die Schweiz.
Offener Brief an seine Freunde.
Vignette Stettin. Druck von F. Hessenland. 1889.

Ein Flug durch die Schweiz.

[Mit grossera Vergnüg-en komme ich der freundliehen Aiifforderung des Redaktenrs der Zeitschrift für Ornithologie, Herrn Röhl nach, einen Neuabdrnck des folgenden, zuerst in der Monatsschrift des Deutschen Vereins znm Schutze der Vogelwelt Band XIII. 1888. S. 242—248. 254—268 erschiencncn Anfsatzes zu gestatten, in welchem ich einige durch Besprechungen an verschiedenen Orten zu Tage geförderte Irrtümer in Anmerkungen [in eckigen Klammern] corrigiere, ebenso die Druckfehler thunlichst entferne und einige Ergänzungen hinzufüge. Bemerkt mag noch werden, dass Hugo's Wiener Jagd-Zeitung den Abschnitt III, die Gotthard-Partie, mit dem dafür allein nicht passenden Titel „Ein Flug durch die Schweiz“ im Jahrgang XXXII. (1889) abdruckte. Lev.]

Separat-Abdrock ans: Röhl, Zeitschrift für Ornitliologie, Band XIII, 1889, Seite 135 u. f.
Offener Brief an seine Freunde von Paul Le verkühn.

I.

Motto: Und immer zirknliert ein nenes frisches Blut.
Goethe, Faust.

Da es durch verschiedene Umstände unmöglich geworden war, eine nur ornithologische Excursion in die Rheinwölder zu unter-nehmen, entschloss ich mich kurz am 18. Mai 1888, einen Ausflug in die Alpen zu wagen, trotzdem die Zeit sehr beschrönkt war. Am 19. morgens fuhr ich von Strassburg i. E. über Appenweier, Orenburg nach Triberg im Schwarzwald. Während der Fahrt auf der wundervollen tunnelreichen Bahn schien schönstens die Sonne, indess in Triberg fing ein Regen an, der bald einem Hagel-schauer wich, unter welchem die Apfelbltüen wie Schneeflocken zu Boden sanken. Ein kleines Gewitter entlud sich. Bei angenehm abgekühltem Wetter stieg ich neben den imposanten Wasserfällen hinauf, vergeblich nach dem Wasserstaar auslugend, welchem das Gefäll wohl etwas zu stark ist. Der Kuckuck rief in den benachbarten ein-samen Tannenforsten, die im übrigen keinen sonderlichen Vogel-reichtum aufwiesen. Nachdem ich den Priesen, eine höhere Kuppe, erklettert, begab ich mich thalwärts, durch den Ort Triberg nach dem Bahnhof, welcher zwischen zwei Tunneln gelegen ist, und von welchem man eine schöne Aussicht auf die Schwarzberge hat. Gegenüber sieht man am Berg die Eisenbahn etliche hundert Fuss höher hinziehen. — Weiter ging's über Donaueschingen, auf einem ‚Hochplateau‘, dessen Grün von der hier noch sehr winzigen Donau, weiterhin von der Aach durchströmt wird. In Singen verliess ich den Zug, um auf den Hohentwiel zu wandern. In den Laubhölzern, welche den Berg bedecken, sangen die Drosseln, Rotkehlchen, Laubsänger ihr Abendlied, indess ein Pirol und ein Kuckuck accompagnierten. Ich hatte das ganz hervorragende Glück, auf dem Gipfel des berühmten Scheffelberges ein ausgezeichnetes Alpenglühen zu gemessen! Prachtvoll beleuchtet lag tief unten der Bodensee, schlängelte sich die Aach, erglänzten die Firnen der sieben Churfirsten, des Säntis, in der Ferne die Jungfrau!

Nach schnellem Abstieg führ ich weiter nach Schaffhausen. Leider schien am folgenden Tage das Wetter eine fatale Wendung nehmen zu wollen. Gewitterschwüle, Staubwolken, ja bei Neuhausen ein feiner stiller Regen! Aber der Schönheit des Rheinfalls geschah dadurch dennoch kein Abbruch! — Auf der Weiterfahrt nach Konstanz hellte sich das Wetter auf. Auf dem Zeller-see schwebten hie und da einige Lachmöven, die an den Ufern brüten, spärlich, denn, obschon durch das Gesetz geschützt, finden sie nur allzu viele Liebhaber für ihre Eier; wie mir ein Einge-borner treuherzig erzählte, giebt es dort sogar Leute, die eigens zu dem Zwecke auf die Suche gehen! Die schilfarmen Ufer bieten wohl nicht sehr vielen Wasservögeln eine passende Niststelle — nach Freund *Podicipes cristatus* schaute ich mich vergeblich um. In Konstanz lachte der „unbewölkte Zeus“, so dass ich an Bord des „Moempelgard“ die Algäuer, Appenzeller und besonders die Vorarlberger Alpen in ganzer Pracht bewundern konnte. Vorbei fuhren wir an dem mythenunnvobenen, alten, finster dreinschauenden Meersburg, dessen Wein indessen vortrefflich schmeckt; vorbei an Friedrichshafen, Lindau mit seinem unschönen Löwenkoloss zu Beginn der Einfährt. In Bregenz machte ich mich, durch ein Glas des ganz ausgezeichneten Tiroler (Bozener) Weins gestärkt, sogleich an den Aufstieg des Gebhardtberges (600 m). Wundervolle Aussicht gewährt die alte Ruine auf dem Gipfel, weithin in das Rheinthal, über den Bodensee, auf die Alpen, zum Teil in Wolken gehüllt. — Da jedoch der Fernblick von dem Pfänder, einem an 1100 m hohen

Berge, noch schöner sein musste, unternahm ich bald den weiteren Aufstieg — und zwar mit besonderem Glücke. Hörte ich doch etwa 250 m weiter und höher zum ersten Male einen Laubsänger — in gemischtem Bestände — welcher nur *Phyll. Bonelli*

Phyllofmeuxle Bonelli wird von Bruh in in seinen,. Wirbeltieren Vorarlbergs" und „Nachträgen zur Wirbeltierfauna Vorarlbergs“ (Verh. k. k. zool. bot. Ges. Wien 1868. XVIII. Vögel S. 235—256 und S. 871—879) noch nicht als Vorarlborger Spezies angeführt.

) sein konnte. Lange lauschte ich dem fremdartigen, typischen Laubvogelgesang. Sehen und identifizieren konnte ich bei blendendem Sonnenschein das Tier nicht. Allein es ist kein Zweifel, dass ich es mit der fraglichen, in der Schweiz viel vorkommenden Spezies zu thun hatte. Auch Herr Prof. Moesch teilte diese Ansicht; er erzählte mir, dass erst vor ca. 20 Jahren diese interessante Art sicher für die Schweiz konstatiert sei, Schinz habe sie nicht als Schweizervogel gekannt.

[Wie Victor von Tschusi zu Schmidhoffen in der Monatsschrift 1888. S. 306 hervorhob, ist die Art 1827 bereits in J. R. Steinmüllor's Neuer Alpina II. S. 87 von Thom. Conr. v. Baldenstein für das Land nachgewiesen und als *Sylv. albicans* beschrieben.]

) Auf dem Kuhn des Pfänder betrachtete ich den Sonnenuntergang beim Abendlied der Singdrosseln. Wunderbar schön waren die weiten Matten, Triften und Weiden der Vorarlberger Alpen beleuchtet, während der Bodensee immer dunkler und dunkler wurde, um schliesslich ganz seine scharfen Konturen zu verlieren und dem Blick zu entschwinden. — Auf einem sehr schnellen Abstieg im Galopp stellte ich praktische Versuche an zu dem Thema, ob das Trinken von Gebirgswasser schadet, wenn man nur in der eingeleiteten schnellen Bewegung bleibt.

An dem Abend noch verliess ich das österreichische Gebiet, um in St. Margarethen, auf Schweizer Grund und Boden, das Haupt niederzulegen. Am 21. in der Frühe führte mich die Bahn über Buchs und Sargans nach Ragatz, vorbei an den wolken-verhüllten Glarner und Appenzeller Alpen. Die imposante Taininaschlucht mit ihren tausendfusshohen Fels'enwänden und ihrem tosenden Gletscherbach, die Tamina, ist wohl auch kein geeignetes Terrain für die Anwohner lustiger Waldbäche — wenigstens war von Gebirgsstelzen und anderen Liebhabern solcher Gegenden nichts zu sehen. — Das Thal wird bei Bad Pfäffers

Auch mir glückte es hier ebenso wenig wie Dr. Girtanner (Ornith. Streifzug durch Graubünden 1871. In: Verh. d. St. Gall, naturw. Ges. 1861. No. V. S. 337) das von StöIck er (Versuch einer Vogelfauna der Kantone St. Gallen und Appenzell. In: Bericht über die Thätigkeit der St. Gall. nat. Ges. 1866—67) und Bruii in *(l. c.)* bestätigte Nest des Mauerläufers *(Tick, muraria)* aufzufinden. Man ist wohl zu der Annahme berechtigt, dass jetzt bei Pfaffers kein Mauerspecht mehr nistet, [im Juli 1865 hat der Senats-Präsident zu Celle, Herr Dr. Eduard Meyer, wie er mir unlängst mündlich erzählte, an besagter Stelle den Mauerläufer angetroffen. Später fand er ihn an den Felsen oberhalb des Urnerlochs und kürzlich, am 31. Juli 1889. an den Felsen bei den Bagni vecchi in Bormio, laut freundlicher brieflicher Mitteilung vom 23. August d. J. Lev.]

) immer enger und enger, bis schliesslich die beiden gegenüberliegenden Thalwände nahe an einander rücken, zu inniger Berührung in der Naturbrücke, während unten durch den Felsen die Tainina reissend dahinfliesst. Ein Ziegenpfad führt über jene ‚Bruck‘ zu dem Dorfe Pfäffers (820 m) sehr steil bergan. Als ich ihn passierte, hörte ich ein Paar Tannenhäher *(Nur. caryocatactes)* auf der steilen Felswand in einer unzugänglichen Tanne krächzen. Der Abstieg erfolgte über die Ruinen der Burg Wartenstein, eines Felsenriestes, welches einen überwältigend schönen Fernblick auf die Alpen ringsum, das Thal des Rheins, das unten liegende Ragatz, die berühmte Rheinstrasse mit ihren in zwei Reihen stehenden Pappelbäumen gewährt. Die Menschlein, welche auf der Strasse zu einem kantonalen Sängerfest spazierten, unterschieden sich in nichts von Ameisen. — In dem Laubwalde, welcher den Berg bekleidet, sangen unsere drei gewöhnlichen Laubsänger — nur diese, Rotkehlchen, Kuckucke, Drosseln und ein Pirol. — Zurück musste ich über Sargans, um nach Zürich zu gelangen. Die Bahn folgt dem Rhein bis Sargans, dann führt die (neuere) Bahn längs des überaus grossartigen Walensee, im Thal der Linth weiter, am Zürcher See hin gen Zürich.

II.

In Zürich war gerade eine Vogelausstellung des „Ornithologischen Vereins“ jener Stadt. Wegen knapper Zeit verzichtete ich auf einen Besuch des hühnerologischen Teils und sah nur die ‚Singvögel‘ an. Grosse Seltenheiten und Specifica der alpinen Ornis waren nicht vertreten. — Eine Menge Kanarienbastarde, besonders vom Stieglitz, fielen mir auf. — Unter der aufgestellten Litteratur war an wissenschaftlichen Werken nur Schinz zu sehen neben einer erdrückenden Menge piepmatzologischer Bücher. Das Vogelbild des Deutschen Vereins zum Schutze der Vogelwelt hing in einer nicht sehr hellen Ecke. — Eine kleine unbedeutende Sammlung der gewöhnlichsten mitteleuropäischen Eier, unter welchen die auch nur annähernd seltenen Schweizer Arten durch ihre Abwesenheit glänzten, war mit der grossen silbernen Medaille gekrönt!

Anderen Tags in der Frühe ging ich zur zoologischen Sammlung des eidgenössischen Polytechnikums,

woselbst mich der Direktor desselben, Herr Professor Dr. Moesch, sehr freundlich empfing. Das ornithologisclie Museum besteht aus meist sehr gut ausgestopften, aufgestellten Vögeln; Bälge werden nicht gesammelt Die Betrachtung der Sammlung ist durch gute Beleuchtung und vorteilhafte Aufstellung sehr angenehm erleichtert. Herr Professor Moesch, bekannt als Verfasser einer Avifauna der Schweiz

Das Tierreich der Schweiz. In: Allgemeine Beschreibung' und Statistik der Schweiz. Brugg. 1869. (Vögel im Sep. - Abdr. S. 163—171.) Siehe auch ebendaselbst Artikel „Die Jagd“ 1870. Sep.-Abdr. 16 pp. von demselben Autor.

), hat auf eine sehr schöne complete Schweizer Lokalsammlung besonderen Wert gelegt. Die Fundamente zu einer solchen waren seit Gessner's Zeiten gelegt, und auf ihnen besonders von Schinz weitergebaut.

Drei herrliche Schweizer Lämmergeier *(Gyp. barbatus)* aus den Jahren 1829, 1858 und 1859 bilden den Stolz der Raubvogelkollektion

Sie sind in der ausgezeichneten Monographie Dr. Girtanners angeführt. (Beitr. zu Nat.-Gesch. des Bartgeiers der Zentralalpenkette *Gvp. alpinus*. In: Verh. d. St Galler naturwiss. Ges. 1869/70 Sep.-Abdr. S. 64.) Der dort citierte Naturforscher Pfarrer Sprüngli zu Stedtlen lieferte eine genaue Beschreibung des Alpcnbartgeiers, begleitet von zwei recht guten Kupferstichen, Fang und Kopf darstellend, für das sonst wenig Ornithologisches enthaltende Werk: Andrea, Briefe aus der Schweiz nach Hannover geschrieben in dem Jahre 1763. Zweiter Abdruck, Zürich und Winterthur 1776 S. 195 .ff. tab. 12 a. 12 b. Da das Buch, in welchem nur ab und zu etwas über Vögel mitgeteilt wird — so S. 186 ff. über Spriingli's Sammlung, S. 59 über die inzwischen zu Grunde gegangene Sehnithess 'sche Sammlung in Zürich, S. 202 die erste sichere wissenschaftliche Beschreibung von *Acc. alpinuts* mit guter Abbildung — in ornithologischen Werken über Schweizer Vögel nirgends citiert wird, glauben wir bei dieser Gelegenheit darauf hinweisen zu dürfen. — Theobald fand den Bartgeier 1862 „noch da und dort im Kngadin horstend“ (Naturbilder aus den Khätischen Alpen. 2. Aufl. Chur 1862 S. 151). Auch in diesem, sonst nicht ornithologischen, „Führer durch Graubünden“ finden sich ab und zu Mitteilungen über Vögel, auf eigener Beobachtung beruhend. (S. 48. 174. 313.) Lev.

). Das letzte Exemplar des Schweizer Lämmergeier wurde im Jahre 1881 in den Walliser Alpen vergiftet und in sehr desolatem Zustande dem Präparator Stauffer in Luzern abgeliefert. Ausgestopft steht es jetzt im Museum zu Lausanne; es war ein Weibchen und seit 18 Jahren einem tüchtigen Kenner der Natur dortiger Gegend bekannt. Wahrscheinlich hat es die gesamte Zeit ein vereinsamtes Leben geführt, da das letztbekannte Männchen schon vor 20 Jahren umgekommen ist. — Aus einem der Magen der drei aufgestellten Bartgeier wurden grosse Rinderknochen, Stücke eines Gamskrickels, Auerhahnknochen, Fellreste etc. geholt, die jetzt im Museo aufbewahrt werden. — Ein Exemplar des Schlangenadlers *(Circ. gcillicus)* aus der Brutzeit, ein Junger, Anfang Oktober 1878 bei Zernetz erlegt, wie auch andere Beweise ergeben, dass derselbe stellenweise in den Schweizer Alpen, so im Kanton Graubünden bei Chur, seinen Horst baut. — Ein auffallender Flussadler *(?Panäion haliaetus)* aus der Schweiz ist aus Schinz' Zeiten im Museo. Die bräunlich gesprenkelten Hosen, sehr kleine Fänge, ein gestauchter Schnabel, ein schmalgebänderter Schwanz machen die Spezieszugehörigkeit zu *P. haliaetus typicus* sehr unwahrscheinlich. — Der sehr seltene *Micrastur mir andollei Schleg*. ist in einem schönen Exemplar vertreten. — Von *Bubo maximus*, welcher bei Zürich nicht selten vorkommt, findet sich eine schöne Suite. — *Strix acadica* wurde bei Beatenberg am Thunersee im Oktober 1870 geschossen. — *Strix Tengmalmi* in dem sehr kalten Dezember 1879 in Enge verhungert gefunden. *Circus eineraceus* Ende November 1878 bei Altstätten, ein zweites Exemplar Mitte Dezember 1878 bei Eglisau, beides Männchen, erlegt *Buteo lag opus*, eine für die Schweiz seltene Erscheinung (welche im Museo fehlt), wurde im Dezember 1879 bei Hombrechtlikon geschossen. — *Tichodroma muraria* beobachtete Herr Professor Moeseh, dein ich vorstehende Notizen verdanke, im September 187? an den Felsenwänden über der alten Strasse bei Trübbach im Rheinthal kletternd. Am 4. März 1879 nach einem sehr strengen Winter liefen an den Mauern der polytechnischen Hochschule zu Zürich einige umher. — Eine echte *Bud. Rayi*

Interessant für die vertikale Verbreitung dieser Art ist, dass Dr. Radde Ende Juni 1885 bei der Besteigung des Schahdagh in einer Höhe von über 3000 Meter ein Exemplar (#) antraf. (Ornis III. S. 485.)

) mit der Heimatsangabe ‚Zürich‘ war unter *fiavus subsummiert*. Zu besonderer Freude sah ich hier das zweite bekannte Exemplar von der Philippinischen *Hypothymis (Cyanomyias) coelestis Sharpe*, wundervoll erhalten, welches Sharpe selbst bestätigt hat (cf. Proc. Zool. Soc. Lond. Sitzungsbericht vorn 4. April 1882). —

Ein Nest von Nuc. *caryocatactes* mit sehr kurzdickschnäbeligen Nestjungen (nicht: Dunenjungen) stammt vom ersten Entdecker dieser nidologischen Rarität, dem weil. Vogel aus Zürich Daneben standen zwei echte Schweizer Alte, ein ganz typischer *lepto*-und ein ebenso veritabler *pachyrhynchus*, ein Umstand, auf den wir später bei eingehender Betrachtung der Tannenhäherfrage zurückkommen werden. — *Bombycilla garrula* kam in grossen Mengen 1887/1888 in die Gegend um Zürich; einige mussten für's Museum ihr Leben lassen. — *Tetrao medius* kommt nicht selten in den Alpen vor; zwei Männchen vom Gotthard sind in der Sammlung. — *Otis houbara* wurde am 20. Mai 1839 bei Metmenstätten im Kanton Zürich, *Otis maqueeni*

Danach zu ändern in Moesch, Tierwelt der Schweiz *l, c.* S. 168, we auch *sub houbara* angeführt. Lev.

) am 18. November 1840 bei Rapperswyl geschossen — beide Exemplare stehen in der Züricher Sammlung.

Von *Grus cinereus* ist ausser dem von Herrn Professor Moesch schon angeführten Exemplar (8. April 1858 bei Wetznikon im Usterthal) ein zweites von dem Jahre 1825 aus der Gegend um Zürich aufgestellt. — *Ciconia nigra* wurde 1850 bei Altstetten, Kanton Zürich, geschossen. —

Die folgenden Notizen gestattete mir Herr Professor Moesch seinem Manualexemplare seiner Avifauna der Schweiz zu entnehmen; sie werden in dem bald zu erwartenden zweiten Teile des grossen Fatio'schen Werkes (Wirbeltiere der Schweiz) verwerthet werden.

"*Oedicnemus crepitans* wurde 1868 und 1809 bei Seihofen im Kanton Bern geschossen;

Ardea purpurea im November 1870 bei Aarau und am 26. Mai 1877 ein zweijähriges # bei Illnau im Kanton Zürich erlegt.

Ardea nycticorax. In einem Zeitraum von zwanzig Jahren wurden dem Präparator Widmer in Zürich nur zwei Stück eingeliefert; das erste etwa 1850, das zweite, ein #, am 15. April 1870, von Maschwanden im Kanton Zürich auf dem Zuge geschossen.

Limosa melanura am 5. August? bei Wald im Kanton Zürich geschossen. Ob der Vogel dort gebrütet hat? Das Exemplar war jung.

Numenius tenuirostris im September 1878 bei Uster, ein zweiter bei Konstanz zur selben Zeit geschossen.

Phoenicopterus antiquorum 1864 auf dem Aargrien (Inseli) bei Bern gesehen; 1809 auf der Au bei Hunzikon bei Bern gesehen.

Podicipes suberistatus Anfang Dezember 1878 bei Stäfa am Zürichersee geschossen." —

Ein *Phalaropus hyperboreus* wurde im Oktober 1854 bei Schwyz erlegt. — *Mach, pugnax* ist in einer grossen Serie vertreten; doch kommt er jetzt viel sparsamer als in früheren Jahren an den Zürichersee. Was mag die Ursache sein? — *Laras vidi-bundus* war zu Schinz' Zeiten noch kein Züricher Brutvogel; jetzt brütet sie am oberen Teil des Sees. Die Einwanderung knüpft sich an die künstliche Schwanenzucht, welche seit 14 Jahren von Zürichern zur Belebung des Sees unterhalten wird. Im Winter fressen die Möven von den Tischen ihrer grossen Verwandten und fangen begierig die Brocken, welche ihnen von den Brücken und vom Ufer aus zugeworfen werden. Leider werden die Schwäne abgeschafft werden, da unverständige Fischer Klage erhoben ob des ihnen vermeintlich durch die Schwäne zugefügten Schadens. Es wird von Interesse sein, zu konstatieren, ob die Möven sich trotzdem halten werden. *Sterna hirundo* dagegen brütet schon lange auf den Inseln am Bielersee und Katzensee — nach Angabe von Herrn Professor Moesch. *St minuta* kommt sehr oft vor. *Carbo pygmaens* ist am 25. Oktober 1850 bei Dietekon bei Zürich geschossen — eine Art, welche im Moesch'schen Verzeichnis noch nicht angeführt ist. — Sehr reich ist die Sammlung Madagaskar-Vögel, mehr als 70 Arten! Auch sämtliche madagassische seltene Säuger finden sich mit alleiniger Ausnahme von *Cryptoprocta ferox*; wir nennen nur: *Galiclia elegant, olivacea, concolor, I iverra Schlegelii, Fossad'Aubentoni*; die gesamten Halbaffen Madagaskars etc. Einen „kurzen Bericht über die zoologische Sammlung in Zürich“ gab Oberstudienrat Professor Dr. von Krauss

In: Jahreshefte des Vereins für vaterländische Naturkunde in Württemberg'. 40. Jahrgang 1884. S. 303—305.

), in welchem auch der ornithologischen Sammlung gedacht ist. — Auch an dieser Stelle möchte ich Herrn Professor Dr. Moesch für sein äusserst freundliches Entgegenkommen nieinen verbindlichsten Dank aussprechen.—

III.

script

Hesiod.

Arn Mittag des 22. Mai fuhr ich von Zürich mit der Schweizer Nordostbahn nach Zug, von dort mit dem Dampfboot über den schönen Zugersee nach Arth. Der Pilatus war in Wolken gehüllt, der Rigi lag in seiner stolzen Grösse klar vor meinen Blicken. Von Arth schob die Lokomotive den Waggon bis Gohlau, der berühmten Bergsturzstätte, dann weiter auf der Zahnradbahn jene weltbekannte Strecke den Rigi hinauf. Es passt nicht in den Rahmen dieser Arbeit, jene fürstliche Fahrt zu schildern mit dem Prachtblick auf die Mythen, den Zuger- und Lowerzersee, steil hin an der jäh abfallenden Kräbelwand, durch Tunnels und auf den kühnsten Brücken über die reissendsten Waldbäche und Wasserlalle. Nur kurze Zeit war von oben jener Zaubergarten sichtbar, die ganze Nord- und Ostschweiz mit der Menge von Seen und der Unzahl von Dörfern und Städten. Dann hüllte Nebel und Gewölk den ganzen Kulm in einen dichten Schleier. So hatte ich Müsse, den Rest des Tages mit der Suche nach alpinen Vögeln zuzubringen. Der Alpenflüevogel (*Accentor alpinus*

In seinen *Notes on the birds of the Upper Engadine* (Ibis 1886, S. 27 ff.) stellt H. Seebohm in einer anziehenden Schilderung der Lebensart dieses Vogels es als eine von ihm entdeckte Neuigkeit hin, dass *Acc. alpinus* hüpfe und nicht laufe, indem Seebohm gleichzeitig den „*writer qnoted by Naumann*“ (Buffon! *Ois. V.*

p. 15(i. Edit. de Deuxp. JX. p. 179) corrigiert. So leid es uns thut. können wir unserm geehrten Freund und Gönner diesen Ruhm nicht lassen, da schon Sprüngli (in Andreae's Briefen, Anhang zum 31. Briefe 1775, *p.* 203) deutlich sagt: „Sie tragen ihren Leib schön, bewegen im Hüpfen öfters den Schwanz, wie auch die Flügel.“ Lev.
) war in mehreren Paaren nahe bei Rigi Staffel vertreten; Nester hatte er wohl noch nicht gebaut, da überall noch unwirtliche Schneehaufen lagen. Das Thermometer zeigte um 7¾ h. p. m. + 7° R. bei einem Barometerstande von 623 mm. Die Vögel flogen munter und wenig scheu nahe den kleinen Fichten, welche über Station Kaltbad auf dem Rigi-Rotstock ihr Dasein fristen. Ein Paar Tannenhäher *(Nuc. caryocatactes)* krächzte vergnüglich in einem etwas höheren Bestände. Sonst vernahm ich nichts besonderes Interessantes — eine sehr laute Singdrossel *(Turd. musicus)* liess thalwärts ihre repetierende Stimme erschallen, als in den Hotels schon Licht angezündet war.

Am anderen Morgen führ ich über die anderen 10000 Zähne der Bahn nach Vitznau herab, ohne den Sonnenaufgang genossen zu haben, da auch am 23. alles in dichten Nebel gehüllt lag. Auf der Station in Vitznau liess ich leider meinen guten Harzstock, einen Andreasberger, zurück — weshalb dieses erwähnt werden muss, wird der freundliche Leser bald sehen. Die .,Helvotia" trug mich nun über die grünen Fluten des Viorwaldstätterseos vorbei an Brunnen und der Tellskapelle neben der Axenstrasse und der etwas tiefer liegenden Gotthardbahn nach Flüelen. Das Wetter war herrlich und die Temperatur gegen die winterliche Kälte des Rigi geradezu drückend heiss. Sofort vom Dampfboot ging's zum Bahnhof, um mit dem Expresszuge auf der grossartigsten aller Bahnen nach Göschenen zu jagen. Die von mir gewählte Reisezeit war in jeder Beziehung eine sehr glückliche: wenig Reisende, keine zu grosse Hitze und vor allem: Wasser in allen Bächen und Flüssen, welches namentlich in den oberitalienischen Gewässern zwei Monate später arg fehlt. Die Reuss hatte hohen Wasserstand; tobend schoss das grünliche eiskalte Gletscherwasser in dem engen Thal herab. Nachdem wir um das Kirchdorf Wassen dreimal in Schraubenlinien uns emporgewunden hatten, so zwar, dass man von der höchsten Stelle der Bahn die Tunnels und Brücken in drei Etagen senkrecht unter sich sah, liefen wir bald in die Station Göschenen ein, einen Steinwurf vor dem Mundloch des längsten aller Stollen, des Gotthardtunnels. Durch eine gute Mahlzeit gestärkt, stieg ich nunmehr den Gebirgsstock hinan, vorerst liess ich vor meinen Augen den Zug in den Berg einfahren: ein märchenhafter Anblick, wenn man die schneebedeckten Alpen in dem engen Thal ringsum bis zu den Wolken ansteigen sieht.

In der wilden Felsenschlucht der Schöllenen merkte ich gar bald, dass meine Hoffnung, unterwegs einen Ersatz für den eingebüssten Stock zu finden, trügerisch sei, denn keine Bäume wuchsen auf den öden Steinklüften, kaum fanden kümmerliches Moos und einige Flechten hier noch ihr Fortkommen. So ging's, in Serpentinen in der nur durch das Gebrause der Reuss unterbrochenen Stille langsam den St. Gotthard hinan. Vom Grat der Felsen lagen ab und zu wie ein langes Tuch zu Thale die Reste der hier allzuoft stürzenden Lawinen, vor welchen die Strasse sogar durch Schutz-Gallerien bewahrt werden musste. Kurz hinter einem Felsendurchlass gelangte ich an den imposantesten aller Wasserfälle, den der Reuss unter der Teufelsbrücke, an jener Stelle, we einer der schauerlichsten Kämpfe von 1799 stattgehabt. Wirkt schon die Scenerie, die tausend Fuss hohen, kahlen, finsteren Felsenwände, das enge Thal, der wilde Fluss in seinem jähen, wohl hundert Fuss tiefen Absturz, das donnerähnliche Getöse des Wassers, in höchst eigentümlicher,' ergreifender Weise auf den Beschauer, so erfüllt ihm vollends der Gedanke das Herz mit Schauern, dass sich in das Gebrüll der Wellen das Todesröcheln von vielen Hunderten braver Streiter zu mischen scheint.—

Den Ernst bewahrt die Gegend; steiler und steiler streben die Felsen himmelan, sie engen sich ein zum sog. Urnerloch. Hinter diesem Stollen breitet sich das Urnerthal aus vor den erstaunten Blicken des Wanderers; allerdings kein freundliches Thal! Kahle, felsige Bergriesen, deren Gipfel ganz von Schnee bedeckt, fahle graugrüne Wiesen, kein Baum, Strauch, kein blühendes Getreidefeld — das ist die Landschaft, welche dieses Thal bildet. Im Beginne desselben liegt Andermatt oder Ursern, ein ärmlicher Ort, den wir schnell passieren wollen. Zu unserer Freude vernehmen wir wieder Vogelgesang: ein Sperling *(Passer domesticus*

Diese Thatsache verdient besondere Beachtung, da 1869 Professor Moesch in seinem Tierreich der Schweiz. S. 167 ausdrücklich bemerkt: haus-sperling sehr gemein, mit Ausnahme des Urserenthales und, wie er mir freundlichst brieflich mitteilte, bis 1870 dem Ornithologen J. Nager in Andermatt aus jenem Thale noch nicht bekannt war. Dasselbe erwähnt beiläufig V. Fatio in seiner Distribution vertic: des sylv.: en Suisse. In: Bull, soc. ornith. suissc. tom. 1. 1865/66 S. 42. Auch im Ober-Engadin, beim Maloja-Hotel vermisste ihn H. Sce-bohm. (Ibis 1886, S. 26.) Auf das eigentümliche Fehlen des Sperlings in einigen Harzorten werde ich später zurückkommen. [Dagegen traf mein Vetter, der Land-gerichts-Director R. Grisebach zu Osnabrück, im August d. J. auf der Höhe des Wormser Jochs, also in fast 2800 Meter Höhe, Sperlinge an. Lew]

) zwitscherte von einem Hausdache, ein Paar Hausschwalben *(Hir urbica)* fliegen über die Strasse, hier (1444 m) wohl nahe dem höchsten Punkte ihrer verticalen Verbreitung. Auf den sehr feuchten Wiesen sangen viele Wiesen- und Wasserpieper *(Anthus pratensis et aquaticus)*, auf deren Nestsuche ich aus Zeitmangel leider keinen Augenblick verwenden konnte. Längs der Steinböschungen, welche die Fahrstrasse zur Rehalp und zum

Rhonegletscher hin begleitet, traf ich mehrere Paar Steinschmätzer *(Sar. oenanthe)*, welche lustig mit dem Schwänze wippend und ‚Tschek' rufend ihre Weibchen beim Nestbau erlustigten. Wenigstens fand ich in den Steinen zwei frische leere Nester, welche wohl bald belegt sein werden. Gradenwegs, ohne steigen zu brauchen, wandelte ich in dem hier ganz flachen Reussthale weiter, links das Mutthorn und die Furka, rechts den Bützberg — alle diese Schneeriesen prachtvoll beleuchtet, vom reinsten Blau überdeckt. So kam ich bald nach Hospenthal, von we aus der eigentliche Gotthard-Aufstieg beginnen sollte. Durch eine gute Tasse Kaffee und ein kräftiges Stück Brod gestärkt, begann ich genau um 4 Uhr die Gotthardstrasse hinanzusteigen. Gleich ober Hospenthal begegnete mir ein wildaussehender Bursche, der sich als Führer (12 Franken, nur für den Anstieg!) anbot; ich verzichtete. „S'liegt ne Viertelschtund höher schon Schnee! Gestern bin i mit drei Herren obe gewese, habe 4½ Schtund gebraucht!" rief mir der Geselle nach. Als ich nach einer halben Stunde sehr rüstigen Wanderns an den ersten Schnee auf der Chaussee kam, merkte ich, dass mich der Kerl angelogen hatte. Schon nach zehn Minuten Kletterns sieht man von dem ganzen Ursemer Thal nichts mehr. Eine dem Schöllenen - Thale ähnliche, höhere, imposantere jähe Felsenschlucht steigt die Gotthardstrasse hinan. Wohin der Blick schweift, liegt in langen Fetzen der Lawinen-schnee die Felsen herab. Unten in der Thalsohle rast die Reuss dahin. Vier Uhr dreissig Minuten kam ich an die erste Stelle, we von rechts oben eine Lawine gestürzt war, die breite Gotthardstrasse überschüttet hatte und vom Felsengipfel bis zur Reuss eine lange schräge Schneefläche bildete. Wenn auch nicht auf eine solche Tour eingerichtet, — ich trug Stiefeletten, kein Unterzeug, keinen Überzieher, keinen Stock — so wollte ich doch nimmer zurück: galt diese Tour, die bei glänzendem Wetter begann, doch der Beobachtung des Alpenschneehuhns *(Lagopus alpinus Nils)*, einer sehr stolzen Art, welche schon einen Kampf verlangte und auch — wert war. — Dieser erste ‚Schneesturz', wie ich die geschilderte Wegsperre nennen will, war nicht so steil, dass ich nicht, den gestrigen frischen Fussspuren folgend, gerade aufgerichtet hätte gehen können. Nach etwa 30 Schritten hatte ich wieder festen Boden unter den Füssen. Keine zehn Minuten weiter wiederholte sich dasselbe Schauspiel, diesesmal war der Schneesturz breiter.

Auf der gesammten Gotthardstrasse, sowohl nach der Schweizer, wie nach der Italienischen Seite hin, sind dem Thale zu in Abständen von drei Schritten kleine, etwa einen halben Meter hohe Steinsockel eingelassen. Sie stehen an der Kante einer gemauerten Brüstung, welche, je nachdem der betreffende Bergesabhang steiler oder flacher ist, bald 20—30 Fuss tief abfällt, bald sich zu nur einem Meter oder noch weniger erhebt. Bei den folgenden Schneestürmen war es mir hie und da möglich, zwischen den Sockeln und der Brüstung, auf einem schmalen Saumpfade also, zu gehen und die Kletterei auf dem Schnee, welche meine drei Vorgänger Tags zuvor ausgeführt, zu vermeiden. In der Zwischenzeit war der Schnee weiter geschmolzen, auch hatte die abstürzende Schneemasse in den Sockeln einen Widerstand gefunden, welcher sich in dem Brüstungsabfall fortsetzte, so dass der durch die Sockel zertrennte Schnee eher den warmen Sonnenstrahlen hatte weichen müssen, andererseits hart an den Brüstungen herab sich schmale fussbreite Spalten bis auf den Boden hinab gebildet hatten. — Bei einer Knickung des Thaies nahm das Landschaftsbild einen weit winterlicheren Charakter an: während vordem nur in grösseren Abständen Schneestürze auf der gegenüberliegenden (rechten) Seite der Reuss, wie auf der von mir begangenen linken Seite stattgefunden hatten, waren in diesen höher gelegenen Partien allüberall die Lawinen gefallen, ja hatten die Reuss so vollständig überdeckt, dass nur ab und zu der rasend stürzende Fluss durch seine Ueberwölbung hindurchblickte, an Stellen, we durch einen Wirbel oder Strudel der Schnee unterwühlt war. Häufiger und häufiger musste ich über den Schnee klettern, denn das Gehen allein genügte nicht immer. War der Absturz zu steil, so legte ich mich mit dem Körper ganz nach rechts über und stiess mit den gespreizten Fingern der rechten Hand in den ziemlich weichen Schnee. Natürlich war es unangenehm, wohl eine Stunde lang den Körper immer so einseitig zu bewegen, dabei Gluthitze im Gesicht, eiskalte Füsse. Somit war ich ganz damit einverstanden, als auf einmal die bislang doch noch ab und zu erblickte Gotthardstrasse völlig in und unter dem Schnee verschwand, die Sockel desgleichen, und die Spur meiner Vordermänner geradeaus auf das langsam ansteigende Schneefeld überging. Von der Reuss war gar nichts mehr zu sehen; ja kaum konnte ich von dem durch den Schnee gedämpften Rauschen noch etwas hören! Nach meiner Berechnung musste ich in nicht allzu langer Zeit auf dem Hospiz anlangen. — Bisher war das Wetter herrlich gewesen, allein ich kam jetzt in die Region, we fast immer Wolken lagern und Nebel herrschen. Unbestimmter wurde die Aussicht vorwärts, aber we möglich bei einbrechender Dunkelheit zurück über die Schneestürze zu kraxeln, daran dachte ich gar nicht — Ich bemerke ausdrücklich, dass ich trotz angespanntester Aufmerksamkeit auch nicht einen Ton eines Vogels seit Andermatt vernommen hatte! Anstattdessen kam ich in Bälde auf einen offenbaren (Tainswechsel; typische Losung, zwei Schritte von meiner Spur entfernt, beseitigte jeden Zweifel! — Da ich stark in Transpiration geraten war, band ich das Taschentuch um den Strohhut zum trocknen; als ich es nach einiger Zeit herabnehmen wollte, war es fort. Sollte ich umkehren? Gewiss, denn die Mönche des Hospizes konnten es mit Hülfe ihrer berühmten Hunde finden und vergeblich nach einem Nichtverimglückten suchen! Einige Zeit war ich unschlüssig, allein der Blick auf die Uhr und die immer wachsenden Nebel bestimmten mich weiterzugehen — ich konnte es den Mönchen ja bald erzählen!

Aus dein Grau und Weiss blickte ein dunklerer Punkt auf — ah das Hospiz! dachte ich, beständig in

Gedanken eine famose lateinische Kintrittsrede für die Mönche einübend. Das Perspektiv überzeugte mich jedoch, dass zwei oder drei grosse Felsblöcke das vermeintliche Hospiz seien. Die Spur, der ich wie Pfadfinder mit peinlichster Ängstlichkeit folgte, führte darauf zu. Schon überlegte ich, wie ich mich davor sichern sollte, von den ziemlich ausgedehnten Felsen aus, die Fortsetzung des „Weges“ 1 nicht findend, wie so manche Reisende vor mir, auf der gekommenen Spur umzukehren und vermeintlich weiterzugehen, als ich, gerade bei, dem Felsen angelangt, mit dem einen Fusse in den weichen Schnee am Stein, mit dem andern auf denselben trat. Ratsch, riss mein ohnehin strapaziertes Beinkleid von oben bis unten entzwei. Mit einiger Mühe kraspelte ich aus der Spalte auf den Felsen, legte mein grosses Fernrohr an der Stelle nieder, we ich angetreten — um mich gegen die eben erwähnte Gefahr und Irrtum zu schützen — und suchte, auf einem Beine bei jedem Windstoss nackt, die Fortsetzung der Spur. Vom zweiten Felsen aus fand ich sie schnell, deponierte hier mein kleines Perspektiv, lief vom Anstieg zurück und setzte dann munter den Weg über den Schnee fort. Alles Sichtbare weiss, alles Schnee, Schnee, Schnee! Der Horizont in Nebel gehüllt. Kein Ton. Leichenstill. Da hörte ich auf einmal, nach der langen Ruhe für die Ohren, selbst erschreckend, ein wunderliches, tiefes Schnarchen rechts von mir im Nebel. Wie angewurzelt hielt ich. Kuorr, Kuorr — tönte es jetzt auch links. War es ein tückischer Berggeist! Nur einen Sekundenteil hatte die milde Fantasie die Herrschaft — dann kam der nüchterne Verstand an die Reihe und sagte: Am Ziel der Wünsche, dieses sind Alpenschneehühner." Vielemale wiederholten die Tiere den so höchst eigenartigen Ton, den ich am besten mit jenem Geräusch vergleichen kann, welches entsteht, wenn man gleichzeitig das Wort Kuorr (einsilbig) spricht und dabei schnarchend die Luft ausathmet. Natürlich machte ich Halt; markirte genau den Platz, we ich stand (um nicht die Spur zu verlieren!) und durchbohrte mit bewaffnetem Auge den Nebel — vergeblich, zu fern waren die geliebten Tetraonen und zu dicht der Nebel! Also weiter! Ich gelangte noch an eine Stelle, woselbst die Reuss sichtbar wurde, einen greulichen Strudel bildend, durch welchen die überlagernde Schneemasse zerstört war. Nur einige Quadratmeter gross war das Loch im Schnee. Da schimmerte wieder etwas Graues, Unbestimmtes am Horizont auf. Das Hospiz? Ach nein, es war eine sog. Cantoniera, ein vollständig eingeschneites Haus, dessen Dach zerbrochen, dessen Thür vom Schnee eingedrückt, und auf dessen leerer Diele ein hoher Turm Schnee lag. Ein seltsamer Anblick! Nach einem ziemlich steilen Aufstieg auf eine kleine Anhöhe sah ich in der Abdachung vor mir eine Brücke, es war die letzte der Reussbrücken, die neunte, die Rodontbrücke, unter welcher sogar der Schnee den Fluss überdachte. Vom Wasser war nichts zu sehen noch zu hören! Als ich, ängstlich, meine Vorgänger möchten über die Reuss hinweggegangen sein, der Brücke zusteuerte, sah und hörte ich gleichzeitig ein paar fidele Schneefinken *(Fringilla nivalis L)* welche zu einem Felsblock flogen und sich hier setzten. In einer eisigen Gegend ohne jedes Grün, we nur Schnee — was in aller Welt thun hier diese sonderbaren Vögel? Sie blieben liebenswürdiger Weise solange sitzen, dass ich sie mir gut ansehen konnte, an einer für mich besonders angenehmen Stelle, mit dem festen Boden der Brücke unter meinen nassen Füssen. — Nach meinem Bädecker hatte ich jetzt noch 25 Minuten bis zum Hospiz. In der That passirte ich bald die zweite Cantoniera, in deren Nähe wiederum Schneehühner riefen. Ich glaube sogar, eines gesehen zu haben, doch war mir bei dem Nebel nicht möglich, mich meiner Sache zu vergewissern. Und damals riskierte ich noch nicht, weiter als fünf Schritte meine Spur zu verlassen, um auf der Schneefläche den rätselhaften Tieren und Tönen nachzugehen. Von Minute zu Minute erwartete ich einem der Mönche zu begegnen; sie mussten doch wohl eine Abend-Ronde machen? Aha, da war die Fährte eines grossen Hundes. Gewiss so ein menschenrettender Bernhardiner! Ruhen wollte ich nicht; wozu auch, hatte ich doch die Spur! Der Nebel wurde dicker und dicker. Sehr unbestimmt erschienen graue Körper vor mir; sie nahmen Gestalt an: Häuser! Das Hospiz! Ja in der That: ein verschlossenes, unbewohntes Haus zunächst: *Hotel du Mont Prosa*, bis zum Hochparterre eingeschneit. Daneben ein finsteres Haus, dessen Thür halb offen. Ich trat ein 6¼ Uhr und stieg die Treppe hinauf, da unten Stallung zu sein schien. In einem düsteren Gemache trat mir ein Italiener entgegen. „Bin ich hier im Hospiz?“ fragte ich auf französisch. „Wo sind die Mönche?“ — — Ich erfuhr, dass seit der Eröffnung der Gotthardbahn und des grossen Tunnels der Canton Tessin das Hospiz eingezogen habe, keine Mönche oben seien und er, der Italiener, zur Aufnahme von meteorologischen Beobachtungen dort stationiert sei. Das sind die Folgen, wenn man mit einer alten Auflage von Bädecker reist!! Meine erste Bitte war natürlich, meinen beträchtlichen Kleiddefekt zu nähen, welcher der freundliche Mann auch bald, wenn auch ohne Kunst, nachkam. Sodann trank ich ein Quart roten italienischen Wein und fragte nach dem Abstieg nach Airolo. Hierüber erhielt ich nur dürftige Auskunft, ich möchte vorläufig der Telegraphenleitung folgen, später immer im Thal der Tremola, dann des Ticino bleiben. Eile war nötig, wollte ich den Abendzug nach Italien zu noch erreichen. In 1¼ Stunde gedachte ich unten zu sein. —

Punkt ½7 Uhr trat ich den Abstieg an. Die Telegraphenstangen waren gute Wegweiser; die Spur eines Menschen, der heraufgekommen war, bot weitere Sicherheit. Aber kaum war ich 10 Minuten über den Schnee gelaufen," als die Telegraphenstangen verschwanden — die Leitung mag vom Schnee begraben sein oder unterirdisch oder wenigstens unter dem Schnee weitergehen — und die Spur scharf rechts einem Thale zu bog. Allein der Unselige, dessen Stapfen ich folgte, war offenbar sehr des Weges unkundig gewesen, denn bald lief

die Spur eine Anhöhe hinan, bald dieselbe wieder herab, bald vorwärts, bald rückwärts. So bedauerte ich nicht, dass sie gar bald sich ganz im Schnee, vom Schnee überweht, verlor, sah ich doch die steilen Schneefelsenwände vor mir, in denen die Gotthardstrasse laufen musste, in deren tiefster Tiefe die Tremola, ein reissender Gletscherbach, fliessen musste. So lief ich flink und längst mutig geworden, zu laufen auf Schnee, we vordem, soweit sichtbar, kein Menschenfuss gewandelt, die Abhänge schräg herab, stets hoffend, bald die erwünschten Sockel der Strasse zu erblicken. Ja, ja, da waren sie. Nur frisch darauf zu. Ich erreichte die Strasse: als ich aber meinen Fuss auf sie setzte, ergriff mich ein Schaudern; eiskalt lief es mir den Rücken hinunter. Soeben mit den letzten Sätzen war ich auf dem Schnee über die Tremola gesprungen, welche gerade an der Stelle, we die Strasse freilag, von dieser überschritten wurde! Nur auf wenige Schritte war die Strasse frei. Alles von Schnee bedeckt. Der Nebel hatte sich Gott sei Dank etwas verzogen, so dass ich wieder blauen Himmel und eine gute Strecke vor mir her die Situation übersehen konnte. —

Das Val Tremola ist ein sehr enges Thal mit himmelanstrebenden jähen Felsen jederseits, natürlich alles schneebedeckt. In der Tiefe der Tremola, unsichtbar, unhörbar, ganz von hohlen Schneegewölben überdacht. Ich ging jezt „links“, das heisst rechts hatte ich die Thalsohle und linker Hand die Bergwand. Die letztere war recht steil, so dass ich nicht mit Gehen auskam, sondern minutenlang mit der linken Hand in den Schnee stechen musste, um eine weitere Stütze zu gewinnen. Immer noch nichts von der Gotthardstrasse wiederzusehen! Immer steiler wird die Wand. Ich konnte nicht mehr in der bisherigen Weise mit Hand und Fuss gehen. Nein, ich musste mich umdrehen, so dass ich, mit dem Gesicht dem Schnee zugekehrt, mit den beiden Fuss-spitzen in den Schnee einstiess und so seitwärts kriechend auf allen Vieren mich langsam weiterbewegte. Die beiden Ferngläser hatte ich jederseits auf einer Schulter, die Riemen über dem Rücken durcheinander geschränkt. Auf hundert Gänge sah ich einen Felsen hervorragen. Da wollte ich ausruhen. Rüstig weiter. Einen Augenblick musste ich halten, da ich einen heftigen Wadenkrampf infolge des ungewohnten muskelanstrengenden Gehens bekam. Weiter, weiter. Da habe ich den Felsen. Gottlob. Ich krieche hinein zwischen zwei Stücke und klammere mich fest. Es bröckelt, der Stein hat keine Festigkeit.

„Die Steinart ist so weich und mürbe, dass man sie mit den Fingern von den Felsen abblättern und zu Staub zerreiben kann“ Andreae l. c. S. 107

) Aber ich kann doch sicher etwas niederkauern, in das abtropfende Wasser mich setzen, um mich umzusehen. Allerdings macht das Thal Tremola hier eine kleine Drehung. Aber nichts ist von der Strasse zu sehen; gar nichts. Doch zweihundert Schritte weiter ist wieder ein Fels, vielleicht sehe ich dort etwas? Viele hundert Fuss geht die schräge glatte Lawinenschneewand über mir bis in die wolken- verhüllten Felsgipfel der Bergriesen; viele hundert Fuss geht die schräge glatte Lawinenschneewand unter mir bis zu der schneeverhüllten reissenden Tremola im Thale! Ich muss weiter! Steiler und steiler ward die Wand; erschöpft musste ich häufiger pausieren; da giebt links unter dem Fusse der Schnee etwas nach, ich trete fester hinein; da bröckelt rechts unter der Hand der Schnee fort.; die blutüberströmte Hand bohrt sich tiefer in das Eis. Weiter, weiter. Ein heftiges Zittern überkommt die Glieder, besonders die Füsse. Wieder giebt der Schnee nach, links oben, unten rechts. Ich verliere den Halt. Mit letzter Kraft reisse ich mich herum. Liege auf dem Rücken. Sause das Thal hinab. Ein lautes Hilf Gott" durchdröhnt die Schlucht. Im Hinabrutsch passierte ich einen Stein, die Hand packt unwillkürlich danach. Durch den Anprall in's Rollen versetzt, fliegt er, schneller als ich, vor mir in die schräge Fläche hinab. Hören und Sehen vergeht mir. „Hilf Gott“ ertönt es zum zweiten Male gellend. Und nun bedenke, der Du dieses liesest, dass ich 100mal schneller hinabflog, als Du oder irgend sonst wer dieses zu lesen im stände sind. . . .

Wie durch ein Wunder hemmten die Absätze meiner Stiefel, welche ich, wie der Reiter dem Rosse, dem Schnee in die Weichen presste, die tolle Fahrt. Ich rutschte langsamer, ich hielt. — Zehn Schritt vor mir war die Thalsohle, in welcher die Tremola grollend ihre Wasser rollte. Der Stein lag ein wenig eingesunken auf der Decke. Warum flog ich nicht so weit? — Wäre ich auf den Hohl-wall, der den Gletscherbach überwölbte, geflogen, so hätte unter dem durch die enorme Geschwindigkeit sehr verstärkten Anpralle gewiss das morsche Schneedach nachgegeben, ich wäre von der Tremola fortgerissen — unter dem Schnee und in dem eisigen Wasser gleichzeitig erfroren, erstickt und ertrunken.... Gottlob athmete ich, fühlte, einem sonderbaren Gefühle folgend, zuerst nach den beiden Perspektiven (deren eines nicht mein eigen), nach Uhr, Portemonnaie — alles in Ordnung, auch der Hut auf dem Kopfe. Dann blickte ich nach oben. Mehrere hundert Fuss sicherlich oberhalb sah ich den Felsen, bei dem und in dem ich soeben gerastet! —

Durch diese wunderbare wilde und doch sanfte Thalfahrt war ich dorthin gelangt, wohin ich musste, in die Tiefe des Thaies Tremola. Munter förderte ich meine Schritte, sicher über den Schnee dahinschreitend. Nun kreuzte ich bald die Gotthardstrasse, die darauf wieder für längere Zeit verschwand. Noch eine kleinere Gefahr war zu bestehen. Als ich die Strasse nach manchem kühnen Schneelauf wieder erreicht hatte, musste ich, um weiter zu kommen, über die Brüstung derselben auf den durch die oben geschilderte Spalte getrennten, gegenüberliegenden Schnee springen. Jedoch war die Entfernung reichlich, und der Schnee an der Stelle, we er an die Spalte grenzt, leicht begreiflicherweise unsicher. Ich nahm einen Anlauf, so kräftig ich konnte, und warf

mich längelangs mit dem Kopfe möglichst weit nach vorne auf das andere „Ufer.“ Es gelang; unter den Füssen bröckelte der Schnee ab — den Körper hielt der Schnee! —

In der Verlängerung des Val Tremola, weit, weithin sah ich hier einen ausgedehnten See, tiefblau und ähnlich aussehend wie der Zuger See vom Rigi aus; als ich einem gegendkundigen Franzosen davon später erzählte, behauptete er, ich hätte auf eigenartig beleuchtete Wolken herabgeblickt, ein See sei dort nicht zu sehen. Endlich erreichte ich ein längeres schneefreies Stück der Gotthardstrasse, gelangte nunmehr in das Thal des Tessin und passierte bald die für mich erste Cantoniera *„di val Tremola“* (nach Bädecker: dritte, so waren No. 1 und 2 wohl unter dem Schnee begraben!). Das Tessinthal führt den unheilkündenden Namen *Volle Leventina* (Lawinenthal) und rechtfertigt ihn in der That Denn an den steilen Felsen und Bergesabhängen lagern überall die mächtigen Schneestürze, Reste der hier gefallenen Lawinen, bisweilen mit Steinen, Schutt und Geröll untermengt. Noch eine gefährliche Kletterpartie über einen solchen Schneesturz und ich hatte weithin, von unbedeutenden Schneefällen abgesehen, die in sehr zahlreichen Schlangenwindungen absteigende Gotthardstrasse vor mir, welche ich rüstigen Schrittes abwärts verfolgte. — Für die Instandhaltung und Schneereinigung dieser Gotthardstrasse

Geschichtliches über die Gotthardstrasse enthält in sehr angenehmer Form Buddeus, Schweizerland. 2. Teil, S. 302 ff. Leipzig 1853.

) hat vor Bau des grossen Tunnels der Canton Tessin ein jährliche Ausgabe von 30—35000 Franken gehabt; es ist sehr leicht begreiflich, dass man jetzt den stolzen Bau ganz verfallen lässt; wandeln doch nur sehr wenige jetzt noch über den Bergriesen, we es so äusserst bequem ist, im comfortabeln Salonwagen, auf weiche Polster gestreckt, im Munde die duftige Havannah zur Abwehr gegen die schlechte Luft, welche trotz Patentschlusses aus dem Tunnel ins Coupee dringt, in nicht ganz 20 Minuten die unterirdische Strecke von last 15000 Metern zurückzulegen! — Den heftigen Durst unterwegs stillte ich mit dem köstlich-reinen Hoch-gebirgsschnee; dieses sowohl wie überhaupt die ganze Tour ist mir ausgezeichnet bekommen! Ornithologisches hörte und sah ich auf dem Abstieg absolut nichts. Abends 10 Uhr 25 Minuten langte ich in Airolo im Hotel an. —

Man wird diese Exeursion jedenfalls gewagt nennen; doch bitte ich zu berücksichtigen, dass keine Silbe von den Schnee-massen in meinem Bädecker (Aullage 15)

[Auch i. d. neuest. 22. Aufl. (1887) figuriert immer noch das Hospiz! Lov.]

) stand und dass ich, einmal oben, mit grösserer Gefahr den Rückweg als den Weitermarsch unternommen haben würde. Keinen Moment bedauerte ich unterwegs, allein zu sein: zwei hätten sich nach der gedankenlos angenommenen Tradition aneinander gebunden und zweifellos wären zwei bei dem Bergsturz nicht im Gleichgewicht geblieben, sondern kopfüber in die Tremola gestürzt. Ob mir ein „Alpenstock“ — ohne Griff, eine ungewohnte Stütze für den Flach- länder — und „Alpenstiefel“ genützt hätten, ist mir sehr zweifelhaft. — Wie dem auch sei, der dreiundzwanzigste Mai Eintausend-achthundertachtundachtzig wird stets zu meinen interessantesten Erinnerungen gehören! —

IV.

Nach einer köstlichen Nacht fuhr ich morgens 5 Uhr weiter im Tessinthal über Bellinzona, schon inmitten von Kastanienwäldern, Maulbeer- und Feigenbäumen, auf der immer prächtigen Gotthardbahn nach Lugano, über den Luganer See, vorbei an den imposanten Bergriesen Monte Generoso und Monte San Salvatore, weiter nach Como. Hier ging ich sogleich an Bord und fuhr über den schmalen schönen See, liess das berühmte Bellagio rechts liegen und stieg in Mennaggio an Land. Vögel traf ich auf dem Comersee nicht. Eine tramwayartige schmalspurige Eisenbahn führt die Passagiere in Kürze nach Porlezza, Endstation des Luganersee. Dieser See trägt einen sehr ernsten Charakter, hoch steigen die dunkelbelaubten Berge aus den dunkeln Fluten an, wenige Ortschaften finden Platz an dem schmalen Gestade. Der Comersee hingegen ist viel freundlicher, von hunderten von Villen umkränzt, deren auch auf den einzelnen Bergen eine Menge zerstreut liegen. Auf der Fahrt nach Lugano hatte ich das besondere Glück, eine weitere, für mich neue Alpenspecies sicher beobachten zu können: den Steinadler *(Aquila fulva)*. Ein altes rostbraunes Exemplar schwebte in majestätischem Fluge über dem See, in herrlichen grossen Schraubenlinien spielend. Einmal umpflog er in einer solchen Kurve den ganzen Gebirgsstock des Salvadore, des „Rigis Oberitaliens.“ Wohl eine gute halbe Stunde tummelte er sich in der Luft bald über den Bergen, bald über dem See; dann flog er geradlinig den Alpen zu. — Unser Schiff hatte inzwischen Lugano angelaufen und fuhr nunmehr um den mehrgenannten Monte San Salvadore in den nördlichen taschenartigen Teil des Sees, an dessen Ende in Pontetresa, einer kleinen italienischen Stadt, die Reisenden von Bord sogleich zur Bahn übergehen, um dem Lago Maggiore zuzueilen. Die kleine Eisenbahn bis Luino ist von einer überraschenden Schönheit: sie folgt der wilden Tresa, einem kleinen verwegenen Gebirgsbach, der sich den Weg durch kastanienbewachsene Hügel und Vorberge bahnt. Eigentümlich wirkt das matte Grau der zahlreichen Olivenbäume auf den dieses Anblicks Ungewohnten.

Nur die Bahn, keine Strasse daneben, läuft in dem engen Thal, welches eine Gebirgslandschaft en miniature darstellt. Von Luino fuhr ich allsogleich mit dem Dampfer über den Lago Maggiore, vorbei an reich mit reifen Orangen beladenen Spaliers. Wunderbar weich wehte ein echt italienischer Wind, obwohl der Abend schon weit vorgeschritten war. Lichter erglänzten auf den seligen Inseln des Grafen Borromeo. Nachtigallengesang ertönte von dort und von den Ufern. Um 9¼ Uhr landete ich in Pallanza. In den Arcaden, dem Strande nahe, spielten zwei Italienerinnen auf Violinen das Finale einer Verdi'schen Oper, ein alter Mann accompagnierte auf der Zither. Ringsum standen in drei Reihen eine bunte Menge Volkes, nichts thuend, den wonnevollen Tönen lauschend: eine italienische Nacht! —

Der 25. Mai war ein besonders feierlicher prächtiger Tag. Azurblau leuchtete der Himmel, azurblau lag der schöne See da. An dem seichten Gestade schaukelten Gondeln mit schneeweissen Leinendächern — das war der erste Blick, den ich vom Balkon meines Zimmers in der Frühe genoss. Baldigst setzte ich mich in eine Gondel und fuhr, von einem Vollblut-Italiener gerudert, hinüber zu den borromäischen Inseln. Der Mann konnte glücklicherweise französisch, so brachte ich doch einiges über die Ornis der Gegend aus ihm heraus. Er erzählte mir, im Herbste sei der See von vielen verschiedenen Enten besucht, welche die Fischer mit sehr grossen Flinten, in einem Boote einzeln liegend, en masse schössen (also ganz à l'anglais!). Möven *(Lar. ridibundus)* brüteten am See nicht sehr zahlreich, da ihre Eier gegessen würden. Dass es sich nur um die Lachmöve handelte, ging deutlich aus der charakterisierenden Bemerkung meines Gondoliere hervor, sie hätten im Sommer schwarze, im Winter weisse Köpfe. Als wir soeben die Isola S. Giovanni passiert hatten, flog eine Sturm-rnöve *(Lar. canus)*,

[Ich hätte *L. Audouini Payr* erwartet, indess war kein Zweifel, dass ich die sehr oft früher an der Ost- und Nordsse beobachtete Sturmmöve, welche Haumr für den *fago maggiore* schon nachgewiesen hftt, vor mir hatte. Lev.]

) einen Flintenschuss vor dem Kahne her. — Bald landeten wir an der südlichen Insel Isolabella, einem Juwel, auf dem Palmen, Orangen, Lorbeern, Magnolien, Gedern vom Libanon, nordamerikanische Korkeichen, üppigster Epheu, Oleander und viele andere südliche Pflanzen in tropischer Pracht im Freien gedeihen. Eine Unmenge Eidechsen *(Lac, agilis)* belebte die Terrassen und Grotten. Schildkröten krochen träge - über den Rasen dahin. Ein mannigfaltiges Vogelconcert erfreute mich, der ich fürchtete, in dem vielgetadelten Italien überhaupt keine Cantatores zu finden. Mehrere Nachtigallen *(Liiscinia vera)* und Singdrosseln *(Tnrd. musicas)*, ein Laubsänger *(Phyll. trochilus)* und zahlreiche Spatzen (leider nicht Passer *italiae*, sondern *domesticus)* stellten die Fröhlichkeit dar; ein Paar Turteltauben *(Turtur risorius)*

(Diese Art und nicht *auritus!* Sie lebt ganz verwildert auf der Insel, wie auch Herr Oberamtmann Nehrkorn einige Zeit nach meinem Besuch feststellen konnte. Lev.]

) gurrten melancholisch; phlegmatisch rief ein Kuckuck *(Cuc. cantorus)* aus einer Magnolie, während ein Puter zornig drein-kollerte. Auf lsola Maclre traf ich dieselben Arten noch reichhaltiger an, auch *Er. rubecida, Hyp. icterina, Sylvia hortensis*, welch letztere übrigens lsola bella auch belebte. Ein Paar Goldfasanen und mehrere Paare halbverwilderte Jagdfasanen *(Phasianus pictus et colchicus)* liefen in dem dichten Unterholz umher. Nachdem ich die Wunder der Inseln alle geschaut, gondelte ich langsam um die lsola dei Pescatori gen Pallanza zurück. — Am Nachmittage genoss ich die herrliche Fahrt auf dem *Lac majenr* zum zweiten Male. Bald entschwand die Simplonstrasse mit ihren schneebedeckten Bergriesen den Blicken; die lieblichsten Landschaften wechselten schnell Alle Gelände waren reich mit goldgelben reifen Orangen geschmückt, welche stellenweise an Grösse unsere stärksten Apfelsinen übertrafen. — Von Locarno, der Vaterstadt jenes berühmten „Bettelweibs“, genoss ich aus der Höhe der Madonna del sasso noch einmal einen Totalblick über den Lago Maggiore, indess die Sonne zur Rüste ging und die Schneegipfel der Alpen in rosiges Licht hüllte. Nicht programmmässig blieb ich in Locarno bis Abends ½9 Uhr, da ich mich, durch die Aussage eines Herrn verführt, nach Römischer Zeit anstatt nach Berner zum Bahnhof aufmachte und den Nachmittagszug verpasste (Bern ist Rom um 20 Minuten voran). So musste ich, um keinen Tag zu verlieren, die Nacht durch mit einen Express die Gotthardbahn zurückfahren, — durch den Gotthard dieses Mal! — um in Altorf um 4 Uhr Morgens den Train zu verlassen und mich gen Fluelen zu wenden. In Altorf spektakelten die Vögel schon munter, soeben bei Morgengrauen und schöner Alpenbeleuchtung. Doch war keine interessante Speeles darunter. Von Fluelen wandelte ich auf der Axenstrasse eine Strecke weit, wurde aber bald durch einen leichten Regen zurück zum Boote getrieben, auf welchem ich in recht empfindlich kühler Luft über den *Lac de quatre cantons* nach Luzern dampfte.

Nach üblicher Besichtigung der Merkwürdigkeiten schlenderte ich zu dem kleinen zoologischen Cabinet des Präparators S. Stauffer in unmittelbarer Nähe des „Löwen“ und des Gletschergarten. In einem gut belichteten Räume stehen, zum Teil malerisch angeordnet und meist gut gestopft und erhalten, eine Anzahl von charakteristischen Alpentieren, von denen uns zunächst die Vögel interessieren. Mit Ausnahme einiger Jagdfalken *(Falc. gyrfalco)* ist das Habitat sämmtlicher Stücke die Schweiz Ein prächtiger alter Lämmergeier *(Gyp. barbatus)*, nach Angabe Girtanners (*l. c*) ein # nach dem Katalog des Besitzers ein # neben einem

jüngeren #, beide aus dem Canton Graubünden, 1859 und 1861 geschossen, fallen sofort in die Augen. *Strix passerina* mit flüggen Jungen, und *St. giu* aus der Umgegend der Stadt, verdienen Beachtung. Das erste von Vogel beschriebene Nest von *Nuc. caryocatactes*, dem so viel Staub aufwirbelnden Tannenhäher, mit einem Jungen (leider auch im Nestkleide, nicht in Volldunen) aus dem Schächenthal im Canton Uri, ist von Stauffer gefunden und wird als kostbares Heiligtum in seinem Cabinet aufbewahrt. Ein interessantes Nest von *Pyrrhoc. alpinus* zeigte mir Strauffer. Er hat es auf einer gefahrvollen Expedition vor 20, 30 Jahren vom Pilatus geholt. Sechs Mann hielten das Tau, an dem St. in eine enge Felsenschlucht herabgelassen wurde. Unten angekommen, sah sich St. vor einer abfallenden Felsenspalte, in welche er mit Hülfe einer schnell beschafften kleinen Leiter gelangte. Auf dem freien Boden dieser stand, ein selbstständiger, nicht angelehnter kleiner Hochbau auf dem Gestein, das Nest mit dem vollen Gelege. Ängstlich krächzten die Alten in der Luft während der Entnahme ihrer Brut. Das Nest selbst oder besser die innerste Portion desselben hält noch 3/.t Fuss im Durchmesser; es besteht aus einer homogenen Masse rotbraunen Bastes, ganz so wie es Girtanner (*l. c. p.* 293) beschreibt. Stauffer hat manchem seltenen Schweizervogel in die Wochenstube geschaut, worüber die jungen Mauerläufer *(Tick, muraria)* und Alpensegler *(Cyp. melba)* u. a. Zeugnis ablegen. Eine Menge Sumpf- und Schwimmvögel ist auf dem Vierwaldstätter und anderen Schweizer Seen erbeutet, unter welchen jedoch keine Species sich befand, die Prof. Moesch in seiner citierten Avifauna nicht anführte. — Dem Besucher wird ein Verzeichnis der Sammlung in die Hand gedrückt, welches haarsträubend von Druck- und andern Fehlern wimmelt. Der freundliche Besitzer würde den Wert seiner hübschen Sammlung, welcher jeder des Wegs ziehende Ornithologe einen Besuch abstatten wird, wesentlich erhöhen, wenn er einen systematisch geordneten Katalog drucken Hesse, in welchem die heutigen Tages gebräuchlichen wissenschaftlichen Namen korrekt verzeichnet ständen. —

Um die ersehnten Alpenkrähen selbst zu sehen und in freier Natur zu beobachten — lebend hatte ich sie bis dahin nur beim sei. Pastor Thiene mann in Zangenberg bei Zeitz gesehen, als ich ihn vor Jahren im Herbste besuchte — steuerte ich baldigst wieder über den See nach Iiergiswyl, um von hier den Pilatus, der in glänzender Beleuchtung klar vor Augen lag, zu erklettern. Doch schon eine Viertelstunde nach begonnenem Aufstieg musste ich mein Vorhaben infolge eines Wolkenbruchs aufgeben. Ein aussichtslos schlechtes Wetter hielt an, somit reiste ich am selben Tage noch weiter auf der Entlibuchbahn nach Bern, nachdem ich zuvor durch das Drahtseil mich auf den Gütsch hatte heben lassen, um Luzern aus der Vogelperspektive zu sehen. — Den Besuch des Luzerner naturhistorischen Museums, obenso wie den des Baseler und der grossen Naturalienhandlung von G. Schneider in Basel versparte ich mir aus Zeitmangel auf einen zweiten, hoffentlich etwas langsameren „Flug durch die Schweiz.“ — Von Bern besah ich nur flüchtig das zoologische Museum, die städtischen Sammlungen; die ornithologische Sammlung ist nicht bedeutend, die Schweizer Ornis ist abseits für sich aufgestellt. Mehrere Falsa in den Etiketten fielen mir auf. In der Mitte der Säule ist eine höchst mangelhafte Eiersammlung aufgestellt, in welcher ein sehr fragliches Bartgeierei (??) thronte,

[Dieses Exemplar erschien mir wegen seiner eigenartigen Schalenstructur als fraglich. Mittlerweile hat G. Schneider (Monatsschrift 1889, S. 143) darauf hingewiesen, dass es von Meissner in Bern dem Eileiter eines in der Schweiz geschossenen Geieradlers entnommen ist. (Meissner, Mus. Naturgeseh. Helvetiens. 1820, S. 59, No. 8.) Um das Ei messen zu können, goss man es seiner noch weichen Schale wegen mit Gyps aus. Das Ei ist von Schinz (Beschr. u. Abb. künstl. Nest, und Eier d. Vög. Zürich 1819) beschrieben und abgebildet. (Vergl. auch meine „Antwort“ auf Schneidens Kritik, Monatsschr. 1889, S. 269.) Lev.]

) nicht weit von einem Misteldrosselnest mit 4 Eiern unter der Bezeichnung: *Nucifraga caryocatactes!!* — Von Bern ging's nach Bienne (Biel), woselbst die längste Drahtseilbahn (über 900 m) den Reisenden hinauf nach einem Hotel zieht, von dem eine Prachtaussicht über die Gesammtalpenkette, das ganze Berner Oberland mit Jungfrau, Finsternaarhorn, weiter bis zu den höchsten Spitzen Mont Blanc und Monte Rosa den erstaunten Blicken sich bietet.

Mit der Jurabahn, einer auch interessanten, oft durch sehr romantische Thäler führenden Trace, gelangte ich via Sonceboz, Délémont, Basel spät am Abend des 27. Mai wieder in Strassbürg an, um eine Fülle der wechselvollsten interessantesten Erinnerungen reicher.

Zum Schluss muss ich wohl einige Worte der Entschuldigung und Rechtfertigung dafür sagen, dass ich die Erlebnisse meiner Reise mit solcher Ausführlichkeit, besonders die Gotthardpartie, in einer ornithologischen Zeitschrift mitgeteilt habe. Jedoch ist es meiner Meinung nach auch für weitere Kreise nicht uninteressant, einmal die Schwierigkeiten und Gefahren mitzuerleben, welche heutzutage überall demjenigen begegnen werden, der sich zur Aufgabe gesetzt hat:

Ein Studium der europäischen Vögel in freier Natur.

Strassburg i. E., Anfang Juni 1888.

Vignette

Druck von F. Hessenlaud in Stottin.

On the Oriolidæ of the Ethiopian Region.

From 'THE IBIS' *for* APRIL 1870.

By R. B. Sharpe, F.L.S.

(Plates VII., VIII.)

THE following sketch of the Orioles of Africa has been suggested to me during a recent study of the species in my collection; and as my series is extensive, I trust I may be able to throw some light upon the synonymy of the different species, some of which are involved in considerable obscurity. Mr Gray's 'Hand-list of Birds' indicates ten species of African *Oriolidæ* as having been distinguished by modern authors. This is very nearly correct; but he has omitted *Oriolus crassirostris*, Hartl., apparently a very good species, and he has included *O. moloxita*, Rüpp., as distinct from *O. monacha* (Gmel.), to which I think it may be undoubtedly referred.

I am by no means certain that the results arrived at in the present paper will be acquiesced in by all ornithologists; but I have done the best with the material at my command, and I can only regret that so few of the specimens examined by me have had the sexes accurately determined by collectors. In birds which vary so much as Orioles in passing from the young to the adult stages it is a matter of great importance to know the sexes of specimens; and if collectors would only think of the additional value which information on this point confers on their treasures, they would, I feel sure, more often append a short note, instead of being satisfied with the mere preservation of the skin.

I have adhered in the present essay to the same form of diagnostic table as in my former contributions, notwithstanding that I have received from a few ornithologists sundry objections to this way of distinguishing species. But, in my opinion, it is the very best way of submitting them to a crucial test, as it exacts the definition of some tangible character by which the species may be distinguished from all others; and this style of diagnosis is particularly applicable in the case of African birds, where often so many races of the same bird exist, differing in nothing but size, races which can only be distinguished as *major* and *minor*. These species cannot be shown in a diagnostic table, and are at once resolved into their position of larger and smaller races of the same species, which I believe to be their proper status in the ornithological system.

As far as I can perceive, there are *nine* species of *Oriolidæ* inhabiting the Ethiopian Region; and they are all referable to the genus *Oriolus*

The genus *Oriulia*, Isid. Geoffr. (*of*. Hartl. Orn. Madag. p. 43) is founded on *Oriolia bernieri*, which is said by Prof. Schlegel to he an *Artamia*, and is figured as *A. bernieri* (Faun. Madag. Ois. p. 80, pi. 26) from the original specimen in the Paris Museum.

. Of these I have examined all but one, namely *O. crassirostris*, Hartl., which is only known by the type in the Bremen Museum. Dr. Finsch, however, has most kindly sent me a description of the bird, and added at the same time some valuable notes, to which I shall refer in the body of the paper. I am greatly indebted to Lord Walden and Mr. Blanford for the loan of specimens, and to Mr. Gray for allowing me free opportunities of examining the species in the British Museum.

The African *Oriolidæ* may be divided into two sections:—(1) with the head black—*Baruffius*, Bp.; and (2) with the head orange—*Oriolus*, L. No difference in structure can be found between the types of these two groups; and the so-called genus *Baruffius* is evidently one of those which were so often established by its author on a difference of plumage alone. The following diagnostic table may be of use in determining the various species of African Orioles :—

1. ORIOLUS GALBULA.

Oriolus galbula, Linn.: Rüpp. Syst. Ubers. p. 61 (1845): Hartl. Orn. Westafr. p. 80 (1857): Heugl. Ibis, 1859, p. 341; Peterm. Geograph. Mittheil. 1861, p. 23; J. f. O.1861, p. 163; Orn. N.-O. Afr. i. p. 400: Hartl. Faun. Madag. p. 43 (1861): Gurney, Ibis, 1865, p. 268: Schl. Alus. P.-B. *Coraces*, p. 99 (1867): Layard, B. S. Afr. p. 135. (1867): Heugl. J. f. O. 1868, p. 323: Chapman, Trav. S. Africa, ii. p. 397 (1868): Gray, Hand-l. B. p. 291 (1869).

O. *pileo aureo: rectricibus externis ad basin nigris: tectricibus alarum nigris.*

Hab. in Europâ, et in totâ regione Æthiopicâ.

Adult male. Above rich golden-yellow: wing-coverts black, the cubital coverts with a narrow tip of yellow; primary coverts black, broadly edged with yellow, forming a conspicuous spot; quills black, lighter underneath,

the secondaries edged towards the tip with yellowish-white; tail black, the middle feathers entirely of this colour, with a spot of yellow at the tip, all the other feathers black at the base, yellow towards the tip, the outer feathers having more yellow than black; a spot between the base of the bill and the eye black; entire under surface golden-yellow; bill reddish-brown; feet black. Total length 9 inches, of bill from front 1, from gape 2.2, wing 5.9, tail 3.1, tarsus .8, middle toe .7, hind toe .4.

Adult female. Golden-yellow above, tinged with olive-green; quills and wing-coverts brownish-black tinged with olive-green; tail-feathers marked as in the male, but the feathers olive-green, blackish towards the tip; throat and breast grey, with black stripes; flanks bright yellow, with fainter stripes; loral spot indistinct, dusky; bill brownish-red; feet black. Total length 9.5 inches, of bill from front 1, from gape 1.2, wing 5.9, tail 3.3, tarsus .8, middle toe .7, hind toe .4.

Europe; North-Eastern Africa *(Heuylin)*; Western Africa, Casamanze (*Veireaux*); Natal (*Ayres*); Damara Land (*Andersson, Chapman*); Madagascar (*Hartlaub*).

I have, of course, not entered every bibliographical reference to the present bird in the list above given, but have selected those only which bear upon its occurrence in the Ethiopian region. The descriptions above given are those of a fine pair shot near Paris by Mr. Harting on the 1st of June 1868. Another bird in my collection, shot by Andersson at Ondonga, in the Ovampo Country, on October 30th, 1866, is lighter underneath, with the black stripes much more distinct. Mr. Andersson has not determined the sex; but it would seem to be a young male, as it agrees very well with another specimen from France, so marked in my collection.

2. ORIOLUS AURATUS.

Le Loriodor, Levaill. Ois. d'Afr. t. 260.

Oriolus auratus, Vieill. N. Diet. d'H. N. xviii. p. 194 (1817): Gal. Ois. t. 83 (1825): Swains. B. W. Afr. ii. p. 33 (1851): Bonap. Consp. Av. i. p. 348 (1850): Cab. Mus. Hein. i. p. 209 (1850): Hartl. Beitr. Orn. Westafr. p. 23 (1852); J. f. O. 1854, p. 24 : Müll. J. f. O. 1855, p. 393 : Sundev. Crit. Levaill. p. 53 (1857): Antin. Cat. Ucc. Affr. C.-N. p. 44 (1864): Schl. Mus. P.-B. *Coraces*, p. 101 (1867): Hartm. J. f. O. 1867, p. 94: Heugl. J. f. O. 1867, p. 203; J. f. O. 1868, p. 324; Orn. N.-O. Afr. i. p. 401: Gray, Hand-l. B. p. 291 (1869).

Le Loriot bicolor, Temm. Cat. Syst. Cab. d'Orn. pp. 46, 202 (1807).

O. bicolor, Licht. Verz. Doubl. p. 20 (1823): Hartl. Orn. Westafr. p. 80 (1857); J. f. O.1861, p. 163 : Monteiro, P. Z. S. 1865, p. 93.

O. chryseos, Heugl. Syst. Uebers. no. 294; Naumannia, 1857, p. 433.

"*O. icterus*, Pr. Paul Würt. Icon. ined. no. 50" (*teste* Heuglin, J. f. O. 1867, p. 299).

O. *capite aureo : rectricibus externis ad basin nigris: tectricibus alarum nigris, late aureo marginatis*.

Hab. In Africâ occidentali necnon in Abyssiniâ.

Adult male. Above very rich golden-yellow, a little lighter on the rump; least wing-coverts entirely yellow; lesser wing-coverts black at the base and very broadly edged with yellow, so that the black scarcely shows, the feather nearest the edge of the wing entirely black; primary coverts black, with a few of the smaller feathers tipped with yellow; quills black, light grey underneath—the innermost secondaries broadly, the outer ones more narrowly edged with yellow; primaries with a narrow white edging tinged with yellow; middle tail-feathers black with a yellow tip, the next two on each side black with a little broader edging of yellow, the next feathers for the most part yellow till the last, which are black only at the base; a line of black feathers from the base of the bill to the extremity of the ear-covert, encircling the eye; entire under surface of the body rich golden-yellow; bill brownish-red; feet black. Total length 9 inches, of bill from front 1.1, from gape 1.3, wing 5.5, tail 3.3, tarsus .75, middle toe .7, hind toe .4.

Adult female. Similar to the male, but with the upper surface tinged with olive-green, the rump alone being bright yellow; the quills more dusky-black, and the tail-feathers tinged with olive, where they are black in the adult male; throat and breast whitish, sides of the body, flanks and abdomen yellow, the whole striped with longitudinal lines. Total length 9 inches; bill from front 1.2, from gape 1.35; wing 5.5; tail 3.4; tarsus .8; middle toe .7; hind toe .4.

Young male. Similar to the female, but brighter in colour, the underparts all yellow and the longitudinal stripes more indistinct; bill blackish. Total length 8.5 inches, of bill from front 1.05, from gape 1.3, wing 5.4, tail 2.9, tarsus .75, middle toe .75, hind toe .4.

Senegambia; Casamanze; Bissao (*Verreaux*); Gambia (*mus. R. B. S.*); Niger (*Thomson*); Angola (*Perrein*); North-eastern Africa (*Heuglin*).

3. ORIOLUS NOTATUS. (Plate VII. fig. 2.)

Oriolus notatus, Peters, J. f. O. 1868, p. 132: Cab., Van der Deck. Reis., Vogel, iii. p. 33 (1869): Gray, Hand-l. B. p. 391.

O. auratus, Gurney, P. Z. S. 1864, p. 2: Andersson, P. Z. S. 1864, p. 6: Layard, B. S. Afr. p. 135 (1867): Chapman, Trav. S. Africa, ii. p. 397 (1868) (*nec* Vieill. *ut suprà*).

O. anderssoni, Bocage, Jorn. Sc. Lisboa, 1870.

O. *capite aureo: rectricibus externis omnino aureis*.

Hab. In Africâ meridionali et orientali.

Adult male. Above rich golden-yellow, a little paler on the scapularies; least wing-coverts yellow, with a black shaft down the centre of the feather; cubital coverts black with a broad margin of yellow; primary coverts black at the base, with a yellow edging gradually getting broader towards the tip; quills black, greyish on the underside, secondaries margined with yellow and the outer primaries with white; middle tail-feathers black, with a yellow tip, the two next to the middle tail-feathers black at the base and for the greater part of the inner web, the four outer tail-feathers yellow; a black streak from the base of the bill, passing through the eye and produced to the extremity of the ear-covert; entire under-surface rich golden-yellow; bill brownish-red; feet black. Total length 8 inches, of bill from front 1.1, from gape 1.2, wing 5.4, tail 3.1, tarsus .8, middle toe .7, hind toe .35.

Mozambique (*Peters*); Mombas (*Van der Decken*); Damaraand Ovampo Land (*Andersson*); Angola (*Anchieta*).

This very distinct species was described by Professor Peters from a Tette specimen; but, so far as I can see, the Damara bird belongs to the same species. It forms one of the section of the genus *Oriolus* with the head golden-yellow, and is allied to *O. kundoo*, *O. galbula*, and *O. auratus*, from all of which, however, it is at once to be distinguished by the four outer tail-feathers being entirely yellow. From the first two it is also distinguishable by the yellow edging to the wing-coverts, which in those two species are entirely black; and although *O. auratus* approaches it in also possessing these yellow margins, the colour of the tail at once separates the South-African species.

There can be little doubt that the bird identified by Messrs. Gurney, Andersson, Layard, and Chapman as *Oriolus auratus* is really the present species; and therefore the following observations refer to it. Andersson (*l. c.*) gives the following note on its habits :—

"I have only once or twice observed this splendid Oriole in the southern parts of Damara Land—that is, the mature bird. The young (at least I believe it to be the same bird) is pretty common, but only during the rainy season; for it is migratory. The old bird is extremely shy and wary, and always keeps to the thickest part of the jungle. On and in the neighbourhood of the Okavango River it is, however, more abundant, but still retains its shy habits. In the young bird the iris is brown, legs lead-colour, bill reddish-brown."

Mr. Chapman (*l. c.*) records both this species and *O. galbula*, and observes :—

"Both these species are to be met with during the rainy season, but they are chietly young birds. The adults are rarely met with, and are always excessively wary and shy in their habits, either keeping to the loftiest trees, or the most secluded thickets. At a distance the two species are easily confounded, and the young still more so."

Mr. Layard (*I. c.*), curiously enough, notices the discrepancy between the birds sent by Andersson from Damara Land and the description given by Dr. Hartlaub of *O. auratus*, but does not describe the South-African bird as new. When first I began to investigate the subject I fully believed that for once Levaillant had told the truth, and that in the present species we had the true *Loriodor* (Ois. d'Afr. t. 260). Levaillant distinctly states that the exterior tail-feathers of this bird were entirely yellow; and the present species is the only South-African Oriole which I knew to possess this character. But on the other hand Levaillant states that all the outer tail-feathers, except the outermost one, are for the most part black, whereas in *O. notaius* the *four* exterior rectrices are entirely yellow. The allied Senegambian species, *O. auratus*, agrees exactly with Levaillant's figure and description, except as regards this outer tail-feather, which has the base black; but this portion of the web is generally covered by the tail-coverts, and requires the attention of a more careful observer than we believe Levaillant to have been, to discover the black colour. I can therefore only follow Prof. Sundevall in considering Levaillant's *Loriodor* nothing more than the Gambian bird; and accordingly Vieillot's name must be employed in preference to that of Lichtenstein.

The description and measurements are taken from an adult male in my own collection from Ondonga, Ovampo-land, sent home by the late Mr. C. J. Andersson. The British Museum also possesses a fine specimen collected at Tette by Livingstone, which, coming from the same locality as the type, may almost be regarded as a typical specimen. I therefore give its dimensions along with those of the Damara bird.

The bird recently described by Prof. Barboza du Bocage (*l. c.*) as *O. anderssoni* is evidently of this species.

4. ORIOLUS MONACHA.

Moloxita ou la Religieuse d'Abyssinie, Montbeillard, Hist. Nat. Ois. iii. p. 405 (1775).

Nun Thrush, Lath. Syn. ii. p. 77 (1785).

Turdus monacha, Gmel. S. N. i. p. 824 (1788): Lath. Ind. Orn. i. p. 357 (1790).

Nun Oriole, Lath. Gen. Hist. B. iii. p. 142 (1822).

Oriolus monacha, Steph. Gen. Zool. xiii. p. 193 (1826).

O. monachus, Cab. Mus. Hein. i. p. 210 (1850) : Heugl. J. f. O. 1868, p. 325; Orn. N.-O. Afr. i. p. 402: Gray, Hand-l. B. p. 292 (1869).

O. moloxita, Rüpp. Neue Wirbelth. Vög. p. 29, t. 12. fig. 1 (1835); Syst. Uebers. p. 65 (1845): Gray, Gen. B. i. p. 232 (1845): Bonap. Consp. Av. i. p. 347 (1850): Heugl. Syst. Uebers. p. 31 (1856): Schl. Mus. P.-B. *Coraces*, p. 108 (1867): Gray, Hand-l. B. p. 292 (1869).

O. *pileo nigro: speculo alari albo: rectricibus externis omnino flavis*. *Hab*. in Abyssiniâ.

Head black, as also the entire throat, extending a little way down the breast; upper surface of the body olive-yellow, brighter on the nape, sides of the neck, and rump; wing-coverts olive-yellow, primary coverts black, white at the tip, forming a very distinct white alar speculum; quills black, very light grey on the underside, the inner secondaries olive-yellow on the outer web, the outer ones very light blue-grey; the primaries white on the basal portion of the outer web, and becoming light brown towards the apical portion; tail pure yellow, except the middle feathers, which are olive-green edged and tipped with yellow; under surface of the body bright-golden yellow; bill brownish-red; feet bluish-grey. Total length 9 inches, bill from front .9, from gape 1.1, wing 5.4, tail 3.l, tarsus .8, middle toe .8, hind toe .35.

Abyssinia (*Rüppell, Heuglin, Blanford*).

There can, I think, be little doubt as to the correctness of the above synonymy; and it must be borne in mind that Gmelin founded his species on the description of the *Moloxita* of Montbeillard (*I. c.*), who in his turn described it from a painting forwarded to him by the celebrated Bruce.

The description is taken from a female specimen very kindly lent me by Mr. Blanford, shot by himself at Antalo.

5. ORIOLUS CRASSIROSTRIS.

Oriolus crassirostris, Hartl. Orn. Westafr. p. 266.

O. *pileo nigro : speculo alari albo: rectricibus externis fere nigris : rostro robustissimo*.

Hab. in insulâ Africæ occidentalis 'St. Thomas' dictâ (*Weiss, Mus. Br em.*).

Not having seen a specimen of this bird, I am unable to give a detailed description. I wrote to Dr. Finsch to ask in what respect it differed from *O. larvatus*, and I in due time received an answer, from which I extract the following remarks:—

"*O. crassirostris* is distinguished from its nearest ally *O. larvatus* (1) by the extraordinary thick and broad bill, which resembles that of *Mimeta*; (2) the yellow on the tip of the outermost tail-feather is only 13 lines broad (in *O. larvatus* this colour reaches nearly to the base); (3) the wing-coverts are dark greenish-grey, those on the carpal joint black with dark grey margins. I do not consider the whitish colour of the underparts to be a character, as these parts have evidently been yellow when the bird was alive, and this colour is lost from the specimen having been sent home in spirits. The tips of the tail-feathers and the under tail-coverts are still yellow, although less brilliant. Dr. Hart-laub's description is correct; but I would add that the whole head, including the nape and the entire throat extending to the upper part of the breast, are black, exactly the same as in *O. larvatus*, the hinder part of the neck and the upper part of the mantle are yellowish-white, the remainder of the upper parts greyish olivaceous-green, the upper tail-coverts more distinct olive-green, like the innermost remiges of the second order, the primary coverts have a broad white apex (as in *O. larvatus; maculâ alari parvâ albâ*, Hartl.). From *O. monacha*, Gm. (= *O. moloxita*, Rüpp.), it is also distinguished at a glance by the different colouring of the tail and by the larger and broader bill.

Oriolus crassirostris.

Orinlus larvatus.

"French measure."

In addition to the foregoing remarks, Dr. Finsch sent me a sketch of the bill of the type-specimen of *O. crassirostris*, thus enabling me to give a representation of it along with that of *O. larvatus*.

I may add that Mr. Keulernans tells me that he shot a specimen of this fine Oriole in St. Thomas's Island.

6. ORIOLUS LARVATUS.

Le Loriot à masque noir, Temm. Cat. Syst. Cab. d'Orn. pp. 46, 203 (1807).

Oriolus larvatus, Licht. Verz. Doubl. p. 20 (1823): Bonap. Consp. Av. i. p. 347 (1850): Cab. Mus. Hein. i. p. 210 (1850): Hartl. Beitr. Orn. Westafr. p. 23 (1852); J. f. O. 1854, p. 24: Grill, Zool. Anteck. p. 34 (1858): Gurney, Ibis, 1860, p. 209: Monteiro, Ibis, 1862, pp. 335, 341; P. Z. S. 1865, p. 93: Schl. Mus. P.-B. *Coraces*, p. 107 (1867): Hartm. J. f. O. 1867, p. 95 : Heugl. *torn. cit.* p. 203 : Finsch, *torn. cit.* p. 247 : Heugl. *op. cit.* 1869, p. 327; Orn. N.-O. Afr. i. p. 403.

Le Condougnan, Levaill. Ois. d'Afr. pl. 261.

O. condougnan, Temm. Rec. d'Ois. livr. 54 (1825).

O. capensis, Swains. Classif. B. ii. p. 237 (1857); B. W. Afr. ii. p. 37 (1837).

O. melanocephalus, Des Murs, Lefeb. Voy. Abyss., Zool. p. 169 (*nec* Linn.)

O. monachus, Wagl. Syst. Av. *Oriolus*, no. 7 (1827) (*nec* Gm.).

O. arundinarius, Burchell, Trav. S. Afr. i. p. 464; W. von Müll. J. f. O. 1855, p. 393.

"*Oriolus chloris*, Cuv." Hartl. Orn. Westafr. p. 81 (1857).

? *O. radiatus*, Gm. S. N. i. p. 384 (1788).

? *O.*, sp. indet., Kirk, Ibis, 1864, p. 318.

O. *pileo nigro : speculo alari albo: rectricibus externis ad basin nigris, duabus intermediis olivaceis, duabus proximis ante apicem flavum nigris : major : supra Itete aureus.*

Hab. in Africâ meridionali et in Abyssiniâ (nec in Africâ occidentali).

Adult male. Whole of the head deep glossy black extending down to the breast; nape and sides of the neck rich golden-yellow; whole of the back and scapulars bright yellow, with a slight olive tinge on the latter, and brighter yellow on the rump; wing-coverts black, but so broadly edged with yellow that the black does not show; the outermost cubital coverts edged with grey; the primary coverts black tipped with white, forming a distinct speculum; quills black, the inner web paler, especially in the secondaries; the secondaries broadly edged with yellow on the outer web, those nearest the primaries having also a margin of white, which in the primaries themselves entirely takes the place of the yellow, so that these are edged and tipped with pure white; tail-feathers for the most part yellow, black at the base; as they approach the middle feathers the black colour occupies the most part of the feather, being, however, strongly tinged with olive on those nearest the middle feathers, which are entirely olive-green; under surface of the body brilliant golden-yellow; bill brownish-red; feet black. Total length 9 inches; bill from front 1.1, from gape l.4; wing 5.4; tail 3.2; tarsus .9; middle toe .8; hind toe .4.

Young male. Similar to the old male, but the colours not nearly so pure, with indistinct brown stripes on the feathers of the upper part of the body; head dusky brown; quills brown, edged exteriorly with lighter brown; breast with black longitudinal markings; tail darker olive-green.

Knysna (*Andersson*),Natal (*Ayres*), Angola (*Monteiro*),Northeast Africa (*Heuglin*).

Dr. Hartlaub gives Senegambia as a habitat for this bird on Swainson's authority, and later authors have also assigned this locality for the bird on the same authority; but a careful perusal of the text shows that Swainson only gives a description of it for the sake of comparison with his *O. brachyrhynchus* (B. W. Afr. *l. c.*).

The *Oriolus radiatus* of Gmelin is very often referred to the present species, in my opinion very erroneously, as in no stage of plumage can it be said to answer to the following characteristics :—"*alarum tectricibus remigibusque nigris* margine albo" or "*pedes* flavi, *ungues rubicundi*." The habitat of Gmelin's bird is unknown.

Var. minor.

Oriolus rolleti, Salvadori, Atti R. Accad. Torino, vii. p. 151: Heugl. Orn. N.-O. Afr. p. 404 (1869).

O. personatus, Heugl. J. f. O. 1867, p. 203; 1868, p. 326.

O. brachyrhynchus, Schl. Mus. P.-B. *Coraces*, p. 108 (*nec* Swains.).

O. larvatus, Heuglin, Syst. Uebers. no. 292.

Abyssinia (*Bmn-Rollet, Heuglin*), Angola (*Monteiro, Sala*).

In his work on the ornithology of North-eastern Africa, Dr. von Heuglin states that in a letter to him I said that I believed this race to be a distinct species from *O. larvatus*; but he misunderstood my words. I said that, not having seen an Abyssinian specimen, I could not say for certain, but that I was disinclined to join the two species, because I very much disliked uniting any two species without having personally examined the birds. I, however, wrote to Dr. Finsch on the subject, and he forwarded me the following reply:—

"Of this so-called species I have minutely compared the types in Turin and other specimens, also from the White Nile, in Vienna, and have already expressed my doubts in our work on the ornithology of Eastern Africa (also again in the Appendix). As regards the colours there is, indeed, no difference between it and the South-African *O. larvatus;* this you may depend upon; but commonly the measurements are not so large, the bill especially being a little shorter. I should have considered these differences of specific value, but for the fact that there are intermediate forms, which will not allow one to do so. *O. rolleti* is by no means a representative of *O. lanatus* in North-eastern Africa, as there are specimens as small from Angola and in the Leyden Museum from South Africa (*teste* Schlegel). I consider it therefore nothing more than a small race.

See also the measurements given by Schlegel."

As I have already stated, I have never seen a single specimen from the White Nile

Since the above was written I have seen two examples in the Leyden Museum; and they certainly seemed to agree exactly with the small race from Angola—so far, that is, as I was able to judge without the actual

comparison of specimens.
; but having some Angolan specimens now before me, I am able to give a series of measurements showing the difference in size between this and *O. larvatus*.

I have endeavoured in the above table to compare, as much as possible, individuals of apparently the same age; and the result confirms the conclusion of Dr. Finsch as regards Angolan and South-African birds.

7. ORIOLUS BRACHYRHYNCHUS. (Plate VIII. fig. 1.)

Oriolus hrachyrhynchus, Swains. B. W. Afr. ii. p. 35 (1837) : Bonap. Consp. Av. i. p. 347 (1850): Hartl. Beitr. Orn. Westafr. p. 24 (1852); J. f. O. 1854, p. 24; Orn. Westafr. p. 81 (1857); J. f. O. 1861, p. 162: W. von Müll. J. f. O. 1855, p. 392: Sharpe, Ibis, 1870, p. 57.

O. *pileo nigro: spcculo alari albo : rectricibus externis ad basin nigris, quatuor intermediis omnino olivaceis*.

Hab. in Africâ occidentali.

Head glossy black, likewise the throat, extending a little way on to the breast; upper surface of the body deep olive-yellow, brighter yellow on the nape, sides of the neck, and rump; wing-coverts of the same colour as the back, inner cubital coverts edged with olive-yellow, the two or three outer ones edged with grey; primary coverts black, tipped with white, forming a distinct white alar speculum; quills brownish-black, quite white on the inner web, the inner secondaries bright olive-yellow on the outer web, the outer ones grey, with a narrow outer edging of white, primaries edged with white on the outer web; the four middle tail-feathers olive-yellow, the outer ones olive-yellow at the base, bright golden-yellow at the tip preceded by a bar of black; entire under surface rich golden-yellow; bill brownish-red; feet black.

Female or young. The two middle rectrices olive-yellow, the two next with a black bar before the yellow tip.

Sierra Leone (*Swainson*), Fantee (*Mus. R. B. S.*), Gaboon (*Verreaux*).

Oriolus baruffii, Bonap. Consp. Av. i. p. 347 (1850) : Hartl. J. f. O. 1854, p. 24: Schl. Mus. P.-B. *Coraces*, p. 109 (1807): Sharpe, Ibis, 1869, p. 383. (Plate VIII. fig. 2.)

Oriolus intermedius, Temm. MS. in Mus. Lugd. (*teste* Hart-laub) : Hartl. Beitr. Orn. Westafr. p. 24 (1852, *descr. nulla*); Orn. Westafr. p. 81 (1857) (*descr. orig.*); J. f. O. 1861, p. 163 : Cass. Proe. Phil. Acad. 1859, p. 43.

Baruffius intermedius, Bonap. Coll. Delatttre p. 74 (*fide* Hart-laub).

Head deep black, likewise the throat, extending a little way on to the breast; upper surface of the body olive-yellow, brighter on the nape, sides of the neck, and rump; wing-coverts of the same colour as the back; inner cubital coverts edged with olive-yellow, the outer ones edged with grey; the primary coverts black tipped with white, forming a distinct alar speculum; quills black, white underneath on the inner web; inner secondaries olive-yellow on the outer web, the outer ones edged with light grey, the primaries edged with white; the two middle tail-

Fig 1. Oriolus Nigripennis *Fig* 2. 0. Notatus

Ibis 1870. Pl. VII. J.G. Keulemans. lith. M. & N. Ranhart imp

Fig. 1. Oriolus Brachyrhynchus. *Fig*. 2.0. Baruffii

Ibis 1870 Pl. VIII J.C. Keulemans. lith M.&N. Hanhart, imp

(Aus den Museen in Bremen, Güttingen und Kiel.)

Die nachfolgenden Notizen, unsere zweite Materialsansammlung für das Studium der Albinos, wurden in den Universitätsmuseen zu Göttingen und Kiel und in den Städtischen Naturhistorischen Sammlungen zu Bremen auf einer Heise im Herbst 1887 gesammelt. Für freundliche Unterstützung bei der Herbeischaffung der Objecte, sowie für anderweitig liebenswürdiges Entgegenkommen sind wir den Herren Prof. Dr. Brandt in Kiel, Dr. G. Hartlaub und Director Dr. Schauinsland in Bremen, sowie Prof. Dr. Ehlers in Göttingen zu Danke verpflichtet. — In der Aufzählung, aus welcher je ein Stück aus der Bremenser und Göttinger Sammlung zu Gunsten eines späteren Beitrages vorläufig fortgelassen ist, bedeutet „B“ Bremensische, „G“ Göttingensche, „Ki“ Kieler Sammlung. Einige Exemplare aus unserer Sammlung sind mit „Coll. Lev.“ eingeführt, ferner einige briefliche Notizen unseres Freundes H. Wiese in Schönkirchen Uber Albinos aus der Umgebung Kiels

ausserdem verwerthet. Von Litteratur ist nur ein kurzes Essay aus der St. James' Gazette mitgetheilt, um es in einem ornitliologischen Fachblatte aufzubewahren. — Denjenigen Arten, welche in unserem ersten Verzeichnisse

Ueber Farbenvarietäten bei Vögeln. I. Aus den Museen in Hannover, Hamburg und Kopenhagen. Cab. Journ. f. Ornith. 1887. p. 79 ff.

noch nicht genannt sind, ist in dieser Liste ein Stern (*) beigefügt. —

1. *Neopliron perenopterus* Savig.*

G. Kirchhoff Coll. Adult: Khartum. A. E. Brehm. Rein weiss.

2. *Strix flammea L.*

G. a) # Kirch hoff Coli. Januar 1857. ‚A. Smith.‘ Die alte Etikette trägt in Chr. Ludw. Brehms Zügen die Aufschrift: „*Strix Kirchhoffii nobis* # Jan. 57. Madrid.“ — Schleier, mit Ausnahme eines konischen Flecks vom Auge bis zum Schnabel abnehmend, und Unterseite silberweiss; ebenso die Tarsusfedern. Oberbrust wolkig isabell, Oberseite recht hell. Auf den Flanken ganz wenige schwarze Punkte. (Cf. Nauniannia 1858. p. 219.)

b) # Kirchhoff Coll. 12. October 1856. Nienburg. Durch eine Katze gefangen. „E. Kümmel“ (Praep? Lev.) ‚A. Smith.‘ Wie Exemplar a), nur der Schleier mehr braun, weniger weiss. Ausserdem sind in der Göttinger Sammlung noch 2 normale Schleiereulen aufgestellt, deren eine unterwärts dunkel, deren andere heller gefärbt ist.

Ki. c) Boie Coll. 1856. Orig. No. 781. Eutin 1843. Dunenjunges, aber schon Federkleid. Auf dem Rücken wenig, auf der Unterseite und dem Kopfe viel Dunen. Flügellänge 10,5" engl, gegen die Normallänge des alten Vogels von 11,8" bis 12" nach Sharpe Brit. Cat. II, 294 ff. Das Exemplar ist rein silberweiss, ohne irgend eine Fleckung! Die Ohrendeckfedern spielen sehr wenig ins Gelbliche. — Ist dieses die normale Färbung? Wir finden in der Litteratur fast nichts über den Fall, wobei wir allerdings bemerken, dass wir die 177 Citate, welche der fieissige Sharpe im Katalog zusammenstellt, nicht alle habe nachlesen können. — Buffon giebt zwar an: Die Jungen sind ganz weiss in der ersten Lebenszeit (dans le premier âge) — und gut zu essen am Ende der dritten Woche (!) [Hist. nat. gén. et part. Tom. XVI, p. 370. 1770. Quartausgabe.] Naumann (Nat. Gesch. Vög. Deutsch. I, p. 486. 1820) schreibt: An den jungen Vögeln sind alle Farben viel blasser, sie fällen, besonders am Unterleibe, sehr stark ins Weisse, die braunen Punkte an der Brust sind kleiner und hier fehlen die weissen ganz. Im Text zu Bädecker s Eier der europäischen Vögel (1855, zu Taf. 42) heisst es: die Jungen haben lange, sehr weiche Daunen, die auf dem Oberkörper giau, auf dem Unterkörper weiss und un-getleckt sind. Chr. L. Brehm bemerkt in seinen „Schleierkäuzen“ (Naumannia 1858. p. 214) nur: Die Jungen sind im Dunenkleid mit weissem Flaum bedeckt. — Die bisher angezogenen Citate sind desshalb nicht zu gebrauchen, weil in ihnen kein genauer Unterschied zwischen Dunenkleid und Nest(-feder)kleid gemacht wird. Als erster thut dieses R. Bowdier Sharpe (1875 l. c.) indem er sagt: Nestjunges bedeckt mit rein weissen Daunen, die Federn im Gesicht röthlich, die der Halskrause theilweise weiss mit schwach orangefarbenen Spitzen, Primären orange mit grauen Enden, Secundären deutlicher graugefleckt. Die Beschreibung des jungen Vogels ‚on leaving the nest‘ fängt an: ‚Hauptfärbung oben orange‘ — und ist fern von der Kürze der Beschreibung unseres Exemplars „reinsilberweiss“. Diese Angaben sind die genauesten, welche wir gefuuden; in Brehms Thierleben, einer Menge von Naturgeschichten, z. B. auch Seebohms History of Brit. Birds, ist gar nichts mitgetheilt, oder nur referiert aus Werken, die wir schon berücksichtigten. Riesenthal (Raubvögel 1878. 517) giebt den Nestjungen „gelblich weissen Flaum, aus welchem in der 3. Woche die Federn hervorsprossen, auf dem Kopfe blaugraue etc. Unser Exemplar hat mindestens ein Alter von 3 Wochen erreicht. Wie dem auch sei, oh *Albino*

Hans Graf von Berlepsch, der uns in Kiel zu ornithologischen Arbeiten besuchte, als wir gerade an dieser Zusammenstellung schrieben, pflichtete uns bei und sprach das Kieler Exemplar für einen echten Albino an.

Lev,

oder nicht, angeregt möchten wir haben die Frage nach den ersten Kleidern der Schleiereule, die uns nicht hinreichend studiert zu sein scheinen. —

Schneeweisse Spielarten führen Naumann (t. c. p. 466) und Giebel (Landw. Zool. 1869 p. 295) an; wir selbst berichteten über eine solche in unseren ersten Farbenvarietäten. (1. c. p. 79.)

3. *Hirundo rustica*, L.

B. a) Orig. No. 2521. # juv. 28. August 1874 von Ottersberg bei Bremen. — Gesammtcolorit: duff; oberwärts schwärzlich. Kehle hellbräunlich, Brust dunkelbräunlich.

Coli. Lev. b) # ad. Gronau a/L., Provinz Hannover. Von A. Mejer erhalten. Im Anfang der 80er Jahre erlegt. Oberseite mit Ausnahme der Stirn silberweiss. Unter den Oberschwanzdeckfedern einige mit braunem Anfluge. Stirn, Kinn, Kehle rostroth-normal; Unterseite rothbräunlich-normal. Axillaren weiss mit rothbräunlichen Federspitzen; Flügel reinweiss, Basen der Decken bräunlich. Schwanzfarbe bräunlich, die Querbinde vorhanden, weisse Spitzen. Füsse und Schnabel normal.

4. *Hirundo urbica*, L.

G. a) In Spiritus conserviert. Reinweiss.

Ki. b) Orig. No. 1390. Plön 1866. Von Fontenay. Rein-silberweiss. Schnabel und Füsse gelbweiss. Iris roth.

c) Orig. No. 1389. Eutin 1843. Reinweiss. Wie manche ausgestopfte und aufgestellte Vögel der Kieler Sammlung durch Schimmelpilzsporen stellenweise bräunlich überlaufen.

d) Kiel. 1880. Von Prof. Heller. Reinsilberweiss. Flügellänge von: b) = 5# engl., c) = 4,5#, d) = 4,1#. „Eine weisse Schwalbe war vor einigen Jahren bei Heikendorf, bei Kiel.“ (H. Wiese in litt.)

5. *Cotyle riparia*, (L.)*

G. a) Ein Exemplar aus der „Alten Göttinger Sammlung" mit der Aufschrift: *„Chel. urbica“*. Reinweiss.

Coll. Lev. b) (Im Fleisch.)

Im Herbst 1887 schwärmten Tausende von Uferschwalben auf der Colberger Heide, einem Sumpfgebiete, nordöstlich von Kiel in Schleswig Holstein, über welches wir eingehend in unseren, Ornithologischen Excursionen im Frühjahr 1886’

In Monatsschrift des deutschen Vereins zum Schutze der Vogelwelt. Band XI. 1886. p. 258 ff

berichteten. Die Schwalben rüsteten sich offenbar zur Abreise. Sie flogen so sorglos, dass ein Hütejunge mehrere mit seiner Viehpeitsche im Fluge todt geschlagen hatte. Auf das vorliegende weisse Exemplar machten zwei andere Schwalben Jagd und hackten mit dem Schnabel nach ihm; dabei riefen sie ji ji. Alle drei streckte ein Schuss. (Sie sind alle in der Coll. Lev.) Das Geschlecht des Albinos konnte von E. Werner, dem wir ihn verdanken, nicht constatirt werden, da das Stück zu zerschossen war. Die Iris war nicht roth, sondern dunkelbraun. — Flügel und Schwanz sind rein weiss, auf dem Kücken und der Unterseite sind scheinbar überall die normalen Farben vertreten. — Mehrfach kamen weisse Uferschwalben und andere Schwalben in England vor. [Alb. in Bds. in St. James's Gaz. Oct. 25. 1887.]

6. *Cuculus canorus*, L.

Nur ein authentischer Fall eines theilweise weissen Kuckucks ist aus England bekannt. [Alb. in Bds. in St. James's Gaz. dat. cit.]

7. *Sturnus vulgaris*, L.

B. a) Orig. No. 2761. Aus Deutschland. Die beiden Flanken sind gewöhnlich gefärbt: grün metallfarben mit weissen Federspitzen; im Uebrigen ist das Exemplar einfarbig hellbraun, nur der Schwanz, die Oberflügeldecken und die Ohrgegend ist ein wenig dunkler.

G. b) Kirch hoff Coll. Nienburg. Unterwärts schlohweiss, jede Feder mit deutlich geschiedenem noch hellerem Endfleck, wie beim normalen. Dadurch erhält die Unterseite ein getropftes Aussehen. Die Unterschwanzdeckfedern tragen isabellfarbene Spitzen. Schwanz reinweiss. Oberflügeldecken, Oberschwanzdecken mit isabellfarbenem Anflug an den Rändern, dies bei letzteren stärker als bei ersteren. Flügel weiss, die Secundären mit isabellfarbenen Rändern. Auf Stirn, Kopfseiten oberhalb des Auges, Nacken, Oberrücken jede Feder getropft, wie beim normalen Herbstkleid. Unterrücken weiss. Die Schäfte der Stirnfedern dunkel. Füsse gelb. Oberschenkel an Basis und Ende bell hornfarben, unterseits dunkler.

Ki. c) Orig. No. 1518. Kiel # 1. October 1848.

Matt isabellfarben. [Unrein wie *Hir. urb.*: Ki. c.] Füsse dunkel-hornfarben; Oberschenkel dunkel; Unterschnabel an der Basis hellgelb, an der Spitze wie Oberschnabel.

d) Reinweiss. Schwanz abgestossen; ob aus Gefangenschaft? Füsse hellhornfarben. Schnabel bis auf die Firste, welche dunkler ist, gelb. [Unrein wie *Hir. urb.*: Ki. c.]

Einzelne völlig weisse Exemplare, welche ihre regelmässige dunkle Augenfarbe bewahrten, in England angemerkt. [Alb. in Bds. in St. James's Gaz. d. c.]

8. *Lycos monedula*, (L.)

Ki. Reinsilberweiss. Füsse und Schnabel blassgelb.

Während der Jahre 1885—1887 wurden viele Fälle von weissen und scheckigen Dohlen in England notirt. [Alb. in Bds. in St. James's Gaz. d. c.]

9. *Corvus cornix*, L.

B. a) Exemplar aus Bremen. Wahrscheinlich Hybrid von *corone* und *cornix*. Keine reguläre Nebelkrähenbefiederung. —

Coll. Lev. b) # ad. Steenby Mölle, Insel Fünen, Dänemark; 15. Januar 1864. (Aus der Benzon'schen Sammlung.)

Kopfseiten und Nacken weiss, ins Bräunliche ziehend; Rücken, Brust und ganze übrige Unterseite reinweiss. Kopf, Kinn, Kehle, Oberbrust dunkelbraun, fast schwarz. Vom Kopfe zum Nacken geht diese Farbe in das Weisse der Oberseite über, so zwar, dass die Federn vom Schwarz immer mehr verlieren, zuerst an der Federbasis, dann an der Mitte, zum Schluss an den Enden. Die schwarzen Federschäfte erhalten sich noch eine Zeit lang auf dem Nacken. — Unterrücken braun weiss, zum Schwanz hin dunkler werdend; analog wie bei der Kopfzeichnung bekommen die zum Rücken hin sitzenden Federn zunächst braune Spitzen; das Braun dehnt sich auf den beiden Federseiten aus — nur ein fahler Saum bleibt ringsum; die dem Schwanz unmittelbar auf liegenden Federn sind fast ganz braun. — Flügel braun, die Aussenfahnen weisslich, von der dritten Primäre an alle. Kleine Flügeldecken dunkelbraun, grosse heller mit fahlen Säumen. — Schwanz dunkelbraun.

Die letzten Secundären und einzelne Caudalen zerschlissen. — FUsse und Schnabel schwarz.

Coll. Lev. c) Aus der Gefangenschaft. Längere Jahre im Zoologischen Garten zu Kopenhagen gehalten, starb 1871.

Bei diesem jüngeren Vogel, dessen Gefieder durch die Gefangenschaft gelitten hat, ist die Anordnung des Colorits wie bei b). Alles was dort braun und dunkelbraun, ist hier rostbraun. Die Vertheilung des Weiss ist dieselbe. Füsse und Schnabel hornbraun. Die Schnabelfedern sind bei diesem Exemplar braunweisslich, indess sie bei No. b) braunschwarz sind.

Bei den hier beschriebenen Exemplaren b) und c) ist die Anordnung der Farben insgesammt nicht von der, wie man sie beim normalen Vogel findet, verschieden: normal grau — hier weiss; normal schwarz — hier braun.

10. *Corvus frugilegus*, L.

Gilbert White sagt, dass ihm in England während einer langen Reihe von Beobachtungsjahren nur ein Fall von einem Albinismus bei Vögeln, „bei denen ererbter oder eigener Leucismus viel seltener [als bei Vierfüssern] vorkommt“, und zwar bei einer Saatkrähe begegnet sei. Er fand in einem Neste zwei junge milch-weisse Saatraben, deren Schnäbel, Beine, Füsse und Nägel ebenfalls milchweiss waren- Leider giebt er nichts über die Farbe der Iris an. — Eine junge Saatkrähe, cremefarben, mit weissen Beinen und Schnabel, wurde 1885 in Dumfriesshire gefunden; ihre Augen waren bläulich. Diese Färbung kommt bei unzweifelhaften Albinos gelegentlich vor. [Alb. in Bds in St. James's Gazette, d. c.]

11. *Corvus corone*, L.

„Eine weisse Krähe hielt sich im Herbst 1887 bei Dobersdorf — nicht weit von Kiel — auf.“ (Wiese in litt:)

12. *Pica caudata*, (Boie).

B. a) Orig. No. 2778. Reinweiss, etwas schwarz auf dem Schnabel; aus Bremen.

Ki. b) October 1856. Von Renard. Reinweiss; Schnabel und Füsse gelb. [Unrein wie *Hir. urbica*. Ki. c.]

Coll. Lev. c) # ad. Liselund, Insel Moen, Dänemark; November 1861. (Aus der Benzon'schen Sammlung.)

Die beim normalen Vogel dunklen Parthien sind matt fahlbräunlich; die Färbung der reinweissen Unterbrust und des Bauches ist gegen die fahle Farbe des Reste der Unterseites zum Kopfe hin scharf abgesetzt — wie beim gesunden Vogel. Schenkel und Aftergegend sind noch einen Ton fahler als die Kehle und Oberbrust. Schwanz, Flügel, Flügeldecken reinsilberweiss. Kopfseiten wie Kehle. Oberseite vom Kopf bis zum Rücken silbergrau, auf dem Oberhaupt etwas in's Fahlbraune spielend. Rücken matt braun. Oberschwanzflecken wie Unterschwanzdecken. Schnabel und Füsse schwarz. —

Dieses Exemplar ist, wenn man so sagen darf, ein typischer Elsteralbino. Derartige Stücke findet man in vielen Sammlungen. Es wäre interessant zu eruiren, ob Exemplare mit Rückschlag zum normalen Colorit schon beobachtet sind. Auch ein anderes Moment ist bei Albinos von *Pica caudata* regelmässig: ein eigentümlich zerschlissener Schwanz, wie ihn unser Exemplar c) in allen Schwanzfedern aufweist.

Coll. Lev. d) Orig. No. 2204. Nestjunges. [#? durch Section nicht genau ermittelt H. v. B.] Long. tot. 325 mm. Pupille röthlich. Am 14. Juni 1876 bei Schloss Berlepsch bei Witzenhausen in Hessen von Hans von Berlepsch geschossen.

Dieses interessante Exemplar, welches wir der Güte unseres Gönners, des glücklichen Schützen, verdanken, zeigt schon ganz schwach jenes für Elsteralbinös charakteristische Colorit, das wir soeben beschrieben. Die Kehl- und Oberbrustfärbung ist ein äusserst mattes, nicht in jeder Lage sichtbares Weiss-chamois; die Grenze zum Weiss der Unterbrust ist zu erkennen. Unter- und Oberschwanzdecken, Kopf, Kopfseiten, Nacken, Oberrücken von derselben Farbe wie die Kehle. Schwanz und Flügel und grosse Flügeldecken matt fahl gelblichbraun. Die kleinen Flügeldecken und die Mitte des Rückens sind reinsilberweiss, so dass dieses Weiss im Fluge auf der Oberseite ein Hufeisen bildet, dessen offene Seite zum Kopfe hinsieht. — Die Schwanzfedern sind erst halb entwickelt Füsse und Schnabel gelb.

13. *Muscicapa grisola*, L.*

B. Total weiss; Mühlenthal.

14. *Accentor modularis*, L.*

Im Jahre 1885 wurde in Irland ein Nest normaler Eltern mit drei vollausgefiederten weissen Jungen gefunden. Ihre Augen waren so verkümmert klein, dass sie als ganz unbrauchbar bezeichnet werden mussten: gewiss ein Fall von echtem Albinismus.

[Albinism in Bds. in St. James's Gazette d. c.]

15. *Troglodytes parvulus*.*

G. Kirch hoff Coll. Von Helgoland. Normale Grösse. Die ersten 4 Primären reinweiss jederseits. Auf dem Hinterkopfe bis zum Nacken ein 12 mm langer, 10 mm breiter rein weisser Fleck.

16. *Merula vulgaris, Leach*.

Scheckige und reinweisse, letztere meist mit tiefblauen Augen (cf. supra bei *C. frugilegus*) sind in den letzten zwei Jahren so oft vorgeführt, dass dies Vorkommen in England nahezu gewöhnlich genannt werden darf. [Alb. in Bds. in St. James's Gaz. d. c.]

B. a) Total weiss.

b) Orig. No. 2548. Aus Bremen. Stirn, Ober- und Unterseite, einige Schwanzfedern und etliche Schwungfedern weiss, im Uebrigen normal gefärbt.

c) Altes #. Reinschwarz, nur auf dem Oberkopf 2,2 cm vom Schnabel beginnend ein reinweisser Fleck von 2,2 cm Länge, 1,4 cm Breite. Ki. d) Helgoland 1842.

Oberseite fahlbraun, auf dem Kopf dunkler; Flügel hellfahlgelb; Kinn, Kehle weisslich, letztere mit braunen Federspitzen. Brust wie Kopf, Bauch heller, jeder Feder Basis weisslich, Oberende bräunlich. Ohrfedern glänzend fahlbraun. Schnabel und Füsse hellgelb. c) # Helgoland 1844.

Auf dem Nacken ein weisses Band von etwa 10 mm Breite. Ueber dem linken Ohr einige weisse Federchen, Uber dem rechten ebenfalls aber weniger. [Auch hier das Weiss unrein wie *Hir. urb*. Ki. c.]

17. *Merula torquata*, (Boie.)

B. a) Orig. No. 2544. Nacken weiss; Gesichtsseiten und Oberkopf weiss gefleckt.

Coll. Lev. b) Ein Exemplar aus Ditmarschen vom November 1885 in einer Wildhandlung in Kiel gekauft, woselbst zu der Zeit sehr viele Ringamseln feil waren, in einer Kiste an einem Tage 50 Stück; wenige *pilaris*.

Grösse und Färbung normal bis auf einige wenige reinweisse Federn auf den beiden Nackenseiten, rechts deren vier, links eine.

18. *Turdus viscivorus*, L.

Ki. Nacken, Halsseiten, Brust, Bauch, Axillaren, Unterflügeldecken, Primären, Unterrücken, Bürzel — reinweiss. Am Steiss etliche schwach rostfarbene Tupfen. Oberkopf, Kinn, Kehle isabellin, jede Feder mit dunklerem Schaft. Brust besonders nach den Seiten hin, Flanken rostbraun, jede Feder mit lichterem Rande, welchem wieder ein schmaler dunklerer Saum folgt. Oberrücken dunkel-rothbraun. Schnabel und Füsse hellgelb.

19. *Turdus musicus*, L.

Ki. a) Oberseite, Schwanz, Flügel fahlbraun, isabellenfarben, zum Schwänze hin heller, die Aussenfnhnen der Schwingen heller. Ein deutlicher Augenstreif. Unterseite (in ähnlicher Weise wie unten bei *Van. cristalus*) in der Anordnung der Zeichnung normal, nur haben alle Tropfenflecken die isabelline anormale Farbe. — b) Ein sehr merkwürdiges Exemplar: die Flecken auf der Brust vollständig normal, nicht ganz dunkel, aber nicht heller, als man sie bei vielen gewöhnlichen Stücken vorfindet; die verwaschene Fleckenzeichnung auf dem Bauch und dem Steiss normal. Dagegen ist Kinn und Kehle schneeweiss: eine einzige Feder auf letzterer trägt die Andeutung eines Tropfenfleckens. Der ganze Kopf, der Nacken, die Schenkel, einzelne Deckfedern, die 3. und 5. Primärschwinge, ferner die Aussenfahnen der Bastard-, 2. und 4. Primäre und eine Secundärschwungfeder reinweiss. Der Schwanz etwas fahler als normal. Der Rest der Oberseite graubraun mit einzelnen weissen Federn untermischt. Die Flankentropfung wie beim Bauch. Der Rest der Schwingen mattbraun. — Füsse, Schnabel hellgelb.

Das Colorit von Ki. b) muss als eine starke Aberration von den gesunden Verhältnissen bezeichnet werden.

20. *Harporhynchus Palmert*, Coues.*

Ki. Mexico 1856. Durch J. G. W. Brandt, Naturalienhändler in Hamburg. Balg.

Völlig normales Kleid bis auf die Oberseite des Kopfes, auf welcher oben 4 oder 5 kleine weisse Federchen sitzen, auf dem Scheitel zwei etwas grössere weisse Federn, über dem linken Auge eine kleine weisse Feder und auf dem Hinterkopf eine braune Feder mit weissem Ende. —

21. *D andalus rubecula*, (L.)*

Ein rein weisses Exemplar aus England, dessen Kehle und Brust allein die normale rothe Färbung zeigte. [Alb. in Bds. in St. James's Gaz. d. c.]

22. *Motacilla alba*, L.

B. Orig. No. 2659. Vom Solling. ‚Pallide fulvescens‘ über und über; creme-farben.

23. *Alauda arvensis*, L.

B. a) Ein Exemplar aus Oberneuland bei Bremen, im Fleisch von uns Ende October 87 im Bremer Museum gesehen. Oberseite dunkelgelb; Unterseite weiss; Füsse hellgelb; Iris normal graubraun. Im Nacken einige regulär farbene Federn.

G. b) # Nienburg. Kirchhoff Coll. 1877. Ganz weiss mit isabellfarbenem Anflug, nur Oberkopf, Zügel und Ohrgegend dunkler.

Ki. c) Orig. No. 13. 22. September 1842.? Vunbel. (Balg.)

Flügel, Schwanz, Oberseite (Kopf, Rumpf, Bürzel), Bauch reinweiss, Flügeldecken schwach ins Mattgelbe ziehend, desgleichen ein wenig stärker Kehle und Brust. Schnabel und Füsse hellgelb.

Einige wenige weisse Lerchen wurden in Grossbritannien constatirt. (Alb. in Bds. St. James's Gaz. d. c)

24. *Emberiza citrinella* aut *miliaria*, L.

„Am 2. September 1887 wurde bei Bisperode am Ith eine fast weisse junge Gold- oder Grauammer geschossen.“ (Haus Kam-lah in litt.: Fide Hans von Berlepsch.)

25. *Passer domesticus*, (L).

Ki. a) Orig. No. 1655. Eutin, a. 1843. Dunkelisabellfarben. Unterseite heller. Schnabel und Füsse hellgelb.

b) Orig. No. 1656. # Kiel. 19. December 1847. Oberkopf, Unterbrust, Bauch, Unterschwanzdeckeu, einzelne Federspitzen auf dem Nacken, Rücken, die Oberflügeldecken — reinweiss. — Das Schwarz von Kinn und Kehle, der rothbraune Zügel und ebensolche Streifen zur Schulter hinab sind angedeutet durch zerstreute schwarze resp. röthliche Federn; die weisse Fitigelbinde ist vorhanden. Schnabel und Füsse hellgelb.

c) # Kiel 1887. Ganze Unterseite schmutzig grau, auf dem Bauche einzelne ganz weisse Federn. Oberkopf und Nacken intensiv weiss, mit einzelnen schmutziggrauen Federchen untermischt. Auf dem Rücken am Ende einzelner Federn und mitten auf ihnen weisse Parthien. Die Flügelbinde ganz undeutlich und unvollständig. Füsse und Schnabel normal.

d) Orig. No. 1654. Oldenburg, a. 1851. Kinn, Kehle, Brust, Axillaren tiefschwarz. Oberbauch, Unterschwanzdecken, Bürzel schwarz mit sehr feinen bräunlichen Rändern. Zwischen den beiden Beinen ein rein weisser Fleck. Auf der weissen Fitigelbinde etliche schwarze Fleckchen. Auf den Gesichtsseiten, fast bis zur Schulter hinab, die schwarzen Federn mit Weiss gefleckt. Auf dem Rücken viele der braunen Federn auf der einen Fahne schwarz und zwar auf der rechten Körperseite vornehmlich die linken, auf der linken Seite die rechten. Primären fast schwarz, an den Enden der Secundären braune Flecken, braune Streifen auf den Fahnen dieser Federn, ebenso auf denen der Flügeldecken erster Ordnung. Schnabel und Füsse gelb. — Dieses sehr merkwürdige Exemplar widerlegt zunächst die von Naumann (IV. 458) aus- gesprochene Meinung: dass schwarze oder braunschwarze Sperlinge in freier Natur nicht vorkämen, denn es leidet keinen Zweifel, dass dieser *Passer russatus* draussen erlegt ist. Wäre er in Gefangenschaft gewesen, so würde das Gefieder nicht so tadellos im Stande sein; auch würde wohl eine Notiz auf der Etikette stehen. — Ferner ist es interessant, dass an ein und demselben Stück Melanismus und partieller Albinismus und theilweises Verschwinden der regulären Färbung (z. B. an der weissen Binde) sich vorfindet. —

e) „Ein weisser Spatz ist hier bei Schönkirchen (bei Kiel) früher gesehen worden. Junge Spatzen haben hier häufig einzelne weisse Federn, die sich bei der nächsten Mauser verlieren.“ (II. Wiese in litt:) Nicht selten ganz weisse in England. [Alb. in Bds. in St. James's Gaz. d. c.]

Coll. Lev. f) Orig. No. 1793.

ad. Cassel. Von Theod. Spillner in Cassel im Sommer 1871 gekauft durch Hans von Berlepsch. Ganzer Kopf und Nacken weiss und braun gescheckt, da zwischen den regulären braunen Federn sowohl reinweisse inserirt sind, als auch braune mit weissen Enden. Von Bug zu Bug zieht sich ein besonders links stärker entwickeltes weisses Band. Rücken mit zahlreichen weissen, etwas ins Isabellfarbene ziehenden Federn durchsetzt. Oberschwanzdecken gelblichweiss. Auf den Kopfseiten, unter den Wangen etliche weisse Federn. Schnabel und Füsse normal. —

26. *Passer montanus*, Briss.*

G. a) „Alte Sammlung.“ Isabellfarben.

b) Im Fleisch in Spiritus erhalten; war längere Zeit lebend in Gefangenschaft gewesen. Reinweiss.

c) # Kirchhoff Coll. Gelbe Varietät. Kopf, Hals, ganze Unterseite regulär; oberwärts sanft verblichen,

besonders Schwanzdeckfedern und Schwanz.

27. *Ligurinus chloris*, (L.)

Ein weisser Nestvogel in England beobachtet. [A.V. in Bds. St. James's Gaz. d. c.]

28. *Cannabt'na sanguinea*, Landb.

Ki. Reinweiss. [Unrein wie *Hir. urb*. Ki. c.] Schnabel und Füsse hellgelb.

29. *Turtur deeipiens*, Hartl. et Finsch.*

B. Reinweiss.

30. *Tetrao urogallus*, L.

G. a) # sehr alt. Hahnenfedrig. Januar 1857. Jemtland, Schweden. Eierstock und Oviduct sehr deutlich entwickelt gewesen. (*Tetrao mandatus* Chr. L. B r e h m). Brust metall-stahlgrtln.

b) # sterilis. Im Uebergang zur Hahnenfedrigkeit. Herbst 1850. Helsinglaud. Die braunen Brustfedern tragen metallgrüne Spitzen.

31. *Tetrao medius*, Mey.

G. a) b) Ohne Etiketten. Ganz schwarze Schnäbel.

c) # Kirch hoff, Coll. Wermeland, Schweden.

Wir führen die in den Museen aufbewahrten Exemplare des Hackelhuhns mit auf, als constante durch dieselbe Kreuzung entstehende Farbenvarietäten.

32. *Phasianus colckicus*, L.

Ki. #. Orig. No. 2008. Kinn, Kehle, Zügel, ein Streifen Uber dem Auge, Stirn reinweiss. Auf Kopf, Nacken, Oberflügeldecken, Rücken, Rumpf haben viele regulär gefärbte Federn breite — von 1 mm bis 30 mm — reinweisse Ränder, so dass der Vogel gescheckt aussieht. Das Abweichende liegt in der verschiedenen Grösse dieser Ränder und ihrer reinweissen Farbe. Schwanz, Füsse, Schnabel normal. Scheckige und weisse Varietäten kommen in England häufig vor.

(Alb. in Bds. in St. James's Gaz. d. c.)

33. *Star na cinerea* (L).

B. a) Aus Bremen, a. 1874. Jugendkleid. Reinweiss.

G. b) Juv. Kirch hoff Coll. Nienburg. Das Exemplar, dessen Schwanz so eben hervortritt, ist über und über isabellfarben. Flügel dunkler; jede Feder zeigt die typischen weissen Sc haft striche und dieVorzeichungder dunklen Querbänder. (cf. infra bei *Vanellus cristatus*.) Kehle ganz weiss.

Ki. c) # Reinweiss. Füsse und Schnabel hellgelb, die Spitze des Oberschnabels nahezu weiss.

d) Orig. No. 2643. Thüringen, a. 1885. Von Tetzner. Stirn, Streifen rings um's Auge, Zügel, Backen, Kinn, Kehle einfarbig isabellbraun; jedoch auf der Kehle etwas heller, am Kinn nahezu weisslich. Die ganze Brust gleichmässig melirt; jede Feder an ihrem distalen Ende mit 6 bis 8 quer verlaufenden, durch feine bräunliche Punkte auf den einzelnen Ramis entstehenden Miniaturbändern. Auf der Mitte des Bauches zwei intensiv rosa-roth gefärbte Flecken. Der Rest der Unterseite weiss, Unterschwanzdecken bräunlich. Die obere Seite: zunächst der Stirn eine quer verlaufende weisse Linie, welche sich jederseits über dem Auge fortsetzt und, der Medianlinie zustrebend, sich über das Ohr hinzieht. Ohrfedern glänzend rehbraun. Unter ihnen ein dreieckiger weisser Fleck. Oberkopf braun mit dunklen Schäften, welche bei einzelnen Federn schwarz werden, und

kleinen hellen gelblichen Tropfenflecken 1 mm vor dem Ende jeder Feder. Nacken nielirt (aus Graubraun und Weiss). Rücken- und Bürzelfedern mit querlaufenden, von oben nach unten an Dicke wachsenden braunen Querbändern, deren jede Feder mehrere trägt. Vom Nacken bis zum Schwanz nehmen diese Querstreifen vollständig regelmässig zu; während sie unter dem Kopfe nur mit der Lupe zu zählen sind, erreichen sie am Ende des Bürzels einen Querdurchmesser von 1 mm. Schwanz rostbraun. Schwanzdecken duff gebändert. Flügel matt isabellin; lebhaft weisse Schaftstriche. Oberflügeldecken, Flanken breit braun gebändert, weiss am Ende. Axillaren, Unterflügeldecken schneeweiss. Füsse gelbbraun. Schnabel gelb. — Gelegentlich weisse und partiell albinotische Exemplare in England constatirt. (Alb. in Bds. St. James's Gaz. d. c.)

34. *Vanellus cristatus* (L).

B. Weibchen, aus Bremen. Unterseite ganz weiss; Oberseite hell, zum Theil bräunlich; Oberschwanzdeckfedern rostbraun. Das Schwarz der Kehle und der Haube ist duff angedeutet, so dass hiermit wahrscheinlich ein neues Pendant zu den früher von uns beschriebenen Exemplaren von *Stur, vulgaris, Pic. major, Emb. cilri-nella, Pool, cristatus,*

Cab. J. f. O. 1887. p. 79 ff.

Turd. musicus, Star, cinerea,

supra p. 132. No. 33. G. b.

und dem von Dr. J. von Madarász abgebildeten und beschriebenen *Picus major*

Ueber abnorm gefärbte Vögel in der Sammlung des ungarischen National-Museums. In Termöszetrajzi füzetek. Vol. VIII. Part. 3. 1864. Deutsch p. 227—239, uug. p. 187—198. Tafel 6. *Pic. major* pp. 237 und 197.

gefunden ist, bei welchen allen bei der nächsten Mauser eine Wiederkehr des regulären Kleides hätte erwartet werden dürfen. —

35. *Scolopax rusticula*, L.

G. # ad. Kirch hoff Coli. Westfalen.

Schnabel, 65 mm gegen 75—80 mm bei der normalen Wald- schnepfe, ¾ seiner Länge vom Kopf aus gerechnet, hellgelb, der Rest schwarz. Zehen lichtgelb, Nägel schwarz. Kleines Exemplar.

Färbung. Analog der normalen Befiederung, hat dieses Stück dort dunkele Parthien, we ein gewöhnliches Exemplar schwarze bis braune Farben zeigt, so an den Zügeln, dem Oberkopf, dem Rücken, den kleinen Flügeldecken, dem Schwänze. Die ganze Unterseite ist dunkelisabellfarben, die Kehle wie bei der normalen Waldschnepfe weiss. Die Subcaudalen sind tiefer gefärbt. Die Wellenlinien der regulären Färbung der Unterseite sind stärker am Ober- als am Unterkörper angedeutet. Die Sub-alaren und Flankenfedern sind sehr bleich — alles Dunkele des Normalgefieders nur aschfahl. Hals und Stirn wie die Unterseite. Der ganze Rücken isabell bis in's Rothbraune ziehend mit fast ganz weissen Enden. Die grossen Schwingen haben reinweisse Enden, ebenso das Schwänzende. Bürzel und Unterrücken sind rostfarben. — Das Colorit erinnert an *Halcyon coromandae,* Steph.

36. *Gallinago scolopacina*, Bp.*

B. Orig. No. 2940. Vom 12. October 1874. „Iris braun.“ Die Primärschwingen weissgespitzt, im Uebrigen das ganze Gefieder ‚pallide isabellinus‘. Die Subcaudalen bleich rothbräunlich, (pallide rufescentes).

37. *Machetes pugnax*, (L.)*

B. Ein Stück mit reinweissem Kragen.

38. *Anas bosckas domestica*, L.*

Ki. Reinweiss, #, aus Büsum in Holstein; 23. November 1876, fünf Monate alt. —

Dieses Exemplar ist, abgesehen von dem bei Hausenten äusserst häufig vorkommenden Albinismus, durch das Fehlen der Schwimmhäute an beiden Füssen auffallend. Bei übrigens normalen Körperverhältnissen sind statt der Schwimmhäute ganz kurze unbrauchbare Rudimente solcher vorhanden. — Ueber diesen Fall referirte

Herr Prof. Dr. Möbius im Zool. Garten Noll's,

Jahrgang XVIII, 1877, p. 223. 224.

mit dem Bemerken: dass sich die Füsse ohne künstliche Mittel so missgebildet haben müssten. Wir haben durch direkt beim Schenker Herrn Courkamp in Büsum eingezogene Erkundigungen ermittelt, dass die schwimmhautlose Ente ohne Schwimmhäute aus dem Ei geschlüpft ist. Gleichzeitig theilte uns Herr Cour kamp mit, dass eine zweite ebenso missgebildete Ente später in demselben Orte erbrütet sei. — Dagegen wurde vor ca. 6 Jahren auf dem Oute Frankenstein in der Rheinpfalz, laut mündlicher Mittheilung unseres Freundes cand. jur. S. Ritter, eine bis dahin völlig gesunde Hausgans (*Ans. domesticus*) plötzlich an dem einen Fusse krank, konnte nicht mehr gut gehen und schwimmen und gewährte einen trübseligen Anblick. Der Fuss schwoll dick an, wurde völlig gelb und sah widerlich aus. Nach einiger Zeit verloren sich „infolge des Geschwürs“ die Schwimmhäute, so dass die Gans mit einem ‚Hühnerfuss‘ umherlief. Sie schwamm langsamer als in früherer Zeit. Es dauerte einige Wochen, bis der Fuss vollständig heilte und die Schwimmhäute regulär wiederwuchsen. Danach ist die Gans gesund gebliehen. — Auch in der Litteratur ist ein ähnlicher Fall verzeichnet. Herr Obermedicinalrath Dr. G. Jäger

In: Jahresbefte des Vereins für vaterländische Naturkunde in Würtemberg. Band III, 1847. Stuttgart, pp. 209—216.

bespricht in extenso einen solchen, bei welchem es sich auch um eine, übrigens gesunde, Hausgans handelt. Leider konnte Dr. Jäger eine Anamnese nicht erhalten. Die Schwimmhäute waren hier beiderseits nur an den Vorderzehen unvollständig entwickelt, der häutige Lappen der Hinterzehe vorhanden. Wie bei dem Kieler Exemplar deuteten kleine freistehende Ränder an den Zehen die Ansatzstellen der Schwimmhäute an. — Wir erfahren nichts darüber, was aus dem Thiere geworden ist. Dagegen betont Dr. Jäger ausdrücklich, wie auch Prof. Möbius, dass an eine Bastardzeugung zwischen Huhn und Ente resp. Gaus (!) nicht zu denken sei; ersterer mit der fortführenden Bemerkung, dass man weiter an die Bebrütung eines Gänseeis durch eine Haushenne und an dadurch entstandene Veränderungen denken könne — physiologische Unmöglichkeiten, ebenso wie die Verwilderung der von Elstern ver-brtiteten Zwerghühner.

Cf. Monatsschrift des Deutschen Vereins zum Schutze der Vogelwelt. Hand VII 1882 p. 270 sqq. VIII 1883. p. 44. 212.sqq.

Endlich plaidirt Dr. Jäger noch für die Eventualität, dass Gänse besondere Vorliebe für das Land gehabt haben könnten, wenig oder gar nicht aufs Wasser gekommen wären und daher nach und nach ihre Schwimmapparate ein-büssten! — wir halten im Gegensatz zu diesen ‚Erklärungen‘ das Phänomen für ein einfach pathologisches und können uns deshalb durchaus nicht damit' einverstanden erklären, wenn Dr. Jäger als Pendant Missgeburten,

Riecke im Journal für Chirurgie und Augenheilkunde von Walther und Ammon. Band XXXIV, 1845 p. 615.

wie Menschen, deren Finger durch Schwimmhäute verbunden waren, anführt. —

39. *Spheniscus demersus*, (L).*

B. Exemplar aus Angra Pequena, a. 1886. Gesammtfarbe: hell graulich, fahl. Auf dem Rücken die Federschafte dunkel. Der Hals hellbräunlich. Unterflügel fahler. — Dieser sehr interessante Albino erinnert sehr an die schöne Abbildung, welche die Sclater'sche Notiz über eine ‚pale variety‘ von *Eudytes chryso-loplius* Brandt in der Zoology der Challenger Expedition illustrirt. Vol. II. Part. VIII. Aves pl. 29, 1880 p. 127 fig. 2 „pale variety“ (Text: „l'eprinted from P.Z.S. 1878).“

40. *Uria Brünniehl*, Sab.

B. Orig. No. 2370. Grönland; von der 2. Nordpolexpedition, ‚Hansa‘, a. 1870 unter Capitän Hegemann. Reinweiss.

Ein zweites albinotisches Exemplar dieser Species, ein Weibchen, erwähnt Dr. O. Finsch in seinem „dritten Beitrag zur Vögelkunde Grönlands“

In: Abhandlungen, herausgegeben vom Naturwissenschaftlichen Verein in Bremen Band 5, Heft 2, 1877. pp. 343—366.

(p. 363), dessen ‚sämmtliche Handschwingen und deren Decken jederseits reinweiss seien‘.

41. *Hydrochelidon nigra*, Boie.*

G. Exemplar aus Lilienthal. Schlohweiss. Schnabel und Füsse hellgelb.

Für unsere Verzeichnisse neu sind in dem vorliegenden Beitrage Albinos von folgenden Arten beschrieben: *Neoph. perciwpterus, Cot. riparia, Muse, grisola, Acc. niodularis, Trogl. parvulus, Harporh, Palmeri, Dand. rubecula, Pass. montanus, Turt. deeipiens, Gall, scolopacina, Mach, pugnax, An. boschas, Sphen. demersus, Hydrochel. nigra*.

Von den angeführten 80 Exemplaren aus 41 Arten sind manche „rein wirklich albinotisch“, manche „bleichsüchtig, chlorochroitisch“, manche „partiell albinotisch“ oder „partiell chlorochroitisch“ nach der Eintheilung Anton Bogdanow's.

Ca'o. Journal für Oruitli. 1858.

Eine Uebersicht über diese Verhältnisse gedenken wir erst am Schluss unserer Materialsammlungen zu geben. —

Kiel, Ende April 1888. Zoologisches Institut.

Description D'Une Nouvelle Espèce De Perruche

(Trighoglossus Josefinae)
Appartenant Au Sous-Genre Charmosyna,
par M. O. Finsch, D. Ph.
Conservateur du Musée de Brême.

Trichoglossus Josefinae: Capile, collo, corpore inferiore kerme-sinis; macula occipitali obscure cyaneo-lilacina, postice vitla nigra circumdata; dorso, alisque viridibus; ventre, tibiisque nigris, viola-scenle-micantibus; uropygio, hypoebondriisque flavis; rectricibus dua-bus mediis rubris, ceteris viridibus, pogoniis internis rubris, apicibus flavis; macula supracaudali obscure cyanea.

Tête, cou, partie antérieure du manteau et les parties inférieures du corps d'un beau rouge cramoisi, de la même couleur que les couvertures inférieures des ailes et les souscaudales; manteau, épaules, toutes les tectrices et les barbes externes des rémiges d'un beau vert d'herbe; les barbes internes des rémiges sont d'un noir mat; l'aile en dessous noirâtre; une grande tache d'un bleu-lilas obscur couvre l'occiput bordé derrière d'une large bande noire qui commerce en arrière des yeux et couvre la région nuchale; ventre, région anale et côlés des cuisses d'un noir mat avec reflets violacés; les plumes postérieures de la région fémorale avec quelches taches linéaires d'un jaune brillant; creupion et ses côtés jaunes; les parties antérieures des couvertures supérieures de la queue d'un bleu-lilas obscur, prennent une teinte vert-clair en dehors, les parties postérieures des couvertures supérieures cramoisi; les deux rectrices intermédiaires d'un beau rouge-sang se terminent à l'extrémité en jaune; rectrices latérales rouges à la base, plus étendues sur la barbe interne, vertes vers le milieu et le reste d'un jaune vif; bec d'un orange-rougeâtre; tour des yeux nu; tarses rougeâtres avec les ongles noirâtres.

Cette brillante nouvelle espèce se rapproche beaucoup de *Trichoglossus* (Charmosyna) *papuensis*, Gml, mais elle se distingue facilement par ses rectrices médianes rouges, au lieu de vertes, par le croupion jaune, par l'absence de la bande transversale du vertex et par l'absence de la tache jaune à chaque côté de la poitrine; les deux rectrices médianes, si excessivement allongées et rétrécies au *Trichoglossus papuensis* (plus long que 240 mm.) ne sont pas plus longues au Trichoglosse de Josefine que chez les autres espèces; p. e. chez le *Trichoglossus placens*, Tem.

J'ai reçu l'individu unique par Monsieur le comte Ercole Turati de Milan, où il forme partie de l'excellente et célèbre collection ornithologique des frères Turati. M. le comte a obtenu cet individu de M. Laurent De Gréaux, marchand-naturaliste à Marseille, qui l'a acheté à Londres avec deux individus de *Psitacula Gulielmi III*, qui sont aussi en possession des frères Turati. L'indication de la patrie manque, mais je crois que l'oiseau est originaire de la Nouvelle-Guinée. Le Musée de Brème a une intéressante collection d'objets ethnographiques de la Nouvelle Guinée et entre autres aussi une coiffure d'un indigène composée de plumes de différents oiseaux, principalement

Trichoglossus Josefina Finseh

Finsch, Trichoglossus Atti Soc. It. Sc Nat Vol XV Tav 7 0. Finsch. ad nat del. Lit.. L. Ronchi des reclrices de *Trichoglossus papuensis* et de eette nouvelle espèce. M. H. von Rosenberg, célèbre par ses voyages dans la Nouvelle-Guinée, m'a averti que ces coiffures sont particulières aux indigènes de l'intérieur de cette ile. Grâce à

ces renseignements nous pouvons considérer ces contrées comme la patrie de notre jolie espèce. M. H. von Rosenberg n'a pas recueilli cet oiseau pendant ses voyages et M. le professeur Scblegel m'a écrit qu'il n'est pas représenté au riche Musée des Pays-bas à Leyde.

Estratto dagli Atti della Società Italiana di scienze nati? ali. Voi. XV, fase. V,

Milano, 1873.
Tip. Bernrdoni

The Glaciation of Caithness. By B. N. Peach, F.R.S.E., F.G.S., And John Horne, F.R.S.E., F.G.S., Of the Geological Survey of Scotland.
Read before the Royal Physical Society of Edinburgh 20th April 1881, and Extracted from the Society's Proceedings, Session CX., Vol. vi.
Edinburgh: Printed by M'Farlane & Erskine. 1881.

The Glaciation of Caithness.

I. Introduction.

In the course of our annual leave of absence from official work, we visited Caithness in the autumn of 1880, for the purpose of continuing our investigations regarding the extension of the ice in the North Sea in the Glacial period. The results of our previous observations in Shetland and Orkney, which have appeared in the *Quarterly Journal of the Geological Society*

Quart. Jour. Geol. Soc., vol. xxxv., p. 778; xxxvi., p. 648.

point to the conclusion that during the climax of the Ice Age the Scandinavian and Scotch ice-sheets coalesced on the floor of the North Sea, and that a great portion of this ice-field moved in a north-west direction towards the Atlantic. We showed that a careful examination of the *roches moutonntées*, the striated surfaces, and more especially the dispersal of the stones in the boulder clay, compelled us to admit an ice movement from the North Sea to the Atlantic during the primary glaciation. We inferred that the Shetland group must have been overridden by the Scandinavian portion of the ice-field, as the striated surfaces clearly point in that direction; while the presence of Scotch rocks in the Orcadian boulder clay led us to the conclusion that these islands must have been overflowed by the Scotch ice-sheet. Further, we adduced evidence to prove the existence of local glaciers in Orkney and Shetland long after the great *mer de glace* had melted back from the old coast lines of these northern islands.

The glacial phenomena of Caithness have an important bearing on the general question of the extension of the ice in the North Sea, and although they have been described by many writers, we resolved to visit the county with the object of gathering evidence regarding the direction of the ice-flow and the probable physical conditions which prevailed during the accumulation of the superficial deposits. In the sequel we hope to show that in many respects there is a close resemblance between the glacial phenomena of Orkney and those of the Caithness plain. We obtained evidence which shows that the local ice, shed from the hilly ground along the county boundary, moved E., N.E., and N. till it debouched on the plain, where it was compelled to veer round to the north-west in harmony with the general movement in the low ground of the county.

II. Previous Literature on the Subject.

The boulder clay of Caithness has long been celebrated for the abundance of organic remains which are present in that deposit, and its origin has consequently given rise to considerable discussion. The occurrence of marine shells in the boulder clay was first made known by Hugh Miller in the pages of *The Witness* in 1847, where he states that Mr John Cleghorn of Wick and Mr Dick of Thurso had supplied him with shells from their respective sides of the county.

"Rambles of a Geologist; or, Ten Thousand Miles over the Fossiliferous Deposits of Scotland."

The writer of the article also states that, to Mr Dick's chagrin, he had come across an old work, entitled, "Minutes of Observations Drawn Up in the Course of a Mineralogical Survey of the County of Caithness in 1802 by John Busby, Edinburgh," wherein were chronicled several instances of the occurrence of marine shells in the blue clay of Caithness. The survey was made at the instance of Sir John Sinclair.

In his rambles across the county Mr Dick brought to light many localities where this deposit yields marine shells, and blocks of fossiliferous secondary rocks along with chalk flints. He detected the ice-markings on the

rocks at Thurso, and he noted the occurrence of erratics at various points which had travelled far from their parent sources.

See "Life of Robert Dick," by Smiles, pp. 159, 164, 169, 184, 187, 195, 223, etc.

Indeed, his long-continued examinations of the sections from the Thurso river to Freswick burn and southwards to Dunbeath, led him to the belief that the boulder clay, in some way or other, was of glacial origin.

To Mr C. W. Peach, however, geologists are indebted for most of the knowledge we possess regarding the organic remains of that deposit. His residence at Wick for many years afforded him frequent opportunities of making collections of these remains. The results of his observations have been communicated mainly to this Society, and have been published in the Transactions, while some reports were also presented to the Geological Section of the British Association.

See the following papers by Sir. C. W. Peach in the Trans, of the Roy. Phys. Soc., Edin., "On the Discovery of Calcareous Zoophytes in the Boulder Clay of Caithness," vol. i., p. 18; "On the Discovery of Nulliporcs and Sponges in the Boulder Clay of Caithness," vol. ii., p. 98; "On the Fossils of the Boulder Clay of Caithness," vol. iii., p. 38; "Further Observations on the Boulder Clay of Caithness, with an Additional List of Fossils," vol. iii., p. 396; also Brit. Ass. Rep. for 1862, Trans, of Geol. Sec., p. 83; *Ibid*, for 1864, p. 61.

He was the first to publish lists of the organic remains, and was likewise the first to recognise the resemblance between the ice-worn blocks of the secondary rocks in the boulder clay and the representatives of these rocks on the Sutherlandshire coast. In 1868 he informed Dr Croll that his researches had led him to the conclusion that the boulder clay was a genuine product of land ice, and in every respect identical with Scotch till.

Geol. Mag., 1870, p. 212.

He also stated that he had come to believe that the ice movement had been from the Moray Firth towards the Atlantic, and that in all likelihood it might have been produced by masses of land ice crossing the Moray Firth from the high grounds to the south-east.

In 1866 Mr T. Jamieson, in a paper on "the Glacial Phenomena of Caithness,"

Quart. Jour. Geol. Soc., vol. xxii., p. 261.

gave an excellent account of the shelly boulder clay, referring specially to its distribution, its physical characters, and organic remains. He advocated the theory that this deposit was due to floating ice during what he terms the glacial marine period, and he suggested that the transport had been from the north-west to the south-east, across the country between Reay and Dunbeath. The main argument adduced by him in support of this movement from the north-west, is the overlapping of the dark grey shelly drift on the grits and conglomerates towards Dunbeath and Berriedale, coupled with the overlap of a reddish-brown boulder clay on the Caithness flags at Reay. We shall point out presently, however, that these features are satisfactorily accounted for by supposing that the ice came from the southeast. We shall have occasion to point out also that this supposed movement from the north-west is at variance with some facts recently brought to light regarding the direction of the ice-markings and the dispersal of the stones in the boulder clay, while it leaves unexplained the occurrence of various secondary rocks in that deposit. Mr Jamieson inferred that the shelly boulder clay of Caithness was of more recent date than the lower boulder clay of Scotland, which is usually unfossiliferous, being led to this conclusion by the small proportion of Arctic forms in the fauna of that deposit.

In 1870, our colleague, Dr Croll, contributed an article to the *Geological Magazine*,

Geo!. Mag., 1870, pp. 209-271.

in which he disputed the marine origin of the Caithness boulder clay, regarding it as a product of land ice. He called attention to two points noted by previous writers on the subject: first, that with the exception of the organic remains, this deposit closely resembles the ordinary boulder clay of Scotland, which is generally ascribed to the action of land ice; and, second, that the marine shells are scattered irregularly through the deposit, and are smoothed and striated precisely like the stones in the boulder clay. He argued that the presence of these organic remains does not necessarily prove the marine origin of the till, but rather that they had been borne inland with the *moraine profonde* from the bed of the Moray Firth and the North Sea. He endeavoured to explain the origin of the shelly boulder clay by supposing that the Scotch ice which filled the basin of the Moray Firth was deflected by reason of the Scandinavian *mer de glace*, and was compelled to overflow the Caithness plain. In his volume on "Climate and Time,"

"Climate and Time," p. 453.

he quotes the testimony of one of the authors of this paper in proof of the gradual bending round of the Scotch land ice between the Orel and Dunbeath, on the east coast of this county. The evidence now referred to will be described when we come to discuss the direction of the ice-flow and the character of the boulder clay.

In 1871, a paper appeared in the *Transactions of the Geological Society of Glasgow*, by the Rev. Henry Crosskey and David Robertson, in which they give a short account of the boulder clay sections near Wick, along with a list of the Foraminifera obtained from that deposit.

"The Post-Tertiary Fossiliferous Beds of Scotland," by the Rev. ii. W. Crosskey and Mr D. Robertson, Trans, of the Geol. Soc. of Glasgow, vol. iii., p. 126, 127. This paper was read in 1868.

In the volume of the publications of the Palæontographical Society, published in 1874, Messrs G. S. Brady and Robertson, in their "Monograph on the Post-Tertiary Entomostraca," describe the boulder clay near Wick, and give a list of Entomostraca from the sections in Wick Bay and burn of Haster.

"Monograph of the Post-Tertiary Entomostraca," by Messrs G. S. Brady, the Rev. H. W. Crosskey, and Mr D. Robertson, Palaioutographical Soc., vol. xxviii., p. 7, 1874.

Before leaving this part of the subject, reference ought to be made to the labours of Mr Joseph Anderson, Curator of the Antiquarian Museum, Edinburgh. Though he is more widely known by his researches among "the Picts' Houses" in Caithness, yet, during his residence in Wick, be was an earnest worker at the present subject, and several observers have been indebted to him for valuable assistance. He was the first to wash the Caithness boulder clay for microscopic organisms—a process which has added greatly to the list of the fauna obtained from that deposit.

III. GLACIATION.

The greater portion of the county is occupied by strata belonging to the Old Red Sandstone formation, of which the most prominent subdivision is the well-known Caithness Flagstone series. A line drawn from Ben Rha, near Rcay, south-eastwards by Loch Scye, Loch More in Strathmore, to Morven and the Ord, marks the inland limit of this forma- tion. The geological structure of this tract has been fully described by Professor Geikie in his elaborate monograph on "The Old Red Sandstone of Western Europe,"

Trans. Roy. Soc., Edin., vol. xxviii., p. 406.

to which reference may be made for details. Beyond the limit just indicated the strata consist of white quartzites forming the range of the Scarabens (2054 feet), orthoclase gneiss, mica schists, and occasional masses of granite; but to these we paid no special attention.

An important feature connected with the glaciation of Caithness is the complete divergence in the trend of the ice-markings, in the area occupied by the shelly boulder clay, and the district lying to the west towards the county boundary. In the former area the prevalent trend is northwest and south-east, which Mr Jamieson and Dr Croll clearly showed could not have been produced by any local radiation of the ice—a conclusion which is self-evident to any one who considers the physical features of the county. In the district lying to the west of this area towards the county boundary, the strife point E., E.N.E., N.N.E., N., and eventually they veer round to the N.W., along the inland margin of the shelly boulder clay. We shall first describe some of the examples met with in the area occupied by the shelly drift.

In the district between Reay and Thurso we observed numerous examples on the surfaces of the flagstones. By the roadside west of the granite ridge at the burn of Isauld, stria; are seen on the grey flagstones beneath a thin covering of red boulder clay, pointing W. 40° N". These agree with the instances noted by Mr Jamieson at Beay, running N.W. and W. 35° N. At Shebster we observed ice-markings pointing W. 30° N., and at Westfield, near the Forss Water, W. 20° to 25° N.

On the surface of the blue flags in the Achscrabster quarries the trend is W. 25° N. This locality is interesting on account of the evidence which it affords of an ice movement towards the north-west. Subangular blocks have been broken off the flagstones by the ice in its passage over them, which are tilted at a gentle angle towards the north-west, while the flags themselves have been bent over in the same direction. In the Jamestown quarries, about two miles southwest of Thurso, the prevalent trend is W. 20° N., but on the same rock surface we noted a fainter set running N.E. These have been well-nigh effaced by the north-west movement, and for this reason they seem to be of older date. This was the only example we noted of a north-easterly trend away from the inland margin of the shelly drifts.

Between Thurso and Castletown, and eastwards to Brough, similar evidence is obtained of this north-west and southeast movement. On the surface of the grey flagstones in the Castletown quarries the direction is N. 20° to 23° W., and again by the roadside, south of St John's Loch, the trend is N. 10° to 15° W. Several examples were noted on the slopes between Brough and Dunnet Bays, on the surfaces of the coarse yellow sandstones of that peninsular tract. In the old quarries, on the slope to the north-west of Brough, the striæ, point W. 35° N., W. 30° N., and W. 25° N. A few yards to the west of the above locality another instance was observed pointing W. 25° N. Farther to the south, by the road leading to Dunnet Church, the direction is W. 25° to 30° N., and to the west of St John's Loch W. 35° to 40° N. A careful examination of the striated surfaces on this slope convinced us that they had been produced by ice moving towards the north-west. The gradual rise on the ground to the west of Brough towards Dunnet Head (346 feet) is due to the presence of coarse massive sandstones of Upper Old Red age. On the south-east slope the sandstones are finely *moutonnéeM,* and the smooth faces point to the south-east, indicating the direction from which the ice came. When we come to

discuss the dispersal of the stones in the boulder clay, we shall see that additional evidence is obtained in support of this conclusion.

In the undulating plain between Halkirk and Westerdale the same north-west and south-east trend is observable. In a quarry south of Achies farm-house, about three miles south of Halkirk, the direction is W. 30° N., and alongside of these is a fainter set pointing nearly west.

On the eastern seaboard, between Duncansbay Head and Dunbeath, numerous instances occur which harmonise with the general trend now described. On the top of the cliff, near Skirsa Head, Mr Jamieson noted striæ pointing W. 25° N.; in the bed of the Freswick burn, N 35° to 40° W.; and at Keiss, N. 35° to 40° W. Numerous examples are met with in the neighbourhood of Wick, varying from N. 15° W. to N.W. One of the best instances occurs on the cliff top opposite the Old Man of Wick, which is specially noteworthy, inasmuch as it presents certain appearances which could only have been produced by ice coming from the southeast. At this locality the flagstones dip inland (N. 30° W.) at a gentle angle, thereby forming tiny escarpments along the outcrops of the successive beds. On the dip slopes the strice point N. 10° to 20° W., but opposite each small escarpment they are deflected, the trend being still more northerly, while in the succeeding dip slope the normal direction is resumed. The slight deflections observable in these small escarpments point to an agent moving inland from the southeast.

A more striking example, in proof of the ice having moved inland from the North Sea, is to be met with in a *goe* between Dunbeath and Latheron, close by Latheronwheel. On the north side of a narrow inlet, which is about 100 feet in depth, the face of the cliff is finely polished and striated; the striae beginning near the water-level, and ascending the cliff obliquely. It ought to be borne in mind that there has been a large amount of denudation along that rocky coastline since glacial times, which is greatly accelerated by the system of jointing so characteristic of the Caithness flagstones. These cliffs usually present clean-cut faces, owing to the removal of huge slices of rock along the joints by the combined action of the sea and atmospheric influences. Hence it is difficult to find instances of striated surfaces rising from underneath the water-level. Moreover, in the bays at Freswick, Wick, Lybster, Latheronwheel, and Dunbeath, the boulder clay descends to the shore, thus indicating that the streams had cut down to the present sea-level, and probably below it in pre-glacial times.

From the foregoing examples, it is evident that all over the broad flats of Caithness the general trend of the ice- markings is north-west and south-east; but to the west of the inland limit of the shelly boulder clay the trend is widely different.

Following the shore northwards from the Ord of Caithness towards Berriedale, the stria; run in an easterly direction, as if produced by ice moving off the high ground in the southeastern part of the county. North of Berriedale, however, towards Dunbeath, they gradually swing round and creep inland from the sea, the trend varying from N. 10° to 15° E.

Again, in the valley of Strathmore, between Loch More and Dirlot, the same curious deflection of the ice-markings is observable. By the roadside between Loch More and Strathmore Lodge, several pits have recently been opened, which have brought to light finely striated surfaces. Not far from the north-west corner of the loch, in a quarry on the north side of the road, there is a beautifully-polished surface which has been produced by ice descending the strath. The striæ occur on red sandy flags and grits, pointing E. 20° N. The smooth face of the *roche moutonnée* confronts the high grounds to the west, leaving no room for doubt as to the direction from which the ice came. On the opposite side of the road well-marked striae are also exposed, pointing E.N.E., and the same trend is observable a short distance to the east of these localities. Again, about a quarter of a mile from the loch, in the direction of Strathmore Lodge, we noted several instances trending N. 5° E. Further down the valley, and a little way east of Strathmore Lodge, ice-markings were found, pointing N.N.E. and N.W., on the same glaciated surface, underneath a thin covering of boulder clay. We shall have occasion to point out in a subsequent paragraph that the shelly boulder clay does not extend further up the valley than Strathmore Lodge. It is apparent, therefore, that the deflection increases as we approach the margin of the shelly drift. It cannot be ascribed to any elevated mass of ground in the neighbourhood of Strathmore Lodge, because no eminences intervene which could possibly give rise to such a phenomenon. On the contrary, it points to the existence of a powerful opposing agent, which must have operated over the whole of the broad Caithness plain.

Again, on the moor between Dalnawillan Lodge and Altnabreac Station well-marked striæ were observed on granite, trending E. 10° to 15° N. This example is in harmony with the striations near Loch More. This locality is situated about four miles from the county boundary, and the markings were clearly produced by ice moving off the adjoining high grounds.

Another traverse from the hills round Loch Scye, eastwards by Loch Shurrery, Ben Dorrery, to Scotscalder, furnishes remarkable proof of the north-easterly trend of the local ice and its gradual deflection near the limit of the shelly drift. Between Achsteenalate and Loch Scye some finely glaciated surfaces have been recently exposed by the roadside. About a mile and a half to the west of Loch Shurrery well-preserved stria; are visible

pointing N. 15° E. on a granitic breccia, which here forms the base of the Old Red Sandstone. To the east of this locality and about half a mile west of the same Loch, near Achsteenalate, the trend is N. 15° E., and a similar direction was noted in the bed of the stream flowing into the Loch on the west side. In these instances the *roches moutonnéecs* indicate a movement towards the N.N.E. Crossing the south shoulder of Ben Dorrery by the road leading to the Dorrery farm-house, several examples were noted by us pointing due N., and in one case N. 20° E. From the manner in which the south slope of this hill has been glaciated, it is evident that the ice-markings were caused by ice moving towards the north. Again, in the long railway cutting west of Scotscalder Station we found several examples pointing N. 5° W., N. 20° W., and N.W. Towards the middle of the cutting on the south side "cross hatches" were observed pointing N. and N.W., while a few yards to the west two instances point towards the N. Now, these "cross hatches," like the instance already quoted at Strathmore Lodge, occur near the inward margin of the shelly drift, and as they are situated in the midst of an undulating plain, no one can for a moment contend that such remarkable proofs of the deflection of the local ice are due to the contour of the ground.

Again, in the extreme north-west of the county similar evidence is obtained. About two miles south-west of Reay, on the south slope of Ben Rah (795 feet), less than a mile from the county boundary, there are fine examples of glacial abrasion to be seen. The two peaks on this hill are composed of outliers of coarse granitic breccia resting on fine white sandstones, which are beautifully polished on the intervening col and on the south slope. Indeed, the striations are as fresh as if the ice had but recently passed away, and they leave no room for doubt as to the direction from which the ice came. The instances noted by us point N. 10° E., N., and N. 10° W.; and they are situated to the west of the limits of the shelly boulder clay. It is evident, therefore, that the local ice must have been powerful enough to override hills of considerable elevation near the sea-level. Descending the slope to the burn of Isauld the striae swing round to the north-west as already indicated.

From the evidence now adduced it is clear that these two diverging systems point to the existence of two opposing streams of ice. From the billy ground along the county boundary and the heights in the east of Sutherlandshire the local ice flowed E.N.E. and N.N.E. towards the Caithness plain, while near the Ord and at Reay it flowed into the sea. But along the line indicated by the inland margin of the shelly drift, the local ice was compelled to veer round to the N., and eventually to the N.W. in harmony with the general movement all over the great plain. The "cross-hatching" met with along this line indicates a sustained conflict between the opposing streams, which resulted in favour of the north-westerly ice-flow. On both sides of this line the boulder clay is of two distinct types, as will be presently described. Occasionally there is a commingling of the material belonging to the rival ice-streams, but in general the features are totally different. Indeed, the phenomena now referred to are quite analogous to those met with in the central valley of Scotland, so well described by our friend and colleague Dr James Geikie. In this latter case, the great ice-streams from the Highlands and Southern Uplands coalesced in the midland valley, producing similar "cross-batching" and the same commingling of the *moraine profonde*.

Dr James Geikie reminds us that similar phenomena have been recorded by geologists in Scandinavia, "cross-hatching" having been observed many years ago by Forchammer in Denmark, and in more recent years again and again in Norway and Southern Sweden by various geologists. Quite recently they have been detected also in North Germany by Dr Fenck. "The intercrossing of boulders derived from different quarters,"

Extract from a letter by Dr J. Geikic, F.R.S., to one of the authors of this paper.

he continues, "has likewise been frequently noted by continental geologists in the drift deposits of various parts of Europe. Perhaps among the most remarkable examples are those described by MM. Falsan and Chantre in their magnificent work on the ancient glaciers of the basin of the Rhone. In the region lying between Bourg and Grenoble (Ain, Savoy, and Isere) the glacial deposits display again and again the most remarkable examples of erratics which have crossed each other in their journey at all angles. For example, in the neighbourhood of St Paul, a little to the west of the beautiful Lac du Bourget, the glacial deposits are charged with blocks of dolomitic limestone, which have descended from Mont du Chat—i.e., in a N.N.W. direction. But in the same district occur many blocks of various rocks which have come from Upper Savoy—i.e., from N.E. Here the one set of boulders has crossed the other nearly at right angles. And numerous other similar examples are pointed out by the French glacialists. Still more striking is the fact that now and again erratics have travelled in precisely opposite directions—one set having been carried *up*, while another has been brought *down*, one and the same valley. Thus, in the Val Romey (S.E. of Nantua) erratics of local origin may be traced south as far as the Lyons and Geneva Railway, while boulders derived from the Alps have travelled up the valley for a number of miles! And the same peculiar phenomena are repeated in the case of many other valleys in Dauphiny and the adjoining regions. The origin of this 'intercrossing' of erratics is very simply explained by MM. Falsan and Chantre. They point out that before the great glacier of the Rhone and the Arve had attained its maximum development, all the mountains of Savoy, Dauphiny, etc., had their local and independent glacier systems, some of which were very considerable. These local glaciers flowed down the valleys, as a matter of course.

By-and-by, however, when the united glaciers of the Rhone, the Arve, the Isere, and the Drac, with their aflluents reached their greatest extension, so as to cover all the region between Bourg, Lyons, Vienna, and Grenoble with a vast *mer de glace*, the formerly independent glacier systems of Dauphiny, etc., were overwhelmed, and their flow arrested, and in many cases actually reversed. In other words, the united *mers de glace* of the Rhone, the Arve, etc., sometimes overflowed the summit-levels from which the local glaciers had descended, while in other cases they simply dammed back the local ice and protruded long tongues of ice into the lateral valleys formerly occupied by independent glaciers. And thus alpine rocks were often carried in very different directions to the course followed by the *débris* of the local moraines. But when the great *mer de glace* declined in importance, the local glacier systems came again into existence, and rocks of local origin travelled clown the valleys as before.

"German geologists have long been familiar with the fact that' intercrossings' of erratics are not uncommon in the so-called Northern Drift; and I may refer you to 'Prehistoric Europe,' pp. 203, 564, and Plate D, where you will find some account of the general results arrived at. The 'intercrossings' of boulders in the drift deposits of Lancashire, Cheshire, etc., so ably described by Mr Macintosh, are, I do not doubt, to be explained in the same way. If those who still cling to the iceberg origin of our boulder drifts can be induced to study MM. Falsan and Chantre's work, they will pause before appealing to the distribution of boulders in the northwest of England in support of the marine theory of the drifts. To me that distribution is eloquent of the successive changes of ice-flow which took place during the gradual increase and decrease of the *mer de glace* which enveloped that part of England. Long before that *mer de glace* attained its full development, the glaciers of North Wales and the Cumbrian Lake Country must have flowed outwards freely in many directions, which they could not afterwards follow when the united *mer de glace* came to fill up the basin of the Irish Sea and advance inland upon Cheshire, etc. At the period of maximum glaciation the path of the ice would often be at right angles to what it was before that maximum was reached, and to what it again became after the *mer de glace* was on its final decline."

Mr Jamieson states in his paper that where he observed "any indication of a *stoss-seite* it was on the north-west side."

Quart. Jour. Geol. Soc., vol. xxii., p. 268.

But no instance is quoted save one about two miles south of Berriedale where some masses of conglomerate "crag" to the east, as if produced by ice moving Seawards. This example is situated at the southern margin of the shelly drift, and was evidently caused by the local ice already described.

The absence of any well-marked *roches moutonénes* in the area occupied by the shelly drift may be satisfactorily accounted for by the peculiar mode of weathering of the Flagstone series. The flagstones were not capable of assuming the dome-shaped contours so characteristic of highly glaciated regions. In many instances they broke up into subangular blocks underneath the ice, a striking example of which has already been described in the Achscrabster quarries. The very same features we found to obtain in Orkney in the tracts occupied by this series. But notwithstanding this mode of weathering, we have adduced several examples which indicate a movement *towards* the north-west, and when these are viewed in connection with the remarkable deflection of the local ice-stream, it must be admitted that the evidence derived from the striated surfaces and the *roches moutonnées* is clearly in favour of this conclusion. This view receives additional support from the evidence supplied by the boulder clay.

IV. Boulder Clay.

Within the county this deposit is of two distinct types, corresponding with the two opposing streams of ice just described. We have (1.) a stiff, dark grey, shelly boulder clay, containing an admixture of rocks of local origin, with a large proportion of blocks which are foreign to the district; (2.) a reddish or brown boulder clay, containing no shells, and including stones derived from the area traversed by the local ice-flow. A line drawn from Shebster midway between Keay and the Forss Water, south-eastwards by Scotscalder Station and Strathmore Lodge to Dunbeath, marks approximately the inland limit of the dark grey boulder clay charged with marine shells. The coast-line from Dunbeath to Duncansbay Head, and thence to near Keay, forms the boundary line on the east and north. Over the whole of this triangular-shaped area, measuring about 300 square miles, the shelly boulder clay is distributed in irregular sheets; and when we consider the remarkable features presented by this deposit and the extent of ground which it covers, there is little wonder that its origin has given rise to considerable discussion. Throughout the area occupied by the shelly drift, the striations have a general north-westerly trend, as already indicated; and in a subsequent paragraph we shall describe certain facts connected with the dispersal of the stones in this deposit, which indicate that the ice-flow must have been from the North Sea towards the Atlantic. The reddish or brown boulder clay, containing no marine shells, lies to the west of the line which marks the inland limit of the shelly drift. We shall first describe the *moraine profonde*

produced by the local ice-flow.

On the shore, between the Ord and Berriedale, the deposit consists of a reddish-brown gritty clay, with well-striated stones composed of rocks belonging to the immediate neighbourhood. Amongst these may be mentioned pink granite, gneiss, quartzite, granitic breccia, red flags, grits, and shales, all of which occur in the vicinity. No shells were observed in this deposit, nor any of the secondary rocks which are so prevalent in the shelly drift. As already described, the stria; along this part of the coast point seawards, and the deposit has evidently been produced by ice which radiated from the adjoining high ground. But to the north of Berriedale and onwards to Dunbeath, where the striae begin to bend inland, the boulder clay completely changes its character. The colour becomes dark grey, blocks of the secondary rocks make their appearance, and organic remains are abundantly met with. Indeed this latter deposit occurs in great force in the Dun-beath Water, as described by Dick and Jamieson. In the Berriedale Water, however, which drains the northern slopes of Morven and the Scarabens, there are high banks of the reddish-brown ground-moraine, resembling in every respect the sections between Langwell and the Ord. Mr Jamieson states that he observed in the Berriedale Water sections some of the dark blue-grey stuff commingled with the red boulder clay, in which, after some search, he found "nine or ten small pieces of shell and a bit of a *Balanus*."

Quart. Jour. Geol. Soc., vol. xxii., p. 270.

But this commingling of the separate deposits occurs near the margin of the shelly drift, where the conflicting ice-streams must have shifted their ground, according to the relative pressure, which need not necessarily have been constant. Such an admixture of the ground-moraine of the respective ice-streams is just what might be expected under these conditions.

We can now explain the overlap of the dark-grey shelly drift on the red conglomerates, grits, and flags north of Berriedale towards Dunbeath, referred to by Mr Jamieson. A similar overlap occurs at the Sarclet, five miles south of Wick, where the same conglomerates and red flags are brought to the surface by means of an anticlinal fold. It is evident that this overlap is due to the forcible invasion of that area by the ice from the North Sea, which pushed along underneath the mass the pebbly silt and sand charged with marine shells lying in its path.

Again, in Strathmore, on the banks of the Thurso river, this reddish-brown boulder clay is exposed above Strathmore Lodge. At the bend above the lodge, close by the footbridge, there is an excellent section of this deposit on the right bank of the stream. It consists of red gritty boulder clay, with well-striated stones, which have been derived from the metamorphic rocks to the west. But not far below the lodge the dark-grey shelly boulder clay makes its appearance simultaneously with the change in the trend of the ice-markings, and from thence it forms a series of bluff cliffs, from 20 to 25 feet in height, as far as the rocky ravine below Dirlot Castle. In these sections we detected numerous blocks of secondary rocks, with fragments of marine shells.

In the burn of Isauld, and by the roadside leading to Shebster, sections of red boulder clay, free from shells and secondary rocks, are found resting on the grey flagstones. Associated with pieces of the grey flags are numerous striated blocks of red sandy flags and grits. A slight knowledge of the geological structure of the district satisfactorily explains the overlap of the red boulder clay on the grey flagstones east of Reay. On the hills round Ben Rah, and southwards to Loch Scye, there is a coarse granitic breccia, largely composed of fragments of orthoclase felspar. In the upper reaches of the Forss Water this granitic breccia passes underneath a great series of chocolate-coloured flags, which cover a strip of ground a mile in breadth between Achsteenalate and the east bank of Loch Shurrery, and these beds are overlaid in turn by the grey flagstones of Ben Dorrery. Now, the local ice, which streamed north-east and north from the hilly ground between Ben Rah and Ben Shurrery, must have crossed these zones at the base of the Old Bed Sandstone; and hence numerous blocks of the chocolate flags would be mingled with the ground moraine, and the colour of the deposit would naturally become red. In its northward march this local ice must have invaded the area occupied by the grey flagstones between the burn of Isauld and Shebster. It is not necessary, therefore, to invoke a movement from the north-west to explain this overlap. In the light of the foregoing facts, all difficulty regarding its occurrence disappears.

To the west of Sandside Lodge, by the roadside, there is a section of similar reddish-brown boulder clay of local origin, containing blocks of grey micaceous gneiss, granite, pink felstone, grey and red flags.

To the east of the line already described, as marking the inland limit of the shelly drift, the boulder clay differs widely in character from that just described. The shelly drift is not distributed uniformly over the whole area. It reaches its greatest depth along the stream courses and in the various bays which indent the rocky coast-line. Excellent sections are exposed in the bed of the Forss Water, the Thurso river, at Scrabster Harbour, in Wick Bay, and Dunbeath Water. In many places it reaches a depth of 40 feet, and at Scrabster Harbour its thickness is upwards of 100 feet. In the undulating dome-shaped tracts it thins out to a foot or so in thickness, and in many places it disappears altogether.

We have little to add to Mr Jamieson's accurate account of the physical characters of this deposit. Again

and again we had occasion to confirm many of the observations recorded in his paper. We shall therefore have to repeat the description of some of the well-known features dwelt on by him in order to show that they cannot be satisfactorily explained by the theory of floating ice.

The shelly boulder clay is of a dark-grey slate colour when moist, but frequently, in the upper part of the sections, it assumes a brown or ferruginous tint, which may be due to oxidation. It is evident that this brown tint is a mere surface discoloration, because when the deposit is dug into for a little way the slate colour appears. Throughout it consists of an extremely stiff gritty clay, charged with stones of various sizes. In all the sections the stones are scattered irregularly through the matrix. Occasionally lenticular seams of sand occur in the midst of the deposit, but their presence does not impart a stratified arrangement to it. Indeed, all those who have carefully examined the sections agree in stating that this shelly drift has no trace of stratification, and that in physical character it resembles ordinary Scotch till. Marine shells in a more or less fragmentary form are scattered irregularly through the gritty matrix as well as the seams of sand. There is one section described by Jamieson, on the south side of Wick Harbour, which is of importance, as it shows a slight change in the character of the deposit in the upper parts of the cliff. The section is about 50 feet high, the lower part of which consists of a dark-coloured and very tough gritty clay, with very small stones and numerous remains of marine shells. Thin seams of sand are mixed with this deposit, but there is no trace of stratification. In the upper part of the section the deposit is of a brownish tint, and less compact. A few feet from the top of the section there are some large blocks of granite, sandstone, and various metamorphic rocks, which are distinctly ice-worn. The occurrence of these blocks, however, is quite exceptional. Along the cliffs to the south of Wick the same change in colour is observable, but fragments of shells are also met with in this material, and the stuff is quite homogeneous from top to bottom.

The nature of the stones embedded in the deposit deserve special attention, as they furnish important evidence regarding the ice movement. Throughout the area the prevalent ingredients are, of course, blocks derived from the underlying Caithness flags. It is particularly observable that in the sections along the eastern seaboard there is a comparative absence of ordinary-sized blocks of this material. Indeed, with certain exceptions, the deposit is not stony, as the matrix contains only small well-rounded pebbles. When the sections are followed inland, however, the stones derived from the Flagstone series increase both in number and size. This feature is satisfactorily explained on the supposition that the shelly boulder clay of the eastern seaboard was mainly composed of the pebbly silt and sand lying on the bed of the North Sea, which was gradually mingled with materials obtained from the flagstones as the ice advanced inland towards Thurso and Reay. The presence of the large blocks of flagstone in the upper part of the sections exposed round Wick Bay may be accounted for in the same manner. It is probable that the ice took some time to remove the silt from the sea bottom, and it was not till it had done so that it was enabled to quarry the underlying rocks out of which to manufacture boulders. Dr Fenck has explained similar phenomena met with in the Danish drifts in the same way. We frequently noted that the larger blocks of the flagstones lay with their long axes parallel to the direction of the ice-flow, while they are invariably striated in the same direction. This feature was observed by Jamieson in the Milton and Haster burns, and it is capitally displayed in the sections in the Thurso river, between Dirlot and Strathmore Lodge. Here there are occasional blocks of grey and chocolate flags, upwards of 3 feet in length, arranged as described.

Owing to the remarkable uniformity in the character of the Caithness Flagstone series there is some difficulty in determining the direction of the ice-carry from the dispersal of the local rocks in the boulder clay. There is one striking instance, however, to which we paid special attention, which confirms the opinion that the ice must have come from the south-east. The peninsular tract of ground, which is situated between Brough Bay and Dunnet Bay, extending northwards to Dunnet Head, measuring about five square miles in extent, is occupied by coarse yellow and red sandstones, which are brought into conjunction with the Flagstone series by a fault. This dislocation runs from Brough Bay southwards by St John's Loch and the church of Dunnet to Dunnet Bay. Now, in the boulder clay sections to the east of the fault, no trace of these characteristic sandstones is to be seen on the shore or inland, whereas the Caithness flagstones have been carried on to the surface of these Upper Old Bed Sandstone rocks. Had the ice-flow been *from* the north-west, the phenomena would have been precisely the reverse of what we have stated, as blocks of these massive sandstones would certainly have been mingled with the *moraine profonde* to the south-east of the fault.

Again, on the shore about four miles to the south of Wick, at the Sarclet, massive beds of conglomerate, attaining a thickness of nearly 300 feet, are brought to the surface by means of an anticline.

Trans. Roy. Soc., Edin., vol. xxviii., p. 376.

Blocks of this conglomerate can be traced inland from this locality, both in the boulder clay and on the surface in the direction of Thurso.

Dick mistook the boulders of this rock, which he found between Thurso and Dunnet, for fragments derived from the conglomerates of Port Skerry in Sutherlandshire, from which they differ considerably.

But in addition to these local rocks there is a large percentage of blocks which are foreign to the Caithness plain. Amongst these may be mentioned granite, porphyritic felsite, diorite, gneiss, mica schist, quartzite, oolitic limestone, oolitic brecciated conglomerate, grey sandstone belonging to the Oolite formation, septarian nodules, along with chalk and chalk-flints. Indeed, over all the tract occupied by the shelly drift chalk-flints are occasionally met with on the surface, having escaped denudation while the matrix which enclosed them has been worn away. Some pieces of jet were also obtained by Mr C. W. Peach in the sections at Wick, and several specimens of belemnites were found by him both at Wick and in the Thurso river. It ought to be borne in mind that the secondary rocks in the dark-grey clay are co-extensive with the shells, and where these blocks occur shells are common. These foreign blocks are hardly ever found in those places where the deposit is only a foot or two thick, and the same remark applies to the organic remains. In that case the blocks are almost invariably composed of the underlying rocks.

We believe that Mr C. W. Peach was the first to recognise the close resemblance between the blocks of the secondary rocks in the shelly boulder clay and their representatives on the Sutherlandshire coast. Many of the included blocks contain the same fossils as those chronicled from the latter locality. Indeed, nearly all the blocks of secondary rocks, save the chalk and chalk-flints, might quite well have been derived from the Sutherlandshire coast, or the outliers which occur in the basin of the Moray Firth. But though cretaceous rocks do not occur in place on the shores of the basin now referred to, they are believed to exist on the bed of the Firth. In addition to these, several blocks of fossil wood are met with in the shelly drift which are identical with those found by us in the Odin Bay section, in Stronsa, Orkney. Sections of this rock show distinct cell structure under the microscope, and they have been determined by Mr Kidston of this Society as specimens of *Pence Lindleyana* of Oolitic age. The same rock is embedded in the oolitic shales in Sutherlandshire, where it is burned for lime.

The occurrence in the shelly boulder clay of these blocks of secondary rocks which are known to exist in the basin of the Moray Firth, is an additional argument in favour of the theory that the ice-flow across the Caithness plain was towards the north-west.

The distribution of the shells in this deposit seems to favour the same conclusion, for along the eastern seaboard the shells are abundant, but they are more difficult to obtain as the sections are followed inland towards Thurso and Reay. The appearances presented by these organic remains indicate glacial abrasion precisely in the same manner as the stones in the same deposit. This fact has been noticed by various observers, and has been repeatedly referred to in connection with the question of the origin of the till. They are broken, smoothed, and striated like the stones associated with them; indeed they resemble the shell fragments we found in the Orkney boulder clay, though in the latter case they are more fragmentary and not so well preserved. The most common forms met with are *Cyprina Islandica, Mactra solida, M. truncata, Turritella ungulina, Astarte clliptica, A. borealis*. But though the shells as a rule are more or less broken and in many instances striated, yet in some cases entire valves have been dislodged. Mr Jamieson found "one entire valve of *Astarte borealis*, another of *A. elliptica*, and two small ones of *A. compressa*, likewise a specimen of *Natica nitida*, and another of *N. Islandica*, both almost perfect." The striking example of the complete bivalve *Anomia*, referred to by Mr Jamieson and Dr James Geikie, was found by Mr C. W. Peach protected in the hollow of a stone. Indeed it is highly probable from the appearances presented by many of the fragile shells that they were frozen in the ground moraine, and in this way escaped complete destruction.

A glance at the accompanying list conclusively shows that the sections have yielded but a small number of forms characteristic of the littoral zone. After years of vigilant searching, Mr C. W. Peach obtained only a few species which lived along the shore, among which may be mentioned two specimens of *Purpura lapillus*, a few specimens of *Patella vulgaris, Mytilus* rarely, and *Tapes pullastra* also rarely. We shall point out presently that the scarcity of these shore forms, and the great abundance of species whose habitat lay in deeper water, have an important bearing on the question of the origin of the shelly boulder clay.

LIST OF ORGANISMS FROM THE CAITHNESS BOULDER CLAY.

Vertebrata.

- Piece of fish-bone.

Annulosa

- CRUSTACEA—
  Portion of shell of Brachyurous Crustacean.
- CIRRIPEDIA—
  Balanus crenatus.

B.scoticus (porcatus).
Verruca stromia.

- OSTRACODA—
  Cythere concinna.
  C. Dunelmensis (Norman).
  C. Finmarchia (G. O. Sars).
  C. lutea (Müller).
  C. mirahilis (Brady).
  C. villosa (G. O. Sars).
  C. viridis (Müller).
  Cytheridea pajrillosa (Bosquet).
  Cytherideis Dunedinensis.
  C. subspiralis.
  Cytlierura undata (G. O. Sars).
  Cytheropteron latissimum (Norman).
  Loxoconcha imprcssa (Baird).
  Xestoleberis depressa (G. O. Sars).
- ECHINODERMATA—
  Echinus neglectus.
  Spatangus spec.
  Ophiocoma rosula.
- ANNELIDA—
  Pectinaria? (sandy tube of).
  Serpula vermicularis.
  Sipunculus Bernhardus(Forbes).
  Spirorbis granulatus.

Mollusca.

- GASTEROPODA—
  Aporrhais pes-pelecani.
  Buccinum undatum.
  Capulus Hungarians

  Capulus Hungaricus has been added to this list from a specimen obtained by C. W. Peach from Freswick, and which he inadvertently omitted from his reports.

  Cerithiopsis costulata.
  Chiton cinereus.
  Crenella decussata.
  Dcntalium abyssorum.
  D. entale.
  Fusus antiquus.
  Lacuna divaricata.
  Littorina littorea.
  L. obtusata (L. littoralis).
  Mangelia laevigata (M. nebula).
  M. Leufroyi.
  M. pyramidalis.
  M. Trevelliana.
  M. truncata.
  Nassa incrassata.
  Natica affinis (N. clausa).
  N. Islandica (N. helicoides).
  N. nitida.
  N. pallida (N. Grœnlandica).
  N. sordida.
  Odostomia acicula (Eulimella acicula).
  O. albella.
  Patella vulgata.
  Purpura lapillus.

Rissoa parva, var. interrupta.
Tornatella fasciata.
Trochus Grœnlandicus (T. undulatus).
T. Vahli.
T. ziziphinus.
Trophon clathratus (Fusus scalaformis).
T. clathratus, var. *Gunneri.*
T. truncatus.
Turritella ungulina (T. communis) (T. tercbra?).

- PELECYPODA—
Anomia cphippium, var. *squamula.*
Astarte borealis (A. ardica).
A. compressa.
A. sulcata, var. *Scotica.*
A. sulcata, var. *elliptica.*
Cardium echinatum.
C. edule.
C. exiguum (C. pygnœum).
C. fasciatum.
C. Grœnlandicum.
C. Norvegicum.
Cyprina Islandica.
Cyrtodaria (Glycimcris) siliqua.
Donax vittatus (D. anatinus).
Leda minuta (L. caudata).
L. pernula, var. *buccata.*
L. pygmœa.
Lacina borealis.
L. spinifera.
Mactra solida.
Mya truneata.
M. truneata, var. *Udivallensis.*
Mytilus edulis.
M. modiolus (Modiola modiolus).
Nucula nucleus.
N. sulcata (N. decussata).
Ostrea edulis.
Pecten Islandicus.
P. maximus.
P. opercularis.
Saxicava Norvegica (Panopœa Norvegica).
S. rugosa.
Tellina calcaria (T. proxima).
T. Balthica (T. solidula).
Venus casina.
V. gallina (V. striclula).
V. lincta (Artemis lincta).
V. ovata.
- BRACHIOPODA—
Rhynconella psittacea.

Molluscoida.

- *Cellarea (Salicornaria).*
- *Cellepora pumicosa.*
- *Crisia dentieulata.*
- *Hyppothoa divaricata.*
- *Lichasopora hispida (Tubulipora hispida).*
- *Membranipora catcnularia.*

- *M. spec*.
- *Mucronella Peachii (Lepralia Pcachii)*.
- *M. Peachii*, var. *labiosa (L. Pcachii, var. labiosa)*.
- *Sehizoporella unicornis (Lepralia unicornis)*.

Protozoa.

- SPONGIDÆ—
  Geodia——?.
  Clionia cælata.
- FORAMINIFERA—
  Biloculina ringens (Linn.).
  Bulimina marginata(D'Orb.).
  B. pupoidcs (D'Orb.).
  Cassidulina laevigata (D'Orb.).
  Cristellaria rotulata (Lamk.).
  Dentalina communis (D'Orb.).
  Discorbina rosacea (D'Orb.).
  Globigerina bulloides (D'Orb.).
  Lagena costata.
  L. globosa (Montagu).
  L. Jeffreysii (Brady).
  L. marginata (Montagu).
  L. semi-striata (Will.).
  L. squamosa (Montagu).
  L. sulcata (W. and J.).
  Nodosaria raphanus.
  Nonionina asterizanus.
  N. depressula.
  Planorbulina Mediterranensis (D'Orb.).
  Polymorphina compressa (D'Orb.).
  P. lactea (W. and J.).
  P. lactea, var.
  Polystomella arctica.
  P. crispa.
  P. striato-jmnctata.
  Pulvinulina Caracalla(Roemer).
  Quinqueloculina seminulum.
  Q. subrotunda.
  Textularia difformis (D'Orb.).
  Triloculina oblonga (Montagu).
  Trochammina inflata (Montagu).
  T. incerta.
  Truncatulina lobulata.
  Vaginulina legumen.
  V. linearis.

Plantæ.

ALGÆ—
Melobcsia polymorpha.

This list has been prepared from the papers published by (1.) Mr C. W. Peach, (2.) Mr T. F. Jamieson, (3.) Messrs H. W. Crosskey and D. Robertson, (4.) Messrs G. S. Brady, H. W. Crosskey, and D. Robertson. The private collection belonging to Mr C. W. Peach has also been re-examined by one of the authors of this paper. For references to these papers, see Footnotes under section dealing with the previous literature of the subject.

Mr Jamieson, in his paper,

Quart. Jour. Geol. Soc., pp. 278-280.

gives an analysis of the Mollusca from the Caithness boulder clay by J. Gwyn Jeffreys, F.E.S., who comes to the following conclusions:

61 per cent, are species now living on the west coast of Europe to the south of lat. 50°.

Since the analysis was published (1866) the French explorations in the Ray of Biscay will no doubt have added to the percentage of the species coming under this category.

80 per cent, are species now living on coasts of Britain.

88 per cent, are species now living on west coast of Europe between lat. 60° and the Arctic Circle.

84 per cent, are species now living on within the Arctic Circle.

55 per cent, are species now living on the east coast of N. America.

V. MORAINES AND GRAVELS.

An interesting feature connected with the glaciation of Caithness is the development of moraines and morainic deposits in several parts of the county. Hitherto they have not been described. In Strathmore they are well developed, and they stretch far down the valley to the edge of the great plain. The most easterly limit of the moraines and gravels is at Dalemore, about a mile to the East of Dirlot Castle. This point is situated about fourteen miles from the county boundary at the head of the strath. Near Westerdale, about a mile to the north of Dirlot, the grey shelly boulder clay forms a great plain, through which the Thurso river has cut a channel, and formed an alluvial terrace. This platform of boulder clay is dotted over with conical heaps and ridges of sand and gravel, at a height of 200 feet above the sea. Sections of these heaps are exposed by the roadside on the way to Dirlot, which show that the material consists of sand and gravel, more or less stratified, with occasional blocks of conglomerate and sandstone, measuring 3 feet across. Indeed, the sections closely resemble the kame series of the midland counties of Scotland. One of these ridges is specially noteworthy on account of its length, extending from the farm- house of Dirlot to Dalemore, a distance of nearly a mile. Its height varies from 20 to 30 feet.

These gravel ridges were noticed by Dick in his rambles. See Quart. Jour. Geol. Soc., vol. xxii., p. 270.

From Dirlot westwards to Strathmore Lodge conical mounds and ridges rest on the plain of grey shelly boulder clay. They are not abundant, however, occurring only at intervals, and chiefly on the left bank of the stream. From this point to Dalnawillan Lodge, which is about eight miles up the strath from Dirlot, similar heaps can be traced. Towards the latter locality they become more numerous, and on the left side of the valley at Dalnawillan they are well developed. Here the moraines form huge mounds and ridges, excellent sections of which are exposed by the roadside and in the burn courses.

It is observable that the material gradually changes its character as we ascend the valley, for while towards the eastern limit it is sandy and gravelly, with distinct stratification, it becomes more compact, and the stones are not so well rounded near the head of the strath. Indeed, it approaches the type of moraine matter which is commonly met with in upland valleys. We are inclined to believe that the kamiform ridges near Dirlot mark the easterly extension of the later glaciers, for it is highly improbable that they are of marine origin, when no trace of similar deposits has been observed between this locality and the eastern seaboard. On the other hand, the fact that the mounds can be traced at intervals from Dirlot to Dalnawillan, where the material resembles ordinary moraine matter, indicates a probable connection between the different deposits.

The evidence supplied by these later accumulations is important, because they rest both on the reddish-brown boulder clay and the grey shelly drift. They steal across the surface of the shelly drift for a distance of three miles between Strathmore Lodge and Dalemore, so that there can be no doubt that the shelly drift is of older date than the deposits under consideration. This is the only locality where we found the shelly boulder clay overlaid by gravel ridges and moraines; indeed, so far as our observations went, there is a marked absence of such accumulations throughout the area occupied by this deposit, as noted by Mr Jamieson.

Between Dalnawillan Lodge and Altnabreac Station, we observed moraine heaps composed of the same material as the mounds at the former locality. Over much of the moor also there is an irregular covering of gravelly material exposed in pits, which may belong to the same series. In Strathmore we observed the same material in places where no mounds could be seen, which leads us to believe that this covering may have been deposited by flood waters from the melting ice.

Again, on the moor to the west of Loch Shurrery, moraine heaps occur, and by the roadside leading to Loch Scye pits have been dug in coarse gravelly and rubbishy material, which evidently belongs to the same formation.

In the Braxside burn, which drains the western slopes of Ben Rah, south of Reay, moraines may be seen extending across the valley, and they occur at intervals on the moor northwards to Sandside. But to the west of Reay, in the direction of the county boundary, similar deposits are irregularly distributed over the slope. They increase in number and in size on the col and along the slope towards Strath Halladale, in the county of Sutherland. Indeed, the deposits of the later glaciation in this strath are grandly developed. The bottom and sides of the valley are covered with groups of moraines, displaying at some points a marked concentric

arrangement. Numerous *blocs perchés* are strewn on these mounds, composed of granite and granitic breccia. The material consists of a compact stony and rubbishy matter, gravelly in some places and clayey in others, with sub-angular and rounded stones, few of them being striated.

Now, it is interesting to note that while the traces of the later glaciation overlap on to the grey shelly boulder clay at Dirlot, they do not reach the outer limit of the red boulder clay at Reay. Taking Shebster as the boundary line between the two boulder clays, the later morainic deposits "tail off" about three miles from this limit. But when we think of the large tract of country between Reay and Strathmore over which these deposits are spread, it will be readily admitted that they form an important feature in the history of the glacial phenomena of Caithness. Moreover, if we take into consideration the physical features of the north-west part of Caithness, the absence of deep valleys, and the limited elevation of the hills, we can hardly escape the conclusion that these later accumulations were deposited by a more or less continuous sheet of ice.

It is rather remarkable that, while these traces of the later glaciation are so abundant in the north-western part of the county, they should not have been observed in the large valleys in the south-east. We traversed the course of the Berriedale Water from the slopes of Maidenpap (2313 feet) to the sea, and observed no indications of moraines on the boulder clay slopes. It is possible, however, that small moraine heaps may yet be met with in the higher reaches of the Langwell, Berriedale, and Glut Waters.

ERRATICS.

Over the Caithness plain occasional boulders have been observed resting on the boulder clay, or partly buried in that deposit, which bear unmistakably the impress of glacial action on their smoothed and striated sides. They cannot be said to be numerous; still a few have been chronicled by Mr Dick and Mr C. W. Peach in their rambles, while we met with several examples during our traverses. The smaller boulders have been removed from the fields in the course of the reclamation of the land, and have been used for building dykes. At Greenvale a boulder of the Sarclet conglomerate was noted by us, and erratics of hornblendic granite. East of St John's Loch boulders of granite were also observed. Along the road from Greenvale to Ham various blocks of foreign rocks occur, which have been borne off the fields, amongst which may be mentioned grey and pink granite, quartzite, grey micaceous gneiss, red sandstone like the beds at Ham, and conglomerate. No boulders of the Upper Old Bed Sandstones, which form the tract already referred to between Brough and Dunnet Bay, were observed to the south-east of the fault, which is quite in keeping with the rest of the evidence in favour of an ice movement from the south-east throughout the Caithness plain.

Mr Dick noted a large granite boulder on the hill-side above East Murkle, near Castletown, a similar one at the head of Weston Loch, and two of the same material round the same loch. He has also recorded the occurrence of a conglomerate boulder near the Slater's Obelisk at Holborn Head. Mr C. W. Teach observed blocks of the Sarclet conglomerate near Weydale, south-east of Thurso.

West of Eeay numerous *blocs pcrchés* occur on the moraine heaps, consisting of granite and granitic breccia, and at Dalnawillan, in Strathmore, blocks of metamorphic rocks also occur on the mounds.

CONCLUSION.

We must now consider the evidence which has been adduced in the foregoing pages with the view of determining the probable physical conditions which prevailed during the formation of the various superficial deposits in Caithness. We have endeavoured to show that across the plain there is one prevalent system of ice-markings running south-east and north-west, which, from the appearances presented by the striated surfaces near Latheronwheel, the Old Man of Wick, and Brough, seem to have been produced by ice moving from the south-east. This conclusion receives additional support from the fact that, as we proceed from the Ord to Reay along the tract lying between the county boundary and the inland limit of the shelly drift, the strife point E., E.N.E., N.N.E., N., and eventually swing round to the N.W. The traverses we made across this tract place beyond doubt that the local ice, radiating from the hilly ground to the west, moved outwards towards the Caithness plain, but having there met a powerful opposing ice-current, it was compelled to change its course and turn round in the direction of the Atlantic.

That such was really the case is confirmed by an analysis of the evidence supplied by the boulder clay. There are two deposits of this nature, the one comprising local rocks and produced by local ice; while the other is richly charged with marine shells, and contains blocks which are foreign to the county. The areas occupied by the two boulder clays correspond with the limits of the respective ice-streams, as indicated by the striations on the rock surfaces. Moreover, in spite of the lithological uniformity which prevails throughout the tract occupied by the Caithness flagstones, there are certain data connected with the dispersal of the stones in the shelly boulder clay which are only explicable on the supposition that the ice came *from* the south-east. Blocks of the Sarclet conglomerate can be traced inland in the boulder clay, while striated blocks of the grey flagstones occur

in the *moraine profonde* west of the fault at Brough. Had the movement been *from* the north-west, then assuredly we would have found material derived from the massive yellow sandstones at Dunnet Head in the ground-moraine to the south-east of the fault. But this is not the case. In addition to this, there are blocks of oolitic limestone, oolitic breccia, septarian nodules, fossil wood, belemnites, chalk, chalk-flints, etc., in the shelly boulder clay, some of which are identical in lithological character and fossil contents with the representatives of these rocks in the basin of the Moray Firth and adjoining tracts. The occurrence of these foreign blocks in the grey drift is not explained by a movement *from* the north-west, while it is quite in keeping with the theory that the ice which filled the basin of the Moray Firth was deflected and forced to overflow the Caithness plain. In view of all these lines of evidence it is impossible to resist this conclusion.

When we consider the physical character of the reddish-brown boulder clay, it so completely resembles the ordinary lower till of Scotland, that no one who believes in the land-ice origin of boulder clay would hesitate to ascribe it to the action of that agent. The features presented by the shelly drift are somewhat different as we have shown, and for this reason the question of its origin has given rise to some diversity of opinion. But a careful consideration of the various phenomena connected with it shows that there is really no valid argument against the land-ice origin of this deposit.

It might be argued that the shelly drift is a product of coast-ice driven along the shore by currents; but the evidence derived from the organic remains is quite at variance with such a hypothesis. It has already been stated that the most careful searching has only brought to light a few specimens characteristic of the littoral zone, while the great majority of the shells belong to deeper water. Moreover, such a supposition leaves quite unexplained the gradual deflection of the local ice in its eastward course, neither does it account for the actual inland limit of the grey shelly boulder clay. Another formidable objection to this hypothesis, which is also applicable to icebergs or floe-ice, is the entire absence of stratification throughout the wide area occupied by this deposit. Dr Croll long ago pointed out that if the grey shelly drift were really due to floating ice, it would undoubtedly have shown signs of stratification. We know that the finely laminated shelly briclc-clays round the coast of Scotland, which occasionally contain striated blocks, point to aqueous disposition. But those who have examined the numerous sections of the grey drift in Caithness unite in saying that in physical character it is indistinguishable from ordinary boulder clay. Mr Jamieson states that it "resembles the Old Boulder Clay of the middle of Scotland in regard to its physical arrangement, but differs therefrom in the prevalence of marine organisms scattered through it." And in order to account for the occurrence of these organic remains, he imagines that "a set of marine beds containing Arctic shells were probably deposited over the low part of Caithness; and much drifting ice seems to have passed over the district from the north-west, which crushed and destroyed these marine beds, broke the shells, and mixed them up with the superficial *débris* into that mass of rough pebbly mud which now overspreads the surface."

Now, there is nothing improbable in the supposition that such marine beds were deposited in pre-glacial or inter-glacial times on the low ground of Caithness, though none has been chronicled by Mr C. W. Peach, Mr Jamieson, nor by ourselves. The only record of stratified beds underneath the boulder clay rests on the authority of Mr Dick.

Life of Robert Dick, by Smiles, p. 228.

He describes a section seen in a small stream running into Gill's Bay, which has cut a channel down to the solid rock through a deposit of grey boulder clay, containing chalk, chalk-flints, and oolitic rocks, and yielding remains of *Mactra, Cyprina, Turritella*, and *Dentalium*. Below the boulder clay he observed a bed of gravel with broken shells resting on red sandstone. Again, on the south side of the Moray Firth, one of us found, in the summer of 1880, while prosecuting the geological survey of Banffshire, a series of stratified sands, with marine shells, which are covered in part with boulder clay. These shelly sands indicate a marine depression to the extent of 500 feet in inter-glacial times. It would seem, then, that there is evidence in favour of the existence of stratified beds with Arctic shells below the boulder clay in the north of Scotland. But even admitting the existence of such deposits, it is difficult to see how floating ice could so act on them as to produce the phenomena presented by the shelly drift. In such a case there would have been signs of stratification in the deeper sections, as, for instance, in the Scrabster Harbour where the deposit is upwards of 100 feet thick. Nay, more, such a theory does not account for the greater abundance of marine shells along the eastern seaboard, and the gradual increase of blocks derived from the Caithness flagstones as we move inland from the east coast. Neither does it explain the deflection of the local ice.

It is perfectly evident, therefore, that the phenomena of the grey shelly boulder clay cannot be satisfactorily explained on the hypothesis of floating ice, and we are therefore forced to accept the only remaining solution, that it is really a product of land ice. Indeed, when we view the evidence supplied by the striated surfaces and the boulder clay in the light of our previous work in Orkney and Shetland, it will readily be admitted that the glacial phenomena of these widely separated areas have a close relation to each other. They point to the union of the Scotch and Scandinavian ice-sheets on the floor of the North Sea. The ice which flowed into the basin of

the Moray Firth, as well as the local ice which streamed outwards in the direction of the Caithness plain, was deflected towards the north-west by reason of the greater force of the Scandinavian *mer de glace*. The pebbly mud and marine shells would be borne inland from the bed of the North Sea across the low-lying part of Caithness, where they would be commingled with the *débris* of the flagstones, and any marine deposits which might have been deposited in pre-glacial or inter-glacial times. Blocks of the various secondary formations derived from the areas crossed by the Scotch ice would also be mingled with the ground moraine.

It is no doubt true, as Mr Jamieson pointed out, that the mollusca are of a less Arctic type than those obtained from the stratified shelly clays of Elie, Errol, and other localities. But this may quite well be explained by supposing that they belong to a pre-glacial or mild inter-glacial period. The evidence in favour of alternations of climate in glacial times is steadily accumulating, during which there were constant migrations of northern and southern fauna. It does not follow, therefore, that because the fauna of the Caithness boulder clay is of a less Arctic type that the deposit does not belong to the boulder clay period. There can be little doubt, from the evidence we have adduced, that the reddish-brown boulder clay of local origin is of the same age as the grey shelly drift.

The widespread traces of moraines and gravels prove that long after the Scandinavian *mer de glace* had retreated, and the climatic conditions had become less severe, local glaciers moved outwards from the hilly ground to the west, depositing their materials alike on the red and the shelly boulder clay.

Glacial Chart of Caithness

The Glaciation of the Shetland Isles.

[*From the* QUARTERLY JOURNAL *of the* GEOLOGICAL SOCIETY *for November* 1879.]

The GLACIATION *of the* SHETLAND ISLES. By B. N. PEACH, Esq., F.G.S., of the Geological Survey of Scotland, and JOHN HORNE, Esq., F.G.S., of the Geological Survey of Scotland.

[PLATE XXXIX.]

I. INTRODUCTION.

ONE of the most interesting problems connected with glacial geology is the explanation of the glaciation of those groups of islands which lie at some distance from the north-east corner of the mainland of Scotland. It is now almost universally admitted, by those who have carefully weighed the evidence, that during the maximum cold of the glacial period, Scotland, Ireland, and the greater part of England wore buried underneath an ice-sheet, which moved off the high grounds towards the sea-level. This has been clearly proved by the careful mapping of the ice-markings indicating the trend of the old glaciers, as well as by a minute examination of the stones in the Boulder-clay which accumulated underneath the ice, and was rolled along with the onward motion of the mass. So far most geologists are agreed; but when the glaciation of the Orkney and Shetland Isles has been discussed, it has given rise to considerable difference of opinion. Doubtless this want of uniformity has been largely due to the imperfect evidence hitherto obtained from the isles regarding the direction of glaciation and the nature of the various superficial accumulations. There has been no systematic examination of Shetland, or even of Orkney, with a view to determine these questions; and hence the absence of reliable observations has given scope for some latitude of opinion, and has likewise retarded the final settlement of the question.

The group of islands to which this paper especially refers may be said to form a broken rampart running nearly north and south for a distance of about 70 miles. The isles are about 200 miles distant from the Norwegian coast-line at Bergen, and about 86 miles from the north-east corner of Scotland. Though they are thus completely isolated from both countries, it will be shown that their physical history is to some extent associated with that of Scotland and Norway.

The earliest references to the dispersion of boulders in these isles were made by Dr. Hibbert, who inferred that "the great diluvial wave which swept over the low elevations of the whole of Scotland and England had in the latitude of Shetland a north-easterly origin, or, in other words, that it had a south-westerly direction"

Edinb. Journ. of Science, vol. iv. pp. 85-91.

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Moro recently certain observations on the glacial phenomena of Shetland were made by Mr. O. W. Peach, who visited Lerwick, the outskerries of "Whalsey, and the island of Unst; and at each of these localities he noted the ice-worn aspect of the rocks, the striae, and the existence of Boulder-clay

Brit. Assoc. Report, 1864, p. 59. It should be remembered that Mr. C. W. Peach gives the magnetic readings in his paper; and hence, in order to obtain the true direction of the ice-markings, due allowance must be made for the magnetic deviation.

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To our colleague, Dr. Croll, belongs the merit of having first suggested the probability of the North Sea being filled with ice, enveloping alike the Orkney and Shetland groups of islands. This suggestion was first thrown out in a paper on "Glacial Submergence," which appeared in the 'Header' of the 14th Oct. 1865. In a subsequent paper "On the Origin of the Caithness Boulder-clay"

Geol. Mag. vol. xvii. pp. 209 and 271. The fullest exposition of Dr. Croll's views is given in 'Climate and Time,' chap, xxvii.

, he pointed out that the Scandinavian and Scotch ice-sheets probably united on the floor of the North Sea, and thence moved northwards and northwestwards towards the Atlantic. He showed that in all probability the enormous *mer de glace* which pressed out on all sides from Scandinavia, produced, in virtue of its greater size, a slight deflection of the Scotch ice, and caused it to override portions of the mainland. He indicated that in all likelihood both the Orkney and Shetland Isles were overtopped by the combined ice-sheets in their onward march towards the Atlantic.

In the autumn of 1876, one of us visited Shetland with the view of determining the question whether the glaciation of that group of islands had any connexion with that of Scotland and Norway. From the traverses then made, it was evident that these isles had been glaciated by Scandinavian ice, though in certain areas it seemed as if a more recent local glaciation had well nigh effaced all traces of the original movement

Nature, vol. xv. p. 139.

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The rich variety of rocks in Shetland renders it a comparatively easy matter to determine the direction of the ice-movement; but in order to insure accuracy it seemed desirable to map out approximately the areas of the respective rock-formations. During our leave of absence from official work in the summer of 1878, we therefore returned to the isles for the purpose of accomplishing this end with as much minuteness as time would permit. We were induced to work out the succession of the representatives of the Old Red Sandstone as developed on the Mainland, as well as the relations of the associated contemporaneous and intrusive igneous rocks, on account of the important evidence which they furnish regarding the ice-movement. While pursuing this object, we were fortunate enough to discover in the Walls district a rich series of plant-remains in rocks which have been hitherto considered as forming part of the metamorphic series. The general character and physical relations of these altered rocks will be briefly described in a subsequent page (p. 785).

II. General Distribution of the Rock-formations.

As the distribution of the rock-formations has an important bearing on the question of the glaciation, it will be desirable to give a brief outline of the nature and respective limits of the various formations, so far as these have been already determined. The stratified rocks belong to two periods:—(*a*) the Old Red Sandstone; (*b*) the great series of metamorphic crystalline rocks on which the representatives of the Old Red Sandstone rest unconformably. To what precise part of the crystalline rocks of the Highlands the metamorphic series of the Mainland and the north isles belongs, we do not at present presume to say

For detailed descriptions of the lithological varieties of the metamorphic series, see Hibbert's admirable volume on 'The Shetland Isles, 'published 1822; also a series of valuable papers by Professor Heddle on The Mineralogy of Shetland," Mineralog. Mag. vol. ii. pp. 12, 106, & 155.

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There are also associated with the metamorphic series some intrusive igneous rocks, and certain masses which may be viewed as products of extreme metamorphism. These may probably be relegated to the time when the metamorphism of the ancient stratified rocks took place. At least some of the igneous rocks now referred to must be older than the basement breccias of the Old Red Sandstone, inasmuch as the latter in certain localities are composed of angular fragments of the former.

But, farther, there are abundant proofs of volcanic activity during the Old-Red-Sandstone period, as is evident from the great development of contemporaneous and intrusive igneous rocks on the Mainland. Similar phenomena are met with in the isles of Papa Stour, Bressay, Noss, the Holm of Melby, and Meikle Rooe; but the magnificent sections on the western shores of Northmavine justify the conclusion that the proofs of volcanic activity on the Mainland surpass in grandeur and extent those of the other Shetland islands.

The Metamorphic Series.

On the Mainland these may be grouped in two divisions, which are clearly marked off from each other by

distinct lithological characters.

- Dark blue, green, and grey schists and clay-slates, with bands of quartzite and limestones.
- Coarse-grained micaceous and hornblendic gneiss, with associated limestones, bands of quartzitc, talcose and micaceous schists.

These subdivisions are peculiarly serviceable to the glacialist, as they help him to determine the different movements of the ice during successive phases of the ice age. The representatives of the former series extend from Fitful Head northwards by the Bonxie and Cliff Hills to Laxfirth Voe; while the members of the gneissose series lie to the north-west of the area just described. They occur in the districts of Tingwall, Weesdale, Nesting, Lunnasting, Delting, and along the eastern seaboard of Northmavine. The strike of these motamorphic rocks is generally N. 10°–20° E.; and though opposing dips are frequently met with, indicating repetitions of the strata, they usually dip to the north of west at high angles. Hence we have a gradually ascending series from the schists and clay-slates of the Cliff Hills to the coarse micaceous gneiss west of the vale of Tingwall, and the massive limestones of Whiteness and Weesdale.

To the persistent trend of the metamorphic rocks must be ascribed the remarkable ridge-shaped contour of the ground in the centre of the Mainland. The coincidence between the trend of the strata and that of the parallel ridges seems to indicate a direct relationship between the two, the denuding agents being guided in their operations by the relative hardness and softness of the materials exposed to their influence. Hence it follows that we have a scries of intervening hollows running parallel with the ridges, which usually terminate seawards in long narrow voes or sea-lochs. The erosion of these hollows has doubtless, in some instances, been duo to the partial removal of the bands of limestone by the chemical action of carbonated waters, inasmuch as the outcrop of the limestones coincides with the course of a longitudinal hollow.

The coarse-grained gneiss of Whalsey and the Outskerries, with the associated limestones, is merely the prolongation of the Mainland series; and the same remark is applicable to the gneiss occuring in Yell.

The structure of Unst and Fetlar is somewhat different, inasmuch as these isles contain well-marked zones of serpentine and gabbro, the distribution of which has an important bearing on the question of the dispersal of the stones in the Boulder-clay. In the island of Unst, the Vallafield ridge which flanks the western seaboard, whose highest elevation is about 697 feet, is mainly occupied by coarsegrained gneiss, dipping to the south of cast at comparatively high angles. On the eastern slopes of the ridge the gneiss is succeeded by grey mica-schists and green chloritic schists, and these are overlain in turn by black graphitic schists. These dark schists seem to form a reliable horizon with reference to the masses of serpentine and gabbro, as they usually crop out along the margin of the areas oeeupied by these masses and generally dip underneath them. Though these schistose rocks form but a narrow band from Belmont Bay northwards to Baliasta, they occupy a much broader area to the north of the latter point, constituting, in fact, the group of hills round Saxavord. They reappear again in the south-east corner of the island, where they cover a strip of ground about a mile in breadth between Skuda Sound and the ruins of Muness Castle.

The masses of serpentine and gabbro in Unst lie in a trough formed by these schists. They may be said to form two parallel zones crossing the island from south-west to north-east, the serpentine lying to the west of the gabbro. The serpentine area is the larger of the two, though somewhat irregular in outline; at the northern limit between Baliasta Kirk and Swena Ness, the mass is nearly two miles in breadth, but as it is traced southwards it diminishes to half a mile in breadth. Another patch of gabbro is to be met with on the promontory east of the ruin of Muness Castle.

It seemed to us that the serpentine has resulted from the metamorphism of the gabbro. Hero and there in the gabbro area, as, for instance, on the west side of Uya Sound, lenticular patches of serpentine occur, as if the transmutation had partly begun and had been interrupted. The gradual transition from the one rock to the other is well seen in the promontory on the south side of Balta Sound. Professor Heddle, who advocates this view, states that the gradual passage can be seen in hand specimens on Swena Ness.

The structure of the northern portion of Fetlar is comparatively simple. The central hollow coincides with a low anticlinal axis of black graphitic schists and chloritic schists similar to those in Unst, and apparently occupying the same horizon with reference to the gabbro and serpentine. These rocks throw off on both sides of the arch beds of gabbro and serpentine, forming the elevated ground round the Yord Hill on the east and the hills near Urie on the west. At Urie the serpentine which overlies the gabbro is immediately succeeded to the west by coarse-grained gneiss, the perfectly conformable junction between the two being distinctly visible on the shore west of the promontory of Urie. The broad mass of serpentine which stretches from the Vord Hill eastwards to Grating Bay is thrown into a synclinal trough, which is nowhere deep enough to bring in the overlying gneiss to the west of Urie. To the east of Gruting Bay occur the micaceous and chloritic schists as well as the graphitic schists, which contain in minor folds small patches of serpentine.

Intrusive Igneous Rocks in the Metamorphic Series.

Under this heading we shall only indicate those intrusive rocks and those products of extreme metamorphism which are probably older than the Old-Red-Sandstone period. We have already referred to the areas of gabbro and serpentine in Unst and Fetlar; but in addition to these there are certain masses on the Mainland deserving special notice.

Of these by far the largest is the mass of diorite occurring in the districts of Delting and Northmavine on the Mainland. It is upwards of ten miles in length, and in places it exceeds two miles in breadth; but it ought to be borne in mind that the whole of the area now described is not occupied by the diorite, nor is the boun- clary line so uniform as we have represented. A minute examination of this tract convinced us that the groundwork of the area, so to speak, is formed of metamorphic schists, which are traversed in all directions by largo and small veins of this rock. Both the diorite and the schists are intersected by innumerable veins of quartz-felsite which were injected at a more recent date, the whole series of rocks forming a complicated network.

Again, in Dunrossness, between Quendale Bay and Loeh Spiggie, there is a mass of intrusive rock termed by Hibbert epidotic syenite, which is traceable northwards through the islands of Oxna, Hildasay, the Sandistura rocks, the Channes, and part of Papa west of Scalloway, to the Mainland in Bixetter Voe and onwards to Aith Voe. This rock varies considerably in character throughout its course; in some places it is a quartz-felsite, while in the neighbourhood of Bixetter and Aith Voes it is a true porphyritic granite, with large crystals of orthoclase. There can be no doubt that it is an intrusive mass, because it crosses obliquely the strike of the metamorphic rocks on Fitful Head and the Wart of Skewsburgh; and it is equally clear that the eruption was prior to the Old-Bed-Sandstone period, as the basement breccias of that formation rest unconformably on this rock, and are largely made up of angular fragments of the subjacent mass.

A similar mass of porphyritic granite occurs in Unst on the bluff headland of Lambaness and on the rocky promontory north of Skaw Bay, which likewise bears important testimony regarding the direction of the ice-movement. In addition to these masses there are minor veins of granite, gabbro, and serpentine, some of which are indicated on the map. There is one fact bearing on the age of the veins of serpentine on the Mainland which is worthy of note; and that is, the occurrence of fragments of this rock in the basement breccias of the Old Red Sandstone in Dunrossness. This circumstance plainly indicates that the formation of the serpentine veins in that neighbourhood preceded the formation of the breccias.

The Old Red Sandstone.

A glance at the map will show the various areas occupied by the members of this formation in Shetland. Beginning with the irregular areas on the east side of the Mainland, the succession may be most readily grasped by means of the following section (fig. 1, p. 784)

For previous references to the Old Red Sandstone of Shetland, see Hibbort's 'Shetland Isles,' 1822; Memoirs of Wernerian Soc. vol. i. p. 162; Quart. Journ. Geo I. Soc. vol. ix. pp. 49, 50, also vol. xv. p. 413; "The Old Red Sandstone of Western Europe," by Prof. Geikie, Trans. Roy. Soc. Edin. vol. xxxviii. p. 414; 'The Old Red Sandstone of Shetland,' by Dr. Gibson, Edinburgh, 1877. 3 G 2

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Owing to a scries of faults which form the boundary-line between the metamorphic rocks and the Old Red Sandstone, over a great part of the districts of Lerwick, Quarff, Conningsburgh, and Dunrossness, it so happens that different zones in this vertical section are brought into conjunction with the schistose rocks. The true base of the series, however, is exposed in the neighbourhood of

Fig. 1.—*Vertical Section of Old Red Sandstone strata on east side of Shetland*.

Flaggy scries of Bressay. Lerwick Sandstones. Rovey Head Conglomerates. Brenista Flags. Basement Breccia. East Quarff, on the hills to the north of the bay and to the south towards Fladabister; while still another locality is met with near Loch Spiggie in Dunrossness. In each of these localities the breccia varies in character according to the nature of the underlying rock.

In the bay west of Brenista Ness, the overlying series of the Brenista Flags is thrown against the breccias and underlying schists by a fault which is traceable inland in a N.N.W. direction. This series consists of well-bedded rod flags, which persistently dip to the east till Gulberwick Bay is reached. The fault just referred to, when traced inland, always throws the flags down against the basement-breccia, and hence the actual superposition is not satisfactorily seen in the neighbourhood of Brenista. Between East Quarff and Fladabister,

however, the one group may be seen resting conformably on the other; and, in addition to this, we find that the basal breccia, which forms vertical cliffs on the coast-line about 200 feet high, thins out inland till there is only about 3 feet of breccia between the underlying schists and the overlying Brenista Flags. In some instances the breccia disappears altogether, and the Brenista Flags rest directly on the schists, a fact which points to the gradual submergence of the area.

Returning to the shore-section north of East Quarff, there is a gradually ascending series from the Brenista Flags to certain coarse conglomerates seen in a small stream at the head of the bay of Gulberwick, which are totally different from the basal breccias already described. Not only are the enclosed pebbles well rounded, but to a large extent the stones are composed of different materials. These beds are traceable up the slope of the Gulberwick hollow, to the road between Lerwick and Scalloway, where they form crags on the hill face, and where they may be seen in small quarries by the roadside. They may be followed also across the hills northwards to Rovey Head, about two miles north of Lerwick, where they are brought into conjunction with the schists by a fault which is well seen on the shore. From Rovey Head southwards to the ridge overlooking the head of Fitch Dale, this fault forms the boundary- line between the conglomerates and the metamorphic rocks. At this point it dies out, and the boundary-line southwards towards Fladabister is formed by the basement breccia already described.

At Rovey Head the conglomerates are thrown into synclinal and anticlinal folds; but eventually they dip to the south-east, and are succeeded immediately by grey sandstones, with blue and grey flags passing upwards into the series of the Lerwick Sandstones. The dominating members of this series are coarse grits, frequently conglomeratic, with partings of fine red shales.

In Bressay, however, these arenaceous and conglomeratic strata are overlain by a more flaggy series, which is more or less persistent till Noss Head is reached. We were struck with the resemblance which some of these grey flaggy bands bear to the calcareous flags of Orkney and Caithness containing the fish-remains; but a careful search failed to bring any to light. Numerous plant-remains have long ago been detected, not only in these strata but also in some of the other groups on the eastern shore of the Mainland.

In the peninsular tract of country which lies to the west of the Weesdale district there is a great series of rocks which, with the exception of a small tract at Melby, have been hitherto considered as forming part of the metamorphic series. The small strip of Old-Red-Sandstone rocks at Melby, measuring about a mile and a half in length, has been referred to by previous observers. They are separated by a fault from the red quartzites and shales of Sandness Hill; and on approaching the fault it is observable that the beds are much shattered on account of this dislocation. They consist of reddish sandstones with dark blue flags and shales, dipping to the east of south and south-east, from Sandness to near Melby.

The great series of rocks which occupies almost the whole of the remainder of this peninsular tract, and which by their fossil contents we have proved to be of Old-Red-Sandstone age, has a somewhat different lithological character. Over a great part of this area the beds consist of grey and blue altered sandstones, with green and pale shales. The altered sandstones are usually traversed in every direction by joints, which are coated with peroxide of iron; and in places the beds have a marked schistose character. Sometimes the sandstones are converted into genuine quartzites, and the shales inter-bedded with them are distinctly cleaved. The strata lie in a trough the axis of which runs approximately from Fontabrough Voe eastwards by the village of Walls to the head of Bixetter Voe. On the north side of the syncline we have a gradually ascending series exposed on the coast-lino from the cliffs of Sandness Hill southwards towards Fontabrough Voe, the average strike of the beds being E. 20° N.

We discovered the plant-remains on the hills north of Walls, and subsequently in quarries by the roadside east of the village, and on the hills between Gruting and Bixetter Voes. They have been examined by Mr. C. W. Peach, who has kindly furnished the notes on the specimens embodied in the Appendix. He is of opinion that the plants are identical with those found in the Old-Red formation of Caithness and Orkney; and the strata in which they are imbedded, altered though they be, must be relegated to that period.

This conclusion is still further strengthened by the occurrence in these rocks of interbedded porphyrites and tuffs in a highly altered form, which we detected on the headlands between Aith Ness and Clouster, and on the western shore south of Dales Voe, resembling in many respects the contemporaneous volcanic rocks to be described presently. Further, we are inclined to believe that the series of altered thick-bedded sandstones and shales which occupy the greater portion of this peninsular tract are on the same horizon with the Lerwick Sandstones on the eastern side of the Mainland.

It is not improbable that the alteration of the strata in this wide area may be duo to the existence of a mass of granite underneath these rocks. We shall have occasion to refer to the mass of granite in the heart of these beds in Sandsting, and to similar intrusive masses of Old-Red-Sandstone age to the north. The extent of ground occupied by these acidic rocks indicates the great volcanic activity which prevailed during that period; and though these are now isolated at the surface, it is highly probable that they may be connected underneath.

These altered fossiliferous strata are brought into conjunction with the gneissose rocks to the cast and north by two great faults which we have traced on the ground, the one running north and south, and the other approximately cast and west. Usually the altered strata are terribly shattered and baked close to the lines of dislocation, and are likewise injected with numerous veins of very fine-grained felsite.

Contemporaneous Igneous Rocks.

In the western district of Northmavine, between Stennis and Ockren Head, at the mouth of Roeness Voe, there is an important development of ancient lavas and ashes, associated at certain localities with ashy sandstones and red flags belonging to this period. The tract of ground occupied by these rocks measures about six miles in length, and varies in breadth from one to two miles. The structure of this narrow tract is comparatively simple, as the strata form a flat syncline, in the centre of which lies coarse ash, and underneath a series of slaggy porphyrites with occasional beds of red ashy sandstones and flags.

On the south bank of Roeness Voe, rather more than a mile from Ockren Head, in a steep grassy goo, the slaggy porphyrites are brought into conjunction with the pink quartz-felsite by a fault. In Braewick Bay, west of Hillswick, the interbedded and intrusive igneous rocks are not found in such close proximity, the junction being concealed by the sandy beach; but there can be little doubt that the same fault runs out to sea in this bay.

Crossing the coarse volcanic breccia, which forms the centre of the syncline, to Ockren Head, at the mouth of Roeness Voe, the successive lava-flows are admirably shown, piled on each other in regular succession. This headland, as well as the adjacent stack, exhibit at least four different lava-flows, capped by coarse ash. The lavas thicken and thin out rapidly, and likewise exhibit. The usual slaggy structure at the top and bottom of the flow. Some of these beds are also highly involved, and show clearly the way in which the partially solidified crust has been caught up and rolled over and over in the advancing current of still molten lava.

We have already alluded to the porphyrites and tuffs which occur in the altered rocks north of Walls. We also detected a bed of lava in the Holm of Melby, and a thin bed of tuff associated with the grey flags on the east side of Bressay, opposite the north end of the island of Noss. The contemporaneous volcanic rocks found in Papa Stour have been previously described by Professor Geikie.

Intrusive Igneous Rocks.

In the north and western portions of the Mainland there is a splendid development of highly siliceous intrusive rocks, which occupy the most elevated ground in the island. They extend from a point on the north end of the Mainland opposite the island of Uya, southwards to Roeness Voe, culminating in the dome-shaped mass of Roeness Hill. Thence they cross the peninsular tract to the Heads of Grocken, west of Hillswick, reappearing in the slender columns of the Drongs. The western portion of Meikle Rooe is formed of the same material, and likewise the north-eastern headlands of Vemeutry, while the small area of quartz-porphyry at Melby must also be included in the same great intrusive series. In addition to the areas now referred to, there are other lenticular masses varying in size down to veins a few feet across, occurring at intervals from Mavis Grind, northwards to Roeness Voe and Ollaborry. These traverse the Northmavine diorite and metamorphic rocks alike, increasing in number and extent as they approach the Roeness mass.

These rocks vary considerably in character; but they all agree in possessing a largo proportion of silica, while the felspar is usually orthoclase. As a rule, they are coarsely crystalline, the two prevalent ingredients, quartz and orthoclase felspar, being distinctly crystallized, which causes the rock to assume a marked granitoid texture. There can be little doubt that these coarsely crystalline rocks must have originally consolidated under great pressure, though the materials under which they lay buried have been wholly removed by denudation. Further, the marked columnar structure which meets the eye along both banks of Roeness Voe, and from the Heads of Grocken to Braewick Bay, as well as along the western shores of Meikle Rooe, suggest the idea of a great intrusive sheet, forced in like a wedge between the metamorphic series and the members of the Old Bed Sandstone long since worn away. A similar intrusive sheet occurs in Papa Stour, as described by Professor Geikie, where the same columnar structure is apparent, and where a fragment of the once superincumbent strata is still to be seen at the Horn of Papa. Fortunately the intrusive nature of this latter shoet is placed beyond doubt, inasmuch as the pink porphyry is seen

Fig. 2. *Section across Northmavine from Ockren Head to Skea Ness*.

W. Ockren Haad Roeness Voe. Roencess Hill The Biurgs. 1. Metamorphic rocks. 2. Pink granite and quartz-felsite. 3. Bedded porphyrites and ashes. 4. Serpentine. cutting across the underlying sandstones from a

lower to a higher horizon.

As the result of careful mapping of the boundaries of the Northmavine mass, we are of opinion that the Roe-ness-hill plateau is a great intrusive sheet which forced its way upwards and laterally between the metamorphic strata on the one hand, and the members of the Old Red Sandstone on the other, at the time when the Mainland lay buried under the sedimentary deposits which accumulated during that period. It is not at all improbable that this immense mass may have been connected with the surface by pipes which traversed the superincumbent strata, and may have discharged volcanic materials at the surface.

Its relations to the metamorphic series are admirably defined. Along the eastern seaboard of Northmavine it forms a mural escarpment about 200 feet high, part of which is known by the name of the Biurgs. Innumerable veins of quartz-felsite branch off from the main mass and intersect the metamorphic series. Further, it sometimes happens that portions of the adjacent rocks are enclosed in the quartz-felsite, as, for instance, near Colifirth Voe, where a fragment of serpentine is caught up in the mass. Again, on the north bank of Roeness Voe, the sheet spreads over the edges of the diorite and metamorphic rocks without producing any deflection of the strike of the metamorphic series, as shown in the accompanying section (fig. 2).

To the west of Hillswick, on the picturesque Heads of Grocken, the highly siliceous quartz-felsite is thrown against the metamorphic series by a fault, which is well seen on the cliffs. This fault passes out to sea between the little islets of Waterhouse Holm and the Drongs, and reappears in Meikle Rooe, separating the quartz-felsite from the diorite of that island. In all likelihood this dislocation is the northward prolongation of the great north-and-south fault already described, which brings the metamorphosed Old-Red-Sundstone rocks into conjunction with the gneissose rocks of Weesdale.

Our conclusion regarding the Roeness plateau is strengthened by a consideration of the relations of the granite mass of Sandsting to the altered Old-Red strata of that district. This siliceous intrusive rock has several lithological varieties; but away from the margin of the area, as, for instance, on the hills above Gruting and round Skelda Voe, it is an ordinary granite consisting of pink orthoclase, quartz, and mica.

On the shores of Gruting Voe, at the foot of Culswick Hill, the junction of the granite with the Old-Red quartzites and shales is well seen, from an examination of which it is evident that the granite is intruded along the lines of bedding of these strata. The junction-line has nearly the same inclination as that of the quartzites, which dip to the north at an angle of about 20°. The two rocks are not strictly conformable, however; for the granite here and there cuts across the bedding, indicating in an unmistakable manner the intrusive nature of the igneous rock. The junction is a sharp and well-defined line, as small hand-specimens can easily be got, 2 inches across, including the granite and the quartzite, the two being firmly welded together. Near the junction of the two rocks the quartzites are pervaded by numerous dykes of pink felstone proceeding from the main mass.

The mass of granite in the north of Delting and on the western shores of Sulem Voe was probably erupted during the same period of volcanic activity; but the evidence is not so convincing as that referring to the areas already described.

But in addition to the grand series of intrusive rocks we have just indicated, there is evidence to prove that even these quartz-felsites and granites were invaded by a still later series of dykes, of a basic character. Hibbert detected the existence of these dykes on Roeness Hill; and during our traverses in the district of Northmavine, Delting, and Meikle Rooe we came across many similar masses, varying in breadth from 2 feet to several yards. Along the cliffs of Roeness Voe, and in the island of Meikle Rooe, these dykes are strikingly exhibited, forming great wall-like masses, running generally in a north-and-south direction. Sometimes they project above the acidic rocks, while, again, they weather more rapidly, forming great clefts in the face of the cliff. They are fine-grained, and consist of a dark-green diabase porphyrite. They traverse the metamorphic rocks, as well as the porphyrites and tuffs, west of Braewick; and there can be little doubt, therefore, that they form the last indications of volcanic activity during the Old-Red-Sandstone period in Shetland.

Close by the entrance to the Noss Sound, on the Bressay shore, we detected a scries of necks arranged in a linear manner, which seem to have come to the surface along a line of fissure. Similar necks occur on Noss, on the opposite side of the Sound. It is highly probable that these volcanic orifices served merely as vents for the discharge of steam, with occasional showers of triturated materials derived mainly from the sides of the vents. The adjacent bed of tuff, associated with the grey flags, as well as the nature of the agglomerate which now fills these necks, seems to support this view.

III. GLACIATION.

From Sumhurgh Head northwards to Hermaness in Unst, we find everywhere the clearest evidence that Shetland must have been at one time smothered in ice. The ice-worn islets along the shoreline, the polished and striated surfaces on the low grounds, the abraded and fluted appearance of the highest hills on the Mainland,

alike point to the action of a thick mass of ice, which must liave enveloped the isles. It is quite true that over considerable areas much of the evidence is obscured by a thick covering of peat; but wherever the peaty covering has been worn away, there are convincing proofs of that intense abrasion which we are accustomed to meet with in highly glaciated regions.

Before describing the proofs of glaciation in the different islands, it may be well to state, as the result of our observations, that most of the *roches moutonnées* and striations indicate the movement of an ice-sheet across the islands from the North Sea to the Atlantic; but, in addition to this, there is satisfactory evidence for maintaining that, as the climatic conditions gradually ameliorated, the primary ice-movement gave place to that of local glaciers, which moved off the high grounds in the ordinary way, depositing their terminal and lateral moraines as they shrank back into the hills.

Along the eastern seaboard of Unst the direction of the ice-markings varies from W. to W. 20° S. From Norwick to Harolds-wick numerous striæ occur on the cliff-heads running W. to W. 20° S., some of which were found on the top of a cliff 500 feet high; while in the southern parts of the island the average trend is W. 30° S. In Fetlar the general direction of the striæ along the northern coast, from Gruting Bay to the promontory of Urie, is W. 30° S., though they vary from W. to W. 30° S. Two exceptions to the foregoing examples were found on the west side of the island—one on a glaciated surface of serpentine west of the promontory at Urie, running north and south, and the other on gneiss at the north-west comer of the island, pointing N. 10° W. These instances, however, have no connexion with the main set indicating the general glaeiation of the island.

Again, on the north-east coast of Yoll the striæ point W. 25° S., harmonizing with the direction of those found on the south side of the island of Unst; but on the western seaboard from Sandwick to the Noup of the Graveland the trend varies from W. 30°–39° N. In spite of this variation we are convinced, from evidence obtained in the Mainland, that these instances belong equally to the period of primary glaciation. It would seem that the ice-sheet abutted on the eastern seaboard of Shetland with a S.S.W. and S.W. trend, and after reaching the crest of the Mainland it swung round to the N.N.W. and N.W.

Along the north-west coast of Whalsey, between Skaw Taing and Symbister, the average direction of twenty-one instances is S. 28° W., varying, however, from S.W. to S. 15° W., the variation being due in many eases to inequalities of the ground; while on the southeastern shore the trend varies from S. 15° W. to S. 23° W. Now it is apparent, on a moment's consideration, that the direction of the striæ would have been widely different had the island radiated its own ice, and had the glaciation been purely local. Both on the north-west and south-east shores the striæ are either parallel with the long axis of the island or cut obliquely across it; and hence, in order to produce these striæ, there must have been, during the primary glaciation, a mass of ice moving in that particular direction.

In addition to this, there is evidence to prove that this island possessed local glaciers at a later period; for to the north of Challi-setter ice-markings occur, trending N. and N. 10° E. Close by these later striations, numerous small moraines are seen on the gentle slope which flanks the central ridge in the northern portion of the island.

There is, perhaps, no district in Shetland where the intense abrasion typical of glaciated regions is so patent as in the out-skerries of Whalsey. When sailing from the latter island to the Skerries, we were struck with the ice-worn aspect of the numerous little domes of rock projecting above the water. Housay, Brury, and Gruna may be described as large *roches moutonnées* which have been ground down, bared, and striated in a wonderful manner. Prom the top of the little hill south of the schoolhouse, one sees all round a succession of bare hummocks and domes of rock, destitute of any drift-covering, and with little vegetation, revealing unmistakably the great pressure to which the islands have been subjected. In Gruna the striae vary from S. 10° W. to W. 42° S.; in Brury, on the top of the highest hill, S. 35° W.; and in Housay, S.S.W. to S.W.

A glance at the map will show that the instances now adduced coincide in direction with those occurring in Whalsey, and, with the exception of a littlo more southing, they agree with those in Unst, Fetlar, and on the east coast of Yell. In the case of the Skerries this south-westerly trend has a marked significance, inasmuch as no one can possibly dispute that the glaciating agent must have been quite independent of the islets. It is equally clear that the markings are not due to the action of any local sheet radiating from the Mainland of Shetland. Apart altogether from the fact that the position of the *roches moutonnées*, as well as a minute examination of the striated surfaces, convinced us that the ice crossed the Skerries from the north-cast towards the south-west, there are other reasons why these markings cannot be attributed to any such local cause. When we come to discuss the evidence supplied by the Mainland in regard to the extent of the later glaciation, we shall see that there is satisfactory ground for maintaining that the later glaciers did not spread far beyond what is now the coast-lino of that island. Moreover, the direction of the later glacier movement on the east side of the Mainland is at variance with the trend of the striæ occurring in the Skerries. For these various reasons, therefore, we are justified in inferring that the glaciation of these outlying islets is due to the action of an ice-sheet originating far beyond the sphere of Shetland.

On the eastern seaboard of Northmavine, in the Mainland, between Ollaberry and North Rooe, the general trend of the ice-markings is in a south-westerly direction. On the north shore of North Rooe Bay two sets of stria: were observed—one pointing S. 40° W., belonging to the primary glaciation; the other S. 30° E., produced by later glaciers moving down the bay. Near Fethaland Point two sets of striæ were observed, which clearly prove the general movement of the ice during the primary glaciation, and at the same time a separate movement of the lower portions of the mass caused by an undertow. On the headland north of the fishing-station the striaæ run N.W. and N. 20° W.; while on the south side of the bay, about a mile from the fishing-station, the markings on the cliff-heads point N. 6° W., N. 10° E., N. 20° W., indicating a varying movement in a northerly direction. On ascending the polished slope which overlooks the foregoing examples, the direction is S. 10°–35° W. This divergence is readily accounted for by supposing that the lower current moved in a north and north-west direction, while on the slopes of the ridge the upper current moved towards the south-west in harmony with the general movement along the eastern seaboard of the Mainland.

Again, in the upper part of Roeness Voe, the striæ point W. and W. 10° N.; but on descending the sea-loch they swing round to the north-west, the instances near the mouth of the voe trending N. 20°–28° W. The same northing of the striæ is splendidly seen on the area occupied by the interbedded volcanic rocks between Braewick Bay and Hamna Voe, the direction varying from N.20°W. to N.W.

Along the highroad from Ollaberry to Mavis Grind, numerous instances were observed which likewise indicate a passage of ice from the North Sea towards the Atlantic. On reaching Sulem Voe from the north, the eye at once fixes on a large *roche moutonnée* of diorite, which rises to a height of 200 feet above the sea-loch, and the surface of which is finely polished and striated, the markings pointing W. 5° S. And so, also, the narrow neck of land at Mavis Grind is similarly grooved; indeed, over the whole of the district round Hagrister and Islesburgh and north of Magnusetter Voe, the ice-worn aspect of the hills is very apparent, the smooth slopes looking to the east, while the rough slopes face the west, indicating the direction from which the ice came.

On the eastern shores of the districts of Nesting, Lunnasting, and Delting there is no lack of evidence regarding the glaciation, as striæ are plentiful, and in certain areas there is but a scanty covering of peat and herbage. It is difficult to convey an adequate impression of the singularly bare and mamillated appearance of the tract of ground which forms the peninsular headlands of Lunnasting. Bare dome-shaped hills, dotted all over with lochs, occur in the tract between Dourye and Vidlon Voes; and the same features are apparont on the rocky promontory north of the latter sea-loch. Indeed, so perfect and so abundant are the *roches moutonnées* that it may be correctly described as by far the finest district on the Mainland for studying the effects of the primary glaciation.

The average trend of the ice-markings in the districts now referred to is W. 35° S., though they vary from W. to S.W. The position of the *roches moutonnées* leaves no room for doubt as to the direction of the ice-movement. In Swining Voe, which lies to the west of Vidlon Voe, there is a gentle Boulder-clay slope on the east bank, and a steep rock-face on the west bank, rising to a height of from 400 to 500 feet. Notwithstanding this steep slope, the whole rock-face is splendidly glaciated; and, strange to say, the stria; do not run parallel with the coast-lino but obliquely across it, the direction being nearly south-west. In one remarkable instance, about halfway down the voe, on a glaciated surface, which slopes downwards into the sea-loch at an angle of 65°, stria; were observed which could be traced from the water-level up the rock-face at an angle of 25° with the surface-plane of the sea-loch. We shall point out presently how the dispersal of the stones in the Boulder-clay completely substantiates this south-westerly movement of the ice.

The tract of country which stretches from Weesdale westwards to Melby and Walls presents the same glaciated aspect, though in many places the *roches moutonnées* have been much broken up by atmospheric waste. Nevertheless the rounded outline of the hills testifies to the moulding of the whole tract by ice, while the stria; have a marked north-westerly trend, quite in keeping with the northing already referred to on the western shores of Northmavine. Not only so, but the highest ground in the centre of the Mainland is likewise ground down and striated. The ridge which extends from Weesdale hill (842 feet) to Scallafield (916 feet) reveals the finer lines as well as the flutings of the ice-chisel wherever the peat is worn away, the direction varying from W. 28°–40° N. Near the gap in the ridge overlooking the head of Weesdale Voe, the polished surfaces and striations are as fresh as if the ice had but recently passed away. Further, the same north-westerly trend is met with on the banks of Olna Voe, east of Meikle Rooe, and in the numerous sea-lochs opposite the isles of Papa Little and Vementry.

In the districts of Lerwick and Quarff, on the eastern seaboard, there is conclusive evidence of the existence of two systems of ice-markings, the one set belonging to the general glaciation trending in a south-westerly direction, and the other set belonging to a later period, indicating a movement in a south-easterly direction, produced by local glaciers. Indeed, so severe must have been the later glaciation in the neighbourhood of Lerwick, that most of the instances belonging to the primary system were well-nigh effaced by it. Both the abundance and the freshness of the stria; belonging to the later system plainly indicate the power of the local

glacicrs in this neighbourhood; but we shall see presently that at no time were they large enough to override the island of Bressay. Several interesting examples of cross-hatches were observed near the fort at Lerwick, also north of the docks, and again near the village of Sound, the older markings running S.W. and the newer ones S. 40° E. to E. 40° S.

In the long tongue of land stretching southwards from Quarff to Sumburgh Head, the striæ belong mainly to the later glaciation, the direction varying from E. 29° S. to S. 34° E.; about half a mile from Boddom, however, by the roadside, some examples occur in which the trend is W. 3°–9° N., produced by ice moving in a westerly direction.

From the evidence we obtained in Bressay, it is clear that the south-westerly system is the one which is most prominently marked in that island; indeed, so abundant are the ice-markings belonging to the early glaciation, that some parts probably escaped the movements of the later glaciers altogether. This much is certain, that the local glaciers of the Mainland were only able to override the north-western portions of Bressay. Along the eastern coast, from Heogan to the lighthouse, as well as by the roadside from Cullonsbro to Gardie, the trend varies from W. 20° S. to S. 30° W. But on the slopes east of the Wart the later system points S. 20° E. to E. 16° S.

In the island of Meiklo Rooe, which lies to the west of the Mainland, the average trend is N. 30° W.; in Papa Stour it varies from N. to N. 28° W.; while in Foula, the most isolated of the Shetland group, situated about 18 miles to the S.S.W. of the village of Walls, well-marked striations were observed, running N.W. and W. 30° N.

Altogether we recorded upwards of three hundred and twenty instances of striations in the Shetland Isles, the great majority of which belong to the primary glaciation.

IV. BOULDER-CLAY

The Boulder-clay and morainic deposits confirm in a remarkable manner the conclusions already established regarding the double system of glaciation in Shetland. The rich variety of rocks, not only in the Mainland, but also in Unst and Fetlar, enables us to test the truth of these conclusions by noting carefully the distribution of the included stones and the sources whence they were derived. If it be true, as has just been stated, that the ice moved from the North Sea to the Atlantic during the primary glaciation, it naturally follows that the Boulder-clay or *moraine profonde* occurring to the west of the serpentine areas in Unst and Fetlar should contain a certain percentage of stones derived from those areas. The very same reasoning is also applicable to the Mainland; and in order to show how completely the dispersal of the stones in the Boulder-clay substantiates this conclusion, we shall briefly describe a series of traverses we made in Unst, Fetlar, and the Mainland, where the rocks vary in lithological character, indicating the variations in the Boulder-clay and the distribution of the included stones.

Round Balta Sound, in Unst, this deposit is sparingly distributed, only occasional sections being visible on the north and south sides of the bay, the included blocks being almost wholly derived from the gabbro and serpentine areas. Duo west of the Sound, in the hollow along which flows the Baliasta burn, there is a considerable covering of Boulder-clay, the included stones being mainly composed of serpentine and dark graphitic schist, though the underlying rock consists of green chloritic schist and gneiss. Ascending the Vallafield ridge, the slope is found to be covered with heather and peat, and well-nigh destitute of drift. Where this covering has been removed, numerous bleached fragments of serpentine are to be found; while near the top of the ridge, where the slope is more gentle, occasional patches of Boulder-clay are met with in which well-striated fragments of serpentine, gabbro, and black schist occur. No Boulder-clay is to be seen on the watershed, which reaches a height of over 600 feet at this point; still, where the peat is worn away, a few bleached fragments of serpentine are observable.

Along the western coast, from Woodwick to Wick Bay, a narrow ledge or terrace intervenes between the rock-slope and the coastline, which is covered with Boulder-clay more or less continuously. Excellent sections of it are exposed at the heads of the numerous geos. At Collaster it consists of a tough fawn-coloured clay, full of striated stones of all sizes up to blocks 2 to 3 feet long. The following percentages wero taken from the banks of the voe at this locality:—

In all the sections south of Collaster, towards Wick Bay, fragments of serpentine and gabbro are invariably present in this deposit. Moreover, it is important to note that the relative distribution of the gabbro and serpentine stones in the Boulder-clay between these localities is in direct proportion to the respective areas occupied by these rocks on the east side of the watershed. The following are the proportions in the Boulder-clay sections at three localities:—

This relative distribution of the stones is not a mere accident; for a glance at the map will show that to the

E. and E.N.E. of Collaster the serpentine occupies a much greater breadth of ground than the gabbro, while to the east of Wick Bay the conditions are reversed. Such a direct relationship is inexplicable on the hypo- thesis that the primary glaciation of the island was due to floating ice.

If we traverse the southern shore from Muness Castle to Belmont, similar evidence is obtained from the Boulder-clay regarding the ice-carry. Again, in the north part of the island, in the lee of Saxavord hill, this deposit occurs on the east bank of Burra fiord, about 300 feet above the sea-level, where it reaches 50 feet in depth. The material is mainly derived from the talc-schist and quartzose bands which constitute the hill; but a considerable proportion of the stones likewise consist of the peculiar granite of Lambaness. Now it must be borne in mind that, ore these granite-fragments could have reached this position along the path-line indicated by the striæ, they must have been transported in the *moraine profonde* across the shoulder of Saxavord hill, where it attains a height of 800 feet; whereas none of the Lambaness granite occurs *in situ* at a greater height than 150 feet.

On the west coast of Fetlar, blocks of gabbro and serpentine, derived from the centre of the island, occur in the Boulder-clay north and south of Burgh Hall; while striated fragments of the same rocks, from Unst, are found in this deposit on the north-east coast of Yell. We likewise observed smoothed fragments of gabbro from Fetlar in this deposit on the east coast, between Mid Yell and Basta Voe.

A traverse across the district of Northmavine, in the Mainland, from Ollaberry on the east coast, by Hillswick, Braewick, Tanwick, to the Grind of the Navir, furnishes admirable opportunities for examining the distribution of the stones in the Boulder-clay. A glance at the map will show the variety of rock-formations which occur along this lino; and the marked lithological characters of the rocks fortunately prevent any possibility of mistaking them. It is particularly observable that the till partakes of the physical character of the rock-formation on which it rests, though there is also a percentage of foreign stones derived from localities which lay in the path of the ice-sheet. The distribution of the stones in the Boulder-clay along this line of section places beyond all doubt that the ice-sheet, as it impinged on the Mainland, moved in a W.S.W. direction, and as it left the Mainland it veered round towards the N.W. and N.N.W.

The sections in the neighbourhood of Ollaberry, and along the road to the Pondswater loch, show that the Boulder-clay is made up of the underlying gneissose and schistose rocks. The deposit consists of a stiff stony day, containing fragments of schists, gneiss, and quartz rock. None of the fragments of the diorite, nor any of the lavas and ashes along the western shores, occur in the Boulder-clay. But when the diorite area is reached, the schists and gneiss to the east are represented in small patches of the deposit lying in hollows between the *roches moutonnées*. Beyond the diorite-area again, in the lee of the ridge of the metamorphic rocks of Hillswick, one of the finest Boulder-clay sections to be found in the Mainland occurs. This section, which is upwards of 100 feet in depth, rests on grey micaceous schists, with hands of quartz-rock, which are much broken up immediately underneath the Boulder-clay. These rocks are intersected by dykes of pink quartz-felsite, which are well seen on the beach at the base of the cliff. The deposit is very tough and clayey, and quite homogeneous from the top to the bottom of the section; it is likewise quite unstratified, the stones being scattered through the clayey matrix in an irregular manner. The lower part of the section is mainly made up of the underlying rocks; but about halfway up the section, a percentage of stones was taken which yielded the following results:—

It may seem strange that none of the underlying schists are represented in the above percentage; but it so happened that the stones we selected high up in the section averaged about 4 inches across. In another percentage of stones measuring about 2 inches across, the underlying schists number about 15 per cent. The prominent ingredient in this section is the diorite, which occurs to the east of Hillswick; but it ought to be remembered that not a single fragment of the lavas and ashes to the west are to be found in this deposit.

About two miles to the west of the foregoing locality, in the north-east corner of Braewick Bay, a section of Boulder-clay, about 12 feet high, is exposed resting on the intrusive quartz-felsite, containing diorite, schist, and felsite stones; while still further west, within the limits of the contemporaneous volcanic rocks, sections of Boulder-clay occur in the bays of Tanwick and Stennis, the included stones being dull purplish porphyrite, blocks of tuff, quartz-felsite, schist, and diorite. Further, along the storm-swept cliffs of the Grind of the Navir, a thin deposit is traceable containing the same ingredients as at the localities last mentioned. The diorite stones, however, are comparatively rare at the Grind of the Navir: in fact they gradually diminish in number in proportion to the distance from their parent source; and the very same remark applies to the other ingredients.

We traversed the south bank of Roeness Voe from the head of the sea-loch to Ockren Head, where similar phenomena were observed, viz. the invasion of the quartz-felsite area by the diorite stones, and the invasion of the area occupied by the porphyrites by the diorito and quartz-felsite stones. Indeed the evidence obtained along these lines of section completely refutes the theory that these northwesterly striæ could have been produced by ice coming from the North Atlantic.

Another traverse, from Vidlon Voe westwards by Swining Voe and across the high grounds to North Brae,

indicates in an unmistakable manner the direction of the ice-movement during the primary glaciation. In passing out of the Vidlon valley, across the watershed into Swining Voe, the eye readily fixes on a rocky ridge or, rather, a scries of semi-detached *roches moutonnées*, which present their bare slopes to Vidlon Voe, in the lee of which lie well-marked "drums" of Boulder-clay, whose long axes coincide in direction with the trend of the striæ. This deposit covers the whole of the gentle peat-covered slope which forms the eastern boundary of Swining Voe; and it contains numerous fragments of a band of nodular gneiss, which crosses Lunnasting in a north-and-south direction about midway between Lunna and Lunna Ness.

But, further, the Boulder-clay in both the valleys draining into Swining Voe consists of a tough tenacious clay, full of striated stones, derived mainly from the underlying schists, quartzites, and dark hornblendic rocks; and associated with these are fragments of the coarse gneiss of the promontory of Lunna and the nodular band already referred to.

Now it is interesting to note that both in the Vidlon and Swining Voes, which lay across the path of the ice-sheet, the Boulder-clay is found to have the greatest development on the eastern shores; while the western slopes, which were exposed to the full sweep of the abrading agent, axe finely *moutonnées* and striated, and well-nigh destitute of drift. But if we take the adjoining Colafirth and Dales Voes, which coincide very nearly with the direction of the ice-markings of the primary glaciation, we find well-marked Boulder-clay slopes on both sides of the sea-loch, indicating that the deposit was distributed more or less equally along the bottom and sides of the valley.

These features remind one very much of the familiar terraces of Boulder-clay in the high-lying valleys in the south of Scotland; while the deposit itself is in all respects identical with the ordinary Scotch till. Indeed, whether we consider the resemblance in the mode of occurrence, or the character of the deposits in Scotland and the Shetland Isles, we cannot resist the conclusion that both have a similar origin.

But even in the Dales and Colafirth Voes it would seem that the deposit steals further up the slopes, and attains a greater thickness on the north than on the south banks—a phenomenon which may be accounted for by the supposition that the ice, as it moved up the sea-lochs, had a greater erosive effect on the one seabank than the other. This supposition is confirmed by a glance at the stri;e-map, which shows that the markings are not quite coincident with the banks of the voes, but cross the southern shores at a gentle angle.

After crossing the Leas of Deal and descending the valley between the Duddon and Gallows hills towards Busta Voe, the boundary-line of the diorite is again crossed, when fragments of this rock are found abundantly both in the moraines and the underlying Boulder-clay. Not a single block of this rock, however, is to be met with on the surface or in the drifts to the east of the boundary-line.

In the district which stretches from Weesdale westwards to Walls, and thence to Melby, the Boulder-clay sections furnish corroborative evidence of the north-westerly movement of the ice in that region. In the vales of Tingwall and Weesdale there is no trace of the altered Old-Bed-Sandstone rocks which occupy the peninsular tract of country to the west. But as soon as the line of the great fault is crossed, which bounds these strata between Aith Ness and Selie Voe, abundant fragments of the gneissose rocks of Weesdale and adjoining tracts, as well as blocks of the porphyritic granite, are found in the Boulder-clay resting on the altered Old-Bed rocks.

Again, in the sections round the coast-line in the neighbourhood of Melby, the fragments in the subglacial deposit entirely consist of the underlying sandstones and the red quartzites and shales of Sandness Hill, along with some pink quartz-felsitcs; but none of the purplish porphyrites which occur in Papa Stour are represented in these sections. Had the movement been *from* the north-west, then assuredly some fragments of the porphyrites would have been met with round Melby. Instead of this being the case, however, the Boulder-clay of Papa Stour contains numerous fragments of the altered Old-Red-Sandstone rocks from the Mainland.

Another traverse across the island, from Gulberwick to West Quarff, reveals phenomena no less remarkable. On the slopes of the hills above Gulberwick, fragments of the red flags of Brenista and grits are met with; and they also occur in some patches of Boulder-clay near the head of the burn draining into the bay at East Quarff. On the west side of the watershed the Sandybanks bum is reached, which flows into Cliff Sound about a mile and a half to the north of West Quarff. In this hollow there is a deep covering of Boulder-clay, attaining a thickness near the farmhouse of 20 feet. Following this burn to its source, the deposit is found to consist of tough tenacious clay, with well-scratched stones, many of which consist of grit, red sandy flags, and shales of Old-Red-Sandstone age, associated with grey schists derived from the underlying rock. But further along the western seaboard, between the mouths of Sandybanks burn and West Quarff, similar phenomena are observable. Where this stream enters the sea, large blocks of the Lerwick sandstones and well-rounded conglomerates, measuring 2 feet across, were met with both in the Boulder-clay and on the surface. A hundred yards to the south of this locality fragments of the Brenista flags appeared, and became more numerous as we followed the coast-lino southwards. Not far from West Quarff blocks of the basement breccia were met with, associated with fragments of the Brenista Flags and Rovey-Head conglomerates, in the thin coating of Boulder-clay on the slope and on the shore.

We have already indicated the relative areas occupied by these subdivisions of the Old-Red-Sandstone rocks between Rovey Head and East Quarff, for the special purpose of showing the analogous distribution of the stones in the Boulder-clay on the western seaboard.

On referring to the map it will be seen that the members of the Old-Red-Sandstone occupy the strip of low ground from Levenwick southwards by Loch Spiggie to Quendale bay. Now from Channer-wick southwards along the hill-tops to the "Wart of Skewsburgh (854 feet), smoothed blocks of the red flags, varying from 2 inches to a foot across, are to be found in those places where the peat has been worn away. These blocks are readily detected on the top of Skewsburgh hill, in spite of their being bleached by the peat.

Further, if we cross from Channerwick to the west coast, and traverse the coast-lino from Maywick to Loch Spiggie, numerous blocks derived from these areas are likewise met with. In the hollow which runs south from Maywick to Bigton, striated blocks from the red flags are strewn on the eastern slope overlooking the valley, the largest of which have been used as building-material by the villagers of Maywick. Again, on the hill-slope about a mile cast from Bigton, blocks of flaggy sandstone are very numerous; and they likewise occur very abundantly in the Boulder-clay on the top of this hill. On both sides of Bigton Bay, the sections of Boulder-clay contain numerous fragments of red flags, though the majority of the stones are made up of the underlying schists. Close to the point where the sand-bar joins the island of St. Ninians to the Mainland, a similar admixture of stones, derived from the red flags on the cast side of the island, is to be seen in the Boulder-clay underneath the blown sand. And so, too, southwards towards Loch Spiggie, wherever patches of Boulder-clay have escaped denudation, the same phenomena are observable.

Again, on the slope of Fitful Head, at a height of 800 feet by aneroid measurement, there are small patches of this deposit, in which we observed smoothed stones of syenite and coarse grits in situ to the east; while on the hill-top (929 feet) blocks of syenite were noted, which must have been carried up the slope. These facts unquestionably point to the same westerly flow of the ice; but at the base of the slope, along the margin of the syenite area, there is an excellent section of morainic stony clay, in which blocks of schist, syenite, and Old-Red grits are commingled. This deposit is evidently the product of a later glaciation, when the Fitful Head shed its own glacier, and when the detritus which had accumulated on the slope during the primary glaciation was rolled downwards to the low ground at the foot of the hill.

From the evidence now adduced it cannot be doubted that, during the primary glaciation, the great *mer de glace* crossed the Mainland from the North Sea to the Atlantic. We might have multiplied the evidence considerably by referring to the Boulder-clay distributed over the other islands; but we have confined our observations to those lines of section where there is the greatest variety of rock-formations, in order to show both the strength and harmony of the evidence. Ere leaving this division of the subject, we ought to state that, though we carefully searched the numerous sections of Boulder-clay in the different islands, we found no traces of shells in the deposit.

There are certain phonomena still to be discussed, which indicate the gradual retreat of the great ice-sheet when this northern archipelago was no longer influenced by the ice-sheets of adjoining countries, but nourished a series of local glaciers which deposited their moraines as they shrank back into the hills.

V. Mobainic Deposits belonging to the Later Glaciation.

On referring to the striæ-map, it will be seen that numerous instances occur along the east coast of the Mainland, from Lerwick to Dunrossness, running in a S.S.E., S.E., and E.S.E. direction, the trend being affected by certain local influences. Now, along this tract there is an irregular covering of a loose morainic deposit, passing into an ordinary Boulder-clay, resting on the areas of the Old Red Sandstone, and containing fragments of the schists from the Cliff Hills, along with the stones derived from the underlying formation. These sections are exposed on the shore between Lerwick and Rovey Head, in the Clickamin bay, Wick Sound, Gulberwick Bay, and in the Old-Red-Sandstone areas from Sandlodge to Boddom. After a carcful examination of these sections, we felt convinced that the small fragments of blue and grey schists occurring in the Boulder-clay and morainic matter have been derived from the hills which extend from the Wart of Skewsburgh northwards by Scalloway to Dales Voe. It has been already shown that these schists and clay-slates form the highest ground between Dunrossness and Dales Voe north of Lerwick; and the occurrence of fragments of these rocks in the drift along the eastern seaboard points merely to a local radiation of the ice, after the great *mer de glace* that overflowed Shetland had melted back and was no longer confluent with the small glaciers that lingered on during the later glaciation.

That this is the explanation of the foregoing phenomena seems still more likely when we examine the

eastern sea-board of North- mavine between Colifirth Voe and Fethaland Point. At certain localities, in the narrow strip occupied by the metamorphic rocks, we found similar deposits mainly made up of the debris of the underlying rocks, but likewise containing stones derived from the Roeness plateau. These sections occur on the north bank of Colifirth Voe in the North-Rooe bay; and again round the Fethaland fishing-station and in the Sand Voe. Now from Colifirth Ness northwards to Calsta extends a well-marked ridge parallel with the Biurg range, against which the local glaciers abutted, which were shed from the Roencss plateau. A similar ridge runs from North-Rooe Bay to Fethaland, culminating in the Lanchestock hill (416 feet). These ridges deflected the later glaciers, and caused them to move southwards into Colifirth Voe, and northwards into North-Rooe Bay and Sand Voe. Hero and there, however, where the ice must have been heaped up, it streamed across the lower portions of the ridge flanking the sea. From the configuration of the ground it is apparent that the Roeness plateau must have shed its largest glacier in the direction of North Rooe. Hence it follows that only at certain localities reached by the local glaciers are fragments of the quartz-porphyry to the west associated with the schists in the drifts. The same remarks are applicable to the erratics of pink granite and quartz-felsite scattered over the surface between Fethaland and Colifirth Voe.

These accumulations were in all probability extruded at the snouts of the local glaciers when the great *mer de glace* had melted away from the immediate vicinity of Shetland. This is rendered all the more likely from the number of striated stones in the deposit, and its tolerably coherent nature, differing somewhat from the loose debris of the ordinary surface-moraines. But, in addition to these later deposits, there is abundant evidence to show that when the hilltops had emerged from the icy covering which so long held sway during the primary glaciation, the severe frosts which prevailed caused an accumulation of blocks and rubbish on the surface of the attenuated glaciers. In course of time, as the glaciers melted back, loose heaps of rubbish were laid down, sometimes as isolated mounds, but frequently in concentric lines indicating pauses in the retreat.

As might be expected from the size of the valleys and the limited elevation of the hills, the moraines are not largo; but they are nevertheless very abundant; indeed there are few of the important valleys draining a mass of high ground which do not contain well-marked groups. They consist of loose debris with angular and subangular stones; and in some cases the deposit is merely an assemblage of small stones without any matrix. Numerous examples occur, however, where the heaps show distinct traces of stratification and the stones are somewhat waterworn.

In a small valley about two miles in length, draining the cast side of the Bonxie hills and flowing into the bay below Connings-burgh, a fine series of moraine heaps occurs, displaying the usual concentric arrangement. They vary in length from 5 to 10 feet; and numerous blocs perches of the Bonxie-hill schists rest on the mounds.

In the district of Delting, moraines are to be found in the main valleys and round the heads of the larger sea-lochs, as for instance the Dales, Colifirth and Swining Voes on the cast coast, and near Voe, North Brae, and Voxter on the west coast. And so also on the banks of Vidlon and Dourye Voes in Lunnasting, similar deposits are seen resting on the Boulder-clay. We frequently observed that the moraines became more numerous where two or more valleys converge at the head of a sea-loch, which is just what might be expected when the tributary glaciers must have coalesced at this point. At the head of Swining Voe two streams join the sea; and at the point where the valleys converge a well-marked series of concentric mounds is met with. The dividing ridge is strewn all over with innumerable moraines, doubtless the lateral moraines of both glaciers; and in the various burn-sections the morainic drift is found to rest on the Boulder-clay. The evidence derived from the disposition of these mounds shows clearly that at the time they wore deposited the glaciers did not fill the valleys to any great extent, neither did the trunk glacier extend very far down the voe.

The scarcity of strife produced by the later glaciers in the district of Delting, when compared with their great abundance on the eastern seaboard, near Lerwick, is deserving of note; but their absence is doubtless due to the fact that the glaciers slipped forward over a terrace of Boulder-clay which effectually buried the underlying rocks.

Abundant moraine heaps with enclosed tarns and innumerable *blocs perchés* were also observed between Colifirth and Sand Voes, and in the valleys draining into Rooness Voe, and likewise in the districts of Weesdale and Sandness.

The islands of Unst, Yell, Whalsey, and Bressay nourished a similar series of local glaciers, as is evident from the moraines now strewn on their slopes. In the morainic deposit found on the northwestern shore of Bressay, near Heogan, while the groat majority of the stones consist of grits and liver-coloured quartz rocks belonging to the Old Red Sandstone, there is also a considerable number composed of grey schists, which we identified as belonging to the hills round the head of Dales Voe in the Mainland. This deposit resembles in every respect the sections occurring in the opposite side of the Sound near Grimmester, and again in the bays between Lerwick and Brenista. It is clear therefore that this deposit points to the advance of the local glaciers of the Mainland; they must have been powerful enough to cross the northern portion of the Sound, and to override

the north-western part of Bressay. We searched carefully for traces of this more recent deposit in other parts of Bressay, hut failed to discover them. The evidence in proof of the existence of local glaciers in the neighbourhood of the Wart at the south end of the island seems to indicate that their further advance would be chocked on this account. We may well believe, therefore, that as the local glaciers of the Mainland streamed into the Sound, they wore met by the small sheets of ice shed from the Wart, and thence moved southwards along the path of least resistance.

VI. ERRATICS.

From an examination of the numerous boulders scattered over the Mainland and the other islands, it is evident that their dispersion belongs to two distinct periods of glaciation. We saw none which cannot be satisfactorily accounted for by the double system of glaciation already established, without invoking the aid of coast-ice or icebergs.

Along the slopes of the Vallafield ridge in Unst we observed numerous blocks of serpentine, some of them measuring 5 feet across, which were dispersed during the primary glaciation. In the Mainland they occur in dozens on the rocky plateau of Roeness, on the diorite area north of Mavis Grind, and on the rocky headlands of Lunnasting.

In the valleys draining the eastern slopes of the Roeness plateau, and in the low hills between Colifirth Voe and Fethaland, blocks of pink quartz-felsite are strewn, sometimes on the moraine heaps, on *roches moutonnées*, or on the drift-slopes, all of which were distributed by the later glaciers.

Again, boulders of the Northmavine diorite are scattered over the low ground between Hillswick and the Grind of the Navir, while blocks of metamorphic rocks were carried by the great *mer de glace* and the later glaciers from the Leas of Deal and the surrounding heights onto the diorite area of Busta Voe. The peculiar band of nodular gneiss on the promontory of Lunna has supplied boulders which can be followed westwards towards the head of Swining Voe, and the ridge overlooking Dourye Voe, in harmony with the primary ice-movement.

West of Weesdale, blocks of the porphyritic granite in Bixetter Voe, as well as boulders of gneissose rocks from the Weesdale hills, are strewn over the area occupied by the altered Old-Red-Sandstone rocks : while boulders of the Sandncss-hill quartzites have been borne seawards to Melby.

Perhaps the most interesting scries of erratics occurs on the ridge of high ground which extends from Scalloway to the Wart of Skewsburgh, where small blocks of the Brenista Flags and the Lerwick Sandstones, varying from a few inches to a foot across, are exposed in places where the peat has been worn away. These have been carried from lower to higher levels; indeed they have been carried to the tops of the highest hills along this tract. We have already incidentally referred to this remarkable fact, and to the occurrence of similar blocks in the Boulder-clay on the west coast, and as erratics on the slopes of the hills. Those which are found on the western sea-board are much larger than those on the bill-tops, as they sometimes measure 3 feet across : many of them still show ice-markings. We believe that their occurrence in the drifts on the west coast and as erratics on the hill-tops is duo to the same eause, viz. to the westerly movement of the great *mer de glace*, which was powerful enough to override the watershed.

VII. FRESHWATER LOCHS AND VOES.

The freshwater lochs abound chiefly in the Mainland; and in certain districts they occur in great numbers. They are due either to the irregular deposition of the Boulder-clay or moraine-matter, to hollows in the peat, or to rock-basins which have been eroded by the ice. Indeed they are so abundant in some of the rocky districts as to recall portions of the north-west of Sutherlandshire. At present we are only concerned with those which occupy rock-bound hollows, and which are the result of glacial erosion.

These occur most abundantly on the rocky plateau of Roeness, in the diorite-area of Northmavine, on the rocky headlands north and south of Vidlon Voe, and in the district of Walls. In each of these localities the sheets of water, with certain exceptions, fill eroded hollows in the rocks; and, from the manner in which their rocky margins are grooved and polished, from the freshness of the *roches moutonnées* which encircle them, there can be little doubt they have been eroded by the ice during the general glaciation. From one of the hills north of Magnusetter Voe, in Northmavine, we eounted about twenty small lochs in the heart of the diorite-area.

On the promontory of Lunnasting they likewise occur in great numbers, varying in size from basin-shaped hollows to locls more than a mile in length. Their long axes coincide with the strike of the underlying gneiss; but, owing to the scooping-agent having crossed the lines of stratification nearly at right angles, their outlines

are very irregular. Similar strike-basins are to he found on the promontory between Vidlon and Dourye Voes; and from the manner in which they are hemmed in by *roches moutonnées* on every side, it is impossible to resist the conclusion that they are duo to ice-action. The lochs now referred to must have originated during the primary glaciation, because there is no evidence that the later glaciers ever overflowed the headlands of Lunnasting.

The voes or sea-lochs are among the most interesting features of the Shetland Isles; and the question of their origin is not free from difficulty. Flowing, as they do, for miles into the heart of the country, it sometimes happens that only a narrow isthmus is left to prevent the waters of opposite shores from uniting. Yell is nearly bisected by the Whalofirth and Reafirth Voes; and a submergence of a few feet would separate Northmavine from the Mainland, and allow the waters of Sulem Voe to flow westward into St. Magnus Bay. Sometimes the voes are flanked by gentle slopes of Boulder-clay, as we have frequently indicated; at other times they are bounded by steep walls of rocks, as in the well-known Roeness Voe. Many of the most characteristic sea-lochs lie along the lino of strike of the metamorphic rocks, of which the Weesdale, Stromness, Whiteness, Dales and Laxfirth Voes may be cited as the best examples; but there are others which have no connexion with the lines of stratification. As a rule, they are found to merge into narrow valleys draining the high grounds, the width of the voes being in direct proportion to the size of the valleys. This relationship would seem to indicate that these narrow fiords are submerged land-valleys which existed long before glacial times. In the course of our traverses in Shetland, we heard frequent testimony pointing to the conclusion that the ridge-shaped contour which is so prevalent in the Mainland, Yell and Unst, likewise extends along the sea-bottom; and it is highly probable that it is due to the same cause in both cases. If this be true, then these fjord-valleys may have been carved out by the ordinary agents of denudation when the floor of the sea which now surrounds Shetland formed dry land. Both in Scotland and along the cast coast of England the evidence derived from buried river-channels would lead us to believe that these countries stood at a higher level in preglacial times than they do now; and we may well believe that Shetland shared in the same continental conditions. The absence of shells in the Boulder-clay seems to strengthen this conclusion.

At any rate the agents of denudation would be guided in their operation in a large measure by the strike of the metamorphic rocks; and if there was a wide area of land round what now constitutes the Shetland archipelago, they would accomplish greater results, as the size of the rivers would be in proportion to the area of drainago. We have seen also that some of the voes and inland valleys coincide with the outcrops of bands of limestone, the erosion of which would be aided by chemical agencies.

There can be no doubt, however, that the sea-lochs in Shetland were deepened by ice-action during the primary glaciation; indeed numorous instances have been cited in this paper where the great *mer de glace* took advantage of the existing hollows in crossing the island, This produced, in certain instances, fjord-basins, of which we shall adduce two examples. The soundings given in the Admiralty chart show that Sulem Voe, which is one of the largest of the sea-lochs in the Mainland, measuriug upwards of seven miles in length, varies from 10 to 15 fathoms in depth between Foula Ness and the mouth of Voxter Voe. Beyond the latter point, however, to the head of the voe, the depth suddenly increases to 21 and 25 fathoms. This increase of 60 feet in depth at the head of the sea-loch is doubtless due to the intense abrasion caused by the ice as it impinged on the rocky isthmus of Mavis Grind. We have already pointed out how distinctly the east face of this narrow isthmus has been polished and striated; and this fjord-basin helps us to realize still better the erosive power of this agent. Still another instance occurs in Roeness Voe; for at the bend north of Urie Firth the depth varies from 102 to 138 feet, while about two miles further down the loch shallows to 42 feet.

There is one peculiar feature connected with these voes which may be dismissed in a few words. It frequently happens that spits of gravel are thrown up by tidal action near the head of the sea-loch. These banks are seen in all stages of formation in Shetland, sometimes extending a third, a half, or nearly the whole of the way across the loch. Ultimately the voe is crossed by a continuous bank of gravel which isolates the upper part; and this isolated portion is converted into a sheet of brackish water.

VIII. CONCLUSION.

1. *Summary of the Evidence regarding the Primary Glaciation.—*

We must now, very briefly, recapitulate the evidence regarding the primary glaciation of Shetland, in order to show the conclusions which may be justly drawn from the facts, and also to determine the relation which the glacial phenomena of these isles bear to the glaciation of Norway and Scotland.

It has been shown that in the islands of Unst, Fetlar, Whalsey, the Outskerries, Bressay, and along the eastern sea-board of the Mainland and Yell, there is one uniform system of ice-markings trending W.S.W., S.W., and in some cases S.S.W.; while in the western districts of the two latter islands, as well as in Meikle Rooe, Papa Stour, and Foula, the striæ swing round to the N.W. and N.N. W. From a careful examination of the striated surfaces and the *Stossseite* of the *roches moutonnées*, it is evident that the agent which produced them must have crossed the islands from the North Sea to the Atlantic. Fortunately this conclusion is placed beyond all doubt by the distribution of the Boulder-clay, as well as by the dispersal of the stones in this deposit. On the western sea-board of Unst the Boulder-clay contains fragments of serpentine, gabbro, and graphitic schists, all of which occur in situ on the east side of the Vallafield range. Moreover the relative distribution of the serpentine and gabbro stones in this deposit on the western shore is in direct proportion to the relative areas occupied by these rocks to the east of the watershed. It follows, therefore, that the agent which glaciated Unst must have crossed the watershed, carrying the bottom-moraine up the slope, and depositing it in the lee of the range. In Fetlar, blocks of gabbro and serpeutine are likewise found in the Bouldor-clay on the west coast; while along the east coast of Yell, blocks of gabbro occur in this deposit which have been brought from Unst and Fetlar, testifying alike to the same westerly movement.

The evidence derived from an examination of the Boulder-clay sections on the Mainland is equally conclusive; for it matters not whether we cross the northern, central, or southern portions of the island, we are compelled to admit that the ice-flow during the primary glaciation must have been towards the Atlantic. In the central part of Northmavine it has been clearly proved that the Boulder-clay partakes of the physical character of the rock-formation on which it rests, while a certain percentage of the stones is derived from localities which lay in the path of the glaciating agent. Abundant evidence has been adduced to show that the quartz-felsite area between Tanwick and Roeness Voe has been invaded by the diorite stones, while the area occupied by the bedded porphyrites has been invaded by the quartz-felsito and diorito stones. Moreover it is particularly observable that the blocks do-rived from the successive areas occupied by these rocks, which are present in the Boulder-clay, diminish in number in proportion to the distance from their parent source.

Again, in the long tongue of land which stretches from Scalloway southwards to Fitful Head, blocks of the Old-Bed-Sandstone rocks occurring on the eastern sea-board are found, not only on the tops of the highest hills, but also in the Boulder-clay on the western shore. Moreover the distribution of the fragments of the Lerwick Sandstone, Brenista Flags, and basement-breccia in the Boulder-clay north of West Quarff is in perfect harmony with the relative areas occupied by these subdivisions of the Old Bed Sandstone south of Lerwick. The same relationship holds true in the district between Maywick and Fitful Head. It is clear, therefore, that the glaciating agent must have overflowed the watershed, as we found to be the case in Unst.

2.*Insufficiency of Icebergs or Coast-ice to account for the Phenomena*.

—Perhaps some may attribute the numerous striated surfaces, as well as the Boulder-clay, to the action of icebergs or coast-ice on a sinking area; but a little consideration will show that either of these causes is quite inadequate to explain the phenomena. We have shown that over the whole of Shetland the glaciating agent must have conformed to the inequalities of the surface, descending into the smallest hollows and overflowing the projecting knobs of rocks, indicating in an unmistakable manner that the agent must have pressed steadily and firmly over the whole area. Nay, more, the islands have been grooved and striated in one determinate direction, while rocky slopes have boon likewise abraded; and from the manner in which the stria; run obliquely up the hill-face, it is evident that the agent must have ascended the slopes, and ultimately overflowed the high grounds. Now it is hardly necessary to point out that neither coast-ice nor icebergs are capable of producing such results as these. It is impossible to conceive that icebergs or coast-ice could press steadily on a wide archipelago like Shetland, so as to plane down the inequalities on the surface; far less could they produce this uniform system of striation. "We may well ask, by what means could floating ice or coast-ice ascend a rock-slope several hundred feet high, leaving at the same time indelible impressions of the upward movement? Such an occurrence would be a physical impossibility.

Again, the phenomena of the Boulder-clay are quite at variance with the floating-ice theory; for if this deposit be due to the droppings of icebergs or coast-ice, then assuredly it would have been more or less stratified; whereas, from one end of Shetland to the other, the Boulder-clay, with but few exceptions, is quite amorphous. If it be really a marine deposit, how could it possibly partake of the characters of the rock-formation on which it rests, and how could the relative ingredients diminish in number in proportion to the distance from their parent source?

Further, the occurrence of blocks in the Boulder-clay on the western sea-board of Unst and the Mainland, which must have crossed the watershed to reach their present position, is still less explicable by this hypothesis.

For if the high grounds of Unst or the Mainland were submerged so as to allow a free passage for icebergs in their westward career, where are the areas of gabbro, serpentine, or Old Red Sandstone which could have supplied the materials found in the Boulder-clay? Even if we suppose that ice rafts drifted off the eastern sea-board laden with such materials, we must suddenly invoke a special subsidence of several hundred feet at least, both in Unst and in the Dunrossness area, to enable them to cross the watershed. But this improbable supposition still leaves unexplained the relationship which exists between the relative distribution of the stones in the Boulder-clay on the west coast, and the relative areas occupied by the rock masses. For these reasons, therefore, and others Which it is not necessary to specify, it is impossible to reconcile the glacial phenomena of Shetland with the theory of icebergs or coast-ice.

3. *Shetland glaciated by Scandinavian Ice*.

—Similar phenomena to those now referred to have been observed and described again and again in Scotland and other highly glaciated regions, where they have been almost universally ascribed to the action of land-ice. It is not necessary for us to show how the uniform system of striation, or the rounded outlines, or the close relation between the Boulder-clay and the rocks on which it rests, are satisfactorily ex- plained by the passage of land-ice over Shetland. It is sufficient for our present purpose if we show that, during the general glaciation of Scotland, Boulder-clay was transported across important hill-ranges by the ice which radiated from the Grampians. On the south of the Sidlaw range, as well as on the south side of the Ochils, the Boulder-clay contains fragments of schist, gneiss, and granite, which must have been transported from the Highlands. Further, on the top of Allermuir hill small patches of Boulder-clay were observed by Dr. Croll containing striated stones derived from the Highlands to the north-west. It is evident, therefore, that the Scotch ice-sheet was powerful enough to override such important ranges as the Sidlaws, the Ochils, and portions of the Pentlands, and must likewise have rolled forward the bottom moraine, depositing it in the Iee of the hills. And if such was the ease in Scotland, then why may not the same thing have happened in Shetland? Indeed, had Shetland formed a part of the western sea-board of Scotland, there would have been no hesitation in ascribing the striated surfaces and the Bouldor-clay to the action of land-ice.

The land-ice which glaciated Scotland could only have come from Scandinavia, as the striated surfaces clearly point in that direction. And we must now briefly consider what grounds there are for believing that the Scandinavian *mer de glace* was powerful enough to invade the North Sea. The researches of Erdmann, Hörbye, Esmark, Holland, Törnebohm and Linnarsson have revealed to us the extent of the ancient glaciation of Norway and Sweden. They clearly show that Scandinavia was not glaciated by Polar ice moving southwards from the Arctic regions; for the ice-markings generally radiate from the great tablelands as they do in Scotland. It must have been buried underneath an ice-sheet which moved off the land in all directions. It has been generally supposed that this *mer de glace* must have broken up in the form of bergs when it reached the shallow North Sea; but fortunately we are now supplied with data which enable us to prove that this could not have been the case. If we take the estimate given by Holland for the minimum thickness of the ice in Sogne Fjord during the period of extreme cold, it follows that, instead of the ice breaking up in the form of bergs, it must have invaded the North Sea and moved in a westerly direction towards the Shetland Isles. He gives 6000 feet as the estimate at this point; and when we remember that the average depth of the German Ocean is about 240 feet, we can readily understand how such a mass of ice could never have floated between Norway and Shetland, much less between Norway and Scotland.

When this *mer de glace* impinged on the Shetland frontier, it would necessarily be deflected to some extent by the opposing high ground. Hence, as we move southwards from Unst, where the average trend of the ice-markings is W. 10°–20° S. towards Bressay and Lerwick, the deflection increases to S.W. and in some cases to S.S.W. But as soon as the ice reached the crest of the Mainland, it would naturally follow the path of least resistance, veering round to the N.W. and N.N.W. It is highly probable that this northing may be due in part to the resistance offered by the Scotch ice-sheet, which must have coalesced with the Scandinavian *mer de de glace* in the North Sea. That this union must have taken place is evident from the proofs of the deflection of the glaciers along the eastern sea-board of Scotland and England; and it would even now appear that the great Chalky Boulder-clay of East Anglia is a product of land-ice which moved inland in a north-east and southwest direction. These phenomena point to the existence of some constantly opposing force which was capable of overcoming the seaward motion of the Scotch and English glaciers. In other words, the two ice-sheets must have united on the floor of the North Sea, one great outlet for this ice-field being towards the north-west by the Pentland Firth and the Orkney Islands. When the Orkney Islands are examined in detail they will doubtless yield conclusive evidence in support of this north-west movement.

After the *mer de glace* had ceased to be confluent with the local glaciers of Shetland, the latter lingered on for a time, filling all the main valleys and flowing off the land in all directions. The deposits met with on the

eastern coast of the Mainland between Lerwick and Boddom, and again between Colifirth Voe and Fethaland Point, must be attributed to this local movement; while the numerous moraine heaps sprinkled over the valleys indicate the immense quantity of debris which must have been borne downwards on the surface of the small glaciers.

4. *Absence of Gravel Kames and Raised Beaches in Shetland*.

Throughout the isles we searched in vain for those ridges of gravel which form such a notable feature in Scotland. Here and there the moraine mounds and the moraine debris, which is spread irregularly over the slopes of the hills, show signs of rudo stratification, while the stones are more or less waterworn; but no one would readily mistake them for true kames. Moreover there is a remarkable absence of raised beaches indicating changes in the relative level of sea and land. Though we examined the islands with considerable minuteness, we never found a trace of those familiar terraces which are so characteristic of parts of the Scotch coast-line. This is all the more remarkable, as the voes or sea-lochs are admirably adapted both for the formation and preservation of sea-beaches. We cannot help believing that, if such deposits had been formed, we must assuredly have met with some indications of them; and for this reason it seems just to infer that they never existed in Shetland. The remarks made by Professor Geikie in an article in 'Nature'

'Nature,' vol. xvi. p. 414.

clearly show that their absence has an important bearing on the question of their origin. For if they be due, as Dr. Croll suggests, to the rise of the sea-level, owing to an accumulation of ice round the North Pole during the glacial period, then we should naturally expect to find them in localities which are so well adapted for their formation; but since this is not the case, we may infer that they indicate pauses in the gradual elevation of the land which must have been general over the whole of Scotland in postglacial times. It would seem, however, that Shetland did not participate in these general movements of upheaval.

APPENDIX.

A List of Fossil Plants, collected in Shetland, by Messrs. 7J. I. Peach and John Home, of the Geological Survey, in 1878. By C. W. PEACH, Esq.

No. 1 & 1a. Catamites cannœformis, from Bressay..... Small specimens. In the Sandstone quarries of Bressay and those on the opposite side of tin Sound, very large ones are far from rare, known by the name of "Corduroy" by the quarriers. Unfortunately these are obscure; they, howeyer, show sufficiently well for identification, and that they are what Salter called L. nothum of Unger? They may belong to Lepidodendron. I rather think they are nearer to Lycopodites Milleri, also figured by Salter. They have not stigmarian roots, but masses of long flat rootlets (the Fucoids of Miller and others). I got in Caithness some of these, with splendid masses of rootlets attached. 2. Lepidodendron nothum, Unger, from Walls district..... 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 12oo. On the opposite side of 12, is a nice example of Psilophyton princeps of Dawson, showing leaflets. 13. Psilophyton (from Noss). 14. Psilophyton princeps, Dawson (from Walls) ..... This is the most abundant plant of the Old Red Sandstone of Shetland, Orkney, Caithness, &c. &c., and of Canada, America, and Turkey &c., in the Devonian of the latter countries. 15. 16. 17.

DISCUSSION.

Dr. HICKS, having studied the adjoining rocks of the mainland of Scotland, differed from the authors as to the age of the metamorphic scries, and thought they must be Pre-Cambrian, and belonging to two if not three Pre-Cambrian series.

Prof. BONNET asked as to the evidence of the passage of gabbro into serpentine.

Mr. HORNE replied that they did not attempt in the paper to fix the age of the metamorphic rocks referred to by Mr. Hicks, and insisted on their views as to the intrusive character of the quartz-felsites of Shetland.

In reply to Prof. Bonney, he stated that he and his fellow author had not minutely studied the supposed passage of one rock into the other, but that Dr. Heddle, who had so studied them, had arrived at the same conclusion as themselves.

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Table Of Signs And Colours. Old Red Sandstone. Gneissose series. Liniestone series. Sehistose series Metamorphic series. Tuff. Porphyrite Old Red Sandstone Volcanic Rocks. Granite, Quartz- felsite, Syemite. (Intrusive) Diorite of the Mainland. Gabbro of Unst and Fetlar, and Porphyrias dykes of the Mainland. Serpentine. Primary. Secondary Glacial Striae. Direction of ice flow and dispersal of atones in boulder clay itiu'itia Primary glaciation Grind of the Navir Shetland

From the "Transactions of the N.Z. Institute," Vol. XIX., 1886

ART. LXVII.—*A Note on Latin Place-names*.

By HENRY BELCHER, LL.D.,
Rector of the High School, Otago (Boys).
[*Read before the Otago Institute*, 12*th October*, 1886.]

IN Livy, xxi., 19, we read, "turn maxime Sagunto exciia;" further on, in xxi., 21. we read, "Sagunto capto." The first expression is explained *per synesin* of "urbe" vith *Sagunlum*, and the participle is taken in agreement with it. Livy occasionally introduces *urbem, vicum*, in apposition to the names of towns, in "*urn*." Hence has arisen a certain perplexity as to the gender of Latin place-names; add to which the influence of Greek place-names, and we have the erroneous statement of our Latin Grammars on this point seemingly justified. But Livy, in using such a sentence as the folloving (among a host of such instances), ii., 63: "Fusi, in primo proelio hostes, et in *urbem* Antium, ut turn res erant *putentissimam* acti," is telling us that the enemy fled to Antiun— a town of very great wealth, as the times were then—and uses the plainest way of saying what he has to tell us.

In our Latin Grammars, (two books of this year, 1886, are enough to cite,) the statement runs substantially thus : "Nanes of countries, *cities*, islands, and trees are feminine." In another Grammar the statement is somewhat guarded: "Most nanes of cities are feminine." Here is a qualification of the previous statement; and it is to be hoped that in time the statement will be further attenuated, so as to represent the facts.

What are the facts? In my copy of Madvig's Gramnar (third edition, an old book), p. 28, the author says very little about the subject; but adds, "of the words in *us* the names of towns are feminine. *These mines are all Greek*." The itaics are mine; and the statement is worth noting, because it indicates the natural order of things: that, in the case of one highly-inflected language passing on names into another highly-inflected language the names hear their gender with them. All these Latinized spellings of Greek place-names only go to show that in Greek the names of towns in *os* are feminine.

But in his "Notes on Latin Word-systems," published in 1844, this great scholar (who has died since this note was can-piled,) goes further: "Not a single name of a place in Lain, irrespective of the nature of its termination, is of the feminne gender." Notwithstanding which dogma of the master, compilers of Latin Grammars for English boys have gone on reiterating the same misleading "rule" with a sort of hide-bound obstinacy.

We find place-names declined according to the scheme of the first, second, and third declensions. I am not acquainted with any belonging to the fourth and fifth declensions, and am inclined to think that as geographical names usually belong to rough speech, these somewhat obscure varieties of declension do not contain any place-names.

Taking suffixes in order, we begin with

i.—a, œ.

All feminine, as the terminations require.

ii.—ii or i.

And, by analogy, Pompeii, together with numerous tribal names, of which, in the case of towns, the suffix ii is a survival. These are masculine words.

iii.—*um*.

—with many others. These are all neuter.

iv.—*a* (of the plural).

—Greek names, but neuter, as their suffix requires.

v.—*us*.

There are no Latin place-names with this suffix, which is native, however, to Greek, and brings with it its gender; even in the case of variants,—as *e.g., Canopus, Isthmus, Orchomenus, Pontus*,—names masculine in Greek are masculine in Latin.

vi.—*o* (gen. -onis).

—all masculine, as the suffix requires.

vii.—*e*.

—all neuter, as the suffix requires. (But Arelate, a Greek word of 1st declension, is feminine.)

viii.—*ur*.

—neuter, as the suffix requires. (Anxur, the mountain, is masculine by analogy with the usual gender of the names of mountains.)

ix.—*Various suffixes*.

—neuter or masculine. (The indeclinable words are neuter.)

In all the cases quoted above we note that the suffix determines the gender of the place-name; the "rule" is not even traceable. There is, *e.g.*, a well-known suffix *-onis*, and another *-inis*. The former is masculine, the latter feminine: hence Narbo -onis is masculine (Narbo Martius), and Carthago -inis is feminine (Carthago Nova).

If we follow Latin further afield, the question is further elucidated. In Gaul, the Romans meet with a place-suffix *din* (enclosure, wick, or burg). To bring this suffix within the scope of their system they add a neuter suffix, *um*, and the place-names become neuter: hence we have—

And even such hybrids as Augustodunum and Cæsarodunun. All these words are neuter.

But the suffix *um*, or *ium*, is freely used to reduce to the Latin scheme a very large number of words found amoig subject tribes:—

—besides words like Trajectum, Durotrajectum, and many others, all neuter, as the suffix requires.

What becomes of the "rule"? As Zumpt seems to have felt, it is so overwhelmed with exceptions that *mole ruit earum*. Having examined three hundred and fifty place-names, found chiefly in the western section of the Orbis Romanus, I am not able to discern any "rule" applicable to the names of towns. But the influence of the "rule" is very great. Even Lewis and Short, s. v., are misled by it. In order to justify Liv., xxi., 19, cited above, they allege that Liv. used *Sazuntus*. But *Saguntum* is in good prose the only form used, *cf.* Mayor on Juv., xv., 114. Poets and writers like Mela and Florus use *Sazuntus*. Juv., *loc. cit.*, uses *Zazynthus*, a thinly-veiled form of *Zacynthus*.

Reply to MR. Hampden's Charges Against MR. WALLACE.

MR. JOHN HAMPDEN having written to many of my friends, and threatening to write to all the members of the scientific societies to which I belong, abusing me in the vilest language, I think it advisable to issue a statement of facts (some of the most important of which are not generally known) referring to sources of full and accurate information should any one think the subject worth enquiring into.

1. Mr. Hampden in the beginning of the year 1870 challenged scientific men to prove the convexity of the surface of any inland water, offering to stake £500 on the result. This challenge was published in "Scientific Opinion," Jan. 12th, 1870, and contains the following passage. "He will acknowledge that he has forfeited his deposit if his opponent can exhibit to the satisfaction of any intelligent referee, a convex railway, river, canal or lake." (See also Carpenter's "Water not Convex," p. 4.)

2. Knowing nothing of Mr. Hampden, I, (most injudiciously, I confess) accepted this challenge, believing that a practical demonstration would be more convincing than the ridicule with which such views are usually met. My first letter to Mr. Hampden was as follows. It was published by him, with several others, in a pamphlet entitled "Is Water Level or Gonvex after all?"

"9, St. Mark's Crescent, Regent's Park, London, N.W., "J. HAMPDEN, ESQ. January 15th, 1870.

"Sir,—As I presume by your offer in 'Scientific Opinion' of January 12th, that you can afford to pay £500 to

have the question of the actual rotundity of the Earth proved to your satisfaction, I hereby offer to stake that sum on the undertaking to show visibly, and to measure in feet and inches, the convexity of a canal or lake. A canal will do if you can find one which is nearly straight for four miles without locks; if not, I propose Bala Lake, in North Wales, as a place admirably suited for the experiment. As an intelligent referee I propose the Editor either of 'Scientific Opinion,' 'The Field,' or 'Land and Water,' or any well known Land Surveyor, or Civil Engineer, or any Fellow of the Royal Geographical Society.

"I remain, Sir, yours very faithfully,

"ALFRED R. WALLACE, F.R.G.S."

3. Mr. Walsh, Editor of the "Field," was at first to have been sole referee; he being a perfect stranger to us both, not scientific and therefore not prejudiced on my side, accustomed to deciding wagers, and a man of such well-known character and position as to guarantee his honesty and impartiality. £500 were deposited with Mr. Walsh by Mr. Hampden, and £500 by myself, the £1000 to abide the result of the reference.

4. Subsequently, Mr. Hampden asked to have a second referee specially to represent him. To this I at once agreed, as shown by another letter of mine which has also been published by Mr. Hampden. ("Is Water Level or Convex after all," p. 15.)

"9, St. Mark's Crescent, Regent's Park, N.W., "January 25th.

"Dear Sir,—Your wish to have a second referee is quite reasonable, and I accede to it at once, only stipulating that he shall not be a personal acquaintance of your own, and shall be a man in some public position as Editor, Author, Engineer, &c.

"Foggy weather would render the experiments impossible, I should therefore wish that, if they are prevented by weather, the time named by you may be extended a month.

"Yours very faithfully,

"ALFRED R. WALLACE."

5. Mr. Hampden thereupon appointed Mr. William Carpenter as his referee. This man is a journeyman printer who, in 1863, published a book called "Common Sense on Astronomy," advocating, with great ingenuity and much show of argument, the flatness of the earth. Mr. Hampden had, only a few months previously, *purchased the copyright and all the stock of this work,* which he considered a masterpiece, but which had been hitherto unsaleable.

These facts are given us by Carpenter himself in his pamphlet—"Water not Convex"—just published, as the following passage at p. 4 will sufficiently show.

"In 1865 'Zetetic Astronomy' was published, and in 1869 was the means of converting John Hampden, Esq., of Swindon. Before the close of the year, the fates decreed that '*Common Sense' on Astronomy* should fall into the hands of this gentleman. The work was no sooner perused than the questions were sent to the author, 'How many copies have you?' and 'What will you take for them?' These questions Mere satisfactorily settled in a short time; when there came another: 'Will you dispose of your copyright? and for how much?' This matter was also at once arranged, through the liberality of Mr. Hampden, who purchased the copyright, certainly as one having the cause of truth uppermost in his mind. The journeyman printer having now disposed of his work, was particularly requested by Mr. Hampden to take part in another: the experiment which we have mentioned and which we must now consider."

In a preface to Carpenter's book separately printed —(Heywood and Co., Strand; pi'ice one penny)—is a note by the Editor and Proprietor, Mr. Hampden, in which occur the following extraordinary statements regarding it.

"All the Scientific Societies of London combined to crush it. They abused his publishers; they threatened to ruin their trade if they dared to sell such a stinging exposure of what had received the approval of the whole scientific world; and so effectually did they bully and bribe the whole bookselling trade, that for nearly five years this extraordinary work was left on the author's hands, and would probably have remained so, had it not been providentially introduced to our notice. We instantly made arrangements for the possession of the copyright, and if we were to lose 95 per cent, of the purchase-money, we shall still feel that to leave such talent and industry unrewarded would be a burden on our conscience which we were not prepared to endure. But to WILLIAM CARPENTER, of London, will ever belong the proud satisfaction of having been the author of one of the most able displays of genius, perseverance, and intelligent acquahtance with the scientific literature of the day,

that Europe or America could boast of."

6. Being then ignorant of these facts, and trusting to the honour of Mr. Hampden, I accspted his referee. Mr. Hampden then proposed th Old Bedford Canal, in Norfolk, as the place in which to try the experiment, and in this I concurred In "Zetetic Astronomy," by Parallax, (the work vhich converted Mr. Hampden), at pp. 11—12, an e:periment is stated to have been made on this very canal proving it to be absolutely flat for six miles! Neither Hampden nor Carpenter said a word about this previous experiment, on which subject, see an article in "The Field," March 26th, 1870.

7. My experiments occupied a week. Mr. Codcher (a surgeon, of Downham Market) was appointed referee in place of Mr. Walsh, who could not remain so long away from his editorial duties. The two referees gave diametrically opposite decisions on the same facts. Carpenter would not join in the appointment of an umpire. At Mr. Hampden's own request, Mr. Walsh was appointed umpire, and it was lift to him to give a final decision, as the following extract from Carpenter's "Water not Convex," p. 22, sufficiently shows : the italics are my own.

"It is now Friday, the 11th. I receive two letters: one is from Swindon, and the other from the Strand. Mr. WALSH writes as follows :—'My dear Sir, I am now *author ized in writing by Mr. Hampden* to settle the matter in dispute between you and Mr. Coulcher, as umpire. Will you therefore forward me to Little Comberton, Pershore, your report together with your diagrams or copies of them? I shall leave there on Wednesday morning after post-time. I propose to come to some decision, either final or otherwise, next Friday at 1 p.m., when you can be present here if you like to support your opinions. . . Yours in haste, J. H. Walsh.' Mr. Hampden, in his letter, says :—' I am sure we shall get it right at last. I enclose you a note received from Mr. Wallace this morning. *I sent him a memorandum empowering Mr. Walsh to consult with both referees or with any others he may choose to add to them.'* Mr. WALLACE says, in a letter submitted to me by Mr. HAMPDEN:—'Dear Sir, *In accordance with your letter of yesterday,* I enclose a memorandum authorizing Mr. Walsh to act in the manner *you suggest,* which, if you see nothing requiring alteration, please to sign and send to *him,'* and so on. Thus is it clearly settled that the whole thing—the money and all—is at the disposal of the editor of *The Field*. And it is a responsibility not to be lightly esteemed! May Mr. WALSH prove himself to be 'the right man in the right place.'"

8. Mr. Walsh decided in my favour, and gave Mr. Hampden notice that he should hand over the £1000 to me. Mr. H. protested that the decision was contrary to the evidence and was unfair; but Mr. Walsh, after hearing all that could be urged by Messrs. Carpenter and Hampden, kept to his decision. (See "Field," March 26th, 1870.) He however asked me for an indemnity against any legal or other expenses Mr. Hampden might put him to on account of his decision. This I gave, thinking it fairly his due, and he then paid me the stakes.

9. Thenceforth Mr. Hampden began abusing Mr. Walsh, but finding he was not likely to produce any effect upon him turned all his wrath upon me. For the last eighteen months he has continued to send, to me and to all my friends whose addresses he can obtain, pamphlets, letters and post-cards, expressed in terms of the most violent abuse, claiming to have won the wager, charging Mr. Walsh and myself with fraud and conspiracy, and stigmatising me as a "liar," "thief,"and "swindler."

10. Not content with this, Mr. Hampden has attempted to reach me through the feelings of my wife. For the following letter he was brought before a police magistrate and bound over to keep the peace for three months, suffering a week's imprisonment before he could find the necessary sureties.

"Mrs. Wallace,—Madam, if your infernal thief of a husband is brought home some day on a hurdle, with every bone in his head smashed to pulp, you will know the reason. Do you tell him from me he is a lying infernal thief, and as sure as his name is Wallace he never dies in his bed.

"You must be a miserable wretch to be obliged to live with a convicted felon. Do not think or let him think I have done with him.

"JOHN HAMPDEN."

11. In January last I commenced an action for libel, expressly to give Mr. Hampden an opportunity of justifying, if he could, his language towards me. He entered no plea or defence, but suffered judgnent to go by default. A jury gave me £600 damages, but Mr. H. pleads poverty and I have not obtaned, and do not expect to obtain from him, any portion of that sum.

12. Under these circumstances I have issued this reply, every statement in which can be verified by the papers referred to, which are mostly those published by Messrs. Hampden and Carpenter. All who believe Mr. Hampden to be an ignorant but very foul-mouthed libeller, will oblige me by burning unopened and unread any further communications they may receive from him. I am unwilling to resort to a criminal indictment, but should any considerable number of my friends think it due to myself or to them to take this course, T shall not hesitate to do so.

Alfred R. Wallace.

November, 1871.

The following pamphlets (above referred to) may be obtained from Mr Hampden, 3, Oxford Terrace, Chippenham.

"Water not Convex, &c." 1*s*. Post free.

"Is Water Level or Convex after all?" 2*d*.

"Preface to Theoretical Astronomy," by Common Sense, 1*d*.

"Common Sense on Astronomy." Cloth gilt, 5*s*.

"Zetetic Astronomy," by Parallax. Simpkin & Marshall, 1864, may be had of Nisbet & Co., Bemers Street, price 3*s* 6*d*.

"The Field" Newspaper, from March 26th to April 16th, 1870, contains the Referees' Reports of the Experiments, and a copious Correspondence on both sides.

J. J. TIVER, Printer, 33, Chancevy Lane, London.

Abstracts of the Proceedings of the Geological Society of London.

No. 296.] [Session 1874-75.

Annual General Meeting.

February 19th, 1875.—John Evans, Esq., V.P.R.S., President, in the Chair.

The SECRETARY read the Reports of the Council, and of the Library and Museum Committee. The general position of the Society was described as satisfactory, although, owing to extraordinary expenses during the year, the excess of income over expenditure was but small in comparison with former years. The Society was said to be prosperous, and the number of Fellows to be rapidly increasing.

In presenting the Wollaston Gold Medal to Professor DE KONINCK, of Liege, F.M.G.S., the President addressed him as follows:—

MONSIEUR LE DOCTEUR DE KONINCK,—It is my pleasing duty to place in your hands the Wollaston Medal, which has been awarded to you by the Council of this Society in recognition of your extensive and valuable researches and numerous geological publications, especially in Carboniferous Palaeontology. These researches are so well known, and have gained you so world-wide a reputation, that I need say no more than that your Palæontological works must of necessity be almost daily consulted by all who are interested in the fauna of the Carboniferous period. Already in 1853 the numerous and able Palæontological works which you had published in the preceding twenty years had attracted the grateful notice of the Council of this Society, who in that year begged you to accept the balance of the proceeds of the Wollaston Fund, in aid of the publication of your work on Encrinites, then in progress. It was in the same year that the Society had the satisfaction of electing you a Foreign Member of their body; and now, after a second period of rather more than twenty years devoted to the study not only of Geology and Palaeontology but also of chemical analysis, I have the pleasure of conferring upon you the highest additional honour it lies in the power of this Society to bestow, by presenting you with the Medal founded by the illustrious Wollaston, who was himself also a Chemist as well as a Geologist. If anything could add to the satisfaction we feel in thus bestowing the Medal, it is your presence among us this day, which will enable you more fully to appreciate our unanimous sense of the high value of your labonrs in the cause, which we all have at heart.

Prof. DE KONINCK, in reply, said :—

MONSIEUR LE PRÉSIDENT, MESSIEURS,

La langue Anglaise m'étant trop peu familière pour me permettre de m'en servir, afin de vous exprimer toute ma reconnaissance pour le grand honneur que vous venez de me faire, en me décernant la Médaille de Wollaston, j'espère que vous voudrez bien me permettre dans la circonstance solennelle dans laquelle je me trouve, de faire usage de l'idiome dont on se sert habituellement dans mon pays.

Laissez moi vous dire d'abord, Messieurs, qu'il m'a semblé que ma présence au milieu do vous, était le plus sur moyen de vous donner la preuve de mes sentiments de gratitude et du prix que j'attache à la distinction dont je vous suis redevable.

Cette distinction sera pour moi un nouvel encouragement et un stimulant pour continuer et pour achever, si possible, mes travaux concernant la faune carbonifère do mon pays. L'étude de cette faune, qui doit comprendre plus de 1200 espèces, m'a conduit à des résultats très remarquables. J'espère que je pourrai bientôt vous en fournir la preuve et vous démontrer qu'elle se compose de trois grands groupes parfaitement distincts entre eux, quoique possédant un certain nombre d'espèces identiques et dont le premier est presque exclusivement formé des espèces recueillies dans le calcaire do Tournai, le deuxième des espèces des environs de Dinant, et le

troisième de celles du calcaire de Visé et de quelques lambeaux de ce même calcaire des environs de Namur.

Ces faunes sont principalement représentées chez vous, la première in Irlande, à Hook Point et ses environs, la deuxième aux environs de Dublin, et la troisième en Ecosse et au centre de Yorkshire, où elle a été l'objet des remarquables recherches de notre savant et regretté confrère le Professeur J. Phillips.

C'est par ces travaux, Messieurs, que je compte terminer ma carrière scientifique, si les forces nécessaires et la santé ne me font pas défaut, et continuer ainsi à mériter votre haute et impartiale approbation.

The PRESIDENT then presented the Balance of the proceeds of the Wollaston Donation Fund to Mr. L. C. MIALL, of Leeds, and addressed him in the following terms :—

Mr. MIALL, I have much pleasure in presenting you with the Balance of the Proceeds of the Wollaston Fund, which has been awarded you by the Council of this Society to assist you in your researches on Fossil Reptilia.

Those who had the good fortune to be present at the meeting of the British Association at Bradford in 1873, and to hear the masterly Report of the Committee on the Labyrinthodonts of the Coal-measures, drawn up by yourself, and those also who have studied the Papers which you have communicated to this Society on the Remains of Labyrinthodonta from the Keuper Sandstone of Warwick, must be well aware of the thorough and careful nature of your researches, carried on, I believe, in a somewhat isolated position, and remote from those aids which are so readily accessible in the metropolis and some of our larger towns. I trust that the proceeds of this fund which I have now placed in your hands will be regarded as a testimony of the interest which this Society takes in your labours, and may also prove of some assistance to you in still further prosecuting them.

Mr. MIALL, in reply, said that he felt that his sincere thanks were due to the Geological Society for awarding him the balance of the proceeds of the Wollaston Donation Fund as a token of appreciation of the little work that he had been able to do, and also to the President for the terms in which he had been kind enough to speak of him. He should regard this donation, not only as an honour received by him, but also as a trust to be expended to the best of his power in accordance with the intentions with which it had been conferred upon him by the Society.

The PRESIDENT next handed the Murchison Medal to Mr. DAVID Forbes for transmission to Mr. W. J. HENWOOD, F.R.S., F.G.S., and spoke as follows :—

Mr. DAVID FORBES,—In placing the Murchison Medal and the accompanying cheque in your hands, to be conveyed to our distinguished Fellow, Mr. William Jory Henwood, I must request you to express to him our great regret that he is unable to attend personal to receive it. His researches on the metalliferous deposits, not only of Cornwall and Devonshire, but of Ireland, Wales, North-western India, North America, Chili, and Brazil, extending as they do to questions of subterranean temperature, electric currents, and the quantities of water present in mines, are recorded in memoirs which form text-books for mining students. They have for the most part been contributed to the Royal Geological Society of Cornwall, which has taken a pride in publishing them; but I trust that it will be a source of satisfaction to Mr. Henwood, after fifty years of laborious research, and amidst the physical suffering caused by a protracted illness, to receive this token of appreciation at the hands of another Society which takes no less interest in the subjects of his investations.

Mr. DAVID FORBES said that in receiving the Murchison Medalon behalf of Mr. W. J. Henwood, he was commissioned by that gene-man to express his great regret that the bad state of his health nd his advanced age prevented his appearing in person to thank he Council for the high honour they had conferred upon him, and he extreme gratification he felt in finding that the results of his labors in the investigation of the phenomena of mineral veins, which ad extended over more than fifty years, had thus been recognized by he Geological Society of London.

Address of Joseph Dalton Hooker, C.B., The President, Delivered at the Anniversary Meeting of the Royal Society,
On *Thursday, November 30, 1876*,
Printed at the Request of the Fellow,
London: Printed by Taylor and Francis, Red Lion Court, Fleet Street. 1876.

ROYAL SOCIETY.

Address of the President, delivered at *The Anniversary Meeting, November* 30, 1876.

GENTLEMEN,

THE annals of the Royal Society show that the year ending with this Anniversary presents no falling off in

the value and interest of the communications brought before our meetings, as compared with previous years, and indeed surpasses them in number and extent of publications, and in demands on the time of your Council. We have been called upon more frequently than ever to aid in giving effect to those efforts for the advancement of natural knowledge which, whether originating in private enterprise or in the Councils of the State, have marked the year as a memorable one in the history of science.

Before, however, proceeding to the historical summary which this statement involves, I have to discharge the always painful task of recalling to memory the names of the most distinguished of our Fellows who have died since the last Anniversary. In Science we have lost Mr. Bennett, Mr. Campbell De Morgan, Dr. Parkes, Mr. Poulet Scrope, Dr. Sibson, and Lieut.-Col. Strange; in letters and public services, the Rev. Dr. Bosworth, Lord Lyttelton, Earl Stanhope, and the Rev. Dr. Wilson; and the names of the botanist Brongniart and the veteran microscopist Ehrenberg disappear from the list of Foreign Members.

As regards the part taken by your Council in the labours of the year now expired, I feel it to be my duty, as it is, indeed, my pleasure, to inform you, so far as the limits of an Anniversary Address will admit, of the importance of those labours—and the more so, as without this opportunity it would not be easy to make you acquainted in a way commensurate with their value with the scientific services of your Council as contradistinguished from their current duties.

As anticipated in my Address of last year, application has been made to the Treasury for a grant to cover the cost of printing the decade 1864-73 of our Catalogue of Scientific Papers, comprising now more than 100,000 titles; and I am happy in having to announce that the application was acceded to in the same handsome spirit as that in which the Lords of the Treasury, during Mr. Gladstone's administration, placed a sum upon the Parliamentary votes to defray the expense of printing the first six volumes. The value of this work becomes more and more appreciated with lapse of time; and you will be glad to learn that the continuation of this Catalogue from year to year has been ordered by your Council as a permanent part of the Society's official work. As you are aware, the expenditure for this work appears regularly in our annual balance-sheet.

Acting under a recommendation by the Library Committee, your Council offered the custody of our collection of Oriental MSS. to the India Office under certain conditions, viz. that the manuscripts which require binding should be bound, and a Catalogue made of the whole collection. The Secretary of State for India in Council has accepted the offer with its conditions; and at a fitting opportunity the collection will be transferred to a locality where it will be in competent hands and be readily accessible to students and scholars.

Arrangements have been made for the publication of the Reports of the naturalists sent to Rodriguez and Kerguelen Islands in a separate quarto form, with illustrations; and a grant of £100 from the Donation Fund has been made in aid of the work. The botanical specimens have been named, and are being distributed to the Herbaria of Kew, of the British Museum, of the Edinburgh Botanic Gardens, and others. A complete set of the zoological collections will be deposited in the British Museum, and the remainder distributed among the Museum of the Royal College of Surgeons of London and the Museums of Edinburgh, Dublin, Oxford, and Cambridge.

The Report on the results of the "Eclipse" Expedition has-been drawn up by Mr. Lockyer, and is far more satisfactory than could have been anticipated, considering the unfavourable conditions which prevailed during the whole of the time the observations were being made. It now appears that the light which photographs the prominences does not come from hydrogen, but most probably from calcium, while the photograph of the corona with the prismatic camera shows that its chief light is derived from the hydrogen. The complete account of the eclipse will appear in our 'Proceedings' very shortly.

For the financial state of the Society I must refer you to the balance-sheet prepared by our Treasurer now in your hands. It shows that our resources have been increased by receipt of the Dircks request, £878 12*s*. 10*d*. A further increase will occur towards the en, of the year by the incoming of the £2000 Consols to which we are entitld under the will of our late Fellow, It. C. Carrington. Besides these, as addition has been made to our Trust Funds by the settlement of te long-pending question of the Handley bequest. The amount ulimately awarded to us was £6378 19*s*., the balance of which, after paynent of legacy duty and certain legal charges, has been invested, as maybe seen in our balance-sheet, in Reduced 3-per-cent. Stock.

The Donation Fund has been increased by the receipt of the £500 bequeathed by our late Fellow, Sir Charles Wheatstone, raising thetotal to £6333 10*s*. 4*d*. Additions to this fund are greatly to be desirel: it is applied, as you are aware, in aid of research; and a very strictaccount is kept of its expenditure. Were such a fund at all what it ought to be, considering the amount of capital accumulating in this country, in great part the direct outcome of scientific inquiry, we should have fewer complaints of the insufficiency of means of encouragement for research.

To Sir Charles Wheatstone we are further indebted for a valuable collection of portraits of scientific men, including one of the advisor, and one of Boyle (by Kneller), both in oil. Mrs. Selwyn has presented the negatives of the eleven years' series of photographs of the sun-spots (more than 2000) taken at Ely, from

1863-1874, under the late Canon Selwyn's instructions.

You will share my feeling of pleasure when I inform you of the deposit in the hands of our Treasurer of a munificent contribution, £6000, to be devoted to the aid of scientific research, by Mr. Thomas Phillips Jodrell, the founder of the Chair of Animal Physiology in University College, London, and donor of the Laboratory of Physiological Research to the Establishment at Kew. Early in last year, Mr. Jodrell informed me by letter that it was his wish to place at the disposal of this Society, as the one body in which all branches of British science are represented, this generous sum, to be applied (principal as well as interest) in any manner that the Society may consider most conducive, for the time being, to the encouragement among our countrymen of original research in the physical sciences—his object being not, on the one hand, to found a permanent endowment for the benefit of a future generation, nor, on the other, to relieve the Government of any part of its obligations to the present, but to ascertain, as far as may be, by practical experiment on a limited 6cale, to what extent the progress of original research in the physical sciences is retarded in this country by the want of public support to those engaged in it, and in what form an increased measure of such support would be most likely to promote its development.

I need hardly add that your Council, before whom I laid Mr. Jodrell's letter at once, thankfully accepted his offer, and appointed a Committee to consider and to report upon the best means of giving effect to his liberal views. Before, however, the Committee had presented their report, we were informed of the intention of Her Majesty's Government to increase largely the funds placed at the Society's disposal in aid of scientific investigations, and to allow part of the increment to be devoted to the sustentation or remuneration of investigators—thus fulfilling the main desire which Mr. Jodrell had in view in making his donation.

"When I communicated the intention of the Government to Mr. Jodrell, he signified his desire to reopen the question of the application of the £6000, which he still wished to leave in our Treasurer's hands; for his object had been to induce the Government to do what, to the surprise of every one, it had done, and not to supplement a permanent government endowment by a temporary one of his own. Whatever might be the ultimate decision, he did not doubt that this Society would be the most competent agency for carrying it into effect; and he suggested that the fund should be invested temporarily, and the question of its appropriation reserved until we should meet this session. Finally, Mr. Jodrell has proposed that the gross sum should be retained in its present investment in the prospect of some want of it arising in the course of the next few years, and that the interest accruing in the mean time should be applied by the Society as part of our revenue. This proposal was willingly accepted, and the best thanks of your Council have been presented to Mr. Jodrell.

In April last I was informed by the Lord President of the Council that Her Majesty's Government had under consideration the question of giving further aid to scientific research, by increasing the Parliamentary grant of £1000 per annum which is administered by the Council under the recommendation of the Government Grant Committee in aiding investigators with apparatus and assistance. They proposed in future to augment the Grant annually for five years by £1000, to vest the administration of the whole in the Science and Art Department, and to invite the Society's Council to aid Her Majesty's Government, as hitherto, with advice and assistance as to its appropriation and expenditure, and further to give us the power of recommending, in certain cases, the payment of personal allowances to investigators. The communication also advised that the Presidents of fifteen learned bodies in the United Kingdom should be ex *officio* members of the Government Grant Committee,—a change in its constitution more apparent than real, as the majority of the Presidents specified were already Fellows of the Society. After several conferences with the Minister, the original proposal was, with his concurrence, modified, and made to apply to the additional £4000 only, the administration of the original £1000 remaining as heretofore, to be accounted for to the Treasury, and the recommendations of the Council with respect to the appropriation of the additional sum to be liable to revision by the Lord President, in whose department the vote is taken, and who must be responsible to Parliament for its expenditure. With this proposal your Council concurred, on the understanding that should it happen that the Lord President found it inadvisable to act upon all your Council's recommendations (which, in his Lordship's opinion, is never likely to happen), the Council should have the opportunity of revising them, so that, if thought desirable, the items of the grant to which exception had been taken might be allocated in some other way.

There are therefore now two Government grants in aid of scientific research, one of £1000 per annum, for the administration of which your Council is directly accountable to the Treasury, and which as heretofore, will be appropriated to the providing of instruments and assistance for scientific inquirers: the other, of £4000 annually for five years, to be applied to the aid of investigators, not only by providing instruments and assistance, but occasionally by personal allowances or grants of money, in accordance with recommendations to be made to the Lord President.

The constitution of this new Committee is not yet settled; but it will probably consist of the existing one, together with all the *ex offieio* members as proposed.

Before dismissing this subject I feel it to be incumbent on me to express our obligations to His Grace the

Duke of Richmond and to Lord Sandon, for the active interest they took in providing the grant, and for the liberal manner in which they entered into the views of the Council in respect of its appropriation.

Two of the provisions of the Vivisection Bill called forth an earnest remonstrance from your Council, which was communicated by the President to the Prime Minister in June last. These provisions were the limitation of experiments, even under anaesthetics, to such only as can be shown to contribute directly to the prolongat ion of human life and the alleviation of human suffering; and the prohibition of experiments upon dogs. It was pointed out, in the communication to the Minister, that, as regards both these limitations, the Bill went beyond the recommendations of the Royal Commissioners upon Vivisection for scientific purposes; and, in respect of the first of them, it was represented that the history of physical science shows that all the great discoveries which have contributed to the welfare of mankind have resulted from investigations pursued in the interests of pure science, without reference to their practical application, and that to this rule physiology forms no exception, since all the physiological truths which constitute the foundation of the rational practice of medicine have been ascertained by experiments upon living animals, conducted by persons actuated by that desire for the advancement of natural knowledge which the Royal Society was instituted to foster; and it went on to say:—" Profoundly convinced of the mutual dependence of all branches of physical science, the President and Council feel that any legislation which arrests the development of one is an injury to all, and they would lament the admission into the Statute-book of a principle which is essentially antagonistic to the progress of all Natural Knowledge."

With respect to the second provision it was urged that, while the Bill professed to regulate experiments only, it prohibited them in the case of dogs, although the constitution of the dog is such as to render it indispensable for some of the most important physiological problems.

The receipt of this letter was followed by Lord Beaconsfield's communicating with me on the subject, when I had the opportunity of representing the views of the Council as being unalterable as to the necessity of modifying, if not of rescinding, these two provisions. The Prime Minister promised and gave full and, as it has proved, favourable consideration to the Council's representations; for, before the third reading of the Bill, its provisions were so modified as to place no obstacle in the way of experiments on all animals for purely scientific purposes by properly qualified persons.

On a subsequent occasion, when time did not allow of my communicating previously with the Council, I ventured, in the name of the Society, to request an audience with the Home Secretary, principally on the subject of the clauses that limited the making of experiments to registered localities, thus preventing physiologists from pursuing their researches during their vacation travels, or at their temporary residences at watering-places and other localities in which no registered institution existed. On this occasion also I found a willing ear lent to the Society's voice, followed by a favourable consideration of our representations, special certificates being now procurable which enable the experimenter to pursue his researches wherever he may be. On the same occasion I urged the confining the operation of the Bill to warm-blooded animals, but with only partial success; the provision which extended to all animals was finally curtailed, so as to apply to the vertebrate class only. Lastly, a protest against the clause compelling all experimenters to transmit to the Secretary of State a detailed report of all the experiments they might undertake, and their results, was more successful; for the Bill now requires reports to be made only when called for by the Secretary of State.

The Loan Collection of Scientific Instruments.—In my address of last year the proposed action of Government in reference to this important object was stated, together with the opinion of the Lord President and Vice-President of the Council, that it might prove the means of carrying out that recommendation of the Science Commissioners which dealt with the want of a Museum illustrating methods of experimenting and means of observing (see 4th Report, §"93). This was followed by a letter from the Duke of Richmond addressed to myself, suggesting that the Scientific Societies should organize in connexion with the Exhibition a series of Conferences, similar to the sectional meetings of the British Association. This led to that brilliant gathering in May last of scientific men from the metropolis and all parts of Europe (not fewer than thirty-five from Germany alone), and from America, many of them charged by their Governments to report on the collections, and to those public lectures on the instruments and apparatus displayed by many of the most eminent of these scientific men, which imparted such value and interest to the Exhibition.

Among the objects so exhibited, amounting to 20,000 in all, were to be seen specimens of the work or evidences of the genius of a considerable proportion of the eminent scientific men and manufacturers of scientific instruments from the days of Tycho Brahe and Galileo down to the present day, together with a collection of the appliances for scientific teaching adopted in many countries.

It cannot fail to be a matter of congratulation that the objects lent by the Royal Society were not surpassed in scientific value or in historic interest by those of any other institution or country, though among these are the Conservatoire des Arts et Metiers of Paris, and the Museums of Berlin, Florence, and Haarlem. We contribute! twenty-seven articles, all of the best construction of their day, and which may be regarded as monuments of the

skill of famous makers. They include:— Boyle's air-pump with double barrel, presented by himself in 1662; Newton's original reflecting telescope, constructed by himself in 1071; Huyghens's aerial telescope, with three object-glasses, of 122, 170, and 240 feet focal length, presented respectively by himself in 1691, by Newton, and by the Rev. G. Burnet; a large levelling-instrument used in the Ordnance Survey; two chronometers by Arnold, which were taken round the world by Capt. Cook; Capt. Kater's hygrometer; Priestley's electrical machine; and Sir II. Davy's experimental Safety Lanp.

The interest excited by the Exhibition is best shown on the one hand by the number of visitors, which at the end of September amounted to a quarter of a million, and on the other by the efforts made by a large body of scientific men, who desire to see effect given to the views of the Lord President in founding a permanent Museum of this nature. Amemorial to this effect, signed by more than one hundred scientific men, has been addressed to the Duke of Richmond, representing the advantages of a Museum of Scientific Apparatus, Appliances, and Objects, and of Chemical Products—illustrating both the history and the development of Science— with which the objects now contained in the "Patent Museun" should be incorporated. Among the advantages enumerated which would accrue from such an institution, are the saving of time and labour to investigators, assisting teachers, informing constructors of phiosophical instruments as to the directions in which reproductions are waited, or in which improvements may be effected, and possibly the lending instruments to investigators under suitable restrictions.

With regard to the advantage of combining the objects of the Patent Museum with the general collection, it is pointed out that the value of these objects as mere subjects of a patent is very imperfectly represented by their separate exhibition, whereas it would be greatly enhanced were they placed in juxtaposition with instruments of the same nature, which, though unpatented, may be both better adapted to their purpose and of greater instructive value.

The Meteorological Office.—In my last years Address I stated that the Lords Commissioners of the Treasury had appointed a Committee to inquire into the working of the Meteorological Office, and the value of the results hitherto obtained by it, and that the result of this might afford to Her Majesty's Ministers the opportunity of adopting measures that would greatly increase the scientific efficiency and public interest of that Office.

The labours of the Treasury Committee are now concluded. It sat frequently during the whole of last session of Parliament, examined many witnesses, scientific and practical, including the most eminent meteorologists of this country whose attendance could be obtained; and a report has been drawn up which will shortly be laid before Parliament. It will include the answer of the Committee of this Society to a letter addressed to the President and Council by a Committee of the Treasury requesting information on the following points:—1. As to the extent to which the objects indicated in the Reports presented by your President and Council in 1855 and 1865 for the guidance of the Office, had been attained by means of the labour and publications of the Office. 2. How far they had led to a better knowledge of the laws governing the weather, and to the discovery of new laws. 3. How far they had led to the collection of data, not otherwise procurable, that form a necessary basis for the establishment of new laws. 4. Should the same objects be further pursued? and if so, in accordance with the programme of operations now in force? 5. Should a change in the programme of the operations appear desirable, what should their nature be?

The Committee of the Royal Society, which consisted of Sir G. Airy, the Rev. R. Main, Professors Adams, Stokes, and B. Stewart, Dr. Guy, Messrs. De La Rue, Warington Smyth, Broun, and Spottiswoode, sent in a series of recommendations to the Council that were embodied in a letter addressed to the Treasury Committee.

Your Council reported that oceanic meteorology had been greatly enriched by the investigations made with regard to winds, currents, and temperatures of the ocean, and by the deductions obtained therefrom, and that these contained results on which sailing-directions of the most trustworthy character, for the use of navigators, an be constructed.

As regards terrestrial meteorology, that the number of sations for which observations are signalled for the purpose of forecasts should be increased rather than diminished; and that these forecasts as justified by the results of three-fourths of the cases recorded.

That daily weather-charts are considered to have contributed materially to a diffusion of the knowledge of meterological phenomena among all classes, and are on that account of great utility; and, further, their preparation and issue are regarded as beyond the means of private establishments, and eminently worthy the support of the Government. That the publications of the Office generally bear the impress of a scrupulous regard to accuracy, and embrace a collection of data not otherwise attainable, and supply a large mass of material of a nature indispensable to the establishment of new laws; and that all the work appears to have been done in accordance with the recommendations of the Royal Society.

As to the future of the Office, your Council were of opinion that the programme now in force should be generally followed; that the hitherto unpublished results of oceanic observations should be brought out it as

soon as possible, so that the meteorology of all navigable parts of the ocean should be known; that the rules followed in forecasting storms should be published for the information of future meteorologists; that it would be advantageous to publish weekly averages of the climate of the British Isles for the use of agriculturists and collectors of statistics of health, mortality, and the distribution of disease, these averages to be printed in a tabular form, giving the results not only of the week but of the previous week, of the corresponding week of the foregoing year, and of the average of the corresponding weeks in the foregoing 10 years. That the operations of the self-recording observatories should be continued as at present, until the expiration of the 12-year sun-period, after which the subject of their number and position might be advantageously reconsidered; and that special observations should at once be taken for the purpose of comparing their records, ascertaining their local peculiarities, and determining such constants as would ultimately permit of a large reduction of their number; and with regard to the eye-observing stations, it was recommended that their position and number should be reconsidered, with the view of obtaining a closer approximation to the meteorological conditions of the British Isles.

More important, however, by far, than these recommendations relating to the collection and reduction of observations, is the expressed opinion of your Council that the most practical method of advancing meteorology is by endeavouring to place the science on a firm basis, not by the accumulation and digestion of observations, but by research and experiment— and that this can only be done by the Government securing the services of scientific men who can devote their time to this object. To this end your Council recommended that the Office should be presided over by a man of the highest scientific attainments, preferably as sole head of the office, and if not, as chairman of a committee composed, like the present, of men eminent in science, but fewer in number—and that an adequate salary should be given to the presiding head, if an individual, or to the members of the committee, if it be retained.

Such is the substance of the recommendations of your Council; and I have every reason to hope that they will be carried out by the Government in as liberal a spirit as were our previous recommendations for the guidance of the Office in 1855 and 1865. Should this be the case, we may expect to be applied to for suggestions as to the general or precise nature of the researches and experiments which your Council have indicated as being essential for placing the science on a firm basis. We have excellent examples of what may be expected from such researches in the essays of our late Fellow, Professor Daniell, and in the more recent contributions to meteorological science of Sir J. Herschel, Balfour Stewart, Tyndall, Straehey, and others; and we look to further improvements from the application of the study of hydrodynamics and the phenomena of light, electricity, and acoustics, and other branches of physical science, to the elucidation of the many unsolved problems which have so long fettered the investigation of the laws of climate.

It will not be thought out of place here if I add a few remarks on the present state of Meteorology as one of the physical sciences, the progress it has really made, and the direction in which further progress is attainable. In this I have been aided by General Straehey, a late member of the Treasury Committee, who, having studied meteorology in India as well as in Europe, has kindly drawn up a statement of our views, and placed it at my service for this Address.

Without question, the chief point in which meteorology now differs from what it was, is the recognition of the necessity for taking into consideration the facts observed at many places simultaneously over a large area, instead of facts observed in succession at a single locality. This great step has been no doubt mainly due to the extension of the electric telegraph, which renders possible the rapid juxtaposition of observations made over a very large area, and the equally rapid dispatch to great distances of the results derived from the consideration of such observations, thus furnishing the means both of acquiring the knowledge and of making it practically useful. A comparison of the first feeble efforts to appreciate the nature of the fluctuations of barometric pressure recorded in the Reports of the British Association for the years following 1843, and chiefly clue to Mr. Birt, and the beautiful synoptical charts now published in many countries, of which those prepared by Captain Hoffmeyer may be taken as an example, will indicate the great progress made in this direction. Charts such as these convey very complete information as to how the chief variations of weather occur over the greater part of Europe and the United States—though why they occur is yet too little understood. It is, unfortunately, still true that very little has been done towards tracing out the physical causes of the changes of pressure of the occurrence of which we are thus made aware; but it is not to be doubted that, the facts being now presented to students in a readily accessible and intelligible shape, no great interval is likely to elapse before the causes that produce them are ascertained, at all events approximately.

It is practically certain that the changes of atmospheric pressure are immediately dependent on changes of temperature; but no intelligible relation has yet been established between the two, except in the very vaguest manner. And this indicates the first great want of scientific meteorology—namely, an improved theoretical knowledge of the movements of elastic fluids subject to changes of temperature. The difficulties to be surmounted in this branch of mechanics are great; but probably the means may be attained of subjecting the

hypotheses that will eventually form the basis of scientific meteorology to the rigorous test of mathematical calculation, though hardly the first step has yet been taken in that direction.

For the purpose of bringing one class of the observations on which a scientific meteorology must be based into a form suited for the application of theoretical tests such as these, the harmonic analysis seems to supply the necessary means. This method may be familiarly explained as having for its object to break up any observed series of quantities representing a recurring phenomenon, such as the diurnal or annual variations of temperature or atmospheric pressure, into other series so arranged that each observed quantity shall be conceived to be an aggregate consequence of a number of different series of variations from the mean value—the first of such series being completed but once in the whole epoch under consideration, the second recurring twice, or being completed in half the epoch, the third recurring thrice, or in one third of the epoch, and so forth.

The arithmetical computations requisite for thus transforming periodical observations being very laborious, Sir W. Thomson (adopting an idea of his brother's, Prof. J. Thomson) has proposed to construct a machine that shall perforin the calculations with the aid only of the graphical projection of the curve resulting from the recorded observations—an illustrative model of which he exhibited to the Society in the course of last Session, and an account of which has been published in our 'Proceedings.'

It is well to remark that this treatment of meteorological or other observations gives no direct aid in referring the phenomena to physical causes, and is only to be regarded as a means of bringing them into a shape in which they can be compared with theoretical formulas or dynamical or other hypotheses. It has too long been thought that the arithmetical manipulation of the results of meteorological observation was a sufficient end to be attained; and too often the necessity for seeking for the efficient causes of the phenomena has been lost sight of. An altogether useless refinement has also frequently been insisted upon in recording observations of what, in a scientific sense, may be termed insignificant details; and a wholly illusory appearance of accuracy has been aimed at, far beyond what can in fact be attained. The true conception of averages is, in meteorological calculations as in many others, very often missed, and mean results are exhibited which have no real signification.

The relation of meteorology to physics may be compared to that of the natural-history sciences to physiology. Physics include the study of the forces the operation of which on the atmosphere gives rise to meteorological phenomena. The intelligent application of physical research is unquestionably one of the most necessary elements in the satisfactory progress of this science; and Professor Tyndall's study of the action of the air and other gases in relation to radiant heat affords an excellent illustration of the manner in which experimental investigation contributes to the knowledge required to explain atmospheric phenomena.

The prodigality of nature in supplying the germs from which life on the earth is sustained, and the comparatively extremely small proportion of those germs that ever come to maturity, has often been a subject of comment. I venture to remark that a prodigal waste no less conspicuous is to be seen in the long rows of volumes on our shelves containing meteorological observations which doubtless contain vast numbers of scientific germs, but germs not destined to fructify. It is without doubt one of the most serious difficulties that attend our efforts at progress in this science to determine what records to make, what to keep, what to publish. So long as our knowledge is so rudimentary, we cannot properly judge what is essential and what unimportant. Like many other difficulties, this, I presume, must be left to time for its solution; at all events, I shall not attempt it.

In concluding my observations on this subject, I would further impress upon all interested in it that it is to well-directed thought on the physical connexion between the many closely related atmospheric phenomena which are now so clearly presented to the student in the publications of the present day, that we must look for real progress in the science—and that it will almost certainly be found that it is rather through an examination of the better-known recurrent phenomena, viewed broadly, that success will be secured, than by a laborious search after deviations from what is of common occurrence.

The most important scientific incident of the year is unquestionably the return of the '*Challenger*' from her voyage round the world and three years and a half of persevering exploration. It is, moreover, one in which the Royal Society has taken the deepest interest, having (as the Lords of the Admiralty officially state) originated it, and having been called upon by the Government to take a very active share in advising as to its organization and equipment.

The 'Challenger' left Sheerness on the 17th of December, 1872, and, after a voyage of 69,000 miles, arrived at Portsmouth on the 24th of May last with all her officers (with the exception of Captain Nares, who was called home to command a more perilous enterprise, and the late Willemöes-Suhm, who died at sea) in excellent health—their labours crowned with complete success, their collections in perfect order and preservation, and the scientific staff eager to work out the results of their long and arduous investigations. The success of this expedition is the more gratifying, as it is the first and only enterprise of its kind which has been

undertaken by any nation for carrying out a thorough and purely scientific investigation of the great oceanic areas, under adequate superintendence and with full appliances.

It is impossible for any one who has not taken an active part both in the organization and conduct of such an expedition as this of the 'Challenger,' to estimate the number and value of the factors that have mainly contributed to its success. Foremost among these were the wise liberality of the Ministry, which gave orders for its outfit being complete on all points, and the care and efficiency of the Naval Department, shown in the attention paid to every detail, in the choice of the ship, its stores, in the selection of the Commander, its executive officers and crew, and in the forethought bestowed on its sailing-directions. The selection of the Scientific Staff (consisting of Sir C. Wyville Thomson, Mr. Wild (Secretary), and Messrs. Murray, Moseley, and Dr. Willemöes-Suhm, naturalists, and Mr. Buchanan), and the apportioning of their duties, was intrusted to your Council; and the manner in which that Staff has carried out its instructions, merits your highest approbation—as is, indeed, testified by the award of a Royal Medal to its Chief, Sir C. Wyville Thomson. Essential to complete success as all these requirements were, they would have been wholly unavailing but for another, which no foresight could provide for and no forethought guarantee; and that is, concord! The trials of social life on shipboard are proverbial; and, according to the early traditions of the naval service, a philosopher afloat used to be considered as unlucky a shipmate as a cat or a corpse. In this ease, thanks to the admirable spirit in which the Commander and his executive worked with the head of the Scientific Staff and his subordinates, I am informed that harmony reigned on board throughout the voyage. And *à propos* of this, I may be allowed here to allude to another prejudice which was once (if it be not still) current in the service, and which I hope the experience of both the 'Challenger' and Polar ships will finally dispel—namely, that to have one mess-cabin only for the Commander and his officers would be incompatible with naval discipline. The contrary practice in both these Expeditions has, as I am assured, been attended with the happiest results—and this not- withstanding the addition to the mess of that dreaded element; the philosophers.

Before proceeding to glance cursorily at some of the unpublished results obtained by the 'Challenger,' I must direct your attention to the number and value of the scientific documents which have been from time to time sent home for immediate publication; for in respect of work published during the progress of the voyage this expedition stands quite alone. I refer especially to the seven folio Reports of proceedings by Capt. Nares and his successor Capt. Thomson, including twenty-nine charts of sections of the great oceans, with soundings and isotherms for all depths from the surface to the bottom. These publications, the issue of which we owe to the zeal and assiduity of the late and present Hydrographers of the Admiralty, are of the greatest interest—the seventh especially, which gives a complete *résumé* of the observations obtained over the whole Atlantic, and deals very ably with their results. It shows that this ocean presents three deep basins, separated by suboceanic ridges. Of these basins, one (the Eastern) extends along the coasts of the Old World, following its main sinuosities from the latitude of Great Britain to that of South Africa. The other two together occupy a somewhat similar position along the coasts of the New World: namely, a northern one extends from lat. 60° N. to 10° N., expanding greatly in the tropics; and a southern one, commencing a few degrees to the south-eastward of the other, extends far into the Antarctic basin, of which it may be regarded as a northern prolongation. Between the eastern and two western basins a comparatively narrow belt of suboceanic highlands extends from the Arctic to the Antarctic circle along a sinuous line which, roughly speaking, occupies a mid-channel course.

Of the oceanic islands, the Azores, St. Paul's rocks, Ascension, and Tristan d'Acunha are emerged peaks of these highlands. The Bermuda Islands rise out of immense depths in the N.W. basin; Fernando de Noronha and Trinidad Island (in 20° S. lat.) rise out of the S.W. basin; while not more than one island (St. Helena) is to be found throughout the whole length of the Eastern basin.

Not only is this discovery of great importance in relation to the sub-oceanic distribution of life, but also in reference to theories of the distribution of land-animals and plants. In the present state of our knowledge, it disposes of all speculations as to the former existence of tracts of now submerged land, which, extending from the great continents to the islands in question, might have aided the migration thither of animals and plants; and it obliges us to conclude that they were peopled with living things by the direct or indirect agency of the elements.

Did time allow, I would have directed your attention to the discussion on Oceanic Circulation contained in these Reports—a subject that has produced, within a very few years, a library of scientific literature, in which the names of Carpenter, Croll, and Wyville Thomson will ever hold a high place,—as also to the memoirs contributed to our 'Transactions' and 'Proceedings' by Thomson, Willemöes-Suhm, Moseley, Buchanan, and Murray.

The as yet uninvestigated materials collected by the Expedition include soundings, dredgings, and trawlings at the surface, bottom, and intermediate depths, from 354 stations in the Atlantic, Pacific, Southern, Antarctic, and Pacific Oceans, and in the China Sea and Malay archipelago, all which have to be studied in connexion with simultaneous observations for the temperature, specific gravity, chemical composition, and movements of

the sea-water at these stations, and with others relating to the mineral matter covering the floor of the ocean.

Sir C. Wyville Thomson informs me that, as yet, no close estimate can be formed of the number of specimens fit for mounting for museum-purposes which were collected in the deep sea; but he thinks that 100,000 would be well within the mark; and this is of course exclusive of microscopic organisms. Being collected over a vast area presenting comparatively very slight variations in physical conditions, the general character of the fauna which they represent is, as might be expected, on the whole uniform. At the first glance it seems to consist of a multitude of closely allied forms, requiring in many cases great care and skill to determine what among them should be regarded as types of species, and what as local or accidental forms of one species.

In the collection of the abyssal fauna, Sponges and Echinodermata predominate; and Sir C. Wyville Thomson expects that at least one half of these consists of undescribed and newly discovered species—an opinion in which he is fortified by competent judges who have inspected the collection. Crustacea, Annelida, and Polvzoa are also well represented, and are to a great extent of new and remarkable forms. Fishes are numerous, but are for the most part referable to families already made known by the memoirs of the late Rev. R. Lowe on the Fishes of Madeira.

All the specimens have been preserved in such a way that they can be investigated anatomically in every detail; and those who visited the biological laboratories on board the ship at Sheerness, and saw the extent and nature of the appliances for the preservation of soft animals of all sorts, may readily understand how rich a harvest awaits the reapers who have sown so diligently.

Considering how liberal has been the action of the Government hitherto, there cannot be a doubt of Sir Wyville Thomson's being placed in a position that will enable him to superintend the publication of the results of this Expedition on a scale and with a completeness commensurate with their value and worthy of the nation. An unequalled opportunity is now afforded him of investigating the phenomena of migration, variation, of the first appearance, succession, multiplication, and extinction of forms belonging to many orders of the animal kingdom—and this over areas so extensive that they may be regarded as, in a certain sense, the equivalents of geological periods. For this purpose it appears essential that the collections should be kept together under the eyes of the naturalists who formed them, until every species and variety has had attached to it all the details respecting its habitat and environing conditions that were obtained when it was collected; otherwise the primary object of the Expedition will be frustrated.

It may appear superfluous to suppose that any other course would be possible under the circumstances; but that it is not so is proved by the fact that, many and important as have been the collections made during voyages of discovery and survey which have been dispatched from our shores and brought to England, there is absolutely not one of them, from the days of Cook to the present time, of which, so to speak, any thing like the whole material has been published. True enough, this has in some cases been attributable to a want of energy on the naturalists' parts; but it has far more frequently been due to the parsimony or indifference of the Government, which has refused the opportunity of study, or the means of publication, or both.

Before leaving this subject, I must mention the endeavour of our Fellow, Mr. Sorby, to determine the nature of the Red Clays of the ocean-bottom, of which we have heard so much. He informs me that, though any conclusions now to be drawn from his observations must be provisional, it is safe to consider that many specimens of the Red Clay are so entirely analogous to what the Gault must originally have been, that those specimens might almost be looked upon as being as truly modern Gault as the *Globigerina*-ooze is modern Chalk. In the Gault the grains of fine sand are chiefly quartz derived from the decomposition of schistose rocks. But the Pacific and Atlantic muds from great depths contain, besides quartz-fragments, others of glassy felspar, pumice, and other volcanic products; and Mr. Sorby has not been able to detect any difference between the main mass of the Gault and other rocks which are composed of very minute granules like those derived from felspar or other minerals which, in a similar manner, easily undergo complete chemical decomposition. Independent, therefore, of the presence of different organic remains, and of the modern volcanic products, there is little or no difference between the Red-Clay deposits and some of the earlier stratified rocks.

The return of the *Polar Expedition* is too recent to allow of any accurate estimate being formed of the value of the scientific facts which it has accumulated. Captain Nares, in his official Report to the Admiralty, bears warm testimony to the services (both as a collector and an observer) of Captain Feilden, who was selected by your Council as Naturalist to the Expedition; and we have very good reason to believe that his and Mr. Hart's contributions to Arctic Geology and Natural History generally will prove to be the most important and extensive ever obtained from the highest latitudes of the globe.

From a communication with which Captain Feilden has favoured me, it appears that there are no signs of a cessation of animal or vegetable life up to the furthest point reached by the Expedition: birds and mammals occur on the shores of the Polar basin in lat. 82° 45#; and the sea itself abounds in Crustacea and Mollusca, which latter were collected in a fresh state chiefly on the recently raised beaches. Of land mammals, the Lemming and its enemy, the Ermine, were found on the North Greenland coast, between the parallels of 82°

and 83°, along with twenty or thirty species of flowering plants, including the beautiful *Hesperis Pallasii*, *Saxifraga flagellaris*, and *Vesicaria arctica*. The absence of whales from Smith's Sound was a noteworthy fact: we may assume that the great *Mysticetus*, which is almost extirpated in the Spitsbergen seas, and which was traced up Baffin's Bay and to Prince Rupert's Inlet, is now hemmed in by the polar ice of Bank's Straits and McClintock's Channel, and did not attempt to face the pack of Smith's Sound. Birds, which abound in Baffin's Bay, were scarce in the Sound, owing to the cold tides and want of open water in the Polar basin; nevertheless the Knot, the Sanderling, and the long-tailed Skua Gull were all observed to breed on the shores of that basin.

Insects were found at the extreme point reached by Caphin Feilden; and, of the lower orders, Echinodormata were very common. Among these is a beautiful *Comatula*, identical with one dredged up in 82° 6# by Captain Buchan, in the 'Dorothea,' in 1818, and afterwards by Franklin in the 'Trent,' in lat. 82° 26#. As the latter localities are on the east coast of Greenland, and this species had not been found previously in any part of the American Polar sea, another reason is suggested for concluding that Greenland is an island, and that the coast traced to the eastward by the sledge expedition of the 'Alert' is truly its northern one.

The geology of Smith's Sound is very instructive, Captain Feilden having succeeded in laying down its outline, at any rate, and connecting its rocks with some of those of the Polar regions to the south. Gneiss, syenite, and hornblende rocks extended from Cape Isabella, in lat. 78°, to Hayes Sound, in lat. 79°, where they were overlain by marine beds of Silurian conglomerates, full of fossils, dipping E. and W., and reaching northward to Cape Collinson. On the Greenland coast, in Bessel's Bay and Petermann Ford, the same rocks are found. On the opposite coast, in Discovery Bay, these fossiliferous rocks, if they ever existed, must have been denuded, and are replaced by azoic slates and limestones presumably answering to the Silurians of American geologists. This formation was traced to lat. 82°, where an anticlinal ridge occurs, the northern strata of which dip to the N.N.E., and are, in lat. 82° 44#, overlain by Carboniferous limestones.

Miocene strata were discovered near Discovery Bay, in lat. 81° 44#, including a 20-foot seam of coal rich in fossil plants. Postpliocene beds full of shells, and sometimes 400 feet thick, filled up the valleys, and overlay hills 100 feet high; these contained bones of the musk-ox and seal, together with drift-wood, nil deposited as they might have been under existing conditions.

Drift pine wood abounds on the shores of the Polar Sea, no doubt drifted from the Siberian rivers; and birch wood occurred in the Sound.

Evidence of a recent change of climate was met with in the number of deserted Eskimo settlements, which were traced nearly as far north as the parallel of 83°. One of the houses was roofed with large whales' ribs.

I have now, Gentlemen, concluded my endeavour to bring under your notice some of the principal labours of your Council during the past year, together with their immediate and prospective results. I should have liked, had time permitted, to direct your attention to a few of the more interesting papers and experiments that have been brought before us at our evening meetings, and to point out to you that in the consideration and preparation of papers for publication a heavy burden is laid on your Secretaries and that longsuffering body the Committee of Papers. It would perhaps surprise you could you be made aware of the amount and importance of the work connected with papers which is performed by your officers and the Committee. It is work which only in its results comes before the eye of the Society; but I think you will agree with me that those results show how well and faithfully the work has been done.

On the motion of Sir James Alderson, seconded by Mr. Francis Galton, it was resolved—"That the thanks of the Society be returned to the President for his Address, and that he be requested to allow it to be printed."

The President then proceeded to the presentation of the Medals :—

The Copley Medal has been awarded to Professor Claude Bernard, For. Mem. R.S., for his numerous contributions to the science of Physiology.

It fell to the lot of Claude Bernard to make, at about the same time, two discoveries of which it may be said that they have proved more pregnant of physiological interest than any two discoveries which have been made by the same man during the last five-and-twenty years. Not only were the discovery of the glycogenic function of the liver, and of vaso-motor nerves, of prime importance at the time at which they were, made, but their subsequent influence on the progress of physiology has been such that it would he difficult to overrate it.

When, in 1853, Bernard published his work 'Sur une Nouvelle Fonction du Foie,' physiologists, notwithstanding the proof afforded by Liebig and others that animals are able to form fat out of the starch and sugar of their food, still clung with remarkable tenacity to the view that the great distinction between animal and vegetable life lay in the fact that the chemical actions of the former were exclusively destructive, ant of the latter constructive. When, however, Bernard showed that the hepatic cells were able, like the vegetable cells, to manufacture and deposit in themselves a veritable *starch*, the older view received its death-blow; the constructive powers of the animal economy could no longer be denied, and the minds of physiologists became open to the fact that in studying animal nutrition they must be prepared for the existence of other processes than those of simple destructive oxidation. The subsequent discovery of glycogen in other (and especially in foetal)

tissues made this still more clear. How beneficial this clearing-away of erroneous theretical conceptions has been is shown by the rapid progress which the physiology of nutrition has made during the last quarter of a century.

The discovery of glycogen has also another influence of a general character. Governed too much by the leading idea of the animal bod; being composed of organs with special functions, physiologists were content with the view that the liver was an organ whose function is to secrete bile, and that when it had secreted a proper quantity of bile its work was clone. The fact that in the liver, at the same time that bile was being secreted, chemical labours of an apparently wholly different kind were being carried on, put an end to these narrow conceptions. It was felt at once that a new path of inquiry had been opened up for the study, not only of hepatic, but of all other tissues—a path of which even yet we see only the beginning.

Though such theoretical considerations as the foregoing stamp the discovery of glycogen as emphatically epoch-making in the history of physiology, its immediate and practical fruits were not inconsiderable. It and the subsequent discovery by Bernard that puncture of the fourth ventricle produces a temporary artificial diabetes, at once threw a vivid light over the dark subject of diabetic disease; and if neither the labours of Bernard himself nor those of Pavy and others, who have extended and, in a measure, corrected Bernard's conclusions, have cleared up the whole mystery of this fatal malady, its rational pathology began with the discovery of glycogen; and the complete interpretation of it, when it comes, must be based on Bernard's results.

No less epoch-making than the discovery of glycogen was the observation made by Bernard in the early months of 1852, that division of the cervical sympathetic caused a dilatation of the blood-vessels of the face and neck. That simple experiment was the beginning of the long series of researches on vaso-motor nerves, on nerves of secretion, we may perhaps add nerves of nutrition, and on inflammation, which so eminently characterize the physiology of the present generation. The progress of physiology during the last twenty years has been far more rapid with respect to our knowledge of the laws regulating vascular supply and secretion than in any other direction. Nor is the value of Bernard's initial experiment lessened by the fact that in a later month (August) of the same year, Brown-Séquard had independently obtained similar results to those of Bernard, and had pushed them further than he had, nor by the fact that Waller in the same year had seen the importance of the new truth more clearly than Bernard himself seems at first to have done. The air of physiology was at that time heavy with some such discovery; and since Bernard not only was the first to call attention to the facts, but also subsequently expounded fully their importance, his merit in the discovery cannot be diminished by others having independently arrived at the same results.

But Bernard's merits as a physiologist do not end here. Second only in importance to the discovery of glycogen and vaso-motor nerves was the observation made by him in 1856, and at about the same time independently by Kölliker, that the South-American arrow-poison, urari, destroys the conductivity and irritability of motor nerve-endings, but leaves muscular contractility intact. This was of great theoretical importance, inasmuch as it afforded striking evidence in support of Haller's views on muscular contractility, views which had been somewhat thrown into the background; and though the opinions expressed by Bernard in publishing this important discovery have not been fully confirmed by subsequent inquiries, the fact which he and Kölliker enunciated, that profound differences exist between the action of the poison on the contractile tissue itself and its action on the endings of the motor nerves, remains as a fundamental doctrine of physiology. The discovery of the properties of urari had, moreover, all the contingent advantages of the invention of a method. Urari has proved of indispensable advantage as a means of physiological analysis; its use in this respect is second only to that of chloroform and other anaesthetics. Many of the most important results in physiology gained during the last quarter of a century would probably have never been reached without the assistance of urari. Indirectly, therefore, we owe these to Bernard and Kölliker.

We are also indebted to Bernard for what was his earliest work, an important research on the functions of the pancreas, more especially on the use of the pancreatic juice in the digestion of fat. This alone was an important addition to physiological science; but it retires into the background before the more important labours on which I have dwelt.

Lastly, in addition to these special researches, physiology has been enriched by a series of general lectures on the nervous system, on digestion, on poisons, on the properties of blood and other animal fluids, in which Bernard not only brought forward many other observations of interest and importance, as for instance those, on carbonic-oxide poisoning, but also directed his readers in a lucid and striking manner to general considerations of great value.

Some of the views which he has thus put forward have not stood the test of subsequent investigation; but many of them, for instance the conception of the blood as an internal medium on which the several tissues live, have become part and parcel of the higher physiological teaching of the day; and by the exposition of his general views, Bernard has done service to physiology quite commensurate with the fruit of his more special inquiries.

[The Medal was received for M. Bernard by His Excellency the French Ambassador.]

The Rumford Medal has been awarded to M. Pierre Jules Cesar Janssen, For. Mem. E.S., for his numerous and important researches on the radiation and absorption of light, carried on chiefly by means of the spectroscope.

For the last 16 years Janssen's labours have been unceasing; and he is continuing them with unabated vigour at the present moment.

His first communication dates from 1860, in which year he recorded some observations on the absorption of radiant heat by the interior of the eye. This thesis gained for him the Doctorat ès sciences physiques. In 1862 he published the first section of his celebrated researches on the origin of the telluric lines of the solar spectrum: he gave us the new form of spectroscope of which we are only now beginning to take full advantage (I allude to the "Direct-vision Spectroscope," long associated with the name of Hofmann, because that optician was employed by Janssen), and pointed out how spectrum-analysis might enable us to settle the vexed question of the existence of a lunar atmosphere.

In 1866, with reference to the telluric line, he experimented at La Villette on a tube, some 37 metres long, containing steam at the pressure of 7 atmospheres, with the result that by comparing the spectra he was enabled to demonstrate that the telluric lines were really due to the absorption of aqueous vapour. The experiment was repeated in another form by observations of the spectrum of a flame several miles away through the vapour overlying the Lake of Geneva.

After these researches he sought and obtained a mission from the Paris Academy of Sciences to South-eastern Europe to make observations on the spectra of stars; and he was enabled to establish the fact that aqueous vapour exists in the atmosphere of some of them.

These researches on aqueous vapour led him to observe many spectra, among which were iodine, bromine, and others; and in the 'Comptes Rendus' and Proceedings of the Société Philomathique, observations are recorded which show that at that time he and Ångström were in the van of such researches.

Janssen's observations regarding aqueous vapour naturally led him to take every occasion of studying the solar atmosphere; and since the annular eclipse of 1867 (which he observed at Trani) there has been one total solar eclipse only which he has not studied.

After a scientific mission to the Azores in 1867, he went to India in 1868 to observe the great eclipse of that year. Not only were his observations of the eclipse itself of the highest value, but during the eclipse, with a flash of genius, the thought occurred to him that an eelipse was not necessary to the observation of the social phenomena into which everybody was inquiring; and he was the first to apply the method, now well known, which is being utilized in all civilized countries for the advancement of knowledge.

For some months after the eclipse Janssen remained in India, and brought home a rich series of observations, opening up many branches of inquiry which have since proved most fruitful in result.

In the eclipses of 1870 in Africa, 1871 in India, and 1875 in Siam, Janssen was present, and advanced further the question which he had set himself, and with the solution of which his name will always be associated.

Janssen's skill as an observer and his sound knowledge of optical and mechanical questions, have not been shown merely in connexion with the spectroscope; he was anxious to observe not only the recent transit of Venus, but to obtain records of several physical phenomena which can be observed only at such times. For this purpose he gave attention to astronomical photography; and the result was the introduction of his revolving apparatus, which was instantly adopted by our own eclipse parties, and will probably be the only photographic instrument used in future transits.

Janssen is at the present time engaged in organizing a physical observatory, and is taking daily photographs of the sun, preliminary to obtaining daily spectrum-photographs to elucidate all those inquiries which have been raised by his former work.

I have limited this Statement to those researches of M. Janssen which have reference to the Rumford Medal. In the sixty notices of his papers printed in the 'Catalogue of Scientific Papers,' some will be found on other branches of knowledge, the results of his many scientific missions, of which a list is appended:—

- 1857-58. Determination of the Magnetic Equator on the Coast of Peru.
- 1861-62. Study of the Telluric Lines in Italy.
- 1864. Continuation of this inquiry from high points in the Alps.
- 1867. Observations of the Annular Eclipse at Trani (Italy). Observations of the Eruption of Santorin. Magnetic Observations in the Azores.
- 1868. Observations of total Eclipse in India. Discovery of the new method. Optical and Magnetical observations at Simla.
- 1870. Observations of total Eclipse in Africa. Janssen escaped from Paris in a balloon to make these.
- 1871. Observations of the total Eclipse in Asia.

- 1874. Observations of the Transit of Venus in Japan.
- 1875. Observations of a total Eclipse of the Sun in Siam. [The Medal was received by M. Janssen.]

A Royal Medal has been awarded to Mr. William Froude, F.R.S., for his researches, both theoretical and experimental, on the Behaviour of Ships, their oscillations, their resistance, and their propulsion.

It is generally admitted that Mr. Froude has done more than anybody else towards the establishment of a reasonable theory of the oscillation of ships in wave-water, as well as for its experimental verification. The very accurate instruments which he has contrived for the measurement of a ship's oscillation at sea have even permitted him to measure (as a differential phenomenon) the mean wave acting upon the ship with a degree of exactness exceeding that with which it has hitherto been possible to ascertain the profile of the surface-wave of the sea.

He was also the first to establish on thoroughly sound principles the mechanical possibility of that form of motion known as the trochoidal sea-wave, which more nearly than any other appears to represent the shape of smooth ocean-wave, and which now forms the groundwork of all useful theories of the oscillation of ships.

He has also conducted a series of experiments, extending now over many years, on the Resistance, Propulsion, and Form of Ships, and on the very important and little-understood question of the law connecting the behaviour of ships, in all these respects, with that of models of ships on a much smaller scale. These experiments have been conducted partly for the government, and with public money; but they have also very largely taxed Mr. Froude's own private resources, the sums repaid to him by no means representing his whole expenditure on these matters, and including no compensation whatever for his own time or labour.

The amount of mechanical skill, as well as of theoretical acuteness, which has been exhibited in all this work has placed Mr. Froude in the foremost rank of all investigators on this subject. No one, indeed, has ever done more, either theoretically or practically, for the accurate determination of a ship's motion, whether in propulsion or in waves, than Mr. Froude. Without undervaluing other modern writers, it is not too much to say that his investigations at present take completely the lead in this very important question—most important to a maritime nation.

Mr. Froude's papers are mainly to be found in (he 'Transactions' of the Institution of Naval Architects and of the British Association, as also in separate official reports published as "Blue Books."

[The Medal was received by Mr. Froude.]

A Royal Medal has been awarded to Sir Charles Wyville Thomson, for his successful direction of the scientific investigations carried on by H.M.S.' Challenger.'

In consequence of representations made to Her Majesty's Government by the President and Council of the Royal Society, the Lords of the Admiralty, in 1872, fitted out and commissioned the ship 'Challenger' for the purpose of undertaking a survey of the ocean of a more systematic and complete character than any which had hitherto been attempted.

After crossing the Atlantic in various directions, the distinguished officer, Captain Nares, who was intrusted with the command of the 'Challenger,' was instructed to proceed southward to the Antarctic regions, and thence to take his way along the western side of the Pacific to Japan; from Japan he was to cross the Pacific, and, running southward through its eastern region, to return to England by way of Cape Horn.

The track taken by Captain Nares, and his successor in command, Captain Thomson, covered 69,000 thousand miles; and the chief objects of the expedition were to obtain at stations of accurately ascertained position, observations by which the temperature of the sea, and its physical and chemical condition, from the surface to the bottom and at all intermediate depths, could be determined, to drag up the sea-bottom itself in quantities sufficient for its satisfactory examination, to ascertain the nature of the fauna at the surface and at the bottom, and to collect and preserve the animals thus obtained, in such a manner as to enable their nature and affinities to-be determined, under more favourable conditions than those afforded by life on shipboard, on the return of the vessel.

In this way it was hoped by those who proposed the Expedition to the Government, that a firmer foundation by far than any which formerly existed, would be laid for the physical geography of the ocean.

The Fellows of the Royal Society hardly need to be reminded of the manner in which those duties have been performed. From time to time, in the space of the three years and a half during which the 'Challenger' has cruised in every variety of climate, and circumnavigated the globe, many long and interesting Reports, sent home by the Director and the other officers of the Staff, have been laid before the Society by order of the Lords of the Admiralty, have been printed in the 'Proceedings,' and afford solid evidence of the nature and value of the work that has been done.

We have records of serial temperatures and determinations of the sea-bottom obtained at 354 station?, of the extraordinary fact of the occurrence of peroxide of manganese in masses over thousands of square miles, of the final answer to the vexed question as to the habitation of the *Globigerinæ* (which contribute so largely to the existing processes of rock-formation), of the general uniformity of the deep-sea fauna all over the world,

together with many other new and interesting discoveries which need not be enumerated. The collections which have been formed are of unexampled value for their extent and the excellency of their preservation.

It may be truly said that no Expedition for scientific purposes ever left the shores of any country better organized or more abundantly pro- vided with all that would be required for its efficiency; and it is no less true that none has ever more completely fulfilled the purpose for which it was organized.

Under these circumstances the President and Council of the Royal Society have judged that the award of a Royal Medal to Sir Wyville Thomson is a well-earned recognition of the great success which he and the Scientific Staff of the 'Challenger,' under his direction, have rendered to Science, and, at the same time, a fitting acknowledgment, on their part, of the successful manner in which he has discharged the duty with which, on their recommendation, the Government intrusted him.

[The Medal was received by Sir Wyville Thomson.]

Address of Sir Joseph Dalton Hooker, C.B., K.C.S.I., The President, Delivered at the Anniversary Meeting of the Royal Society,
On *Friday*, *November* 30, 1877.
Printed at the Request of the Fellows.
London: Printed by Taylor and Francis, Red Lion Court, Fleet Street. 1877.

Royal Society.

Addeess of the President, Delivered at

The Anniversary Meeting, November 30, 1877.

GENTLEMEN,

FOLLOWING precedent, I have at the commencement of my Annual Address to record the losses by death of eminent Fellows of this Society which have taken place since the last Anniversary. Though, happily, these losses are not so numerous as they have been in late years, the number amounts to twenty-three, and the list includes the names of men of great distinction in science, and among them of one to whom the Society is under lasting obligations for his active interest in its welfare during upwards of a quarter of a century. Need I name Mr. Gassiot, the founder of the Scientific Relief Fund, the munificent subsidizer of the Kew Observatory, and the ever-ready and liberal promoter of scientific investigation—Mr. Fox Talbot, the discoverer of photogenic drawing (the Talbotype proess), proved to be the fruitful parent of photography—Sir Henry James, under whose administration the operations of the Ordnance Survey of Great Britain were greatly extended, and its resources utilized in various ways, especially through the application of scientific processes all tending to the advancement or diffusion of knowledge—Mr. Robert Were Fox, eninent for his researches on the temperature and the magnetic and electric:! condition of the interior of the earth, especially in connexion with the formation of metallic veins, and who was, further, the inventor of some and improver of other instruments now everywhere employed in ascertaining the properties of terrestrial magnetism? In Sir William Fergussn we have lost a surgeon of rare ability and manual dexterity and an operator of great repute; in Mr. David Forbes an accomplished traveller, chemist, and mineralogist; and in Dr. Bowerbank a naturalist of the old school, whose enthusiasm and genial encouragement kindled into a flame the scientific spark that lurked in the breast of many an amateur. There have further been removed by death from the list of Foreign Fellows two recipients of the Copley Medal, the venerable Von Baer and the comparatively young Le Verrier, together with a traveller and physicist of rare attainments, Erman, the narrative of whose travels is one of the richest storehouses of scientific information that has hitherto been given to the world in the narrative form.

Finance.—As heretofore, I must refer to our Treasurer's Report for evidence of the satisfactory condition of the Society's finances. Not but that this is a matter that requires constant vigilance, as the demands upon our pecuniary resources annually enlarge, owing mainly to the rapid increment of matter brought before us and found worthy of publication in our Transactions and Proceedings, and, above all, to the number of expensive illustrations which accompany many of them. This, and the prospect of the results of the Government Fund for the encouragement of research being laid before the Society for publication, appeared to me to render it desirable that a Committee should be appointed to inquire into and report upon the receipts and expenditure of the Society, and that the subject of the outlay on printing and paper should be referred to the Library Committee for report, together with that of the compilation of the Catalogue of Scientific Papers, the labour and expense of which were likely to increase with that enormous development of scientific literature which characterizes this century.

On the recommendation of that Committee, our printing has been transferred to a well-qualified firm of printers, on such conditions as will enable us, we hope, to effect an important saving in our annual charge for printing. It is thought, moreover, that the compilation of the Catalogue of Scientific Papers, which, though no part of our ordinary work, had been voluntarily undertaken and paid for by the Society, and diligently conducted under the supervision of your officers, should not be allowed to press unduly upon our resources, and that the time had come when application should be made to the Government Fund for aid to enable us to meet the increasing demands on our income for the work of the Catalogue.

And further, as bearing on the question of finance, your Council have resolved that the difference between the amount of Life composition payable by newly-elected Fellows who have and those who have not previously to election contributed a paper to the Transactions should cease, and that a part of the funded property of the Society should be invested in secure Stocks yielding a larger interest than the Government funds.

Presents.—It is always with peculiar pleasure that I announce the presentation of good portraits of scientific worthies. Two in oils, received during the vacation, are now hung on our walls: one of Sir John Herschel, a very faithful likeness, presented by our Fellow, Mr. John Evans; the other, presented by our late Secretary, Dr. Sharpey, is that of Haller, the physiologist, anatomist, botanist, and poet, whose genius and labours were the admiration of his contemporaries, as they have been ever since of his successors. It is not without pride that our countrymen can record the facts that an English sovereign, George II., was the first who recognized the merit of Haller, the Swiss, by bestowing on him his earliest preferment, a professorship in Göttingen,. and ever after showing him every mark of respect, and that, on a subsequent occasion, an English University, Oxford, offered him a professorship. The portrait is an excellent one, in perfect preservation, and forms a most valuable addition to our gallery.

I have also to inform you that a sum of £500 has been contributed anonymously by five Fellows to the Society's funds for general purposes, and that our Foreign Secretary has proposed that his office should, as long as he holds it, be regarded as an honorary one, with charge of the Society's foreign correspondence. This very liberal proposal was accepted by the Council, only in so far as resolving that the Foreign Secretaryship should be placed on the same footing in respect of salary as it was before the year 1805; that is to say, that the honorarium should be limited, as in former years, to the proceeds of .the original endowment.

Our Fellow, Dr. William Farr, has presented to the Society an annotated copy of Thomson's 'History of the Royal Society,' containing the dates of death of Fellows who died subsequently to the publication of that work, as far as these could be obtained from the Society's minutes and from printed books, together with a complete chronological list of all the Fellows admitted since 1812 down to 1870. These, with other documents which he has added, enable Fellows to ascertain the names, and dates of birth and death, of every person admitted into the Society since its origin, and hence, to a great extent, supplies valuable data for determining the vitality of scientific men at different periods. In his letter accompanying these very valuable documents Dr. Farr observes that the records of the Royal Society were allowed for years to remain defective as to particulars which were formerly accurately recorded, and that Halley and others seemed to have been alive to the importance of such facts relating to the scientific men of their age. In future, the date and place of birth of Fellows will be registered regularly and accurately, in accordance with Dr. Farr's excellent suggestion, for which, as for the documents, a unanimous vote of thanks was returned by your President and Council.

The Catcdogue of Scientific Papers.—In my last year's Address I informed you that the Lords of the Treasury had granted the funds necessary for printing the decade 1864-73 of the Catalogue of Scientific Papers; and I have now to announce that the first (the seventh of the series) of the two volumes of which it will consist is published. It contains more than a thousand pages. The expediency of the Society's further undertaking the compilation of an "Index of Subjects" having been 'urged upon the Library Committee, was carefully considered by them. To this end the members were supplied with printed specimens of a well-considered plan adapted to the decade 1864-73, with the request that they would favour the Council with their opinion upon it; when it appeared that, owing to the number of subjects often comprised in one paper; and the differences of opinion as to which of these were worthy of citation, and under what name, the task would be one of prodigious labour and unsatisfactory result, and far beyond the Society's means. The printing of the eighth volume is steadily progressing, together with the compilation of the decade for 1874-83.

The Meteorological Council.—The Report of the Treasury Committee of Inquiry into the working of the late Meteorological Office was published last summer. It includes that of the Committee of this Society (none of the members of which had served on the Treasury Committee); and the recommendations of the two bodies are almost identical. As a member of the former, and cognizant of the views of the Government as to the future of the Office, I may state that those views were from the first, and throughout, favourable to giving a more scientific character to the work than it had hitherto possessed, recognizing the principle, that its aim and endeavour should be to advance meteorology as a science, while directing and controlling all such practical operations as were required for the public service. The main difference between the recommendations of the

Treasury Committee and our own is that we favoured the retention of the Office under a department of the Crown, with a Government officer as Director, in preference to leaving it subject to a Committee or Council of Control. The Treasury Committee, influenced by the evidence of very eminent scientific men to this effect, that meteorology was not as yet in a scientific condition, and that to render it so required the combined labours of men with various attainments, as also by the fact that there was no department of Government capable of controlling purely scientific investigations, recommended that, as a tentative measure, a modified Committee of Control (to be called a Council) should replace the old Committee, and that the Royal Society should be asked to nominate the members, and, after a period of five years, to review their labours.

Other recommendations, in which both Committees concurred, were, that ocean meteorology should be transferred to the Admiralty, that the maxims which determine the issue of storm-warnings should be put in a clear shape and issued to the public, that the number and position of both the continuously-recording and the eye-observing stations should be revised, that the latter should be increased so as to satisfy the claims of the Registrars-General, Medical Council, Agricultural Societies, and other bodies, and that a fair approximation to the meteorological condition of the whole British Isles should be daily obtained and published.

Far more important to us, however, than these practical measures, is the strong expression of opinion on the part of both Committees that scientific hypothesis and discussion should be pursued as a duty incumbent on the Office, and that, to this end, an annual grant should be made for the purpose of remunerating investigators, selected by the Council, on a scale proportionate to the work performed.

At the request of H.M. Treasury, and in communication with them, your Council drew up the following suggestions for the administration of the Meteorological Office, which, having been approved, are now put in practice:—That the Office be in future administered by a paid Council, consisting of a Chairman and four effective members, together with, as an *ex officio* member, the Hydrographer of the Navy, whose services were rendered necessary by the Admiralty having declined to undertake the ocean meteorology; that £1000 should be granted for the remuneration of the Members of Council, who should be persons in a position to devote adequate time and attention to the duties of the Office, and to the inauguration of investigations and experiments designed to place meteorology on a scientific basis, to advance it, and to promote its usefulness to the community; that paid inspectors of stations should be appointed for Scotland and Ireland, and £500 be granted for this purpose; that a sum of £1000 per annum be granted for the payment of individuals, to be selected by the Council, to be engaged in special scientific researches; and that £1500 be granted for new land-stations, and £500 for the extension of telegraphy to Sundays. The result of these new measures will be to raise the annual grant for the Meteorological Office from £10,000 to £14,500.

Your Council having further been requested to nominate the effective members of the Meteorological Council for the approval of the Lords of the Treasury, proceeded to do so in accordance with the spirit of the resolutions which gave scientific research so prominent a position—keeping in view, at the same time, the necessity of obtaining the services of as many members of the old Committee as possible, their knowledge of the details of the Office being at first indispensable, and their efficiency already proved. The result has been the appointment of Mr. Henry Smith, Savilian Professor of Geometry at Oxford, as Chairman, and your Senior Secretary, Mr. P. Gallon, Mr. De La Rue, and General Strachey as the other members. The services of Mr. Scott, who has so long and so ably directed the practical operations of the Office, and of Mr. Toynbee, whose labours in ocean meteorology are so well known to you, and of the other officers being all retained, nothing would seem to be wanting, in men or money, to develop the science of meteorology, and to supply the public with data for all the useful purposes contemplated in the establishment of the Meteorological Office. It is to be hoped that the tentative measure thus inaugurated will lead, in five years, to the constitution of a national Meteorological Office under the undivided control of a man of high scientific attainments.

Government Fund of £4000 *per Annum for Five Years*.—The constitution of the Committee for the administration of this fund, under (he authority of the Lord President of the Council, has been provisionally settled, and as much of the first year's grant as was available for the last quarter of the financial year March 31, 1876, to April 1, 1877, was allotted in March last.

The first meeting of the Committee took place on January 11th, when it was resolved:—that four subcommittees should be constituted—namely, (A) Mathematics, Physics, and Astronomy, (B) Biology, (C) Chemistry, (D) General Purposes; and that all applications for grants should be addressed to the Secretaries of the Society, and referred by them to one of the first three subcommittees for examination and report and recommendation; that the subcommittees' reports and recommendations should be printed and circulated among the members of the General Committee not less than one week before the meeting at which the grants would be discussed; and that the grants applied for should be limited to sums required for a period not exceeding twelve months. It was further resolved that a report of progress should be required of the recipient at the end of the year in which the grant was made, and that instruments of permanent value purchased out of the Fund, or supplied by the Government on the recommendation of the Royal Society, should be regarded as the property

of the Government.

The Committee meetings are fixed for February in each year; those of the subcommittees will take place whenever summoned by the Secretaries of the Society; and notice has been given that applications for grants are to be sent to the Secretaries of the Royal Society not later than December 31st in any year.

At the meeting of the General Committee in March last the subcommittees reported that 102 applications had been received, and that the amount applied for was .£14,459. Of the 102 applications 33 were approved, and sums of £300 and under (the total being £2220 1*s*. 6*d*. for instruments, assistance, and materials, and £1810 for personal remuneration) were granted.

The results of this step towards the endowment of research will. I. hope, be narrowly watched, in the interests both of science and of this Society, which, in undertaking to administer for the Government a sum so largely devoted to personal remuneration, has assumed a very onerous responsibility, and largely increased the burthen of your Secretaries.

Reports of Naturalists sent by the Society to Rodriguez and Keryuelen Island.—These are being printed uniformly with our Transactions, under the editorship of Dr. Günther and your President. They will consist of a series of papers, illustrated with plates, on all branches of the natural history of the islands, contributed by the naturalists themselves and various coadjutors, whose services are gratuitous. The cost of printing will be defrayed by the liberality of your Treasurer, and some of the plates have been presented by the contributors.

The Polar Expedition.—The scientific results of the Polar Expedition, and especially the biological, appear to me to have, in most departments, quite come up to our expectations; and considering that but one season was available for collecting and observing (and we all know how short that is in the arctic regions), they are indeed most creditable to the gentlemen who contributed them. Geology has proved by far the most prolific field of research. Perhaps Botany comes next, and this, and the insects which have been worked up by Mr. M'Lachlan, prove that, between 80° and 83° N., in Grinnell Land, the conditions for the existence of these organisms are far more favourable than are those of lands a long way to the southward.

The flora of the series of channels between 80° and 83° N., the shores of which have been botanized by the officers of the Polar Expedition, have yielded upwards of 70 flowering plants and ferns, which is a much greater number than has been obtained from a similar area among the polar islands to the south-westward, and is unexpectedly large. All are from a much higher latitude than has elsewhere been explored botanically, except the islets off the extreme north of Spitzbergen. The species are, with two exceptions, all Greenlandic. The exceptions are *Androsace septentrionalis*, which, though found in the northern regions of all the continents, has never elsewhere been seen north of lat. 72°, and *Pedicularis capitata*, an American and North-Asiatic species, not hitherto recorded north of the same parallel.

Spitzbergen, stretching from latitude 76° 30 to 80° N., quite to the south of the positions here referred to, has contributed not more than 100 flowering plants and ferns, notwithstanding that its west coast is washed by the Gulf-stream, and that its shores have been diligently explored by many trained collectors. Fifteen of the plants collected by the Expedition have not been found anywhere in Spitzbergen. Compared with Melville Island, in lat. 75° N., and Port Kennedy, in 72° N., the contrast is even more striking, these well-hunted spots, both so much further south, yielding only 67 and 52 species respectively.

This extension of the Greenland flora to so very high a latitude can only be accounted for by the influence of warm currents of air, or of the air being warmed by oceanic currents, during some period of the summer; and I look with great interest to the meteorological observations made during the voyage, which are being discussed by Sir George Nares, who hopes to have them completed in a couple of months. The observations on the temperature of sea-water will, he expects, give new information; and the study of certain warm gales and warm currents that were observed in lat. 82° and 83° N. can hardly fail to increase our knowledge of the local climate.

May not these phenomena of vegetation and temperature indicate the existence of large tracts of land clothed with vegetation in the interior of Greenland, far within the mountain-ranges of its ice-clad coast, and protected by these from the heavier snowfalls and from the accumulation of glacial ice which borders that island on all sides?

The fossil plants collected have been examined and reported upon by Professor Heer. Of these the most important are the Miocene. They consist of 25 identifiable species, of which 18 are known Arctic Miocene fossils. All but one had been previously found in Spitzbergen. The most interesting of them is the Conifer, assumed to be identical with the existing American "Bald Cypress," *Taxoclium distichum*, a plant which is now confined to Eastern North America, from lat. 39° southwards, and to which specimens found in the Miocenes of Prance, Italy, Prussia, Greenland, and N.W. America have also been referred.

Professor Heer further thinks that he has identified the remains of a Spruce with the European and Asiatic Norway Spruce (*Abies excelsa*), which occurs as a fossil only in Post pliocene beds. Its existence in the Miocene period only in such a high latitude would indicate that it is a polar form which has migrated southward in more recent times.

This tracking of the Miocene flora so far to the northward was one of the principal scientific objects to be accomplished by the Polar Expedition; and the fact that the character thereof continues to be neither polar nor arctic, but temperate, supports the hypothesis that during the era in question a vegetation analogous to that now prevailing in the temperate latitudes entirely covered the north-polar area of the globe.

Other branches of Geology have yielded very valuable results in the hands of Mr. Etheridge, who has worked up the very large number of Palæozoic fossils collected especially by Capt. Feilden. These, with the Carboniferous, Miocene, and Post pliocene fossils, animal and vegetable, and the abundant rock specimens, have thrown more light on the former condition of the cireumpolar regions than perhaps all the collections of previous expeditions.

Capt. Evans has been so good as to supply me with the results of the magnetical observations made during the voyage, which were in general accordance with those of the American expeditions to Smith's Sound. Nearly continuous hourly observations of the Differential Decli- nation Magnetometer were taken throughout the winter from October to April. "With an inclination of nearly 85°, and a horizontal force of 1.13, the westerly declination disturbance occurred usually between 9 a.m. and 5 p.m., the easterly between 9 p.m. and 5 a.m., the are ranging through 8°. The greatest range (Feb. 19, 1876) reached 5° 48#; the lowest (July 12, 1870) was scarcely 7#. Compared with the results of previous expeditions, we find that, at Rensselaer Harbour, with horizontal force of 1.14 and inclination nearly 85°, the ranges were respectively 4° 52 and 1° 1#; while at Port Bowen, with horizontal force 0° 46# and inclination 88°, they were 11° 56# and 0° 35# respectively. The mean daily range of declination was 86°.8, and mean declination 101° 42# W.

The observers were on the alert to observe any signs of connexion between the auroral displays and declination-disturbances, but to no purpose; for, as with Parry in Port Bowen, and Kane in Rensselaer Harbour, no evidence was discoverable. On the other hand, various previous voyagers have registered a marked connexion, as at Port Kennedy by Maguire, at Point Barrow by M'Clintock, and in the Spitzbergen seas by Weyprecht. Considering that there can be no doubt as to the trustworthiness of all these observers, a decisive solution of the question is greatly to be desired.

Sir William Thomson and Prof. Everett have examined the few observations made for the amount of atmospheric electricity, with the result of finding that they confirm the observations of former explorers.

Sir George Nares has obligingly sent me a *éesumé* of some of the principal meteorological results, and their comparison with those taken at Polaris Bay in 1871-72: for example: —

The warmer temperature at Floeberg Beach was due to its exposure to the warm winter gales, from which Discovery Bay was cut off. The still warmer temperature of Polaris Bay is partly attributable to there being some uncovered water in the neighbourhood.

The barometer indicated and foretold changes in the weather as in temperate regions.

Making due allowance for unavoidable sources of error, the temperatures of the sea observed on the west shores of Smith's Sound prove the existence of a stratum of cold outer water (temperature about 29°) lying between the locally heated surface-water and a depth of twenty to thirty fathoms, flowing southward in summer, as also of an underlying stratum with a temperature of about 30°. This latter was not found near Floeberg Beach; but, coupled with the 1872 observations of the 'Polaris,' which showed a temperature of 32°.8 at 203 fathoms in lat. 80° 44# N. (midway between Franklin and Hals Islands, in Robison Channel), and 32°.l at 17 fathoms in Polaris Bay, it would appear that the warm underlying water forces itself to the northward on the east side of Robison Channel. Its entrance into the polar sea or not will depend on the depth of water at the north end of the channel. They also prove the non-existence of a lower temperature of the water than 28°.8 at a depth below 275 fathoms in Smith's Sound or Baffin's Bay. The coldest portion of the arctic water appears not to affect Hayes Sound or Discovery Bay to so great an extent as that of the direct channel.

The Rev. Dr. Haughton, to whom the tidal observations of the 'Discovery' and 'Alert' were entrusted, informs me that he has completed the preliminary discussion of the whole, and hopes to present the final results of those of the 'Discovery' to this Society before June next. He remarks that the 'Discovery' was better provided for observations than the 'Alert,' and, fortunately, her position was better also, as she lay nearer the head of the tide at Cape Payer. The officer charged with the observations, Lieut. Archer, made them hourly for seven months, with only six days of interpolation. The officers of the 'Alert' were able to make hourly observations for two months only, with fifteen days of interpolation.

Dr. Haughton has already arrived at the following general conclusions:—1. The tide which comes down Smith's Sound from the north is generically distinct from the Behring's Straits tide and from the Bafiin's Bay tide. 2. It must therefore be the East-Greenland Atlantic tide; and consequently Greenland is an island. 3. This new tide contains a sensible tertiodiurnal component of much interest.

The mean coefficients of the components are:—

The 'Challenger' Expedition.—You will hear with gratification that the Lords of the Treasury, after advising with your Council, have appropriated the munificent sum of £25,000 for publishing the biological

results of the voyage in a style and with a completeness worthy of the Expedition and the nation. Adopting a course as wise as it is liberal, Sir Wyville Thomson has, with the approval of your Council and the Government, chosen for his collaborators the ablest specialists, irrespective of their nationality. It is creditable to our country that, with but few exceptions, it has supplied thoroughly competent and willing workers in most of the departments; and association with such foreign naturalists as Agassiz and Haeckel cannot fail to be gratifying to themselves and assuring to the public. I had the advantage of inspecting the Echino- dermata in Professor Agassiz's charge in the Peabody Museum at Harvard College, and of learning the progress he had made in the examination of the vast body of materials entrusted to him. These, he informed me, far surpassed Sir Wyville's estimate in number of species and of interesting and novel forms; and I was surprised to find that the whole had already been sorted, that the greater part was named and ready for return to Edinburgh, and that nearly a dozen exquisite' lithographic plates of new and rare forms were prepared for publication.

Sir Wyville Thomson informs me that he is already far advanced towards the publication of two quarto volumes, and that he estimates the whole being completed in fourteen, of the form and size of the Philosophical Transactions.

Transit of Venus.—Sir George Airy has been pleased to inform me that the inferences from the telescopic observations of the transit of Venus, made in the British expeditions for records of that phenomenon, under the superintendence of the Astronomer Royal, have now been published—first, in response to an order of the House of Commons; secondly, in a more elaborate communication to the Royal Astronomical Society. The number of districts of observation was five, but each of these included a principal and some subordinate stations. The number of observers was eighteen, and as some of them observed both ingress and egress of Venus at the Sun's limb, the total number of observations was fifty-four. The concluded value of equatorial mean solar parallax was 8".754. The calculation of the photographic records of the transit is advancing rapidly.

The Report on the results of the total Solar Eclipse of 1875, announced in my last year's Address as being drawn up by Mr. Lockyer, is now in our hands.

The Harvard College Observatory (U.S.).—During my recent visit to the United States, I was for .a short time a guest at the Cambridge Botanic Garden, and consequently in close proximity to the fine Observatory of Harvard College, to which I paid several visits, being most kindly received by Professor Pickering, successor to the distinguished astronomer, W. C. Bond. The system carried out in this observatory is known to British Astronomers to be so productive of good results that I felt sure that some account of it would be acceptable to the Fellows of the Royal Society; and I therefore availed myself of Mr. Pickering's good offices to obtain a few particulars.

The current work of the Observatory is threefold, and consists of observations with the 15-inch equatorial, with the 8-inch aperture meridian circle, and communication of true time-signals to the public.

The principal work of the equatorial is photometrical, an instrument having been devised by the Astronomer by which two stars may be compared directly without using an artificial star as an intermediate step in the measurement. By this means the relative brightness of the components of numerous double stars, including some having only very faint components, as also the relative brightness of the Satellites of Jupiter and Saturn, has been determined.

At the time of my visit Prof. Pickering was engaged in a special study of the newly discovered satellites of Mars, one of which, the outer, I had the satisfaction of observing through the equatorial. Their brightness he had determined by three very ingenious methods:—1st, by comparison with an image of Mars shining through a very minute circular hole placed at the focus of the telescope; 2nd, by comparing the satellite with a minute image of Mars formed in the field of the large telescope by a small auxiliary telescope; 3rd, by reducing the light of the inner satellite by one, two, or three plates of microscope-glass, until its brightness was equal to that of the outer satellite. Of these methods the second showed that the outer satellite does not partake of the red colour of Mars.

The meridian circle was, or had lately been, in use for the following purposes:—1st, the determination of the position of all stars brighter than the 9th magnitude contained in the zone 50°–55° N.; 2nd, observations of Mars during the opposition of last summer for the solar parallax; 3rd, observations of a list of composite stars, at the request of Mr. Gill, for determining the solar parallax by means of Ariadne; 4th, preparations are being made for the determination of the absolute position of a catalogue of stars, independently of all previous observations, and, 5th, for the publication of a catalogue of polar stars observed in 1872-1873; 6th, with the assistance of the U.S. Coast Survey, a beginning has just been made of the measurement of all stars in the northern hemisphere brighter than the 6th magnitude, whose positions have not recently been determined with precision.

Time-signals for the meridian of Boston are sent by telegraph every two seconds from the Observatory; they are used by the local railways, are transmitted over a large area of New England, and they strike the noon-bells in Boston and in many of the smaller towns.

Besides the above, several thousand observations for atmospheric refraction were made, with the assistance of the Rumford Committee, during last summer with a micrometer level, simple in construction and accurate and rapid in action, invented by Mr. Pickering.

United States' Scientific Surveys.—Of the many surveys of the United States territories undertaken, some by the Central Government, others by State governments, and still others by private enterprise, more or less aided by public funds, none has effected so much for science as that directed by Dr. Hayden. Its publications, distributed with great liberality, are in every scientific library, and its Director is honoured no less for the energy and zeal with which he has laboured as a topographer and geologist, than for the enlightened spirit in which he has sought to render the resources of the Survey available for the advancement of all branches of natural knowledge by every means in his power, and with admirable impartiality.

Having obtained an extended leave of absence from my official duties at the Royal Gardens, I, at the close of our last session, accepted an invitation from Dr. Hayden to join his survey, and, in company with our Foreign Member, Prof. Asa Gray, to visit, under his conduct, the Rocky Mountains of Colorado and Utah, with the object of contributing to the records of the Survey a report on the Botany of those States.

I have thus had some opportunity of learning for myself the extent and value of the operations of the Survey, which are so interesting that I venture to think a brief sketch of its rise and progress and a few of its results may be acceptable to you.

When the territory of Nebraska was admitted into the Union in 1867, Congress set apart an unexpended balance of £1000 for a Geological Survey of the new State; and Dr. Hayden, then a young man who had distinguished himself as an indefatigable palæontological observer and collector (in various expeditions since 1853), was appointed to conduct it. In 1868 the operations of the Survey were continued, and carried westward into the Rocky Mountains of Wyoming, the rich Tertiary and Cretaceous beds of which were examined and described in detail, and the famous Yellowstone district, with which Dr. Hayden's name will ever be associated, was reconnoitred. The value of the Survey was immediately appreciated, and in 1869 a large appropriation was voted by Congress for placing it on its present footing under the supervision of the Secretary of State for the Interior. In 1869 and 1870 operations were carried on in Colorado and New Mexico; and full reports on the meteorology, agriculture, zoology, and palæontology of these regions, of great interest and importance, were drawn up and subsequently published. In 1871 the detailed survey of this Yellowstone district was begun, and those marvellous natural features were carefully studied, which have excited the liveliest interest in Europe, and have induced Congress, on Dr. Hayden's representations, to appropriate the whole area as a Government reserve, thus securing to naturalists free access to natural phenomena which in other places, both in Europe and America, are too often monopolized by speculators and closed to the public.

In 1872 the Survey was further extended, and was organized into two corps, each provided with a topographer, geologist, mineralogist, meteorologist, and naturalist, and the States of Idaho and Montana were embraced in its operations; in 1873 it was pushed into Colorado, thence into Utah, and on its completion in 1876, an area of not less than 70,000 square miles, much of it exceedingly mountainous, had been included in the Survey.

The literature of the Survey consisted, in 1870, of 41 volumes, classified as follows:—1, annual reports, with maps and sections; 2, bulletins for giving speedy publicity to new facts; 3, miscellaneous publications, comprising tables of elevations, catalogues of plants and animals, and meteorological data; 4, monographs on various branches of natural history, especially palaeontology, copiously illustrated with admirable plates in quarto, among which are the works of Leidy, Lesquereux, Coues, C. Thomas, Cope, Parry, Meek, Packard, Silliman, Hayden himself, and others, all of whom are well known on this side of the Atlantic; lastly, the number of photographs now exceeds 4000, and includes, besides geological and geographical features of great interest, views of ancient architectural remains, and of 1200 Indians, belonging to 74 tribes.

In giving these particulars I speak from some personal knowledge. I wish that the same could be said of the local habitation of the Survey and its museum, which, I am assured, contains a very extensive and instructive collection; but these are at Washington, and my pressing duties here and at Kew prevented my visiting the federal capital.

The most important scientific results hitherto derived from the labours of Dr. Hayden and his parties are unquestionably the geological: such as the delineation of the boundaries of the Cretaceous and Tertiary seas and lakes that occupied more than one basin of the mountains of Central N. America, and the marvellous accumulation of fossil Vertebrates that these ancient shores have yielded. Over an area of many hundred thousand square miles in North America there have been found, within the last very few years, beds of great extent and thickness, of all ages from the Trias onwards, containing the well-preserved remains of so great a multitude of flying, creeping, and walking things, referable to so many orders of plants and animals, and often of such gigantic proportions, that the palæontologists of the States, with museums vastly larger than our own, are at a loss for space to exhibit them. So common indeed are some species, and so beautifully preserved, that I

saw numbers of them, especially insects, plants, and fishes, exposed for sale, and eagerly purchased by travellers, with confectionery and fruit, at the stalls of the railway stations, from the eastern base of the Rocky Mountains all the way to California.

An examination of some of these fossils has brought to light the important fact that in North America there is no recognized break between the Cretaceous and Tertiary beds. This is due to the interpolation of a vast lignitic series the fossils of which furnish conflicting evidence. Concerning this series Dr. Hayden, who has traced it over many hundred miles, observes

Report of Geological Survey, 1874, p. 20.

that the character of its palæontological, as well as of its strictly geological results is such, that whether the entire group be placed in the Lower Tertiary or Upper Cretaceous is unimportant, and that the testimony of paleontologists will probably always be as conflicting as at present.

Professor Marsh, of Yale College, Newhaven, one of the highest authorities in America, has found that not even invertebrate fossils afford a satisfactory solution of the difficulty. "These," he says, "throw little light on the question;" and he is obliged to assume that "the line, if line there be, must be drawn where the Dinosaurs and other Mesozoic Vertebrates disappear, and are replaced by the Mammals, henceforth the dominant type."

This last passage I have taken from the lucid address of Professor Marsh to the meeting of the American Association for the Advancement of Science, held last autumn at Nashville, to which I must refer for an exposition of the riches of the fossil Vertebrate fauna of these regions, of the convincing proofs they afford of the doctrine of Evolution, and of the light they throw on the introduction, succession, and dispersion of existing organisms in the New World. Among the suggestive observations with which this address abounds is another in reference to this question of the disputed horizons of the Cretaceous and Eocene beds— namely, its dependence on the relative value to be given to evidence derived from plant and animal remains. He concludes that plants afford unsatisfactory measure of geological periods as compared with animals —a conclusion at which I had long ago arrived. We agree further that a chief cause of this difference of value is the less complex organization of plants, which hence furnish less evidence of the influences of environing conditions; to which might be added the feeble conflict among the higher members of the vegetable kingdom as compared with the vertebrates, their stationary habits, and the duration of similar, if not identical, forms through long geological ages, which has always appeared to me to be one of the most signal characteristics of the early condition of the higher plants as compared with the higher animals. Other, and perhaps even more cogent, reasons for plants being so little satisfactory is, that their reproductive organs, those upon which the classification is principally based, are rarely preserved, and seldom in connexion with the vegetative organs, which are abundantly preserved; and that, with regard to these, the vegetative organs, their prevalent and best-preserved characters, outline and venation, vary in individual species to a surprising degree, and, being repeated in groups otherwise in no way related, become too often fallacious guides.

Another result, previously obtained in respect of other organisms, but ably worked out by Professor Marsh as regards the Vertebrates, is that all the Tertiary beds of North America—Eocene, Miocene, and Pliocene—are of older date than the corresponding beds in Europe. This, though apparently supported by his conclusions that the main migrations of animals took place from the American to the Asiatic continent (which he deduces from the American, as compared with the European, life-histories of the Edentata, Marsupialia, Ungulata, Rodentia, Camivora, and even Primates), is a very bold generalization. Without presuming to question the abundance and teachings of the American data, I cannot but think that his theory of migration is, in the present state of palaeontology, premature, especially under our almost absolute ignorance of the Vertebrate fossils of the continents of Asia and Africa. The prodigal palæontological wealth of the United States, as compared with the poverty of that of Europe as yet known, may be likened to that of a metropolitan museum or library as contrasted with a provincial collection; and with regard to Central Asia especially, there are indications, in the narratives of travellers and the reports of natives, of vast accumulations of vertebrate fossils there existing. These may revolutionize our present ideas, as Falconer's and Cautley's discoveries in the outer Himalayas did those of our predecessors; and he would be a rash speculator who, having studied what is known of the physical geography of Asia north of that range, ignored the probability of the existence there of fossiliferous Cretaceous and Tertiary seas and lake-basins, in comparison with which those of the Rocky Mountains may sink into insignificance, both as to extent and productiveness. Professor Huxley has, indeed, suggested, as an alternative or escape, the possible former existence of a submerged continent, from which both Asia and America derived their types of animals and plants, which is tantamount to an opinion that the subject is not yet advanced enough for other than speculation.

Other results of Professor Marsh's labours are equally instructive —such, I mean, as support the doctrine of Evolution; but these have been made known to the scientific public of this country by Mr. Huxley, who examined the Tale College Museum last year. Since then, as I was informed by the Professor, during a visit to the same museum, his species and specimens have largely increased in number and proportionately in

value—that is, from the palæontological point of view; and the address which I have quoted gives a summary of the state of the whole collection up to the present time.

A few words on the magnificent collection of vegetable remains, Cretaceous and others, that have been studied and described by Mr. Leo Lesquereux in various published Reports of the U. S. Geological Survey, and in separate works issued under its auspices, may be fitly spoken here. It would be difficult to overrate the value of these contributions to fossil Botany, which, in its present state of advancement, affords no results comparable with those obtained from the animal kingdom for fixing the limits of periods, tracing the direction of migrations and the areas of distribution, or for following the devious paths of evolution. In the whole range of the natural sciences no study is so difficult, and at the same time so fruitless, if we regard the amount of results accepted by botanists, as compared with the prodigious labour their acquisition by pala:ontologists has demanded. Of all the orders of fossil plants of the formations referred to the Gymnosperms alone have, as a rule, yielded much trustworthy information; and this is due to their texture, to the peculiar character of their vegetative and reproductive organs, to the frequent adhesion of these to the branchlets, to their gregarious habits, to their wide distribution, and to their close affinity with existing species. Of other orders and genera of plants, with the exception of a few with well-characterized foliage, as the Palms, the identifications of a large proportion hitherto published are not recognized as having much claim to confidence by those who have the largest acquaintance with the varied forms of the vegetative organs of plants. And if the identification of the fossil leaves of one country is so hazardous, what must be the risk of identifying the fossil leaves of one continent with those of another? a forlorn hope which has constantly to be resorted to. The result, in the case of the North-American Cretaceous and Tertiary floras, has been the discovery of certain well-ascertained plants, which would appear to show that various prevalent existing American genera have inhabited that continent from a very early period; but that, along with them, there existed types of European, Asiatic, and Australian genera, temperate and tropical, that are no longer associated anywhere on the globe in a state of nature. It is well, under such perplexing conditions, that men of ability and unconquerable zeal (such as Heer, Saporta, and Lesquereux) are to be found who will undertake to investigate them; and while thanking them cordially for what they have done, I would urge upon them the importance of constant reference to large Herbaria, in order to enable them fully to appreciate the variability of foliar organs, and the deceptive nature of the characters they present.

Though doubtless the most productive to science generally, Dr. Hayden's is, I need hardly say, neither the oldest of the States' Surveys nor the first that brought its resources to bear on other matters than geography and geology. Indeed, from the beginning of the century, the Americans have busied themselves with inquiries into the resources and productions of their States—never on any recognized system, too often under difficulties and discouragements, not seldom to be nipped in the bud, or, worse still, sacrificed when the fruit was fit for gathering, through the ignorance or parsimony of the holders of the national purse; but, thanks to the single mindedness of the labourers, never without some good, and often with great results. The Coast Surveys are admirable alike for their system, for their breadth of purpose, for the attainments and ability of the officers in charge of them, and for the minute topographic accuracy aimed at and attained—an accuracy which, I need not say, is unattainable by such surveys as that here briefly described. The various surveys for railways across the continent have contributed a very library to natural science in many departments; and some of the individual States have, through the like agency, contributed greatly to our knowledge of their natural history and other products. For an excellent and full account of the history, labours, and results of all these, I must refer you to Prof. Whitney's article on "Geographical and Geological Surveys" in the 'North American Review' for July and September 1875, which he was so kind as to send me at the moment of my departure from the States. Prof. Whitney's own Geological Survey of California and Nevada is one of the very best of the series. It was begun in 1864, and continued for ten years; but after the publication of a topographical map, and some very valuable results, including natural history, at a most moderate cost, the whole work was stopped by the State Legislature, and the geological maps and sections, though admirable and paid for, have consequently never been given to the public! The last of these Surveys which I shall mention is that of Kentucky by Professor Shaler, the State Surveyor, of which the first volume of the Report has just appeared, containing, besides articles on prehistoric remains, fossil Brachiopods, and caverns and cavern-life, an exhaustive article by Mr. Allen, of singular interest, on the Bisons of America, living and extinct.

The American Flora.—Though I have as yet little to say of the results of Dr. Gray's and my own investigations under the Survey, I have every reason to hope that, having been extended through the Sink, Salt, or desert regions west of the Rocky Mountains, and thence across the Sierra Nevada to the Pacific coast, they will, with the materials previously obtained by my fellow traveller and myself, enable us to correlate our several researches into the distribution of North-American plants, and to point out the lines along which the migrations of the existing types were directed, and the countries whence they migrated.'

As regards the components of the United-States flora, these seemed to us to be threefold, and to be

intermixed throughout the continent—an endemic American, a European, and an Asiatic: it seemed that the flora was a ternary compound, so to speak, while that of the temperate Old World was, in a continental point of view, binary—Europe and Asia having many types in common, but very few representatives of the strictly American flora. The distribution of North-American plants, unlike the European, is mainly in a meridional direction, the difference of the floras of the Eastern, Central, and Western States being wonderfully great—far greater than those of similarly situated regions in the Old World. The European components extend over the whole breadth of the continent, diminishing, however, to the westward. The American components present many localized genera, inhabiting the Eastern, Central, and Western States respectively; they increase in numbers and peculiarity, as also in restriction of range, towards the west. The Asiatic components are found both in the Eastern and Western States, but hardly at all in the Central; and some of them are common to both the east and west, while others are peculiar to each. But whereas the European components prevail on the side towards Europe, the maximum of Asiatic representation is on that remote from Asia. This has been conspicuously shown by Gray's discovery, in the Eastern States, of single representatives of Japanese genera previously supposed to be monotypic; and what is most noteworthy is, that such representatives are in some cases extremely rare and local plants, found in single and very restricted areas, indicating a dying-out of the Asiatic representation in America.

The evidences of climatic changes in past eras of the existing flora of the continent are seen in the prevalence of arctic and northern species of plants in the alpine zones of the meridional mountain-chains, the Appalachian, Rocky Mountains, and Sierra Nevada, even as far south as the 33rd parallel. These plants had spread southwards during a period of cold, and on its subsequent mitigation had retired to the lofty situations they now inhabit. To the former existence of a warmer climate we may partly look for the extension of Mexican types to the dry regions west of the Rocky Mountains up to the 41st parallel; and to it may be attributed the remarkable northward extension of the Cacti in a very narrow meridional belt, scarcely one hundred miles broad, along the eastern flanks of the same mountains, from their head-quarters in New Mexico, in the 33rd, almost to the 50th parallel.

Of existing influences that determine the development in amount of the vegetation of a country, and the extension in various directions of its components, none are so powerful as the distribution of rainfall and of vapour in the atmosphere. This subject will repay a careful study in America, especially in connexion with the presence or absence of woodlands and forests, an excellent map of which by Professor Brewer, of Newhaven, was published in 1873 by the Supreme Government, in which the density of the forests in each State is portrayed by five shades of colour.

I must not end my notices of some of the labours of our scientific brethren in the United States without expressing my admiration of the spirit and the manner in which the Government and people have cooperated in making known the physical and biological features of their country, and my conviction that the results they have given to the world are, whether for magnitude or importance, greater of their kind than have been accomplished within the same time by any people or government in the older continents. How great would now be our knowledge of the climate and natural features of India and of our Colonies had the excellent Trigonometrical Survey of the one and the territorial and Geological Surveys of the others been supplemented by Reports such as those to which I have directed attention!

The President then proceeded to the presentation of the Medals.

The Copley Medal has been awarded to Professor James Dwight Dana, of Tale College, Newhaven, United States, for the numerous, varied, and important contributions to Mineralogy, Geology, and Zoology with which he has enriched science during more than fifty years. Professor Dana's first published paper bears the date of 1823, while the year 1877 finds him, as ever, vigorously at work.

Commencing his career with the inestimable advantage of a sound training in mathematics, physics, and chemistry, one of Professor Dana's earliest writings is an essay upon the connexion of electricity, heat, and magnetism. He then turned his attention to mineralogy; and, after exhibiting his thorough study of both the crystallographic and the chemical aspects of minerals by the publication of a large number of separate memoirs, he produced a systematic treatise on mineralogy, which at once took the place it still holds among standard works upon the subject.

In geology, the diversity and importance of Professor Dana's labours are not less remarkable. Not only have multitudinous detached essays, embodying the results of wide and accurate observations in all parts of the world, and on all classes of geological phenomena, proceeded from his pen, but his Manual of Geology,' of which a new edition appeared two years ago, is at once a most clear and comprehensive statement of the present state of geological science, and a complete, though necessarily condensed, monograph of the geology of North America; and, it may be added, few treatises on this branch of knowledge show so thorough and practical an acquaintance with all those sciences which are auxiliary to geology, or so extensive and profound a study of the phenomena presented by the existing condition of the globe, from the knowledge of which every rational

attempt to reconstruct the past history of the earth, upon the data afforded by its rocks and their organic contents, must start.

As naturalist to the United States Exploring Expedition, which made a circumnavigatory voyage, under the command of Captain Wilkes, in the years 1838 to 1842, Professor Dana enjoyed unusual opportunities for zoological investigation; and his remarkable works on the Zoophytes and the Crustacea observed during the voyage testify to the admirable use which he made of those opportunities. Nor has Professor Dana confined himself to the merely descriptive side of zoology; but, drawing general conclusions from his vast store of accurate observations, he has published views on classification and on questions of general morphology of much originality and breadth of view.

The Medal was received for Prof. Dana by the Hon. Edwards Pierre-point, United States Minister. The President, in delivering the Medal, expressed his assurance of the esteem and regard in which Prof. Dana was held by the Royal Society, not less for his own scientific achievements than for the liberal aid he has always rendered to other investigators.

A Royal Medal has been awarded to Mr. Frederick Augustus Abel, for his physicochemical researches on gunpowder and explosive agents.

Mr. Abel's career as a contributor to chemistry commenced about 30 years ago. Between 1847 and 1865 he contributed a number of papers to the Chemical Society, which were published in their Journal: some of the investigations were made in conjunction with other chemists; among these were the action of nitric acid on cumol (1847), and researches on strychnine (1849), when the composition of that alkaloid was finally established. They were followed by papers relating to metallurgy (copper) and analytical processes, one of which, on the application of electricity to the explosions of mines, may have led to his various works on explosives, on which the claims of Mr. Abel for the distinction of a Royal Medal mainly rest. So far back as 1863 he directed his attention to the study of gun-cotton in consequence of the development of its manufacture in Austria for artillery purposes, and in that year communicated to the British Association a report on the preliminary results arrived at by his experiments on the Austrian process, and the products furnished by it.

In 1866 a memoir was sent to our Society, which was published in the Phil. Trans, vol. clvi. p. 269, "On the Manufacture and Composition of Gun-cotton." In this paper, as the result of a long series of experiments, made with great accuracy, the conditions were laid down for its uniform manufacture and purification; and the true nature of gun-cotton (trinitrocellulose) was finally established by an exhaustive series of analytical and synthetical experiments.

This paper was followed by another in 1867, published in the Philosophical Transactions, vol. clvii., entitled, "On the Stability of Gun-cotton," which was considered worthy of being made the Bakerian Lecture for that year. This memoir details the results of four years' extensive experiments on the effects of light and heat on gun-cotton, and upon the protective action of water at low and high temperatures. It will be recollected that the uncertain stability which had been characteristic of gun-cotton was conclusively traced to minute quantities of unstable substances remaining in the fibre, even after the most careful purification by the methods hitherto known, and the efficiency of simple measures for securing the stability of gun-cotton was established. This led ultimately to the development of a system of manufacture of gun-cotton which permitted of its ready manufacture in a high state of purity (pulping).

Mr. Abel did not, however, confine his attention to gun-cotton; and, indeed, in 1864 had sent in a paper to the Royal Society, which was published in the 'Proceedings,' vol. xiii., on "Some Phenomena exhibited by Gun-cotton and Gunpowder under special conditions," in which the behaviour of these substances when exposed to high tempera- tures in rarefied atmospheres and in different mechanical conditions was described.

In 1869 a memoir, entitled "Contributions to the History of Explosive Agents," was printed in the Philosophical Transactions, vol. clix. In this memoir is discussed the influence of more or less strong confinement and other mechanical conditions under which the *detonation* of such compounds and mixtures was developed. It will be recollected that some striking results were obtained in the examination of the behaviour of explosive compounds when exposed to *initiative* detonations of different character.

These phenomena were more fully discussed in a second memoir, published in the Philosophical Transactions for 1874, vol. clxiv.; it includes an exhaustive investigation of the transmission of detonation from one mass of gun-cotton, fulminates, and nitro-glycerine to other distinct masses in the open air, and also through the agency of tubes. The causes of interference with the transmission of detonation-force, and the development of detonation as distinguished from explosion, were clearly discussed. The influence of dilution by solids and by liquids on the susceptibility of explosives to detonation, and also the velocity with which detonation is transmitted by different explosive agents under various conditions, was carefully studied. Some important results were obtained by the comparison of the behaviour of the liquid nitro-glycerine and the solid pulped and compressed gun-cotton devised by Mr. Abel. Among other things, the detonation of gun-cutton when thoroughly saturated with water, the transmission of detonation to distinct masses of gun-cotton enclosed

in receptacles in which the space between the masses was filled up with water, and, further, the value of water as a violent disruptive agent (as in shells) when it was caused to transmit the force generated by the detonation of very small quantities of gun-cotton, which it surrounded, were established.

The last memoir published in the Philosophical Transactions, on "Fired Gunpowder," is a joint production of Mr. Abel and Captain Noble; and as the merit of the investigation, which has occupied the authors for some years, is divided, I do not dwell particularly upon it, except as affording evidence of the continuity of Mr. Abel's researches in physicochemistry, which places him at the head of all other workers in the line of research which has mainly engaged his attention, and which has been productive of practical results of the greatest importance to this country.

A Royal Medal has been awarded to Prof. Oswald Heer, of Zurich, for his numerous researches and writings on the Tertiary plants of Europe, of the North-Atlantic Islands, North Asia, and North America, and for his able generalizations respecting their affinities, their geological and climatic relations.

It is mainly to Prof. Heer's labours that we owe those great advances made of late in our knowledge of the Miocene, Pliocene, and Post-Pliocene floras of Central Europe, which establish upon broad but safe grounds the close analogy existing between the vegetation of these epochs and that of the present period in Eastern North America and Eastern Asia. To Prof. Heer also we are mainly indebted for the remarkable discovery that a rich and varied arboreous vegetation, strikingly similar to what now obtains intemperate and subtropical countries, once extended to the Arctic Circle and far beyond it—a fact of which no adequate explanation has been found, and the importance of which, in relation to all questions as to the former geological and geographical conditions of the northern hemisphere, cannot be overestimated.

Prof. Heer's youthful studies were directed to botany and entomology. His scientific authorship commenced in 1836; and the early bent of his mind towards the higher problems of natural science is evinced by one of his very first memoirs, being 'Sur la Géographie Botanique de la Suisse,' published in 1837. His earliest work on fossil plants was upon those of the Rhone valley, published in 1846, since which period he has been uninterruptedly and indefatigably engaged on the comparative study of recent and fossil plants and insects—describing and illustrating them with a completeness and exactitude that have been thoroughly appreciated by geologists and botanists, and appending to the systematic descriptions of them geological and climatic considerations, remarkable alike for their caution and significance. Amongst his numerous works his 'Flora fossilis Helvetise,' 'Flora Tertiaria Helvetia,' and 'Flora fossilis Arctica' are conspicuous examples of well-directed labour and great learning; while the number of his minor works on various branches of biology testify to a life spent in successful devotion to science.

During Prof. Heer's long and laborious career he has been conspicuous for the liberal aid he has given to other investigators, and for the disinterested spirit in which he has worked out the collections brought by the government and private expeditions of various European nations from the northern and arctic regions. In particular, we are beholden to him for the labour he has bestowed upon our own Arctic collections, made during the last fifteen years, from that of Belcher to that of Nares, and especially for his elaborate and exhaustive memoir on the Miocene flora of Bovey Tracey, published in the 'Philosophical Transactions,'—labours all the more praiseworthy from being, for some years past, pursued in a recumbent posture, to which grievous bodily ill-health has confined him.

The Medal was received for Prof. Heer by M. Henri Vernet, Consul-General for Switzerland, to whom the President acknowledged the Society's obligations to Prof. Heer for his elucidations of the Geology of England and of the Flora of the Bovey-Tracey Coalfield, published in the Philosophical Transactions; and on behalf of the Society expressed his hope that Prof. Heer might soon be restored to health.

For the Davy Medal, now for the first time awarded, Prof. Robert Wilhelm Bunsen and Gustav Robert Kirchhoff, both Foreign Members of the Society, in recognition of their researches and discoveries in spectrum-analysis, have been selected.

The method of spectrum-analysis, as established by these two eminent men, must rank among the most important extensions of our means of investigating the properties of matter. Before that discovery, the chemical constitution of matter was examined solely by the study of the changes which take place within the narrow range of cases of which we can grasp and weigh the substance under investigation; but the tests employed in spectrum-analysis have no necessary dependence upon the distance of the material from the observer. It has enabled us to see, not only further, but deeper; for, on the one hand, it has led to the detection of many of the chemical constituents of masses distant from our planet, and, on the other hand, it has enabled us to discover many constituents of terrestrial minerals which had escaped detection until our ordinary methods of analysis were guided by the more refined tests afforded by the spectrum-analysis.

Address of Sir Joseph Dalton Hooker, C.B., K.C.S.I. The President, Delivered at the Anniversary Meeting of the Royal Society,
Saturday, November 30, 1878.

Printed at the Request of the Fellows.
London: Harbison and Sons, St. Martin's Lane. Printers in Ordinary to Der Majesty. 1878.

Royal Society.

Address of the President, Delivered at

The Anniversary Meeting, November 30, 1878.

GENTLEMEN,

AT the conclusion of this, the fifth and last year during which I shall have held the most honorable office of your President, I have the gratifying assurance that the communications made to the Society and its publications have in no respect fallen off in scientific interest and value. We have not, indeed, been called upon to undertake during the past year such responsible and time-absorbing duties in behalf of the Government as the Polar, Circumnavigation, Transit of Venus, and other Committees demanded of us during the previous four years; but some of the results already achieved by those expeditions have been contributed to our publications, and we are in expectation of more. It is also with satisfaction that I can refer to the good attendance it our evening meetings, soirees, and reunions as evidence of the interest taken in our proceedings by the Fellows generally and their friends.

Before proceeding to touch upon some of the advances nude in Science during the last few years, I have, as heretofore, to inform you of the Society's condition and prospects, and of those duties under-taken by its Council, for information as to which non-resident Fellows look to the annual address.

The loss by death of Fellows, twenty-one in number, is but little short of last year's rate, whil ethat of Foreign Fellows (six) is twice as great as last year. On the homo list is Sir George Back, the last, with the exception of our former President, the venerable Sir E. Sabine, of that celebrated band of Arctic voyagers, which during the early part of the century added so much to our renown as navigators and discoverers. Sir George was further the companion of Franklin and Richardson in that overland journey to the American Polar Sea, in which human endurance was tried to the uttermost compatible with human existence, as is related by two of the party in that modest but thrilling narrative which will ever hold a unique place in the annals of geographical discovery. Of our Indian explorers four have been taken away, namely, Major-General Sir Andrew Waugh, for many years Director of the Great Trigonometrical Survey of India; and shortly afterwards his successor, Col. Montgomerie; Dr. Oldham, for a quarter of a century the Director of the Geological Society of India; and Dr. Thomas Thomson, my fellow-traveller in the Himalaya, whose report of explorations in Western Tibet contains the first connected account of the physical and natural features of that remote and difficult country. Lieut-General Cameron survived but for one year our late Fellow, Sir Henry James, his predecessor in the Direction of the Ordnance Survey of Great Britain. In the Rev. James Booth we have lost a mathematician of high attainments. The Rev. W. B. Clarke, of New South Wales, was the author of many papers on the Meteorology and Geology of the Capo of Good Hope, Australia, and the Pacific. The Rev. R. Main, Director of the Radcliffe Observatory, was for nearly half a century an indefatigable observer. Lastly, Earl Russell, the distinguished statesman, and the earnest advocate, whether in the Government or in Parliament, of every measure for the promotion of scientific inquiry. He it was who, when Prime Minister in 1849, wrote to the then Earl of Rosse, President of the Society, offering to place £1,000 (now known as the Government Grant) on the annual votes of Parliament, if the Council would undertake to apportion that sum among scientific workers requiring aid in their researches.

Of Foreign Fellows our losses are a great Chemist in Becquerel, of Paris, whose election took place upwards of forty years ago; a great Physiologist in Claude Bernard, also of Paris; the father of Mycology, and for long the patriarch of Scandinavian Botanists, Elias Fries; a most distinguished Physicist and the recipient of both a Rumford and Copley medal in Regnault; a veteran Anatomist in Weber; and in Secchi, of Rome, an Astronomer of astonishing activity, the author of more than three hundred separate contributions to the science of which he was so great an ornament.

In matters of Finance I may with satisfaction refer you to our Treasurer's Balance Sheets.

It will be in your recollection that Mr. T. J. Phillips Jodrell placed in 1874 a sum of £6,000 at the disposal of the Society, with the view of its being devoted to the encouragement of Scientific Research by periodical grants to investigators whom your Council might think it expedient thus to aid. Shortly after the receipt of this munificent gift, the Government announced its intention of devoting annually for five years £4,000 to the same object, thus anticipating the special purpose which Mr. Jodrell had in view. Thereupon, with his consent, the

donation was temporarily funded and the proceeds applied to the general purposes of the Society until some other scheme for its appropriation should be approved. In April last I received a further communication from Mr. Jodrell, declaring it to be his wish and intention that, subject to any appropriation of the sum which we might, with the approval of the Society, make during his lifetime, it should immediately on his death be incorporated with the Donation Fund, the annual income in the meantime going to the general revenue of the Society. Upon this subject I have now to state that since the receipt of that letter Mr. Jodrell has approved of £1,000 of the sura being contributed to a fund presently to be mentioned.

I have also to inform you of a cheque for £1,000 having been placed in my hands by our Fellow, Mr. James Young, of Kelly, to be expended in the interests of the Society in such manner as I should approve.

Mr. De La Rue, to whose beautiful experiments I shall have occasion to refer, has presented to the Society both the letterpress and the exquisitely engraved facsimiles of the electric discharges described in his and Dr. Hugo Midler's paper, recently published in our "Transactions."

Our Fellow, Dr. Bigsby, has presented seven copies of his "Thesaurus Devonico-carboniferus" for distribution, and they have been distributed accordingly.

A very valuable addition to our Gallery of deceased Fellows has been the gift by Mr. Leonard Lyell of a copy in marble by Theed of the bust of his uncle the late Sir Charles Lyell, F.R.S., together with a pedestal. This is the best likeness of the late eminent geologist that has been executed, and is in every respect a satisfactory one.

I have the gratification of announcing to you, that through the munificence of a small number of Fellows, means have been advanced for reducing the fees to which all ordinary Fellows in future elected will be liable. That these fees, though not higher than the most economical expenditure on the part of the Society for its special purposes demanded, were higher than it was expedient to maintain if any possible means for reducing them could be obtained, was not only my own opinion but that of many Fellows. They exceed those of any other scientific society in England or abroad; their amount has occasionally prevented men of great merit from having their names brought forward as candidates, and they press heavily, especially upon those who, with limited incomes, have other scientific societies to subscribe to. Nor does it appear to me as otherwise than regrettable that so high an honour as Fellowship of the Royal Society, the only one of the kind in England that is limited as to the number annually elected, and selective in principle, should be attainable only at a heavy pecuniary expenditure. It is true that our Fellows receive annually in return publications of great value to Science generally; but these treat of so many branches of knowledge that it is but a fraction of each that can materially benefit the recipient, while their bulk entails an additional expenditure; and now that the individual papers published in the "Transactions" are separately obtainable, the advantages of Fellowship are less than they were when to obtain a treatise on his own subject a specialist had either to join the Society, or to purchase a whole volume or a large part of it annually.

It was not, however, till I had satisfied myself that the annual income of the Society, though not ample, was sufficient for its ordinary purposes, that its prospects in other points of view were good, and that the expenditure upon publication was the main, if not the sole, obstacle to a reduction of fees, that I consulted your Treasurer on the subject of taking steps to attain this object.

My first idea was to create, by contributions of small amount, a fund the interest of which should be allowed to accumulate; and when the income of the accumulated capital reached a sufficient amount to enable the Society to take the step without loss of income, to reduce either the entrance fee or annual contribution; and to which fund Mr. Young's gift should be regarded as the first donation.

This proposal was in so far entertained by your Council that they resolved to establish a Publication Fund, and to place Mr. Young's gift to the credit thereof; and further, appointed a Committee to consider and report upon the Statutes of the Society concerning the fees.

The movement once set on foot met with an unexpectedly enthusiastic reception, several Fellows with the best means of forming a judgment, not only approved of it, but offered liberal aid, urging that the reduction of fees should be the first and immediate object, and that if such a course were thought desirable, the means of carrying it out would surely be forthcoming. On this your Treasurer prepared for my consideration a plan for raising £10,000, the sum required for effecting any material reduction; and we resolved to ascertain by private inquiry whether so large an amount could he obtained.

Here again our inquiries were responded to in a spirit of, I may say, unexampled liberality: in a few weeks upwards of £8,000 was given or promised by twenty Fellows of the Society, and I need hardly add that the remaining £2,000 was contributed very shortly afterwards.

At a subsequent meeting of the Council it was resolved:—

- 1.—That the sums referred to as the Publication Fund, as well as those received or that may be hereafter received, for the purpose of relieving future ordinary Fellows from the Entrance Fee, and for reducing their Annual Contribution, be formed into one fund.

- 2.—That the Entrance Fee for ordinary Fellows be henceforth abolished; and that the Annual Contribution for ordinary Fellows hereafter elected be £3 (three pounds). Also, that the income of the Fund above-mentioned be applied, so far as is requisite, to make up the loss to the Society arising from these remissions and reductions.
- 3.—That the account of this Fund be kept separate; and that the annual surplus of income, after providing for the remission and reduction above recommended, be re-invested, until the income from the Fund reaches £000. So soon as the annual income reaches this amount, any surplus of income in any year, after providing for the remission and reduction above-mentioned, shall be available, in the first instance, in aid of publication and for the promotion of research.

A list of subscribers to this Fund will be placed in the hands of every Fellow, with the information that it will be kept open for future contributions, in the interests of research and of the Society's publications. I hope that it will be largely and speedily augmented, and that it may eventually reach an amount which will provide us with the means of accomplishing as much as is effected by the Government Fund, upon our own sole and undivided responsibility. I must not conclude my notice of this movement without a mention of those whose encouragement and liberality have most largely promoted it; and first of all, Mr. Spottiswoode, to whose counsel and active co-operation throughout, its success is mainly due; Messrs. Young's and Jodrcll's contributions have already been mentioned, they have been supported by others:—-£2,000 from Sir Joseph Whitworth, £1,000 from Sir W. Armstrong, and £500 each from His Grace the Duke of Devonshire, Mr. De La Rue, Mr. Spottiswoode and Mr. Eyre (jointly), Dr. Siemens, and the Earl of Derby, and £250 from Dr. Gladstone. The balance comprises contributions of thirty-two Fellows.

I have to mention your obligations to Dr. W. Farr for the labour he has bestowed in ascertaining those vital and other statistics of the Society, upon an accurate knowledge of which the calculations for the reduction of fees had to be based; and to Mr. Bramwell for constructing a table showing to what extent these changes will affect the Society's present and future income. It may interest you to know that the contribution of ordinary Fellows in future to be elected, is but little over that which was required of all Fellows from the very commencement of the Society's existence till 1823, namely, 1*s*. per week, and that the last Fellows who paid that sum died in 1869.

Looking back over the five years during which I have occupied this chair, I recognise advances in scientific discovery and research at home and abroad far greater than any previous semi-decade can show. I do not here allude to such inventions as the Telephone, Phonograph, and Microphone, wonderful as they are, and promising immediate results of great importance to the community; nor even to those outcomes of high attainments, the Harmonic Analyser of Sir W. Thomson, and the Bathometer and Gravitation Meter of Siemens; but to those discoveries and advances which appeal to the seeker of knowledge for its own sake, whether as developing principles, suggesting new fields of research, or awakening attention to hitherto unseen or unrecognised, or unexplained phenomena of nature, and of which the Radiometer and Otheoscope of Crookes are conspicuous examples.

In the foremost rank as regards the magnitude of the undertakings and the combination of means to carry them out, nothing in the history of physical science can compare with the Transit of Venus Expeditions. To observe the Transit of Venus various nations of Europe and the United States competed as to the completeness of the Expeditions they severally equipped. The value

The Astronomer Royal informs me that Captain Tupman, who has taken the principal share in the superintendence of the calculation, fixes provisionally on a mean parallax of 8"'8-155, corresponding to a distance of 92,400,000 British miles, but that the observations would be fairly satisfied by any parallax between 8".82 and 8".88, which in distance produces a range of from 92,044,000 and 92,770,000 miles, differing by 726,000 miles, a quantity almost equal to the sun's diameter.

of the solar parallax cannot be ascertained until the results of all the Expeditions are taken into account, when it will have an international claim to acceptance. But advances in this direction will not have ended here, the very difficulties attending the observation of the Transit of Venus, having directed attention to the method originally suggested by the Astronomer Royal in 1857, of obtaining the solar parallax from the diurnal parallax of Mars at its opposition.

Mr. Gill by the skilful employment at Ascension Island of the heliometer lent by Lord Lindsay, has greatly increased the accuracy of the method by which the necessary star comparisons with Mars are made, and there is every reason to believe that the results of his observations which are now in course of reduction will he very satisfactory.

Within the last two years a remarkable addition has been made to the number of members of the solar system by Professor Asaph Hallos discovery of the satellites of Mars; and more recently, Professor Watson has announced his detection of planetary bodies within the orbit of Mercury, during the Solar Eclipse which was visble in America.

In 1876 Schmidt recorded an outburst of light in a star in Cignus, which showed a continuous spectrum containing bright lines smilar to those of the remarkable star of 1866. As the star waned the continuous spectrum and bright lines faded, all but one bright ine in the green, giving the object the spectroscopic appearance of a small, gaseous nebula.

Great progress has been made during the last five years at Greenwich in the method of determining the motions of the heavenly bodies by the displacement of the lines in their spectra, as first successfully accomplished by Mr. Huggins in 1868. Not only do the results obtained by the stars observed at Greenwich agree with those of Mr. Huggins, as satisfactorily as can be expected in so delicate an investigation, but the motions of seventeen more have been determined; while the trustworthiness of the method has been shown by the agreement of the values for the rotation of the sun and the motions of Venus, with the known movements of these bodies. Mr. Huggins has also obtained photographs of the spectra of some of the brighter stars, which give well defined lines in the violet and ultraviolet parts of the spectrum. These spectra have already shown alterations in the lines common to them and the sun, which are of much interest.

In Solar Physics, which afford remarkable evidence of Mr. Lockyer's energetic labours in this country and Mr. Janssen's in France, I must mention our Foreign Member's wonderful photographs of the sun, wherein the minutest of the constant changes in the granulations exhibited on its surface (and which vary in size from of a second to 3 or 4 seconds) can be studied in future from hour to hour and day to day; as can also their different behaviour at different periods of the occurrence of sun-spots.

Before dismissing this fruitful field of research, I must allude to Mr. Lockyer's discovery of carbon in the sun; and to his announced but not yet published observations on the changes and modifications of spectra under different conditions, some of which he even regards as indicating the breaking up of the atoms of bodies hitherto regarded as elementary.

Some important investigations on the Electric Discharge have been communicated to the Society by Messrs. De La Hue and Müller, and by Mr. Spottiswoode. These, prosecuted by different means, tend to limit the possible causes of the stratification observed in discharges through vacuum tubes. They also point to the conclusion that this phenomenon is in a great measure due to motions among the molecules of the residual gas, which themselves become vehicles for the transmission of Electricity through the tube. It is well known that gases at atmospheric pressure offer great resistance to the passage of Electricity; and that this resistance diminishes (to a certain limit, different for different gases) with the pressure. And the researches in question appear to show that the discharge, manifestly disruptive at the higher pressures, is really also disruptive even at pressures when stratification takes place. The period of these discontinuous discharges has not yet been the subject of measurement, but it must, in any case, be extremely rapid.

The remarkable experiments which have resulted in the liquefaction of the gases hitherto regarded as permanent will be noticed presently when I deliver to their authors the medals they so richly deserve.

Under the auspices of the Elder Brethren of the Trinity House, and as their scientific adviser, Professor Tyndall has conducted an investigation on the acoustic properties of the atmosphere. The instruments employed included steam whistles, trumpets, steam syrens, and guns. The propagation of sound through fog was proved to depend not upon the suspended aqueous particles, but upon the condition of the sustaining air. And as air of great homogeneity is the usual associate of fog, such a medium is often astonishingly transparent to sound. Hail, rain, snow, and ordinary misty weather, were also proved to offer no sensible obstruction to the passage of sound. Every phenomenon observed upon the largo scale was afterwards reproduced experimentally. Clouds, fumes, and artificial showers of rain, hail, and snow were proved quite ineffectual to stop the sound, so long as the air was homogeneous, while the introduction of a couple of burners into a space filled with acoustically transparent air soon rendered it impervious to the waves of sound. As long as the continuity of the air in their interstices was preserved, the sound-waves passed freely through silk, flannel, green baize, even through masses of hard felt half an inch in thickness, the same sound-waves being intercepted by goldbeater's skin. A cambric handkerchief which, when dry, offered no impediment to their passage, when dipped into water became an impassable barrier to the sound-waves.

Echoes of extraordinary intensity were sent back from non-homogeneous transparent air; while similar echoes were afterwards obtained from the air of the laboratory, rendered non-homogeneous by artificial means. Detached masses of non-homogeneous air often drift through the atmosphere, as clouds pass over the face of the sky. This has been proved by the fluctuations observed with bells having their clappers adjusted mechanically, so as to give a uniform stroke. The fluctuations occur only on certain days; they occur when care has been taken to perfectly damp the bell between every two sue- ceeding strokes; and they also occur when the direction of the sound is at right angles to that of the wind. Numerous observations were also made on the influence of the wind, the results obtained by previous observers being thereby confirmed. From his own observations, as well as from the antecedent ones of Mr. Alexander Beazeley and Professor Osborne Reynolds, Professor Tyndall concludes that the explanation of this phenomenon given by Professor Stokes is the true one.

Turning now to biological branches of Science, I find that the discoveries and researches of the past five years in this department also are far in advance of those of any previous period of equal length. The "Challenger" Expedition was, in point of the magnitude of the undertaking and completeness of its equipment, the rival of that for observing the Transit of Venus. Its general results, as far as hitherto made known, have been dwelt upon in my previous addresses, and the publication of them in detail is being rapidly pushed forward. Some very important papers by Mr. Moseley on the Corals collected on the voyage have indeed been published in our "Transactions" with admirable illustrations by himself

To the Botanist and Geologist no subject has a greater interest than that of the conditions under which the successive Floras, which inhabited the polar area, existed and were successively dispersed over lower latitudes previous to their extinction, some *in toto* and over the whole globe, while others, though extinct in the regions where they once flourished, exist now only in lower latitudes under identical or under representative forms. It is only during the last few years that, thanks to the labours of those engaged in systematic Botany in tracing accurately the directions of migrations of existing genera and species, and in determining the affinities of the extinct ones, and of Palaeontologists in referring the latter to their respective geological horizons, that any material advance has been made towards a knowledge of the origin and distribution of earlier and later Floras. I cannot better illustrate the condition of this inquiry than by calling your attention to two publications on the subject, which have appeared within the last few months.

As a contribution to the principles of Geographical Botany, Count Gaston de Saporta's essay, entitled "L'Ancienne Vegetation Polaire" (which appeared in the "Comptes Rendus" of the French International Geographical Congress) is a very suggestive one, and having regard especially to its author's eminence as a geologist and paleontologist, is sure to command attentive study. Although it may be argued that neither is solar nor terrestrial physics, nor Geology, nor Palæontology in a sufficiently advanced condition to warrant the acceptation as fully established truths of all the conclusions therein advanced, still the array of facts adduced in evidence of these conclusions is very im- posing, while the ability and adroitness with which they are brought to bear on the subject are almost worthy of the great French genius whose speculations form the starting-point of the theory, which is that life appeared first in the northern circumpolar area of the globe, and that this was the birthplace of the first and of all subsequent Floras.

I should premise that Count Saporta professedly bases his speculations upon the labours of his friend, Professor Heer, whose reasonings and speculations he ever puts forward with generous appreciation, while differing from him wholly on the subject of evolution, of which he is an uncompromising supporter; Professor Heer holding to the doctrine of the sporadic creation of species.

In his "Epoques de la Nature "Buffon argues that the cooling of the globe, having been a gradual process, the polar regions must have been the first in which the heat was sufficiently moderate for life to appear upon it; that other regions being as yet too hot to give origin to organised beings, a long period must have elapsed, during which the northern regions, being no longer incandescent, as they and all others originally were, must have had the same temperature as the tropical regions now possess.

Starting from this thesis, Count Saporta proceeds to assume that the termination of the Azoic period coincided with a cooling of the water to the point at which the coagulation of albumen does not take place; and that then organic life appeared, not in contact with the atmosphere, but in the water itself. Not only does he regard life as originating, if not at the North Pole, at least near to it, but he holds that for a long period life was active and reproductive only there. In evidence of this he cites various geological facts, as that the older, and at the same time the richest, fosilliferous beds are found in the cool latitudes of the North, namely in lats. 50° to 60°, and beyond them. It is in the North, he says, that Silurian formations occur, and though they extend as far south as lat. 35° N. in Spain and America, the most characteristic beds are found in Bohemia, England, Scandinavia, and the United States. The Laurentian rocks again, he says, reach their highest development in Canada, and Palaeozoic rocks cover a considerable polar area north of the American great lakes, and appear in the coasts of Baffin's Bay, and in parts of Greenland and Spitzbergen. It is the same with the Upper Devonian and marine carboniferous beds preceding the coal formations; these extend to 76° N. in the polar islands and in Greenland, and to 79° N. in Spitzbergen, and he adds that M. d'Archiac has long ago remarked that, though so continuous to the northward, the coal-beds become exceptional to the southward of 35° N. Hence Count Saporta concludes that the climatic conditions favourable to the formation of coal were not everywhere prevalent on the globe, for that while the southern limit of this forma- tion maybe approximately drawn, its northern must have extended to the Pole itself.

I pass over Saporta's speculations regarding the initial conditions of terrestrial life, which followed upon the emergence of the earlier stratified rocks from the Polar Ocean, and proceed to his discussion of the climate of the carboniferous epoch as indicated by the characters of its vegetation, and of the conditions under which alone he conceives this can have flourished in latitudes now continuously deprived of solar light throughout many months of the year. In the first place, he accepts Heer's conclusions (founded on the presence of a tree-fern in

the coal measures specifically similar to an existing tropical one), that the climate was warm, moist, and equabo, and continuously so over the whole globe, without distinction of latitude. This leads him to ask whether, when the polar regions were iniabited by the same species as Europe itself, they could have been exposed to conditions which turned their summers into a day of many nonths' duration, and their winters into a night of proportional length?

A temperature so equable throughout the year as to favour a rich growth of Cryptogamic plants, appears, he says, to be at first sight incompatible with such alternating conditions as a winter of one long night and a summer of one long day; but equability, even in high latitudes, may be produced by the effect of fogs due to southerly warm oceanic currents, such as bathe the Orkneys and even Bear Island (in lat. 75° N.), and render their summers cool and winters mild. To the direct effects of these he would add the action of such fogs in obstructing terrestrial radiation, and hence preventing he evil effects which its cold would otherwise induce; and he would further efface the existing conditions of a long winter darkness by the hypothesis that the solar light was not, during the formation of the coal, distributed over the globe as it now is, but was far more diffusive, the solar body not having yet arrived at its present state of condensation.

That the polar area was the centre of origination for the successive phases of vegetation that have appeared in the globe is evidenced, under Count Saporta's view, by the fact that all formations, Carboniferous, Jurassic, Cretaceous, and Tertiary, are alike abundantly represented in the rocks of that area, and that, in each case, their constitutents closely resemble that of much lower latitudes. The first indications of the climate cooling in these regions is afforded by *Coniferæ*, which appear in the polar lower Cretaceous formations. These are followed by the first appearance of Dicotyledons with deciduous leaves, which again marks the period when the summer and winter season first became strongly contrasted. The introduction of these (deciduous-leaved trees) he regards as the greatest revolution in vegetation that the world has seen; and he conceives that once evolved they increased, both in multiplicity and in diversity of form, with great rapidity, and not in one spot only, and continued to do so down to the present time.

Lastly, the advent of the Miocene period, in the polar area, was accompanied with the production of a profusion of genera, the majority of which have existing representatives which must now be sought in a latitude 40° farther south, and to which they were driven by the advent and advance of the glacial cold; and here Count Saporta's conclusions accord with those of Professor A. Gray, who first showed, now twenty years ago, that the representatives of the elements of the United States Flora previously inhabited high northern latitudes, from which they were driven south during the Glacial period.

Perhaps the most novel idea in Count Saporta's Essay is that of the diffused sunlight which (with a densely clouded atmosphere), the author assumes to have been operative in reducing the contrast between the polar summers and winters. If it be accepted it at once disposes of the difficulty of admitting that evergreen trees survived a long polar winter of total darkness, and a summer of constant stimulation by bright sunlight; and if, further, it is admitted that it is to internal heat we may ascribe the tropical aspect of the former vegetation of the polar region, then there is no necessity for assuming that the solar system at those periods was in a warmer area of stellar space, or that the position of the poles was altered, to account for the high temperature of Pre-Glacial times in high northern latitudes; or, lastly, that the main features of the great continents and oceans were very different in early geological times from what they now are. Count Saporta's views in certain points coincide with those of Professor Le Conte of California, who holds that the uniformity of climates during earlier conditions of the globe is not explicable by changes in the position of the poles, but is attributable to a higher temperature of the whole globe, whether due to external or internal causes, to the great amount of carbonic acid and water in the atmosphere, which would shut in and accumulate the sun's heat, according to the principles discovered by Tyndall and applied by Sterry Hunt in explanations of geological times. Le Conte, however, admits the possibility of the earth's having occupied a warmer position in stellar space, of its having exhibited a more uniform distribution of surface temperature, and a different distribution of land and water.

Professor Jos. Le Conte, in "Nature," October 24, 1878, p. 668.

Before Count Saporta's Essay had reached this country

Count Saporta's Essay was presented to the International Congress of Geographical Science which met in Paris in 1875, and was not received by me till the autumn of 1878, though it bears the date 1877 on the title page.

another contribution to the subject of the origin of existing Floras had been communicated to our own Geographical Society, by Mr. Thiselton Dyer, in a Lecture on "Plant Distribution as a field for Geographical Research." Mr. Thiselton Dyer's order of proceedure is the reverse of Count Saporta's, and his method entirely different. He first gives a very clear outline of the distribution of the principal existing Floras of the continents and islands of the globe, their composition, and their relations to one another, and to those of previous geological epochs. He then discusses the views of botanists respecting their origin and distinctive characters, and availing himself of such of their hypotheses as he thinks tenable, correlates these with those of

palaeontologists, and arrives at the conclusion "That the northern hemisphere has always played the most important part in the evolution and distribution of new vegetable types, or in other words, that a greater number of plants has migrated from north to south than in the reverse direction, and that all the great assemblages of plants which we call Floras, seem to admit of being traced back at some time in their history to the northern hemisphere." This amount of accordance between the results of naturalists working wholly independently, from entirely different stand-points, and employing almost opposite methods, cannot but be considered as very satisfactory. I will conclude by observing that there is a certain analogy between two very salient points which are well brought out by these authors respectively. Count Saporta, looking to the past, makes it appear that the fact of the several Floras which have flourished on the globe being successively both more localised and more specialised, is the natural result of conditions to which it is assumed our globe has been successively subjected. Mr. Dyer, looking to the present, makes it appear that the several Floras now existing on the globe are, in point of affinity and specialisation, the natural results of the conditions to which they must have been subjected during recent geological time on continents and islands with the configuration of those of our globe.

The modern development of botanical science, being that which occupies my own attention, is naturally that on which I might feel especially inclined to dwell; and I should so far have the excuse that there is, perhaps, no branch of research with the early progress of which this Society is more intimately connected.

One of our earliest Secretaries, Robert Hooke, two centuries ago, laboured long and successfully in the improvement of the microscope as an implement of investigation. He was one of the first to reap the harvest of discovery in the new fields of knowledge to which it was the key, and if the results which he attained have rather the air of spoils gathered hither and thither in a treasury, the very fulness of which was embarrassing, we must remember that we date the starting point of modern histology from the account given by Hooke in his "Micrographia" (1667) of the structure of cork, which had attracted his interest from the singularity of its physical properties. Hooke demonstrated its *cellular structure*, and by an interesting coincidence be was one of the first to investigate, at the request, indeed, of the founder of the Society, Charles II, the movements of the sensitive plant *Mimosa pudica*—one of a class of phenomena which is still occupying the attention of more than one of our Fellows. In attributing the loss of turgescence, which is the cause of the collapse of the petiole and subordinate portions of the compound leaf which it supports, to the escape of a subtle humour, he to some extent foreshadowed the modern view which attributes the collapse of the cells to the escape of water by some mechanism far from clearly understood—whether from the cell-cavities, or from the cell-walls into the intercellular spaces.

Hooke having shown the way, Nehemiah Grew, who was also Secretary of the Royal Society, and Marcello Malpighi, Professor of Medicine in the University of Bologna, were not slow to follow it. Almost simultaneously (1671-3) the researches of these two indefatigable students were presented to the Royal Society, and the publication of two editions of Malpighi's works in London proves how entirely this country was at that time regarded as the head quarters of this branch of scientific inquiry. We owe to them the generalisation of the cellular structure, which Hooke had ascertained in cork, for all other vegetable tissues. They described also accurately a host of microscopic structures then made known for the first time. Thus, to give one example, Grew figured and described in several different plants the stomata of the epidermis:—" Passports," as he writes, "either for the better avolation of superfluous sap, or the admission of air."

With the exception of Leeuwenhoek no observer attempted to make any substantial addition to the labours of Grew and Malpighi for more than a century and a half, and however remarkable is the impulse which he gave to morphological studies, the view of Caspar Wolff in the middle of the 18th century (1759), in regarding cells as the result of the action of an organizing power upon a matrix, and not as themselves influencing organization, were adverse to the progress of histology. It is from Schleiden (1838) who described the cell as the true unit of vegetable structure, and Schwann who extended this view to all organisms whether plants or animals, and gave its modern basis to biology by reasserting the unity of organization throughout animated nature, that we must date the modern achievements of histological science. Seldom, perhaps, in the history of science has any one man been allowed to see so magnificent a development of his ideas in the space of his own lifetime as has slowly grown up before the eyes of the venerable Schwann, and it was, therefore, with peculiar pleasure that a letter of congratulation was entrusted by your Officers to one of our Fellows on behalf of this Society on the recent occasion of the celebration of the 40th anniversary of Schwann's entry into the professorate:

If we call up in our mind's eye some vegetable organism and briefly reflect on its construction, we see that we may fix on three great steps in the analysis of its structure, the organic, the microscopic, and the molecular, and, although not in the same order, each of the three last centuries is identified with one of these. In the 17th century Grew achieved the microscopic analysis of plant tissues into their constituent cells; in the 18th, Caspar Wolff effected the organic analysis (independently but long subsequently expounded by the poet Goethe) of plant structures into stem and leaf. It remained for Nägeli in the present century to first lift the veil from the

mysterious processes of plant growth, and by his memorable theory of the molecular constitution of the starch-grain and cell-wall, and their growth by intussusception (1858), to bring a large class of vital phenomena within the limits of physical interpretation. Strasburger has lately (1876) followed Sachs in extending Nägeli's views to the constitution of protoplasm itself, and there is now reason to believe that the ultimate structure of plants consists universally of solid molecules (not however identical with chemical molecules) surrounded with areas of water which may be extended or diminished. While the molecules of all the inert parts of plants (starch-grains, cell-wall, &c.) are on optical grounds believed by most physiologists to have a definite crystalline character, no such conclusion can be arrived at with respect to the molecules of protoplasm. In these molecules the characteristic properties of the protoplasm reside, and are more marked in the aggregate mass in proportion to its denseness, and this is due to the close approximation of the molecules and the tenuity of their watery envelopes. The more voluminous the envelopes, the more the properties of protoplasm merge in those of all other fluids.

It is, however, to the study of the nuclei of cells that attention has been recently paid with the most interesting results. These well-known structures, first observed by Ferdinand Bauer at the beginning of the century (1802), wore only accurately described thirty years later by Robert Brown (1833). Up to the present time their function has been extremely obscure. The beautiful investigations of Strasburger (1875) have led him to the conclusion that the nucleus is the seat of a central force which has a kind of polarising influence upon the protoplasm molecules, causing them to arrange themselves in lines radiating outwards. Cell-division he regards as primarily caused by the nucleus becoming bipolar, and the so-called caryolitic figures first described by Auerbach, exhibit the same arrangement of the protoplasm molecules in connecting curves as in the case of iron-filings about the two poles of a bar-magnet. The two new centres mutually retire, and each influencing its own tract of protoplasm, the cell-division is thereby ultimately effected. This is but a brief account of processes which are greatly complicated in actual detail, and of which it must be remarked that while the interest and beauty of the researches are beyond question, caution must be exercised in accepting the mechanical speculations by which Strasburger attempts to explain them. He has himself shown that cell-division presents the same phenomena in the animal kingdom; a result which has been confirmed by numerous observers, amongst whom I may content myself with mentioning one of our own Society, Mr. F. Balfour. Strasburger further points out that this affords an argument for the community of descent in animal and vegetable cells; he regards free cell-division as derivable from ordinary cell-division by the suppression of certain stages.

Turning now to the discoveries made during the last five years in Physiological Botany, we find that no one has advanced this subject so greatly as Mr. Darwin. In 1875 was published his work on Insectivorous Plants, in which he ascertained the fact that a number of species having elaborate structures adapted for the capture of insects, utilized the nitrogenous matter which these contain as food. The most important principle established in the course of these researches was, that such plants as *Drosera, Dionæa, Pinguecula*, secrete a digestive fluid, which has led through Gorup Bezanez's investigations on the ferment in germinating seeds, to a recognition of the active agency of ferments in the transmission of food-material, which marks a great advance in our knowledge of the general Physiology of Nutrition.

The extreme sensitiveness of the glands of *Drosera* to mechanical and chemical stimulus (especially to phosphate of ammonia), the directive power of its tentacles, depending upon the accurate transmission of motor impulses, and the "reflex" excitation of secretion in the glands, were all discoveries of the most suggestive nature in connexion with the subject of the irritability and movements of plants. The phenomenon of the aggregation of the protoplasmic cell-contents in the tentacles of *Drosera* is a discovery of a highly remarkable nature, though not yet thoroughly understood. Lastly, Mr. Prank Darwin, following his father's footsteps, as it were crowned the edifice by showing to what an extent insectivorous plants do profit by nitrogenous matter supplied to their leaves.

In close relation to these researches are those, also by Mr. Darwin, on the structure and functions of the bladder of *Utricularia*, which he has shown to have the power of absorbing decaying animal matter; and those of Mr. Frank Darwin on contractile filaments of extraordinary tenuity attached to the glands on the inner surface of the cups formed by the connate bases of the leaves of the Teasel, which filaments exhibit motions suggesting a protoplasmic origin. It is to be hoped that their discoverer will pursue his investigations into these curious bodies, whose origin and real nature in relation to the plant and its functions are involved in obscurity.

The subject of the cross-fertilization of plants, which though a long known phenomenon, first become a fruitful scientific study in Mr. Darwin's now classical work "On the various contrivances by which Orchids are fertilized," has within the last few years made rapid advance under its author's hand. The extreme importance of avoiding self-fertilization might indeed be inferred from the prevalence in flowers of elaborate contrivances for preventing it; but it remained to be shown that direct benefit attended cross-fertilization, and this has now been proved by an elaborate series of experiments, the results of which are not only that both increased fertility or greater vigour of constitution attend cross-fertilization, but that the opposite effects attend self-fertilization. In

the course of these experiments it became evident that the good effects of the cross do not depend on the mere fact of the parents being different individuals, for when these were grown together and under the same conditions, no advantage was gained by the progeny; but when grown under different conditions a manifest advantage was gained. As instances, if plants of *Ipomœa* and *Mimulus*, which had been self-fertilized for seven previous generations, were kept together and then intercrossed, their offspring did not profit in the least; whereas, when the parent plants were grown under different conditions, a remarkably vigorous offspring was obtained.

Mr. Darwin's last work, "On the different forms of Flowers," though professedly a reprint of his paper on dimorphic plants, published by the Linnæan Society, contains many additions and new matter of great importance concerning the behaviour of polygamous plants, and on Cleistogamic flowers. Among other points of great interest is the establishment of very close analogies between the phenomena attending the illegitimate union of trimorphic plants, and the results of crosses between distinct species, the sterile offspring of the crosses of the same species exhibiting the closest resemblance to the sterile hybrids obtained by crossing distinct species; while a whole series of generalizations, founded on the results of the one series of experiments, are closely paralleled by those founded on the other. The bearing of this analogy on the origin of species is obviously important.

Besides these investigations, Mr. Darwin has produced within the last five years second editions of his volume on the Fertilization of Orchids, and on the Habits and Movements of Climbing Plants; as also of his early works on Coral Reefs, and Geological Observations in South America; all of them abounding in new matter.

Of special interest to myself, as having been conducted in the Jodrell Laboratory at Kew, are Dr. Burdon Sanderson's investigations on the exceptional property possessed by the leaves and other organs of some plants which exhibit definite movements in response to mechanical, chemical, or electric stimuli. In 1873, Dr. Sanderson showed us in this meeting room, that the closing of the laminæ of the leaf of *Dionæa* is preceded by a preliminary state of excitement, and is attended with a change in the electric conditions of the leaf; and this so closely resembled the change which attends the excitation of the excitable tissues of animals, that he did not hesitate to identify the two phenomena.

This remarkable discovery immediately directed the attention of two German observers to the electromotive properties of plants, one, Dr. Kunkel, in the Laboratory of Professor Sachs; the other Professor Munk, in that of the University of Berlin.

Professor Munk, whose researches are of much the greater scope and importance, took as his point of departure Dr. Burdon Sanderson's discovery. The leading conclusion to which he arrived was, that in *Dionæa* each of the oblong cells of the parenchyma is endowed with electromotive properties, which correspond with those of the "muscle-cylinder" of animals; with this exception, that whereas in the muscle-cylinder the ends are negative to the central zone, in the vegetable cell they are positive; and he endeavours to prove, that according to this theory, all the complicated electromotive phenomena which had been observed, could be shown to be attributable to the peculiar arrangement of the leaf-cells.

During the last two summers Dr. Burdon Sanderson has been engaged in endeavouring to discover the true relations which subsist between the electrical disturbance, followed by the shutting of the leaf-valves of *Dionæa* and the latent change of protoplasm which precedes this operation. He has found that though the mechanism of the change of form of the excitable parenchyma which causes the contraction is entirely different from that of muscular contraction, yet that the correspondence between the exciting process in the animal tissues, and what represents this in plant tissues appears to be more complete the more carefully the comparison is made; and that whether the stimulus be mechanical, thermal, or electrical, its effects correspond in each case. Again, the excitation is propagated from the point of excitation to distant points in the order of their remoteness, and the degree to which the structure is excited depends upon its temperature. Notwithstanding, however, the striking analogies between the electrical properties of the cells of *Dionæa* and of muscle-cylinders, Dr. Burdon Sanderson is wholly unable to admit with Professor Munk that these structures are in this respect comparable.

In Morphological Botany attention has been especially directed of late to the complete life-history of the lower order of Cryptogams, since this is seen to be more and more an indispensable preliminary to any attempt at their correct classification.

The remarkable theory of Schwendener, now ten years old, astonished botanists by boldly sweeping away the claims to autonomous recognition of a whole group of highly characteristic organisms—the Lichens—and by affirming that these consist of ascomycetal fungi united in a commensal existence with Algæ. The controversial literature and renewed investigations which this theory has given rise to are now very considerable. But the advocates of the Schwendenerian view have gradually won their ground, and the success which has attended the experiments of Stahl in taking up the challenge of Schwendener's opponents and

manufacturing such lichens as *Endocarpon* and *Thelidium*, by the juxtaposition of the appropriate Algæ and Fungi, may almost be regarded as deciding the question. Sachs, in the last edition of his Lehrbuch, has carried out completely the principle of classification of Alga?, first suggested by Cohn, and has proposed one for the remaining Thallophytes, which disregards their division into Fungi and Alga;. He looks upon the former as standing in the same relation to the latter as the so-called Saprophytes (*e.g. Neottia*) do to ordinary green flowering-plants.

This view has especial interest with regard to the minute organisms known as Bacteria, a knowledge of the life-history of which is of the greatest importance, having regard to the changes which they effect in all lifeless and, probably, in all living matter prone to decomposition. This affords a morphological argument (as far as it goes) against the doctrine of Spontaneous Generation, since it seems extremely probable that just as yeast may be a degraded form of some higher fungus, Bacteria may be degraded allies of the *Oscillatoriæ* which have adopted a purely sapropliytal mode of existence.

Your "Proceedings" for the present year contain several important contributions to our knowledge of the lowest forms of life. The Bev. W. H. Dallinger, continuing those researches which his skill in using the highest microscopic powers and his ingenuity in devising experimental methods have rendered so fruitful, has adduced evidence which seems to leave no doubt that the spores or germs of the monad which he has described differ in a remarkable manner from the young or adult monads in their power of resisting heated fluids. The young and adult monads, in fact, were always killed by five minutes' exposure to a temperature of 142° F. (61° C.), while the spores germinated after being subjected to a temperature of ten degrees above the boiling point of water (222° F.).

Two years ago, Cohn and Koch observed the development of spores within the rods of *Bacillus subtilis* and *B. anthracis*. These observations have been confirmed, with important additions, in these two species by Mr. Ewart, and have been extended to the *Bacillus* of the infectious pneumo-enteritis of the pig, by Dr. Klein; and to *Spirillum* by Messrs. Geddes and Ewart; and thus a very important step has been made towards the completion of our knowledge of the life-history of these minute but important organisms. Dr. Klein has shown that the infectious pneumoenteritis, or typhoid fever of the pig, is, like splenic fever, due to a *Bacillus*. Having succeeded in cultivating this Bacillus in such a manner as to raise crops free from all other organisms, Dr. Klein inoculated healthy pigs with the fluid containing the *Bacilli*, and found that the disease in due time arose and followed its ordinary course. It is now therefore, distinctly proved that two diseases of the higher animals, namely, "splenic fever" and "infectious pneumoenteritis," are generated by a *contagium vivum*.

Finally, Messrs. Downes and Blunt have commenced an enquiry into the influence of light upon *Bacteria* and other *Fungi*, which promises to yield results of great interest, the general tendency of these investigations leaning towards the conclusion that exposure to strong solar light checks and even arrests the development of such organisms.

The practical utility of investigations relating to *Bacillus* organisms as affording to the pathologist a valuable means of associating by community of origin various diseases of apparently different character, is exemplified in the "Loodiana fever," which has been so fatal to horses in the East. The dried blood of horses that had died of this disease in India has been recently sent to the Brown Institution, and from seeds therein contained a crop of *Bacillus anthracis* has been grown, which justified its distant pathological origin by reproducing the disease in other animals. Other equally interesting experiments have been made at the same Institution, showing that the "grains" which are so largely used as food for cattle, afford a soil which is peculiarly favourable for the development and growth of the spore filaments of *Bacillus;* and that by such "grains" when inspected, the anthrax fever can be produced at will, under conditions so simple that they must often arise accidentally. The bearing of this fact on a recent instance in which anthrax suddenly broke out in a previously uninfected district, destroying a large number of animals, all of which had been fed with grains obtained from a particular brewery, need scarcely be indicated.

In Systematic Botany, which in a nation like ours, ever extending its dominions and exploring unknown regions of the globe, must always absorb a large share of the energies of its phytologists, I can but allude to two works of great magnitude and importance.

Of these, the first is the "Flora Australiensis" of Bentham, completed only a year ago; a work which has well been called unique in botanical literature, whether for the vast area whose vegetation it embraces (the largest hitherto successfully dealt with), or for the masterly manner in which the details of the structure and affinities of upwards of 8,000 species have been elaborated. Its value in reference to all future researches regarding the geographical distribution of plants in the southern hemisphere, and the evolution therein of generic and specific types, cannot be over estimated.

The other great work is the "Flora Brazilicnsis," commenced by our late Foreign Fellow, von Martins, and now ably carried on by Eichler, of Berlin, assisted by coadjutors (among whom are most of our leading systematists) under the liberal auspices of His Majesty the Emperor of Brazil. When completed, this gigantic

undertaking will have embraced, in a systematic form, the vegetation of the richest botanical region of the globe.

Having now endeavoured to recall to you some of the great advances in Science made during the last few years, it remains for me, after the distribution of the Medals awarded by your Council, to retire from the Presidency in which I have so long experienced the generous support of your Officers and yourselves. This support, for which I tender you my hearty thanks, together with my sense of the trust and dignity of the office, and the interest attached to its duties, make my resignation of it a more difficult step than I had anticipated. My reasons are, however, strong. They are the pressure of official duties at Kew, annually increasing in amount and responsibility, together with the engagements I am under to complete scientific works, undertaken jointly with other botanists, before you raised me to the Presidency; and the fact that indefinite postponement delays the publication of the labours of my coadjutors. I am also influenced by the consideration that, though wholly opposed to the view that the term of the Presidency of the Royal Society should be either short or definitely limited, this term should not be very long; and that, considering the special nature of my own scientific studies, it should, in my case, on this as well as on other grounds, be briefer than might otherwise be desirable. Cogent as these reasons are, they might not have been paramount, were it not that we have among us, one pre-eminently fitted to be your President by scientific attainments, by personal qualifications, and by intimate knowledge of the Society's affairs; and by calling upon whom to fill the proud position which I have occupied, you are also recognising the great services he has rendered to the Society as its Treasurer for eight years, and its ofttimes munificent benefactor.

The Copley Medal has been awarded to Jean Baptiste Boussingault for his long-continued and important researches and discoveries in agricultural chemistry.

The researches of Boussingault have extended over nearly half a century, and it might be difficult to find an investigator whose results relating to a great variety of subjects have in respect of accuracy and trustworthiness better stood the test of time.

The lucid simplicity with which his writings narrate well-established and well-arranged facts, is not less remarkable than the judicial caution with which he has abstained from expressing opinions upon questions beyond the reach of decisive evidence.

His experimental results and the conclusions which he has drawn from them have been deservedly trusted by other workers in the same field, and have safely guided them in their labours. Their incontestable excellence has prevented them from becoming subjects of animated discussion, and thus arousing as much attention and interest in the outer world as has sometimes been aroused by hasty experiments and daring generalizations.

I cannot attempt within the limits of this address to give an account of his investigations, and I should probably weary you were I even to enumerate them, relating as they do to a vast variety of phenomena; but I may point out that lying as most of them do in the domain of agricultural chemistry, they have involved difficulties of no common order. Boussingault is not only an excellent chemical analyst and experimentalist, but at the same time a model farmer.

His numerous determinations of the nitrogen, carbon, and hydrogen in crops and in the manures supplied to them, have proved him to be skilled not only in selecting and applying the best known methods of analysis, but even in improving and perfecting them.

His determinations of the proportions of those valuable constituents of manures which can be assimilated by various crops, have involved an intimate acquaintance with the conditions which experience has proved to be most favourable to the cultivation of the various crops.

His numerous and varied experiments on the feeding of animals, showing the proportions between the nitrogenized and fatty or amylaceous constituents supplied in the food and those assimilated or formed by the animal organism, while tracing the distribution of the remainder between the pulmonary and other excretions, have had most important physiological as well as practical bearings.

In all his investigations we see proofs that while accurately and critically acquainted with the discoveries and opinions of other workers and thinkers in his own particular domain of science, he has been able to devise and carry out simple and crucial forms of experiment well calculated to decide the truth.

A remarkable instance of this is afforded by those truly masterly experiments by which he proved that all the nitrogen found in the organism of plants can be traced to compounds of that element which had been supplied to them; and accordingly that there are no grounds for believing that plants can assimilate the free nitrogen of the air.

By awarding to Boussingault the Copley Medal, we place his name in the honoured list of those who, in modern times, have rendered the highest services to the advancement of natural knowledge.

A Royal Medal has been awarded to Mr. John Allan Broun for his investigations during thirty-five years in magnetism and meteorology, and for his improved methods of observation.

When the labours of Gauss had given an impetus to the study of terrestrial magnetism by rendering

precision possible, Observatories devoted to this branch of research, in conjunction with meteorology, began to rise in various places. The late General Sir T. M. Brisbane erected one at Makerstown, in Scotland, and placed it under the direction of Mr. Broun, who remained in charge of it from 1842 to 1850. His observations and their results, have been commended by magneticians and meteorologists, for the skill employed in the development of new methods of reduction and investigation.

In 1851 Mr. Broun went to India to organize and take charge of a similar Observatory established at Trevandrum by His Highness the late Rajah of Travancore. Here he remained for thirteen years, accumulating results of very great value, the first instalment of which, consisting of a volume on the magnetic declination, was published some years ago. Magneticians look eagerly towards the completion of this publication when the means necessary for the purpose shall have been furnished to Mr. Broun.

While in India he established an Observatory on a mountain peak 6,000 feet above the sea, and fitted it up with a very complete assortment of scientific instruments. This was an undertaking of a very arduous nature, effected in a wild country, and presenting great difficulties in the erection of instruments and obtaining trained observers.

Shortly after the commencement of magnetic observatories, Mr. Broun indicated the insufficiencies of the methods then in use for determining coefficients and correcting observations, and he devised new methods for these ends, the principal of which have been generally adopted.

This is not the place in which to give a complete catalogue of Mr. Broun's researches in magnetism and meteorology, extending as they do over a period of thirty-five years, but I may indicate those of his results that are of the greatest importance. Among them are the establishment of the annual laws of magnetic horizontal force, exhibiting maxima at the solstices and minima at the equinoxes. Mr. Broun was also the first to give in a complete form the laws of change of the solar-diurnal variation of magnetic declination near the equator, showing the extinction of the mean movement near the equinox. His researches on the lunar-diurnal variation of magnetic declination are of very great interest. Besides being an independent discoverer of the existence of this variation, he showed that near the equator its law in December was the opposite of that in June. He found, too, that the lunar-diurnal variation was in December sometimes greater than the solar-diurnal variation—that the lunar action was reversed at sunrise, and that it was much greater during the day than during the night, whether the moon was above or below the horizon. Finally, he found that the lunar-diurnal law changed (like the solar-diurnal law at the equator) near the equinoxes, so that, as a consequence, the laws for the southern and northern hemispheres were of opposite natures.

Another and very remarkable fact discovered by Sir. Broun was that the variations from day to day of the earth's daily mean horizontal force were nearly the same all the world over. He found certain oscillations in these daily means which were due to the moon's revolution, and others having a period of twenty-six days; the latter he considered as due to the sun's rotation. It results from these investigations that the observed variations of the earth's daily mean horizontal force have been represented with considerable accuracy in all their more marked features, by the combination of the means calculated for these different solar and lunar periods. During the discussion of these periods, Mr. Broun found that the great magnetic disturbances were apparently due to actions proceeding from particular points or meridians of the sun—a fact this (if verified) of very great importance.

In meteorology he has shown the apparent simultaneity of the i changes of daily mean barometric pressure over a great part of the globe, and he has likewise discovered a barometric period of twenty-six days nearly. He was also the first to commence and carry out, during several years, a systematic series of observations of the motions of clouds at different heights in the atmosphere; and, lastly, he has found certain laws connecting the motions of the atmosphere, and the directions of the lines of equal barometric pressure.

A Royal Medal has been awarded to Dr. Albert Günther, F.R.S., for his numerous and valuable contributions to the zoology and anatomy of fishes and reptiles.

Dr. Günther's labours as a systematist and a descriptive zoologist have been devoted chiefly to the order of Fishes, Reptiles, and Amphibia. Upon these he has published during the last quarter of a century a very long series of valuable papers, whereby our knowledge of the structure, affinities, and distribution of the genera and species of those interesting groups has been greatly advanced. We owe to his indefatigable exertions the excellent condition in point of arrangement and nomenclature of the unrivalled collection of fishes in the British Museum, and of which he prepared a systematic catalogue in eight volumes, which has been published by order of the Trustees. This is a work of prodigious labour; it required for its satisfactory execution an intimate knowledge of the fish of all parts of the world, and an intuitive perception of the natural character upon which a sound classification should be based. From possessing these attributes it has been accepted as the standard authority on the order by all zoologists. Under this head too I must specially allude to his excellent work on the Ceratodus. The Reptilian collections of the Museum have been no less successfully dealt with by Dr. Günther, and have afforded the material for some of his most important works, amongst which his "Reptiles

of British India," "Memoir on Hatteria," and "Monograph of the Gigantic Land Tortoises of certain islands in the Pacific and Indian Oceans," are examples conspicuous for their completeness and accuracy.

The Rumford Medal has been awarded to Mr. Alfred Cornu for his various Optical Researches, and especially for his recent redetermination of the Velocity of Propagation of Light.

Mr. Alfred Cornu is the author of papers on optical and other subjects published in the "Comptes Rendus" and other scientific periodicals. He has been engaged, for example, with the difficult subject of crystalline reflection, and kindred researches.

It was in 1849 that Fizeau astonished the scientific world by an actual experimental determination of the velocity of light, a velocity so enormous that hitherto its finiteness has been proved, and its value approximately determined, only by two astronomical phenomena. Foucault almost simultaneously brought out an experimental determination by a totally different method.

The method of Fizeau gave at once a near approximation to the value got from those two astronomical phenomena, combined with the parallax of the sun, assumed known. But the difficulties of obtaining a sufficiently accurate result were such that the velocity obtained by Fizeau's method was not considered to rival in exactness the velocity determined astronomically. Indeed, Foucault's method seemed to be preferred, though Fizeau's is the simpler in principle, and is free from certain doubts which may be raised as regards the other. But the difficulties alluded to, which turned mainly on the determination of the velocity of the revolving wheel, were such that almost twenty years have elapsed without the method having been brought to a sufficient degree of perfection to make it astronomically available.

Such was the state of the problem when it was taken up by M. Cornu. By methods of his own devising he succeeded in getting over the difficulties with which Fizeau's further progress had been stopped, and in achieving a determination so exact as to compete with the astronomical determinations, and thereby lead, we may say, to an experimental determination of the solar parallax fully rivalling that which is likely to result from the observations of the transit of Venus which have been carried out at so much cost and trouble.

A double award of the recently instituted Davy Medal has again been made, the recipients on the present occasion being M. Louis Paul Cailletet and M. Raoul Pictet. This award is made to these distinguished men for having, independently and contemporaneously, liquefied the whole of the gases hitherto called permanent.

The methods pursued by these experimenters, in accomplishing results which equal in interest and importance those obtained by Faraday in the same direction fifty-five years ago, were quite distinct, and were, in each case, the result of several years' preparatory labour. M. Cailletet, by comparatively very simple arrangements, such as admit of ready employment in lecture-demonstrations, has succeeded in obtaining evidence of the liquefaction, and possibly solidification, of carbonic oxide, marsh-gas, oxygen, nitrogen, and hydrogen. His system of operating consists in submitting the gases to very powerful compression at comparatively moderate degrees of cold, and in then allowing them very suddenly to expand.

M. Pictet has applied the very perfect system, elaborated and put to industrial use by him, for obtaining low temperatures to the attainment, though on a larger scale, of results like some of those arrived at by M. Cailletet. By an arrangement of vacuum and force pumps he reduces liquefied sulphurous acid to a low temperature, and applies this as the means for cooling down liquid carbonic acid which, in turn, serves to reduce to a very low temperature a thick glass tube, in which the gas to be condensed is confined at a very high pressure. M. Pictet has not only produced liquid oxygen in somewhat considerable quantity, and succeeded in determining its density, he has also obtained evidence of the solidification of hydrogen, and the description given of its appearance in the solid form seems to leave no doubt regarding its metallic character.

The interest which attaches to the remarkable experiments of MM. Cailletet and Pictet is only equalled by the importance of the fact, now absolutely demonstrated by those experiments, that the property of molecular cohesion is common to all known bodies without exception.

The Charter and Bye-Laws of the Geological Society of London.
Instituted 1807;
Incorporated 1826.
London: Printed by Taylor and Francis, Red Lion Court, Fleet Street. 1869.

Charter

Of the Geological Society of London.

GEORGE THE FOURTH, by the Grace of God, of the United Kingdom of Great Britain and Ireland King,

Defender of the Faith.

To all to whom these presents shall come, greeting. Whereas the Reverend William Buckland, B.D., Arthur Aikin, Esquire, John Bostock, M.D., George Bellas Greenough, Esquire, Henry Warburton, Esquire, and several others of our loving subjects, being desirous of forming a Society for investigating the Mineral Structure of the Earth,

Purpose for which the Society is instituted.

and having for promoting such investigation expended considerable sums of money in the purchase and collection of Books, Maps, Specimens, and other objects, and in the publication of various works, the said William Buckland, Arthur Aikin, John Bostock, George Bellas Greenough, and Henry Warburton have humbly besought Us to grant unto them and unto such other persons as shall be appointed and elected Fellows of the Society, as hereinafter is mentioned, Our Royal Charter of Incorporation, for the better carrying on the purposes aforesaid. Now therefore know ye that We, being desirous to encourage so laudable an undertaking, have, of our special grace, certain knowledge, and mere motion, willed, ordained, constituted, declared, given, and granted, and by these presents Do, for us, our Heirs, and Successors, will, ordain, constitute, give, and grant,

That our loving subjects the said Reverend William Buckland, Arthur Aikin, John Bostock, George Bellas Greenough, and Henry Warburton, and such other persons as shall from time to time be appointed and elected Fellows of the said Society in manner hereinafter directed, and their respective successors, shall for ever hereafter be by virtue of these presents one Body Politic and Corporate, by the name

Name of the Society.

of "The Geological Society of London." And we do will, constitute, and declare them and their successors to be one Body Politic and Corporate, for the purposes aforesaid, and by the name aforesaid to have perpetual succession, and to have a Common Seal, with full power and authority to alter, vary, break, and renew the same at their discretion, and by the same name to sue and be sued, to implead and be impleaded, and to answer and be answered unto in every Court or place of Us, our Heirs, and Successors.

And we do will, constitute, and grant, that the persons hereby incorporated, and their successors, shall be for ever able and capable in the Law, to purchase, receive, hold, possess, and enjoy, to them and their successors, any goods and chattels whatsoever, and (notwithstanding the statutes of Mortmain) to take, purchase, hold, and enjoy, to them and their successors, any lands, tenements, or hereditaments whatsoever, not exceeding at the time or times of purchasing or acquiring such lands, tenements, or hereditaments respectively, the yearly value of Two thousands pounds in the whole, computing the same at rack rent which might have been had or gotten for the same respectively at the time of the purchase or acquisition of the same: And shall have full power and authority to sell, alien, charge, or otherwise dispose of any real or personal property, so to be by them acquired as aforesaid, and to act and do in all things relating to the said corporation in as ample manner and form as any other our liege subjects being persons able and capable in the Law, or any other Body Politic or Corporate in our said United Kingdom of Great Britain and Ireland, may or can act or do.

The first

And we do hereby declare and grant, That the number of Fellows of the said Society shall be indefinite; and that they the said Reverend

five Fellows, who have

William Buckland, Arthur Aikin, John Bostock, George Bellas Greenough, and Henry Warburton shall be the first Fellows of the said Society; and that any three or more of them shall and may, on or

power, for a time, to appoint other Fellows, and Foreign Members. President and Council.

before the Third Friday in February next ensuing the date of these presents, under their respective hands in writing, appoint such other persons to be Fellows and Foreign Members of the said Society as are willing to be appointed, and as they may think fit.

And we do further declare and grant, That for the better government of the said Society, and for the better management of the concerns thereof, there shall be from the date of these presents, thence-

First Council to consist of five Members: Future Councils of twenty-three Members.

forth and for ever, a President and Council of the said Society, and that such Council (whereof the President shall be deemed a Member) shall, from the date of these presents until the third Friday in February next ensuing, consist of Five Members: and from the said third Friday in February thenceforth and for ever, shall consist of Twenty-three Members.

First Council of five appointed, and to remain in office until the third Friday in Feb. 1826.

And we do hereby appoint the said Reverend William Buckland to be first President; and the said Reverend William Buckland together with the said Arthur Aikin, John Bostock, George Bellas Greenough, and Henry Warburton, to be the first Council, all and each of the aforesaid persons to continue in such their respective offices until the third Friday in February next ensuing the date of these presents.

And we further direct, That the Fellows of the said Society, or any

Future Councils of twenty-three how and when to be elected.

Eleven or more of them, shall and may on the said third Friday in February next ensuing, and also shall and may on the third Friday in February (or as near thereto as conveniently may be) in every successive year, assemble together at the then last or other usual place of meeting of the said Society, and, by method of ballot, remove from the then present Council one-fifth or more of the persons of whom it shall then

One-fifth or more to vacate annually.

be composed; And also shall and may, by the like method of Ballo, elect other persons, being Fellows of the said Society, into the Council, who, together with the persons not so removed, shall form the Council for the then next ensuing year, so that the Members of such Council shall amount in number to twenty-three.

And also, That the Fellows of the said Society, or any eleven or more

What officers are to be elected annually, from among the Members of the Council.

of them, shall and may, at the time and in manner aforesaid, by tie like method of Ballot, elect from among the Members of the Council, when formed and elected in the manner aforesaid, one person to he President of the said Society for the year ensuing, and so many aid such persons as they shall think proper to be Vice-Presidents, Secretary or Secretaries, and Treasurer or Treasurers of the said Society for the year ensuing.

And also shall and may, in case of the death of the President, or of

Power to fill up vacancies in case of death.

any Vice-President, Secretary, or Treasurer, or of any other Member of the Council for the time being, of the said Society, within the space of two months next after such death, or as near thereto as conveniently may be, in manner aforesaid, elect some other person, being a Fellow of the said Society, to supply the place of such President, Vice-President, Secretary, Treasurer, or other Member of the Council so dying.

And we do further declare and grant, That from and after the said third Friday in February now next ensuing, the Fellows of the said Society, or any eleven or more of them, shall and may have the power,

Power to

from time to time, at the General Meetings of the said Society, to be held at the usual place of meeting, or at such other place as shall have been in that behalf appointed, to elect by method of Ballot such persons to be Fellows and Foreign Members of the said Society, and such

elect new Fellows, and Foreign Members and other

Fellows or Foreign Members to remove from the said Society as they shall think fit; and also shall and may from time to time nominate and appoint such persons as they shall think proper, to be Officers and Servants for carrying on and executing the necessary concerns of the

Officers and Servants.

said Society, and such Officers and Servants again remove, and renew or restore, as they shall see occasion.

And we do further declare and grant, That from and after the said third Friday in February now next ensuing, the Fellows of the said Society, or any eleven or more of them, shall and may have the power

Power to make Orders or Bye-laws.

to make and establish such Orders and Bye-Laws as shall appear to them useful for the government of the said Society, for defining the powers to be entrusted to the Council, the President, and other Officers thereof, and the duties to be performed by such Officers respectively; for the management of the Estates, Goods, Lands, Revenues and business of the said Society; and for the regulating the particular manner of proposing, electing, admitting, and removing all and every the Fellows, Foreign Members, Officers, and Servants thereof; for fixing the times and places of the Meetings of the said Society; and also the Sum or Sums to be paid by the Fellows towards carrying on the purposes of the said Society; and the same Orders and Bye-Laws, from time to time, as they may see occasion, to alter, suspend, or repeal; and to make such new Orders and Bye-Laws in their stead as they shall think most proper and expedient, so as the same be not repugnant to these presents, or the laws of this our realm.

And also, That the Council, or any five or more of the Fellows of the said Society, shall have power to move the enactment of any new Bye-Law, or the alteration, suspension, or repeal of any existing Bye-Law, provided notice of such Motion shall have been delivered to one of the Secretaries in writing, and shall have been read from the Chair at two successive Meetings of the Fellows of the said Society; but that no such motion shall be deemed or taken to pass in the affirmative until the same shall have been discussed and decided by Ballot at another Meeting summoned especially for that purpose, an absolute majority of the Fellows then present having voted in the affirmative. In Witness whereof, We have caused these our Letters to be made Patent.

Witness Ourself at our Palace at Westminster this Twenty-third day of April, in the Sixth Year of our Reign.

By Writ of Privy Seal,

(Signed)
Scott.

Bay Laws of the Geological Society of London.

SECTION I.—*Object*.

THE GEOLOGICAL SOCIETY OF LONDON is instituted for the purpose of nvestigating the mineral structure of the Earth.

SECTION II.—*Constitution*.

1.—The Society consists of Fellows, Foreign Members, and Foreig Correspondents.
2.—The number of Fellows is not limited.
3.—The number of Foreign Members and Foreign Correspondents i limited to forty of each class.

SECTION III.—*Method of proposing and electing Fellows*.

1.—Every Candidate for Admission into the Society, as a Fellow, lust be proposed by three or more Fellows, who must sign a certificate in recommendation of him

Blank Certificates, of the form required, to which is appended a summary of he Bye-Laws relating to the admission-fee, the annual contribution, and the composition-money may be had of the Clerk, at the House of the Society.

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2.—The certificate must set forth the names, description, place for residence, and qualifications of the Candidate, and state that he is derous of becoming a Fellow.

3.—The proposer whose name stands first upon the certificate most have personal knowledge of the Candidate, and must certify to that effect upon the certificate.

4.—Such proposer, before proposing the Candidate, must make kown to him to what payments of money, in the event of his being electedhe will forthwith or may afterwards become liable, in respect of admison-fee, annual contribution, or composition-money. [See Sect. VI.]

5.—The certificate, when duly filled up, must be delivered at the House of the Society, addressed to the Clerk, who shall write upon it the date of the day whereon he received it, and lay it before the Council at their next meeting.

6.—The certificate shall be read aloud by one of the Secretaries at the three ordinary general meetings of the Fellows next ensuing such meeting of the Council, and, during the intervals between those three meetings, shall be suspended in a conspicuous place appropriated to that purpose, in one of the rooms of the Society.

7.—The method of voting for the election of Fellows is by Ballot.

8.—The ballot shall take place at the ordinary general meeting at which the certificate is appointed to be read the third time, and immediately after such reading.

9.—No such ballot is valid unless eleven or more Fellows ballot.

10.—When two-thirds or more, of the Fellows balloting shall be in favour of the Candidate, such Candidate shall be elected a Fellow; hut when fewer than two-thirds of the Fellows balloting shall be in favour of the Candidate, he shall not be elected a Fellow.

SECTION IV.—*Notice of Election—Fellows to pay Admission-fee and sign Obligation—Admission*.

1.—The Secretary shall address to every person elected a Fellow, on the day after his election, a printed copy of the letter No. I. in the Appendix, and of the Obligation, No. II. in the Appendix, together with a copy of the Charter and Bye-laws of the Society, a list of the Fellows, and a Card announcing the days on which the Society will hold its Meetings during the season.

2.—No person elected a Fellow shall be entitled to exercise any privilege as such, nor shall his name be printed in any list of the Society, until he shall have paid his admission-fee [see Sect. VI.], and shall have returned the Obligation, signed by himself and addressed to the Secretaries at the House of the Society; and unless he pay his admission-fee, and return the Obligation, signed and addressed as aforesaid, within two

calendar months from the day of his election, or within such further time as the Council may grant upon special cause to them shown, the election of such Fellow shall be void.

3.—When a Fellow shall have paid his admission-fee, and shall have returned the Obligation, as aforesaid, he shall then be entitled to exercise all the privileges of a Fellow; and his name shall be entered in the lists of the Society.

4.—Every Fellow who has paid his admission-fee, and has returned the Obligation, as aforesaid, shall, at the first ordinary general meeting whereat he shall be present, subscribe a duplicate of the aforesaid Obligation, in a book to be kept for that purpose; after which he shall be presented by some Fellow to the Chairman, who, addressing him aloud by name, shall say, "In the name and by the authority of the Geological Society of London, I admit you a Fellow thereof."

SECTION V.—*Withdrawing and Removal of Fellows*.

1.—Any Fellow may withdraw from the Society, by signifying his wish to do so, by letter under his own hand, addressed to the President at the House of the Society: provided always that such Fellow shall be liable to the contribution of the whole year wherein he signifies his wish to withdraw: and that he shall continue liable to the annual contribution until he shall have discharged all sums, if any, due from him to the Society, and shall have returned all books or other property, if any, borrowed by him of the Society; or shall have made full compensation for the same, if lost or not forthcoming.

2.—Whenever written notice of a motion to be submitted to a general meeting, for removing any Fellow from the Society, signed by the Chairman, for the time being, of the Council, on the part of the Council, or by any five or more Fellows, shall have been delivered to one of the Secretaries, such notice shall be read from the chair at the four successive Ordinary General Meetings next following the delivery thereof; and within fourteen days after the last of such meetings a Special General Meeting shall be called, for taking such motion into consideration and deciding it by method of ballot; whereat if eleven or more Fellows should ballot, and a majority of the Fellows balloting shall vote that such Fellow be removed, he shall be removed from the Society.

SECTION VI.—*Residence—Admission-fee—Annual Contribution— Composition for Annual Contribution*.

Fellows elected before November 2, 1859, come under the following Bye-Laws

For the Bye-Laws relating to payments by Follows elected on and after the 2nd November 1859, see pp. 9 and 11.

:—

1.—A Fellow shall be deemed resident during any year, commencing on the 1st January, who passes any sixty days, or more, of that year within twenty miles of London.

N.B. Any question that may arise concerning the distance from London at which a Fellow resides shall be decided by referring to a Map, on which shall be drawn the boundary of the district deemed to lie within twenty miles of London. This Map shall be hung up to view in the House of the Society.

2.—Every newly elected Fellow designated in his certificate as resident shall pay an Admission-fee of Six Pounds Six Shillings; and every newly elected Fellow designated in his certificate as *non-resident* shall pay an Admission-fee of Ten Pounds Ten Shillings.

3.—The Annual Contribution to be paid by those Fellows who shall be liable to payment thereof shall be Three Pounds Three Shillings

At a Special General Meeting, held February 26, 1862, the Annual Contribution of Resident Fellows previously elected was reduced to Two Pounds Two Shillings (see p. 11).

, due on each successive 1st of January, and payable in advance for the current year.

N.B. Every Fellow liable to the Annual Contribution is requested to give a permanent order on his banker, or agent, in London, for paying the said contribution as it falls due from year to year. [See the form of such an order, No. III. in the Appendix.]

4.—All Fellows who shall actually reside during the current year shall be liable to the contribution for that year.

N.B. The articles No. 4, 5, 6, 7, 8 of the present section do not apply to Fellows who are Personages of Royal Blood, or who have compounded for the annual contribution.

5.—Of the Fellows who during the current year shall not reside, or shall withdraw from the Society, those shall be liable to the contribution for that year:

- Who, having been liable to the contribution for the preceding year, shall not, before the 1st of January of the current year, have given notice to the Council of their intention to be non-resident, or of their wish to

withdraw:

- Who shall have been elected into the Society, subject to the payment of an admission-fee of Six Guineas, within the period of one year and ten months preceding the 1st of January of the current year. [See Art. 7 of the present Section.]

6.—Of the Fellows who during the current year shall actually be nonresident, or shall withdraw from the Society, those only shall be entitled to exemption from the contribution for that year who

1°. shall have been elected into the Society that year, subject to payment of an admission-fee of Ten Guineas:

or 2°. shall have been exempt from the contribution of the preceding year:

or 3°. having been liable to the contribution of the preceding year, shall before the 1st of January of the current year have paid such contribution, together with all arrears due from them to the Society, and given notice to the Council of their intention to be non-resident, or their wish to withdraw.

7.—Every newly elected Fellow, described in his certificate as resident, if elected in the month of January or February, shall be subject to the whole contribution of the current year: but if elected in any subsequent month shall be subject to a part only of such contribution, to be computed from the day of his election to the 1st of January next ensuing, at the rate of Half-a-Guinea for every two months.

8.—So soon in every year as the Auditors shall have presented to the Council their annual Report, the name of every Fellow reported by them to be in arrear to the Society, together with a statement of the arrear, as reported, shall be hung up to view in one of the rooms of the Society; and immediate notice of the circumstance, with an account of the arrear, as reported, shall be forwarded to every Fellow whose name shall have been so hung up; and if the arrear be not paid within one calender month from the date of such notice, or within such further time as the Council may grant upon special cause to them shown, the Council shall direct that the name of the Fellow so suspended shall be read from the Chair at two successive Ordinary General Meetings; and if the arrear shall not have been discharged before the second Ordinary General Meeting, the Council shall then be empowered to remove the Fellow from the Society: and the name of the Fellow which has been hung up shall not be taken down until either the arrears shall be paid, or the Fellow shall be removed from the Society.

9.—A Fellow may at any time compound for future annual contributions, that of the current year inclusive, by payment of Thirty-one Pounds Ten Shillings

At a Special General Meeting, held February 20, 1862, the Composition for the Annual Contribution of previously elected Resident Fellows was reduced to Twenty-one Pounds; see p. 12.

. If he has already paid the contribution for the current year, or any part of it, such payment shall be allowed in part of the composition.

10.—Every Fellow shall, from time to time, communicate to the Clerk his address, or that of his banker or agent; and all notices forwarded to such address shall be considered as having been duly delivered to such Fellow.

SECTION VI. a.—*At a Special General Meeting, held June 15, 1859, it was resolved that Fellows proposed and elected on and after the 2nd November, 1859, shall come under the following Bye-Laws.*

For the Bye-laws relating to payments by Fellows elected on and after the 1st of March 1862, see p. 11.

1.—A Fellow shall be deemed resident during any year commencing on the 1st of January, who passes any sixty days or more of that year within twenty miles of London.

N.B. Any question that may arise concerning the distance from London at which a Fellow resides shall be decided by referring to a Map, on which shall be drawn the boundary of the district deemed to lie within twenty miles of London. This Map shall be hung up to view in the House of the Society.

2.—Every newly elected Fellow shall pay an Admission-fee of Six Pounds Six Shillings.

3.—The Annual Contribution to be paid by Resident Fellows shall be Three Pounds Three Shillings

See footnote to p. 11.

and by Non-Resident Fellows One Pound Eleven Shillings and Sixpence, due on each successive 1st January, and payable in Advance for the current year.

N.B. Every Fellow liable to the Annual Contribution is requested to give a permanent order on his banker, or agent, in London, for paying the same contribution as it falls duo from year to year. [See the form of such an order, No. III. in the Appendix.]

4.—All Fellows who shall actually reside during the current year shall be liable to the contribution for that year.

N.B. The articles No. 4, 5, 6, 7, 8 of the present section do not apply to Fellows who are Personages of Royal Blood, or who have compounded for the annual contribution.

5.—Of the Fellows who during the current year shall not reside, or shall withdraw from the Society, those shall be liable to the resident or full contribution for that year who, having been liable to the resident or full

contribution for the preceding year, shall not, before the 1st of January of the current year, have given notice to the Council of their intention to be nonresident, or of their wish to withdraw.

6.—Of the Fellows who during the current year shall withdraw from the Society, those only shall be entitled to exemption from the contribution for that year, who, having been liable to the contribution of the preceding year, shall, before the 1st of January of the current year, have paid such contribution, together with all arrears due from them to the Society, and have given notice to the Council of their wish to withdraw.

7.—Every newly elected Fellow, if elected in the month of January or February, shall be subject to the whole contribution of the current year, but if elected in any subsequent month, shall be subject to a proportionate part only of such contribution, to be computed from the day of his election to the 1st of January next ensuing.

8.—So soon in every year as the Auditors shall have presented to the Council their annual report, the name of every Fellow reported by them to be in arrear to the Society, together with a statement of the arrear, as reported, shall be hung up to view in one of the rooms of the Society; and immediate notice of the circumstance, with an account of the arrear, as reported, shall be forwarded to every Fellow whose name shall have been so hung up; and if the arrear be not paid within one calendar month from the date of such notice, or within such further time as the Council may grant, upon special cause to them shown, the Conned shall direct that the name of the Fellow so suspended shall be read from the Chair at two successive Ordinary General Meetings; and if the arrears shall not have been discharged before the second Ordinary General Meeting, the Council shall then be empowered to remove the Fellow from the Society: and the name of the Fellow which has been hung up shall not be taken down until either the arrears shall be paid, or the Fellow shall be removed from the Society.

9.—A Resident Fellow may at any time compound for future annual con- tributions, that of the current year inclusive, by payment of Thirty-one Pounds Ten Shillings

At a Special General Meeting held February 26,1862, the composition for the Annual Contribution of previously elected Resident Fellows was reduced to Twenty-one Pounds. See p. 12.

; and a Non-Resident Fellow by payment of Fifteen Pounds Fifteen Shillings. If a Non-Resident Compounder becomes resident, he will be required to pay an additional composition of Fifteen Pounds Fifteen Shillings, or an Annual Contribution of One Pound Eleven Shillings and Sixpence, so long as he shall continue to be a Resident Fellow. If he has already paid the contribution for the current year, or any part of it, such payment shall be allowed in part of the composition.

10.—Every Fellow shall, from time to time, communicate to the Clerk his address, or that of his banker or agent; and all notices forwarded to such address shall be considered as having been duly delivered to such Fellow.

SECTION vi. b.—*At a Special General Meeting, held February 26, 1862, it was resolved that Fellows proposed and elected on and after the 1st of March, 1862, shall come under the following Bye-Laws, as also shall those Fellows now contributing as Residents, so far as regards the payment of Annual Contributions.*

1.—Every newly elected Fellow shall pay an Admission-fee of Six Pounds Six Shillings.

2.—The Annual Contribution to be paid by Fellows shall be two Pounds Two Shillings, due on each successive 1st of January, and payable in advance for the current year.

N.B. Every Fellow liable to the Annual Contribution is requested to give a permanent order on his banker, or agent, in London, for paying the same contribution as it falls due from year to year. [See the form of such an order, No. III. in the Appendix.]

3.—Of the Fellows who during the current year shall withdraw from the Society, those shall be liable to the contribution for that year who, having been liable to the contribution for the preceding year, shall not, before the 1st of January of the current year, have given notice to the Council of their wish to withdraw.

N.B. The articles No. 3, 4, 5, 6 of the present section do not apply to Fellows who are personages of Eoyal Blood, or who have compounded for the annual contribution.

4.—Of the Fellows who during the current year shall withdraw from the Society, those only shall be entitled to exemption from the contribution for that year who, having been liable to the contribution of the preceding year, shall, before the 1st of January of the current year, have paid such contribution, together with all arrears due from them to the Society, and have given notice to the Council of their wish to withdraw.

5.—Every newly elected Fellow, if elected in the month of January or February, shall be subject to the whole contribution of the current year; but if elected in any subsequent month, shall be subject to a proportionate part only of such contribution, to be computed from the day of his election to the 1st of January next ensuing.

6.—So soon in every year as the Auditors shall have presented to the Council their annual report, the name of every Fellow reported by them to be in arrear to the Society, together with a statement of the arrear as reported, shall be hung up to view in one of the rooms of the Society; and immediate notice of the

circumstance, with an account of the arrear, as reported, shall be forwarded to every Fellow whose name shall have been so hung up; and if the arrear be not paid within one calendar month from the date of such notice, or within such further time as the Council may grant, upon special cause to them shown, the Council shall direct that the name of the Fellow so suspended shall be read from the Chair at two successive Ordinary General Meetings; and if the arrears shall not have been discharged before the second Ordinary General Meeting, the Council shall then be empowered to remove the Fellow from the Society: and the name of the Fellow which has been hung up shall not be taken down until either the arrears shall be paid, or the Fellow shall be removed from the Society.

7.—A Fellow may at any time compound for future annual contributions, that of the current year inclusive, by payment of Twenty-one Pounds. If he has already paid the contribution for the current year, or any part of it, such payment shall be allowed in part of the composition.

8.—Every Fellow shall, from time to time, communicate to the Clerk his address, or that of his banker or agent; and all notices forwarded to such address shall be considered as having been duly delivered to such Fellow.

SECTION VII.—*Personages of Royal Blood*.

Personages of Royal Blood who have been elected Fellows shall be required to sign their names in the Obligation-book; but not to pay any admission-fee or annual contribution, nor to serve in any office of the Society.

SECTION VIII.—*Foreign Members and Foreign Correspondents*.

1.—Any person who has distinguished himself as a geological investigator, or who has shown himself able and willing to communicate to the Society original and important geological information, or who has exercised signal liberality towards the Society, except he be a native of the British dominions, or of their dependencies, or be domiciliated therein, may be elected a Foreign Correspondent.

2.—The Foreign Members shall be elected out of the list of Foreign Correspondents.

3.—Candidates for admission into the Society as Foreign Members or Foreign Correspondents are to be proposed and balloted for in the same manner as candidates for admission into the Society as Fellows; except that the proposer, whoso name stands first on the certificate, may, in default of personal knowledge, certify his knowledge of the works and respectability of the candidate; and that the certificate need not state that the candidate is desirous of becoming a Foreign Member or Foreign Correspondent.

4.—The President shall sign, and the Secretaries shall countersign, the Diploma [see No IV. in the Appendix] of every Foreign Member or Foreign Correspondent, as soon as may be after his election; and shall deliver the same, so signed and countersigned, to the Foreign Secretary, who shall, on the earliest opportunity, forward it to such Foreign Member or Foreign Correspondent, together with notice of his election.

5.—Foreign Members and Foreign Correspondents shall not be required to sign the Obligation until present at a general meeting of the Society; and when so present, they shall be admitted with formalities similar to those prescribed for the admission of Fellows.

6.—Foreign Members and Foreign Correspondents may be removed in the manner prescribed for the removal of Fellows.

7.—Foreign Members and Foreign Correspondents shall be exempt from payment of any admission-fee or annual contribution.

8.—Foreign Members shall not be entitled to propose candidates, to vote at general meetings, or to fill any office in the Society; but they shall be entitled to the exercise of every other privilege whatsoever allowed to Fellows.

9.—Foreign Correspondents cannot exercise any of the privileges of Fellows or Foreign Members.

SECTION IX.—*General Meetings*.

1.—No general meeting of the Fellows shall be competent to enter on any business unless eleven or more Fellows be present.

2.—The President shall be the Chairman at all general meetings; or, in case of his absence, one of the Vice-Presidents; or, in case of their absence, one of the Members of the Council; or, in case of the absence of all the Members of the Council, a Fellow to be appointed for the occasion by the meeting.

3.—The Chairman is required to keep order and check irregularity in the proceedings of the meeting: to state every question, on putting it to the vote, according to the true intent of the proposer and seconder: to declare truly to the meeting how, according to the best of his judgment, every question has been decided: to see

that minutes are taken of the proceedings of the meeting during their progress; and when the minutes of the former meeting have been read, and, if found accurate, confirmed, to certify such confirmation, by subscribing to the minutes his signature.

4.—The ordinary method of voting shall be by show of hands; but a ballot shall be taken in cases prescribed by the Charter or Bye-Laws, or when demanded by any Fellow present.

5.—No show of hands or ballot shall decide a question, unless eleven or more Fellows actually vote.

6.—The decision of the majority of the Fellows voting at a meeting shall be considered as the decision of such Meeting; and an absolute majority shall suffice, exception cases specially designated by the Charter or Bye-Laws

In ease of the Election of a Fellow, Foreign Member, or Foreign Correspondent; and, contingently, in certain cases of the Election of the Council and Officers.

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7.—The Chairman shall not vote when the voting is by show of hands; but he may vote when the voting is by ballot; provided that when the votes on either side shall be equal, except in cases specially designated by the Charter or Bye-Laws, he shall give a casting-vote.

8.—In all cases of ballot the Chairman shall examine the drawers of the balloting-box publicly; and in case either of a show of hands, or of a ballot, if it shall appear doubtful to him, or to any fellow present, on which side the majority lies, he shall count aloud the votes or balls.

9.—The voting upon any question, except it be one of adjournment, or of the election of a Candidate, shall, on the demand of a proposer and seconder, be deferred to a subsequent general meeting.

10.—If the question of adjournment has been put and carried, an adjournment may be made of any general meeting; but no business shall be transacted at any adjourned meeting other than such as was proposed to have been transacted at the meeting from which the adjournment was made.

11.—Minutes of the proceedings of every general meeting shall be taken, during their progress, by one of the Secretaries, or, in case of the absence of the Secretaries, by some Fellow, whom the Chairman of the meeting shall appoint for the occasion. The minutes shall afterwards be fairly copied into a minute-book, and at the next meeting shall be read aloud by one of the Secretaries for confirmation.

12.—The minute-book of the Council shall lie upon the table at every general meeting, and extracts therefrom shall be read to the meeting on the requisition of any Fellow.

13.—The general meetings to be held by the Society shall be of three kinds:—1. *Annual;* 2. *Special;* 3. *Ordinary*.

SECTION X.—*Annual General Meeting—Election of Council and Officers— Reading of Annual Report*.

1.—The *Annual* General Meeting of the Fellows shall be held in their meeting-room, on the third Friday of February in every successive year.

2.—Notice of the meeting shall be sent to every resident Fellow whose place of residence is known, and shall be inserted in two or more public newspapers one week at least before the day of meeting.

3.—The object of the meeting shall be to choose the Council and Officers for the then ensuing year; and to receive from the Council, and hear read, their annual report on the general concerns of the Society.

4.—The Council consists of twenty-three Members.

5.—The Fellows assembled at such meeting in every successive year must remove, by method of ballot, from the then present Council some five or more of the persons of whom it shall then be composed; and elect into the Council, by method of ballot, as many other persons, being Fellows of the Society, as may be necessary to supply the places of those who shall be so removed; and such persons so elected, together with the persons not so removed, amounting in number to twenty-three, shall form the Council for the then ensuing year.

6.—The Fellows assembled, as aforesaid, must elect by method of ballot from among the Members of the Council, when formed and elected as aforesaid, one person to be President, and so many and such persons as they shall think proper, to be Vice-Presidents, Secretary or Secretaries, and Treasurer or Treasurers of the Society for the then ensuing year.

7.—Every Fellow balloting on the occasion aforesaid must prepare and deliver-in two balloting-lists; whereof one must contain the names of such persons as he wishes to be retained in or elected into the Council, and must not contain the names of such persons as he wishes to be removed from the Council; the other must contain the names of such persons, being Members of the newly elected Council, as he wishes to be elected Officers of the Society for the then ensuing year.

8.—Printed balloting-lists (according to the forms No. V. and No. VI. in the Appendix) shall be prepared before the day of the annual general meeting: the former containing the names of such persons as the Council

recommend to be retained in or elected into the Council; the latter the names of such persons as (provided they be elected members of the new Council) the Council recommend to be elected Officers of the Society for the then ensuing year; and a copy of each List shall be handed at the meeting to every Fellow present.

9.—Should any Fellow balloting disapprove of any name or names contained in either of the balloting-lists, and be desirous of inserting therein some other name or names, he will draw a line in ink across the name or names of which he disapproves; and will write immediately opposite, in the blank space left for that purpose, the name or names of the other fellow or Fellows for whom he wishes to vote.

10.—The Chairman shall take the chair at one o'clock p.m., and, as soon thereafter as eleven Fellows shall be present, shall proceed to real to the meeting those clauses in the Charter and Bye-Laws which relate to the annual general meeting. This done, he shall appoint two or more Scrutineers, from among the Fellows present, to superintend the ballot during their progress, and, when they are severally closed, to examine the Its, and report the results to the meeting.

11.—Two balloting-glasses shall be placed on the table: the one, for receiving lists for the Council, shall remain open until two o'clock; the other, for receiving lists for the Officers, until three o'clock p.m.; at which respective hours the ballots shall be closed.

12.—It shall be the duty of the Scrutineers, during the progress of the ballots, to see—That each list is put into its proper glass; that none other than Fellows ballot; that no Fellow ballots more than once, or delivers at one time into either glass more than one list; and, immediately on the closing of either ballot, to report to the Chairman whether as many as eleven Fellows have balloted.

13.—At the close of the ballot for the Council, if eleven or more Fellows shall have balloted, the Scrutineers shall examine the lists given in upon that ballot; one of them opening each list, and counting the names contained in it; when all those lists shall be rejected which contain the names of more than twenty-three persons, or of more than eighteen persons who were Members of the old Council. If, after this rejection, there be fewer than eleven lists remaining, no election can then take place, and the meeting must adjourn: but if eleven lists, or more, remain, then—

- One of the Scrutineers shall read the several lists aloud, and the other shall note each name, and put a mark against each, as often as it is repeated.
- The two Scrutineers shall count the number of marks affixed to the several names: and if, of the twenty-three names having the greatest number of marks, not more than eighteen shall have been of the old Council, the said twenty-three names shall constitute the new Council. But—
- If, of the said twenty-three names, more than eighteen shall have been of the old Council, the surplus names of the old Council, having the fewest marks against them, shall be struck out, and the deficiency be supplied from the names of persons not of the old Council, in the order of the number of marks against their names respectively.
- If two or more names shall be found to have an equal number of marks, the order of preference shall be decided by lot.
- When the list of twenty-three shall be completed, the names, arranged alphabetically, shall be forthwith reported, in writing by the Scrutineers, to the Chairman, who shall declare the same to the meeting as the list of the Council for the then ensuing year.

14.—When the Council for the ensuing year shall have been declared, and not before, the Scrutineers shall examine the lists in the glass set apart for the election of Officers from among the Members of the Council.

15.—The number of Vice-Presidents, Secretaries, and Treasurers is not limited, but there shall be so many of such officers, respectively every year, as shall be specified in the majority of balloting-lists for the election of Officers, delivered in at the Annual General Meeting.

16.—Noperson shall hold at the same time more than one of the following offices; viz. President, Vice-President, Secretary, or Treasurer.

17.—The Scrutineers shall take no account of any balloting-list for the election of Officers which shall contain the name—of any person not a Member of the newly chosen Council; of more than one person as President; or of the same person as holding more than one of the offices mentioned in Art. 16.

18.—In other respects the scrutiny for the election of Officers, and the report thereon, shall be made, as nearly as may be, in the manner directed respecting the Council; and the Chairman shall in like manner declare such persons as the Scrutineers have reported to him to be the Officers of the Society for the ensuing year.

19.—If, from default of attendance on the part of the Fellows, or from any other cause, a general meeting should not be holden on the third Friday of February in any year, or if the Fellows assembled at such meeting should not elect a Council and Officers for the year ensuing, the Council and Officers for the time being shall continue to be the Council and Officers until another Council and other Officers shall be duly formed and elected; and in order to form and elect such other Council and Officers, another general meeting shall be held within fifteen days from the third Friday in February; whereof notice shall be given to the resident Fellows in

the manner directed in Art. 2. of the present Section; and such general meeting shall proceed to the election of a Council and Officers.

20.—While the ballots are in progress at the annual general meeting, the annual report of the Council shall be read by the Secretaries to the meeting; and any Fellow present may propose any questions to the Council respecting the matters contained in such report, and comment thereon, and on such other matters relating to the government of the Society, and the management of its concerns, as to him may seem proper.

SECTION XI.—*Special General Meetings*.

1.—*Special* General Meetings of the Fellows shall be held from time to time, as there may be occasion, for the purpose of taking special matters, relating to the business of the Society, into consideration.

2.—A week's notice, at least, of the time when, and the object for which every Special Meeting is to be holden, shall be given to every resident Fellow, whose residence is known, living within the limits of the penny post.

3.—No other business than that of which notice has been given, in the summons for convening the meeting, shall be entered upon or discussed at such meeting.

4.—A Special General Meeting shall be convened, within a reasonable time after a requisition to that effect, specifying the business for which the meeting is to be convened, and signed by the Chairman of the Council on the part of the Council, or by any five or more Fellows, shall have been delivered, addressed to one of the Secretaries at the House of the Society.

5.—In case of the death or resignation of the President, or of any Vice- President, Secretary, or Treasurer, or of any other member of the Council, in the interval between any two successive Annual General Meetings, a Special General Meeting shall be held within two months next after such death, or as near thereto as conveniently may be, for the purpose of filling up the vacancy; and the summons for such meeting, and the proceedings thereat, shall, as far as circumstances will admit, be after the manner directed for the annual general meeting.

6.—The Fellows assembled in Special General Meetings shall from time to time appoint such persons as they shall think proper to be Officers and Servants for carrying on and executing the necessary concerns of the Society; and may again remove such Officers and Servants, and restore the same, as they shall see occasion.

7.—The Fellows assembled in Special General Meetings shall have power to make and establish, from time to time, such Orders and Bye-laws as shall appear to them useful:

- For the Government of the Society:
- For defining the powers to be entrusted to, and the duties to be performed by, the Council, the President, and the other Officers of the Council:
- For the management of the estates, goods, lands, revenues, and business of the Society:
- For regulating the manner of proposing, electing, admitting, and removing the Fellows, Foreign Members, and Foreign Correspondents; and of electing or appointing, of removing and of restoring the Officers and Servants of the Society:
- For fixing the times and places of the meetings of the Society:
- For fixing the sum or sums to be paid by the Fellows towards carrying on the purposes of the Society:

—And shall have power to alter, suspend, or repeal such Orders and Bye-Laws, from time to time, and to make such new Orders and Bye-Laws in their stead as they shall think expedient; so as the same be not repugnant to the Charter, or to the laws of the realm.

8.—When it is intended to move the enactment, alteration, suspension, or repeal of any Bye-Law, written notice of such motion, signed either by the Chairman of the Council, on the part of the Council, or by five or more Fellows, must be delivered, addressed to one of the Secretaries at the House of the Society; and must be read from the Chair at two successive general meetings of the Fellows; and a special general meeting must be summoned, within a reasonable time from the last reading of such notice, for taking the motion into consideration; and in the interval between such meetings, such notice must be hung up to view in the meeting-room of the Society; and when the motion is made at such special meeting, the question, after due discussion, shall be decided by ballot; and no motion shall be made for the enactment, alteration, suspension, or repeal of any Bye-Law, nor shall any Bye-Law be enacted, altered, suspended, or repealed, but in the manner above directed.

SECTION XII.—*Ordinary General Meetings*.

1.—The *Ordinary* General Meeting shall be held in the Meeting-Room of the Society on the Evenings of the alternate Wednesdays from November to June inclusive, or oftener if the Council shall see occasion.

2.—A card, announcing the days and hours of the Ordinary Meetings, shall be sent annually, before the first meeting in November, to every resident Fellow whose residence is known.

3.—Persons not belonging to the Society, if introduced by Fellows or Foreign Members, may be present at the Ordinary Meetings. Their names shall be inserted in the minutes, with the names of the persons who introduced them.

4.—At the Ordinary Meetings the order of business shall be as follows:—

- The names of the visitors allowed to be present at the meeting shall be read aloud by the Chairman.
- The minutes of the last meeting shall be read aloud by one of the Secretaries, confirmed by the Meeting, and signed by the Chairman:
- The presents made to the Society since their last meeting shall be announced and exhibited:
- Certificates in favour of Candidates for admission into the Society shall be read, or submitted to ballot:
- Fellows, Foreign Members, and Foreign Correspondents shall sign their names in the Obligation-book, and shall be admitted:
- Geological communications shall be announced and read:
- When the other business has been completed, the persons)resent shall be invited by the Chairman to deliver aloud, from their places, their opinions on the communications which have been real, and on the specimens or drawings which have been exhibited it that meeting.

5.—No motion relating to the government of the Society, its bye-laws, the management of its concerns, or the election, appointment, or removal of its officers and servants, shall be made at any Ordinary Meeting; noi shall any business relating thereto be transacted at any such meeting, except in so far as the Charter or Bye-Laws may expressly enjoin or permit

Notices of intended motions are to be read from the Chair (see Sect. XI. Art.); and extracts from the minute-book of the Council may be read (see Sect. IX. Art. 12) a Ordinary Meetings.

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SECTION XIII.—*Council: Forms of proceeding—rowers—Duties—Restrictions on Powers*.

1.—The Council shall meet at the House of the Society once, at lest, in every calendar month, from November to June inclusive, and may met in any other month, on what day or days they shall deem expedient.

2.—The President, or any three Members of the Council, may call a Meeting of the Council.

3.—When a Meeting of the Council is to be holden, the Clerk of the Society shall summon by letter every Member of the Council.

4.—No meeting of the Members of the Council shall be competent to enter upon or decide any business unless three or more Members be present; and such meeting, having been duly summoned, shall be competent to carry into execution all the powers entrusted to it by virtue of the Charter and Bye-Laws.

5.—The President shall be the Chairman of all meetings of the Council; or, in case of his absence, one of the Vice-Presidents; or, in case of their absence, one of the other Members of the Council, to be appointed for the occasion by the meeting.

6.—The ordinary method of voting at the Council shall be by show of hands; but a ballot shall be taken in cases prescribed by any regulations of the Council, or when demanded by any Member present.

7.—The decision of the majority of Members voting at a meeting shall be considered as the decision of the meeting; and the Chairman shall be entitled to vote; and, if the votes on either side be equal, he shall give a casting-vote.

8.—The voting on any question, except it be one of adjournment, shall, on the demand of any Member present, be adjourned to the next ensuing meeting.

9.—Minutes of the proceedings of every meeting of the Council shall be taken during their progress by one of the Secretaries, or, in case of their absence, by some Member present, whom the Chairman shall appoint for the occasion. The minutes shall afterwards be copied fairly into a minute-book, to be kept for that purpose.

10.—The Council shall, from time to time, draw up such regulations, not inconsistent with the Charter and Bye-Laws, as may appear to them expedient for conducting the proceedings of their own meetings; and the regulations so drawn up shall be binding on the Members of the Council.

11.—The government of the Society and the management of its concerns are entrusted to the Council, subject to no other restrictions than are and may be imposed by the Charter and Bye-Laws, and to no other interference than may arise from the acts of the Fellows in General Meeting assembled.

12.—The Council may from time to time make such regulations, and issue such orders, not inconsistent with the Charter and Bye-Laws, as shall appear to them conducive to the good government of the Society, and to the proper management of its concerns: and all such regulations and orders shall be binding on all and every

the Fellows, Foreign Members, Foreign Correspondents, Officers, and Servants of the Society.

13.—The Council may appoint persons, not being Members of the Council, to be salaried Officers, Clerks, or Servants, for carrying on the necessary concerns of the Society; and may define the duties to be performed by them respectively; and may allow to them respectively such salaries, gratuities, and privileges, as to them, the Council, may seem proper; and may suspend any Officer, Clerk, or Servant, from office, whenever there shall seem to them occasion: provided always that every such appointment or suspension shall be reported by the Council to the next ensuing general meeting of the Fellows, to be then confirmed or annulled, as to such meeting may seem good.

14.—The Council may appoint Committees to examine into, and report to them on any special matters, scientific or otherwise, relating to the objects or concerns of the Society, and may require such Committees to Report, and may dissolve such Committees, whensoever they shall think proper.

15.—The Council may make purchases, and may enter into, enforce, vary or rescind any contract for purchase, on behalf of the Society; but no such contract shall be of longer duration than one year, except by special permission of a general meeting of the Fellows; and in every such contract it shall be stipulated that the effects of the Society shall be the only fund for payment.

16.—The Council may affix the Common Seal of the Society to any deed, contract, agreement, or writing, to which the Society is to be a party.

17.—The Council may exchange for other property, or otherwise dispose of, any duplicate books, maps, or specimens, belonging to the Society, in such manner as may in their opinion best conduce to the advancement of Geology, and the interests of the Society.

18.—The Council may present copies of the Transactions of the Society to other scientific bodies, and to the heads of departments.

19.—The Council shall carry into effect, as far as in them lies, the resolutions of General Meetings.

20.—The Council shall appoint a person to collect the moneys due to the Society, and shad require him to provide sureties to such an amount as may be deemed expedient.

21.—The Council shad appoint a Banker to the Society, for the time being, to whom ad sums of money received by the Collector or other person, for the use of the Society, shall be paid; and no money shad be drawn from the said Banker but by order of the Council, and by cheques signed, at a meeting of the Council, by the Chairman and two other Members.

22.—Whenever the balance in the hands of the Banker shad exceed the sum requisite for the probable or current expenses of the Society, the Council shall invest the excess in Government securities.

23.—At the first meeting in January, in every year, the Council shad appoint two Fellows, the one a Member, the other not a Member of the Council, to audit the accounts of the Society for the preceding year; and shad give to the Auditors, so appointed, full authority to examine persons and papers.

24.—The Council shall present, and cause to be read to the Annual General Meeting, to be held on the third Friday of February in every year, a Report on the general concerns of the Society for the preceding year. The Report shad state the income and expenditure, the receipts and disburse- ments, the balance in hand, and the increase or diminution of the property of the Society during that year, and shall give an estimate in detail of the probable income and expenditure of the current year. The Report shall also set forth the progress of the Library and the collection of Maps, and of the Museum in its various departments.

25.—The Council shall submit to the Annual General Meeting, in every year, lists of such persons as they shall consider most fit to be Members of the Council and Officers for the ensuing year.

26.—The Council shall cause a Register to be kept of all the persons declared, appointed, or elected Fellows, and appointed or elected Foreign Members and Foreign Correspondents of the Society; with the dates of their being so declared, appointed, or elected respectively; and with the names of such of those persons as have been admitted, and have subscribed to the Obligation, No. II. in the Appendix.

27.—The Council shall not incur expenses in any year exceeding the clear annual income of the Society, nor any particular item of expense amounting to 50*l*. not included in the previous estimate.

28.—The Council shall not sell or otherwise dispose of (except as is permitted in Art. 17 and 18), nor mortgage or encumber, the lands, tenements, hereditaments, or effects of the Society, nor borrow money on account of the Society, unless with the sanction and concurrence of a Special General Meeting convened expressly for taking such matter into consideration.

SECTION XIV.—*President*.

1.—The President shall be, in virtue of his office, the Chairman of the Council, and of all general meetings of the Fellows, and a Member of all Committees appointed by the Council.

2.—It shall be the duty of the President to execute, and cause to be executed, the provisions of the Charter

and the Bye-Laws of the Society; to see that all the Officers of the Society and Members of the Council and of Committees perform the duties assigned to or undertaken by them respectively; to call for reports and accounts from Committees and Persons; to cause, of his own authority, and when necessary, Special Meetings of the Council and of Committees to be summoned; and to propose from time to time to the Council such measures as shall appear to him conducive to the welfare of the Society.

3.—It shall be the duty of the President, whenever he shall deem it expedient, to direct the Secretaries to suppress, in whole or in part, or to postpone, the reading of any paper, communicated to the Society in order to be read at its meetings, and to report to the Council the directions so given.

4.—It shall be the duty of the President, as Chairman of the Council, to appoint Referees to examine and report on original papers communicated to the Society previous to their publication. [See Sect. XXI. Art. 5.]

5.—It shall be the duty of the President, after advising with the other Officers, to submit to the Council, for their consideration, the names of persons to be appointed Auditors, and of persons to be recommended to the Annual General Meeting as Members of the Council or Officers of the Society.

6.—It shall be the duty of the President, when prevented from being present at the meetings of the Fellows or of the Council, or from giving his attention to the current business of the Society, to give timely notice thereof to some Vice-President, or other member of the Council, in order that his place may be properly supplied.

SECTION XV.— *Vice-Presidents*.

1.—It shall be the duty of the Vice-Presidents, by rotation or otherwise, as they may agree among themselves, to supply the place of the President, when he shall be absent from the meetings of the Fellows or of the Council, or unable to give his attention to the current business of the Society.

2.—It shall be the duty of the Vice-Presidents, twice at least in every season, commencing in November, and ending in June, to examine into, and report on the state of,—

- The Household:
- The Clerk's department, and the keeping of official books:
- The Library, including maps and drawings:
- The Museum in all its departments.

SECTION XVI.—*Secretaries, not including the Foreign Secretary*.

1.—It shall be the duties of the Secretaries,—

- To conduct the correspondence of the Society and Council, either by writing, or by causing the Clerk to write, such letters as may from time to time be necessary; unless, from some particular cause, some other person be appointed to that duty:
- To attend the general meetings of the Fellows, and the meetings of the Council; to take minutes of the proceedings of such meetings during their progress; and at the commencement of every such meeting to read aloud the minutes of the previous meeting:
- At the ordinary meetings of the Fellows, to announce the presents made to the Society since their last meeting; to read the certificates of Candidates for admission into the Society; and the original papers communicated to the Society, or the letters addressed to it:
- To make abstracts of the papers read at the ordinary general meetings, to be inserted in the minutes:
- To see that all such minutes and abstracts of the proceedings, whether of the Society or of the Council, are entered by the Clerk in the several minute-books, before the following meeting shall be holden; and that all other writings are made by the Clerk which the service of the Society in the department of the Secretaries may require:
- To edit the Transactions of the Society; and to superintend the printing, and the making of the Index of each volume:
- To give direction for placing in the cabinets all newly presented specimens.

2.—The Secretaries, according to their number, shall, by mutual agreement, divide among themselves the performance of the duties above enumerated, and shall communicate to the first meeting of the Council to be holden after the day of the annual election, which of those duties they have each undertaken to perform.

3.—The Secretaries, by virtue of their office, shall be Members of all Committees appointed by the Council.

SECTION XVII.—*Foreign Secretary*.

1.—It shall be the duty of the Foreign Secretary to conduct the correspondence of the Society or Council

with Foreign Societies and with persons residing abroad; and to forward to Foreign Members and Foreign Correspondents notices of their election, and their diplomas.

2.—The Foreign Secretary shall lay before the Society or Council the official letters which he may from time to time receive, relating to the Society or Council; and shall preserve dates and minutes, and (if required) copies of the letters which he may write on behalf of the Society or Council.

SECTION XVIII.—*Treasurer*.

1.—It shall be the duty of the Treasurer,—

- To see to the collecting of all moneys due to the Society; and, to that end, to recommend to the Council a person to be appointed Collector; to ascertain that the sureties offered by such person are sufficient; to give instructions to such person from time to time in what manner to proceed; to see that both he, and all other persons in receipt of sums for the use of the Society, pay in the sums, as soon as received, to the Banker of the Society; and that all sums so paid in are regularly entered in the Banker's Book:
- To see that the drafts paid by the Banker are regularly authorized by the Council:
- To examine from time to time the various account-books of the Society, and to advise the Council as to the sums to be advanced in order to meet the house-expenses:
- To see that accounts of the receipts and payments, of the income and expenditure, and of the property of the Society, are regularly kept by the Accountant, arranged in such manner as may apear expedient to the Council; and that, as soon as may be after the 1st of January in every year, the annual accounts are prepard, in order to be submitted to the Auditors:
- To attend, when required, to the investment and disposition o any moneys, effects, stock, or securities, belonging to the Society:
- To report at the desire of the Council, or whenever he may hink fit, on any special matter relating to the finances of the Sociey.

SECTION XIX.—*Fellows*.

1.—The Fellows have the right to be present, to state their opinion and to vote, at all General Meetings; to propose candidates for admission in the Society, either as Fellows, Foreign Members, or Foreign Correspondent; to introduce visitors at General Meetings of the Society; and to introduce, other in person or by letter, scientific Foreigners to the Library and Museui; to purchase the Transactions of the Society at reduced prices; to have tansmitted to them ad official documents which the Council may cause no be printed for the use of the Society; and, under such limitations as the Council may deem expedient, to have personal access to the Library, Museum, ad ad other public rooms in the House of the Society, and to borrow books, laps, plates, drawings, or specimens, belonging to the Society.

2.—All the Fedows are eligible to be Members of the Council and officers of the Society.

3.—The property of the Society is vested in the Fellows; but no Fllow, not being a Member of the Council, shad have any right of interference or control in or over the management of the concerns, or of the hereditamets or effects of the Society, otherwise than at the general meetings, as hereinefore specified; nor be entitled to any share or participation in the capital, herditaments, effects, rents, profits, revenue, or income of the Society.

4.—No Fedow shad be absolved from the effect of the provisions (f the Charter, or from the Bye-Laws, on the plea of not being acquainted with them, or of not having received a copy of them.

5.—The Society shall not and may not make any dividend, gift, division, or bonus in money unto or between any of its members.

SECTION XX.—*Committees*.

1.—The Fedows, in General Meeting assembled, or the Council, may appoint Committees to examine into and report on any special matters, scientific or otherwise, relating to the objects or concerns of the Society.

2.—Every Committee may be dissolved by the authority which appointed it.

3.—Every Committee shad cause minutes to be taken of its proceedings, and shall produce the original minutes, if required, to the authority which appointed it.

4.—Every Committee shall report, when called on, to the authority which appointed it.

5.—Every Committee may appoint its own Chairman and Secretary.

SECTION XXI.—*Original Papers and Transactions*.

1.—Every paper communicated to the Society, in order to be read at its meetings, shall be deemed the

property of the Society from the time of its being delivered at the House of the Society, unless any previous engagement to the contrary have been made with the author.

2.—Papers shall be read, as nearly as may be, without alteration, and in the order of time in which they are delivered; and should any deviation from this rule occur, it must be reported by the President to the Council.

3.—Selections of the papers read before the Society shall be published

Since 1845 the papers read before the Society have also been printed, either in abstract or in full, in the Quarterly Journal of the Society.

, from time to time, under the title of "Transactions of the Geological Society of London."

4.—The consideration of the papers to be selected for publication, and of the form in which, and the time when they shall be published, shall be referred to the Council.

5.—At the first meeting of the Council after the reading of a paper, the Chairman of the Council shall appoint a Referee, to examine the paper and to report thereon: and after the report of the Referee shall have been presented to the Council, the question of publishing or not publishing the paper shall be submitted to their consideration and decided by ballot.

6.—If an Author shall signify to the Council his desire that his paper may not be published, the question of publishing it shall not be taken into consideration.

7.—Such communications as the Council shall determine not to publish shall be preserved among the records of the Society.

8.—An author shall be entitled to borrow his own manuscript for the purpose of taking a copy, on engaging either to return it, or, in case of his printing the same, to present the Society with a printed copy.

SECTION XXII.—*Common Seal and Deeds*.

1.—The Charter, the Common Seal, and the deeds of the Society shall be deposited in an iron box and in a fireproof room.

2.—Every deed or writing to which the Common Seal is to be affixed shall be sealed at a meeting of the Council, and signed by the President and 'two or more other Members of the Council.

SECTION XXIII.—*On the persons who were designated as "Honorary Members" of the Society before the granting of the Charter*.

All those persons who, before the granting of the Charter, were designated as *Honorary Members* of the Society shall be permitted to exercise the same privileges as Foreign Members. A list of their names shall be appended to the printed lists of the Fellows, Foreign Members, and Foreign Correspondents of the Society.

Appendix.

[No. I.]

Letter notifying the Election of a Fellow. Apartments of the GEOLOGICAL SOCIETY OF LONDON, *Somerset House*. *the* 18

I have the honour to inform you, that on the_____of you were elected a Fellow of the GEOLOOICAL SOCIETY OF LONDON; and I beg to transmit to you a printed copy of an Obligation, a copy of the Charter and Bye-Laws of the Geological Society, a List of the Fellows and a Card announcing the Evenings of Meeting during the present session.

According to the Regulations of the Society, you are required to pay your Admission-fee, being the sum of_____and to return the Obligation, signed and addressed to the Secretaries, on or before the day of;_____otherwise your election will be void.

These Conditions having been complied with, you will be entitled to be admitted by the President a Fellow of the Society.

The Annual Contribution for the present year, in addition to the Admission-fee, is

Under the Bye-Laws, Fellows may at any time compound for their annual contributions, that of the current year included, for Twenty-one Pounds.

I have the honour to remain,
Your most obedient and humble Servant,

Secretary.

[No. II.]

Obligation to be subscribed by Fellows on their admission.

() the undersigned, do hereby engage that () will endeavour to promote the interest and welfare of the GEOLOGICAL SOCIETY OF LONDON, and observe its Orders and Bye-Laws, so long as () shall continue () thereof._____[Signed]

[No. III.]

Permanent Order on a Banker for the payment of Contributions.

Messrs.

Pay the Collector,_____my Annual Contribution of Two Guineas to the GEOLOGICAL SOCIETY OF LONDON, due on the first day of January 18;—and the same Amount on that day in every succeeding year, till further Notice.

I remain,
Your most obedient Servant,

London,

18

[No. IV.]

Diploma of a Foreign Member of the Society. Societas Geologica Londinensis. a.d. mdcccvii. Privatorum Hominum Consiliis Primum Instituta, Dein Favore Augustissimi Principis Georgii IV. a.d. mdcccxxv. Sancita et Chartâ Regiâ Confirmata, Virum ornatissimum Observantice Ergo In Sociorum Exterorum Ordinem Ascribi Voluit. In Cujus Rei Testimonium Consessu Solenni Londini Habito Hoc Diploma Communi Societatis Sigillo Muniri Jussit Die Mensis A.D. Præside Secretarüs. Diploma of a Foreign Correspondent of the Society. The Geological Society Of London, In recognition of the services rendered to Geological Science by Have elected him a Foreign Correspondent Of the said Society: In witness whereof this said Diploma has been signed, and the Seal of the Society affixed. (Here follow signatures of President and Secretaries.) Geological Society of London, 18

[No. V.]

Balloting List for the Election of the Council.

Geological Society of London. *February*, 18

Balloting List for the Election of the Council.

Present Council. Names of Fellows proposed as Members of the New Council.

If you wish to substitute any other name in place of that proposed, erase the printed name in the second column, and write opposite to it, in the third, that which you wish to substitute.

[No. VI.]

Balloting List for the Election of Officers.

Geological Society of London. *February* 18

Balloting List for the Election of Officers Out of the Newly Elected Councl.

Present Officers.Officers proposed. President. Vicecc-Presidents. Secretaries. Foreign Secretary. Treasurer.

If you wish to substitute any other name in place of that propose, erase the printed name in the second column, and write opposite to it, in tb third, that which you wish to substitute.

The End.

Printed by TAYLOR AND FRANCIS. Red Lion Court, Fleet Street.

Plate XVIII.

Vol. V Proc. Rxryal Physical Society Edinburgh. (B)—continued. Section (A) extends from Hoy to Sanday; shows relation of rocks in the Northern Islands. Section (B) extends from South Ronaldshay to Stromness; shows relation of rocks in Southern Islands. Reference. Old Red Sandstone Srrirs. Upper. 7. Agglomerate in Volcanic Vents. 6. Red and Yellow Sandstones. 5. Diabase (Lava). Lower. 4. Red and Yellow Sandstones and Marl. 3. Grey Sandy Flags. 2. Grey Flags. Pre-Old Red Sandstone Rocks. 1. Crystalline Rocks of Stromness and Gremsay. f = fooults

The Old Red Sandstone of Orkney.

BY B. N. Peach, F.G.S., AND John Horne, F.G.S.

Read before the Royal Physical Society 21*st April* 1880.

WHILE engaged in working out the glacial geology of Orkney, during our leave of absence from official work, in the autumn of 1879, we had occasion to pay some attention to the geological structure of the Old Bed Sandstone, which is so largely represented in that group of islands. In the course of our traverses we detected certain points regarding the physical relations of the strata which have not as yet been described; and we likewise noted a new and interesting feature in the history of this formation in Orkney, viz., the proofs of contemporaneous volcanic action in Lower Old Red Sandstone times. In the paper now laid before the Society we purpose to describe briefly the general results of these observations.

The abundance of ichthyolites in the flagstones of Orkney was made known through the descriptions of Agassiz, and more recently by Hugh Miller in his well-known volume "The Footprints of the Creator." In the opening chapters of that work he makes the following statement:

"It is not too much to affirm that in the comparatively small portion which this cluster of islands contains of a system regarded only a few years ago as the least fossiliferous in the geologic scale, there are more fossil fossil inclosed than in every other geologic system in England, Scotland, and Wales, from the coal measures to the chalk inclusive."

In spite of the inducement herein contained, the ichthyology of Orkney has never been so vigorously or exhaustively worked out as that of Caithness and the Moray Firth basin.

The paper published by Sir E. Murchison in the Quart. Jour, of the Geol. Soc.

Quart. Jour. Geol. Soc., XV., 410.

contains a brief description of the geological character of the deposits, and an attempt to correlate the strata with the representatives of the same formation in Caithness. He refers to the axis of ancient crystalline rocks near Stromness on which the Lower Conglomerate rests unconformably, to the large development of the Flagstone series, which is analogous to that of Caithness and to the great succession of red and yellow sandstones of Hoy, which graduate downwards into the flagstones.

In 1878 appeared the first part of Professor Geikie's treatise on the Old Red Sandstone of Western Europe.

Trans. Hoy. Soc. Edin., XXVIII., 345. This memoir contains references to other papers than those we have quoted on "The Old lied Sandstone of Orkney." We have chiefly referred to those publications which treat of the geological structure of the islands.

This valuable monograph was the first comprehensive attempt to sketch the history of the deposits belonging to this formation in Shetland, Orkney, Caithness, and the Moray Firth basin, and to restore in outline the physical geography of the period. In that portion of the memoir which refers to Orkney, he pointed out, for the first time, the unconformity between the massive yellow sandstones of Hoy and the flagstones. He likewise called attention to the contemporaneous lavas and tuffs which lie at the base of the Upper Old Red Sandstone of Hoy, and to the existence of volcanic "necks" from which these materials had been discharged. He also

controverted the idea, advocated by Murchison, that the conglomeratic strata which rest unconformably on the crystalline rocks at Stromness, form the true base of the formation. He regards them merely "as a local interruption of the Flagstone series, due to the rise of an old ridge of rock from the surface of the sheet of water in which these strata were accumulated." Moreover, lie correlates the Orkney flagstones with the higher subdivisions of the Caithness series, which is so far confirmed by the fossil evidence hitherto obtained.

In the *Mineralogical Magazine* for December 1879, Professor Heddle published a paper on the Orkney Islands, in which he describes a well-marked trough which runs through the centre of the group of islands. The strata which occupy the centre of the trough he describes as "loose arenaceous freestones, with silicious granules sometimes so coarse as almost to entitle them to the designation of grits." Moreover, he notes the important fact that these arenaceous strata repose conformably on the ordinary blue flags of the islands.

The results of our observations confirm the statements we have just quoted from the papers of Professor Geikie and Professor Heddle. In the course of our recent traverses we examined nearly the whole of the coast line of Westray, Sanday, Eday, Stronsay, Shapinshay, South Ronaldshay, and the Mainland, a portion of Hoy, and some of the small islands of the group. The succession of the strata is more clearly defined in the northern islands, and we shall therefore begin by describing the relations of the Flagstone series as they are exposed on the coast sections of Westray, Eday, and Sanday.

Along the western shores of Westray there are admirable sections of grey and rusty-coloured flags, dipping in a westerly direction at a gentle angle. The bluff cliff of the Noup Head (about 240 feet) in the north-west corner of the island, consists throughout of finely-bedded rusty-coloured flags; and similar strata are met with on the slopes of the Fitty and Gallow Hills, to the south-west of Pierowall. The remarkable terraced appearance which these hills present when seen from Pierowall or Cleat, is characteristic of the flagstones. This feature is due to the denudation of softer members of the series, which must have been mainly accomplished in preglacial times. This is evident from the occurrence of polished surfaces and ice markings in many of the successive ledges on the hill slopes.

At Nethergarth, in Tuquoy Bay, the flagstones roll over to the east, and this easterly dip continues, with some gentle undulations, along the south-western shore to the promontory of Rapness. And so also along the eastern shore from Newark by Rackwick, Stangar Head to Weatherness, the grey and rusty flags are inclined to the east and south of east. The same easterly dip is observable on the southern promontories of Papa Westray. It follows, therefore, that we have a low anticlinal arch with several minor foldings in the island of Westray, the axis of which crosses the island from Tuquoy Bay northwards in the direction of the western shore of Papa Westray. The flagstones exposed in the south-eastern part of the island are merely the repetitions of those met with in the western portions.

As we approach Weatherness, which forms the southeastern promontory of Westray, the flagstones are more highly inclined to the east. On the islands of Fara Holm and Fara, the same high angle is observable with a similar easterly dip; and there can be little doubt that the grey flags in the latter islets are higher in the series than those at Weatherness. The flagstones exposed on the western shore of Eday between Fara's Ness and Seal Skerry are merely the southern prolongations of the flaggy beds in Fara and Fara Holm. On the whole, then, the succession of the strata between Westray and Eday is tolerably clear, notwithstanding some short gaps in the sections.

The structure of the island of Eday is comparatively simple. The strata form a well-marked syncline, the axis of which lies to the west of the Flighty and Fara's Ness Hills. The centre of this trough is occupied by a great series of yellow and red sandstones, which rest conformably on the flagstones already described. The shore sections on the east and west sides of the island are so clear and convincing, that no one can possibly dispute the conformable passage of the flagstones into the overlying arenaceous series. So strongly do the sandstones of Eday resemble the Upper Old Red Sandstones of Hoy, that Sir Roderick Murchison placed them on the same horizon. But a minute examination of the coast sections proves that they really belong to the Flagstone series, and are therefore of much older date.

A traverse along the shore from Fara's Ness to the sandy bay about a mile to the east, shows the gradual alternation of sandstones and flags at the base of the arenaceous series. At the promontory now referred to, the grey flagstones are seen dipping to the east at an angle of 30°; but not far to the east they are interstratified with bands of flaggy sandstone. These beds are overlaid by false-bedded yellow sandstones which contain numerous brecciated bands made up of angular fragments of crystalline rocks. These false-bedded sandstones likewise contain two thin zones of grey flagstones, which resemble in every respect those at Fara's Ness. It is apparent, therefore, that the change of physical conditions indicated by the respective groups of strata must have been gradual.

The same conformable passage between the flagstone and the overlying arenaceous series is observable on the east coast near the Kirk of Skail, and to the north of Warness, which forms the south-western promontory. Owing to the synclinal fold in the strata, the flagstones at Fara's Ness are brought to the surface again at

Warness, and these beds are prolonged in a north-north-easterly direction towards the Kirk of Skail. At both of these localities grey and white sandstones are interbedded with the flags, and these pass upwards into conglomeratic red and yellow false-bedded sandstones.

The section exposed on the beach at Kirk of Skail and on the south side of Lonton Bay, exhibits the following succession in descending order:

The sandstones at the top of this section are flaggy at their base, but become more massive and conglomeratic upwards. The included pebbles consist of fragments of mica schist, quartzite, gneiss, granite, and other metamorphic rocks all stained of a reddish colour. The occurrence of these pebbles tends to confirm Professor Geikie's expressed opinion that the Lower Old Red Sandstone strata of Orkney were laid down on a very uneven surface of the older crystalline rocks; for an exposure of these latter must have still existed at no great distance, when the highest beds of the Lower Old Red Sandstone series now preserved in Orkney were being deposited.

In the bay to the north-east of Stenniehill a zone of grey flagstones with fish remains is interleaved with the sandstones, as we found to be the case on the west side of the island in the bay of Fara's Ness. This zone can be traced at intervals across the island in a south-westerly direction to the coast line west of the Wart of Eday.

About half a mile to the south of the entrance to the Calf Sound, the base of the arenaceous series is again exposed on the coast line. The grey and rusty flags form a low arch on which the coarse-grained sandstones rest conformably. The flags are truncated on the north side by a small fault which brings down the overlying sandstones. The greater portion of Eday and the whole of the Calf of Eday are occupied by these sandstones. Perhaps the finest exposure of the series is to be seen on the Red Head of Eday (209 feet), which forms the northern promontory of the island. These strata form prominent hills in the centre of the island, whose features are totally different from those characteristic of the Flagstone series in Westray. As a rule the beds are extremely coarsegrained, and frequently conglomeratic, with much false bedding; indeed, as we have already remarked, they have a striking lithological resemblance to the Upper Old Red Sandstones of Hoy.

Southwards from the Kirk of Skail, along the shore, there is a steadily descending section of the flagstones for nearly a mile and a half. There is no great thickness of strata exposed however, as the coast line forms only a very small angle with the line of strike for some distance. North of Veness the Flagstone series is abruptly terminated by a fault which brings down the overlying sandstones to the west. This dislocation runs in a north and south direction, and passes out to sea to the west of the Veness promontory. There is therefore a small detached area of the arenaceous series in the south-east corner of the island.

In the island of Sanday the thick sandstone series of Eday and the underlying flagstones are repeated partly by foldings and dislocations of the strata. Along the western shore between Spurness and Stranquoy, the grey flagstones are exposed interbedded with red and grey sandstones which are conglomeratic in places. These beds are inclined to the west and north of west at angles varying from 50° to 70°. The conglomeratic sandstones and red shales interbedded with the flags are seen on the western shore, about a mile to the north of Spurness. It is highly probable, therefore, that the strip of the Flagstone series, extending from Spurness to Stranquoy, is on the same horizon with the flags, which immediately underlie the Eday sandstones.

The strip of the Flagstone series now referred to is bounded on the east by a dislocation which brings in the Eday sandstones. This fault is well seen on the shore, a short distance to the north-east of Spurness, where the red and yellow sandstones which dip to the west at an angle of 40° are brought into conjunction with the grey flags. The effect of this dislocation is also well exposed on the shore in Stranquoy Bay. The chocolate-coloured sandstones and shales are seen on the east side of the fault dipping in a south-westerly direction; while to the west of the fault the grey flags are bent round in the form of an arch. The effect of this dislocation is shown on the accompanying sheet of horizontal sections.

To the east of Stranquoy the arenaceous series, which is brought in by the fault just described, is traceable for nearly a mile. The red and yellow sandstones are admirably seen in Pool Bay and on the shore at Hack Ness, having a persistent dip to the west at angles varying from 15° to 25°. A thin zone of interbedded flagstones is exposed in the bay to the west of Hack Ness, which reminds the observer of similar zones on the same horizon in Eday.

The gradual passage of this arenaceous series downward: into the flagstones is presented on the shore at Moy Ness where the same alternations of flags and sandstones at the bast is observable, which obtains in Eday. Northwards along the shore towards Bacaskeal Bay there is a steady descending series of grey and purple flags.

In the northern promontories of the island, and specially along the shore from Hermaness Bay to the Holms of Eyre the grey and purple flags are repeated by gentle foldings. There is, therefore, no great thickness of strata exposed in the central portion of Sanday. The time at our disposal did not permit us to visit the north-eastern promontories of Sanday, nor the island of North Ronaldshay; but from the observations of previous observers only the Flagstone series seems to be represented at these localities.

The greater portion of the island of Stronsay is occupied by the flagstones, but at one or two localities there

are small detached areas of the arenaceous series. On the northern headlands, the grey flags are exposed dipping in a northwesterly direction, and the same inclination is observable in Odin Bay and Linga Sound. About a mile to the north of Holland, on the western shore, the yellow sandstones are thrown against the flags by a fault which is admirably seen. The sandstones dip to the north of west, and, on following the coast line southwards, they graduate downwards into the grey flags.

In the south side of the island, at Housbay, and in the bay west of Lamb Head, the flagstones roll over to the south-east, and a similar passage upwards into the yellow sandstones may be noted. The small area occupied by this series at Lamb Head is bounded on the north side by a fault.

A small patch of yellow sandstone, which is quarried for building purposes, occurs between Odin Ness and Burgh Head, but as it is bounded by faults, its relation to the flagstones is not apparent.

The greater portion of the island of Shapinshay is likewise occupied by the Flagstone series. The sections exposed on the coast line prove, beyond all doubt, that the same beds are constantly repeated by gentle undulations. Along the western shore, between Stromberry Ness and the Gait, the general dip is to the north-north-west, but as the observer traverses the shore of Veantro Bay and the coast line between Balfour Castle and How, he cannot fail to note the frequent changes of dip which bring the same beds to the surface again and again. In the south-eastern corner of the island, however, there is a small patch of red and yellow sandstones inter-stratified with grey flags. Though the gradual passage be- tween the two groups, which is so clear in the northern islands, cannot be made out in Shapinshay, there can be little doubt, from the character of the strata, that the patch of sandstones, between Haco's Ness and Kirkton, are near the base of the arenaceous series. A small fault separates the two groups to the south of Kirkton, which obscures the relations between them, and it is highly probable that this dislocation may be the northern prolongation of the great fault to be described presently, on the Mainland. This conjecture is strengthened by the fact that, though the flagstones on Shapinshay roll about in every direction, yet the preponderance of dips is towards the south-east, and this is especially .he case on the eastern shore of the island. Bearing this in mind it is easy to account for the Eday sandstones being brought in by the aid of a comparatively small fault. It is important to note this dislocation, for these beds are continued across the channel to Inganess on the Mainland, whence they strech across to Scapa, and are extended on to near Orphir Krk, being cut off from the flagstones along their whole northern boundary by a large fault with a downthrow to the south.

An interesting feature connected with the patch of said-stones and the associated flags at Haco's Ness, is the occurence of interbedded volcanic rocks, clearly proving he existence of volcanic action in Lower Old lied Sandstone times in Orkney. The lithological character of these rocks, as well as their appearance under the microscope, will be described under a separate heading.

On the Mainland, the arenaceous series just describedas occurring in Shapinshay, and which is likewise represened in Stronsay, Sanday, and Eday, is well developed. But before describing the relations of the two groups as repesented on the Mainland, we shall refer briefly to the develpment of the Flagstone series in the western part of the island. The unconformity between the flagstones and the axis of crystalline rocks at Stromness has been frequently described. Our observations tend to confirm the conclusions alredy arrived at by Professor Geikie, that the conglomeratic strata which repose on the gneissic rocks merely indicate a leal base. It is quite true that the brecciated flagstones re mainly derived from the underlying crystalline rocks, but the conglomeratic character disappears within a short distance of the gneiss. Professor Geikie has alluded to the fact that the general dip of the flagstones in Hoy is to the north and northwest, and consequently the flaggy strata, which rest unconformably on the gneissic ridge, are probably higher in the series than those in Hoy. This evidently points to a gradual subsidence of the area during the deposition of the Flagstone series.

The strata represented in the north-western portion of the Mainland are evidently the southern prolongations of the flaggy series which we have already described as occurring in Westray. They are admirably exposed on the shore between Burness and the Brough of Birsay, and along the western coast line. They are likewise well developed in the island of Rowsay, where they form the characteristic terrace-shaped hills. The lithological characters of the flaggy series in Westray, Rowsay, and the north-west of Pomona, are precisely similar.

On the coast line also, between Irland Bay and Houton Head, similar strata are met with, rolling about in gentle folds.

Again the flaggy series of Shapinshay reappears on the headlands of Carness and Work Head, north-east of Kirkwall, where the general inclination is to the north-west.

From Ingauess Head south-westwards to Scapa Bay, and along the shore to Smoogra Bay, and thence to Orphir Kirk, a strip of red and yellow sandstones with red marls is traceable. These red and yellow sandstones are the southern prolongations of the Eday sandstones. They are bounded on both sides by faults which bring them against the underlying flagstones. The dislocation which forms the northern boundary line has been traced by us for a distance of nearly ten miles from Orphir Kirk north-eastwards by Scapa Bay to the bay east of

Inganess Head. The fault is admirably seen at various localities, but perhaps one of the most interesting of these is on the west coast of Scapa Bay, where the main fault as well as a minor dislocation are seen.

On the high cliff which bounds the west side of Inganess Bay, friable red clays are associated with the red sandstones. They decompose readily, and break up into small cubical fragments.

Along the shore from Scapa southwards to Howquoy Head, the same red and yellow sandstones are brought into conjunction with the flags by a fault which runs almost parallel with the coast. At Scapa the rocks consist of red mottled sandstones, underlaid by coarse honey-combed yellow and white sandstones, which alternate with calcareous flags and dark bituminous schists. Owing to numerous foldings these beds are often repeated.

To the east of this arenaceous series, the flagstones reappear in Inganess Bay. They are well developed on the shore near Tankerness, and along the coast line between Mull Head and Air Point. Flagstones only, are exposed on the shore to the east of St Mary's, and also along the road from Græmeshall to Kirkwall, save where the narrow patch of red sandstones already mentioned crosses from Inganess to Scapa.

In South Ronaldshay the lowest beds exposed are to be met with at its southern extremity, where they form the Old Head overlooking the Pentland Firth. Here the rocks consist of grey calcareous flags, charged with abundant remains of *Coccosteus* and other ordinary Caithness fishes, which are well preserved as in Caithness, and are not represented by a black lead-like smudge characteristic of those from Skail. Following the eastern coast line, these beds continue for a considerable distance with a northerly dip. There are several faults, some of which are occupied by veins of barytes and iron pyrites, but they seem not to be of any great magnitude. A little to the north of Halcro Head, the flags pass under a series of yellow and red sandstones and red shales, which at Windwick are suddenly truncated by a large east and west fault, the effect of which is to bring up the underlying flagstones. Near the fault flagstones are inclined towards it, but they soon recover their northerly dip, and at Stow Head once more dip below the sandstones. Owing to the sandstones being arranged in a small trough, the flags soon reappear, and after rolling about for some miles along the coast line, they finally plunge under the sandstones near the mouth of Watersound, never to reappear on South Ronaldshay; for the reel sandstones, with occasional thin intercalations of red flags and massive bands of red marly clay, extend to Crow Point in the extreme north-west. These beds are continued along their strike into Burra, where the passage from the flags into the red sandstones is well shown at the eastern entrance to Watersound. The islands of Flota, Fara, and Cava, show the same alternation of flagstones with red and yellow sandstones and red marls. In Flota the dip is almost north at Pan Hope, where the passage from the flagstones to the sandstones is well seen; while in Fara and Cava, the inclination is more to the north-east.

In the district of South Walls and the promontory of Brim's Ness, in Hoy, the rocky cliffs exhibit the ordinary grey flagstones. On the shore of the Longhope, between Melsetter and the Inn, they pass under the red and yellow sandstones; and the same relation is observable on the coast facing the Atlantic, a little to the south of Melsetter. On a former visit of one of the authors with Professor Geikie considerable difficulty was experienced in tracing the fault which divides the Upper Old Red Sandstones from the arenaceous series associated with the flagstones, till the intercalation of the sandstones with the Lower series was realised.

From what has been said it will be seen that Scapa Flow occupies the site of a geological basin, towards which the rocks dip on every side, and along the shores of which the highest beds of the Lower Old red Sandstone exposed in Orkney are to be met with as well as in Eday and Sanday.

The beds in South Ronaldshay are exceedingly like those exposed along the shores of Gills Bay on the opposite Caithness Coast and in the intermediate island of Stroma, and are, in all probability, their prolongations to the north-east, which is the direction of their strike. We have thus a definite horizon to start from, for the highest beds in Orkney are also the highest in the Caithness series.

It is worthy of note that the sandstones become coarser as they are traced northwards. In South Ronaldshay there are great masses of friable marly clays, intercalated with the sandstones. In Eday and Sanday there are only about ten feet of such strata, while the sandstones are very coarse and even conglomeratic, and approach much more to the type of the Lower Old Red strata of Shetland.

Igneous Hocks in the Lower Old Red Sandstone.—The only" contemporaneous rocks of this nature occur at the south-east corner of Shapinshay, between Haco's Ness and Foe, where they form the coast line for about half a mile. They are perfectly conformable with the flagstones. The upper surface of the diabase is highly vesicular and amygdaloidd, and exhibits all the characters of a regular lava flow. The flagstones overlying it are not altered in the slightest along the line of contact. The base of the volcanic series is not seen, though the sea has cut trenches in the rock at least thirty feet in depth. Where the dip is visible, it is sea wares. In the cliff they are covered by the flags, but they crop out inland not far from the coast line. These rocks are dark green in colour, weathering olive green. They may be considered as varieties of diabase, which have undergone considerable alteration. Some of the specimens contain much calcre, which fills drawn-out vesicles, indicating the flow of tie molten lava. We have had some of these rocks sliced, and examined under the microscope,

which confirms the opinion regarding the extreme alteration which they have undergone.

One of the sections is found to be largely constituted of a plagioclase felspar, with a small amount of intervening chlorite, but with much altered olivine. The felspar is much decomposed, and forms the bulk" of the rock. The olivine, which is now changed into a pale greenish yellow serpentine, is distributed in large crystalline grains, and is abundant. In places the chlorite is represented by masses of radial aid vermicular groups of crystals which appear to have under-gone a change to the same serpentinous mineral as that which replaces the olivine. Magnetite is irregularly distributed as grains, and also frequently, either wholly or party, envelopes the crystals of olivine.

Another section shows that the rock consists of closdy crystallised plagioclase and much interstitial augite, with a considerable amount of olivine. The augite and the olivine have been converted into serpentine, although a few crystals, as well as portions of crystals, still remain unaltered. The felspar in many places is permeated with the same mineral. Much magnetite is present, together with quartz, some calcite, and serpentinised chlorite.

In the examination of the microscopic sections we have been kindly aided by Mr T. Davies.

Intrusive Igneous Rocks.—Among the few examples of this class met with are the two necks filled with volcanic agglomerate already described by Professor Geikie as occurring on Hoy, and which he has shown, in all likelihood, helped to supply the volcanic platform which underlies the main mass of the Upper. Old lied Sandstone of that island, and are therefore to be considered of that age.

Several dykes of basalt were observed among the islands. They are most numerous and conspicuous on the west coast of the Mainland from Brackness to Skail, but as they have been so often described, it is unnecessary to refer to them in detail. They have the same lithological characters, and behave exactly in the same manner as the dykes in other parts of Scotland, which have been regarded as the product of volcanic energy in Miocene times. A noticeable feature about the Orcadian representatives is, that they are usually divided up the centre of the dyke by a line of vesicles. This is not an uncommon feature elsewhere.

Summary.—The descriptions we have given of the Lower Old lied Sandstone strata as represented in the Orkney Islands, tend to confirm the conclusion previously arrived at by Professor Geikie, that these flagstones, with the associated arenaceous series, must be correlated with the higher subdivisions of the Caithness series. It is highly probable, therefore, when the ichthyology of Orkney is worked out in detail, that the fossils will be identical with those derived from the higher portions of the Caithness series. The great development of the sandstone series in the northern isles is of special interest, as it shows that the strata gradually assume the arenaceous character which is so prevalent in Shetland.

Moreover, it is of importance to note that the coarse silicious sandstones and marls, which are the highest representatives of the Lower Old lied Sandstone in Orkney, must not he confounded with the massive red sandstones which form the noble cliffs on the west side of Hoy. The latter rest unconformably on the flagstones. It is evident, therefore, that after the deposition of the Flagstone series, with its associated sandstones and marls, the bed of this inland sea was elevated so as to form a land surface. These strata were subjected to a considerable amount of denudation ere they were again carried below the water in Upper Old lied Sandstone times

M'Farlane & Erskine, Printers, Edinburgh.

Plate I.

Vol. V. Proc. Royal Physical Society Edinburgh Quarff. Brenista. Gulberwick. Sea-Level. (a) Section from Quarff to Wart of Shoredoun. Cliff Hills. Lerwick. Bressay. Noss. Sea-Level. (d) Section from Cliff Hills to Nobs Head. Ockren Head. Roeness Voe. Roeness Hill. The Biurgs. Skea Ness. Sea-Level. (c) Section across Mainland from Ockren Head to Skea Ness. Reference. Pre-Old Red Sandstone Rocks. 1. Metamorphic rocks. Gneiss and Schist. Rocks of Old Red Sandstone Age. 2. Basement Breccia. 3. Brenista Flags. 4. Rovey Head Conglomerate. 5. Lerwick Sandstones. 6. Bressay Flags. 7. Volcanic Agglomerate in Vents. 8. Porphyrite, Tuft, and Sandstone, of West side of Shetland. 9. Pink Granitoid Quartz-Porphyry. 10. Porphyrite Dykes. S— Serpentine. f— Faults. To illustrate Messrs Peach and Home's Paper on the Old Bed Sandstone of Shetland.

The Old Red Sandstone of Shetland.

BY B. N. PEACH, A.R.S.M., F.G.S., AND JOHN HORNE, F.G.S.

(*Read before the Royal Physical. Society*, 19*th February* 1879.)

THE Old. Red Sandstone of Shetland, though inferior in development to that of Caithness or Orkney, claims

special attention on account of the interesting proofs which it affords of the previous extension of that formation, as well as the remarkable history of the volcanic phenomena which characterised that period. Though the areas now occupied by the sedimentary rocks are limited in extent, there can be little doubt that they convey but a faint impression of the original extension of this formation in the Shetland Isles. The fine mural precipices of Old Red Sandstone which are visible in some of the islands, notably in Bressay and Foula, furnish a striking proof of the importance of the relics which have escaped denudation.

As far back as the year 1811, Dr Fleming pointed out the occurrence of vegetable impressions in the sandstones of Bressay, in a paper published in the Memoirs of the Wernerian Society, vol. i., entitled, "A Mineralogical Account of Papa Stour." Since that time numerous plant remains have been found in the members of this formation at different localities in Shetland.

In 1853 Dr Hooker referred some plant remains collected from the Lerwick sandstones, by the Bight Hon. Henry Tuffnell, to calamites; while, in 1858, Sir Roderick Murchison intimated the discovery of *Esthcria* in the Lerwick beds, which linked these strata with those of Caithness and Orkney.

Dr Hibbert, in his admirable work on the Shetland Isles, laid down approximately the limits of the different Old Red Sandstone areas. In 1877 Dr George Gibson published a thesis descriptive of these rocks; and in 1878 Professor Geikie, in his exhaustive monograph on the Old Red Sandstone of the North of Scotland, described the relations of the Shetland representatives to the other members of this formation in Orkney and Caithness. He refers specially to the proofs of volcanic activity in Papa Stour, the geological structure of which is given in detail.

During the summer of 1878 we made some traverses in the islands for the purposes of determining the disputed question of their glaciation, and in the course of these traverses we felt it to be necessary to map out with as much minuteness as time would permit the boundaries of the various Old Red Sandstone areas, on account of the important evidence which they furnish regarding the movements of the ice in the glacial period. We were induced to work out the order of succession on the eastern side of the Mainland as well as the relations of the associated contemporaneous and intrusive igneous rocks in the western districts.

While pursuing this object we were fortunate enough in discovering in the Walls district a rich series of plant remains in rocks which have been hitherto considered as forming part of the metamorphic series. Mr C. W. Peach has kindly named the plant remains for us, and from his description it is evident that they are identical with the plants found in the Old Red Sandstone formation of Caithness and Orkney. The rocks in which they are embedded must therefore be relegated to that period, though they seem to have undergone a considerable amount of metamorphism.

In this paper we propose to give a brief sketch of the different areas occupied by these rocks in Shetland, indicating as far as possible the succession of events and the relations of the contemporaneous and intrusive igneous rocks. We shall endeavour to show that during the early phases of that period, the Mainland, which is the largest of the Shetland group, must have formed an island somewhat smaller in size than now, round whose coast-line the basement breccias accumulated; but eventually as the land slowly sank beneath the sea-level, the higher deposits overlapped on to the gneissose rocks, and ultimately buried them. The long process of denudation to which the Shetland archipelago has been subjected has removed in a great measure the greater portion of these deposits; those which now remain being protected in part by the hard gneissose rocks against which they have been brought by dislocations of the strata.

The order of succession on the east side of the Mainland is as follows:

- *e*. Flaggy group of Bressay and Noss.
- *d*. Lerwick sandstones.
- *c*. Rovey Head conglomerates.
- *b*. Brenista flags.
- *a*. Basement breccia, resting unconformably on the underlying schists.

Owing to a series of faults which form the boundary line over a great part of Lerwick, Quarff, Conningsburgh, and Dunrossness, it so happens that different zones in the fore-going vertical section are brought into conjunction with the gneissose rocks. The true base of the series, however, is exposed in the neighbourhood of East Quarff on the north side of the bay, and again on the south side towards Flaoabister, while still another locality in which the basement breccias occur, is to be seen near Loch Spiggie in Dunrosness. In each of these localities the breccia varies in chancier according to the nature of the underlying rock. Perhaps the finest exposures of this breccia are to be seen on the hils to the north of East Quarff, and round the shore towads Brenista Ness. Here it forms well marked cliffs, the beds being inclined to the east at an angle of 25°, and resting on a highly eroded platform of the metamorphic schists. The prominent ingredient in this deposit round the bay of Est Quarff is the underlying rock, which consists mainly of gray schists. Blocks of this material sometimes measure time feet across, retaining their angular edges and showing little trace of aqueous action.

Near Loch Spiggie, in Dunrossness, the fragments mainty consist of pink syenite and serpentine derived from the under- lying rocks which form the floor on which the breccia rests in that neighbourhood. The occurrence of fragments of these rocks in the basement breccia is of great moment, as it helps us to fix the age of the pink syenite and serpentine between Quendale Bay and Loch Spiggie.

In the bay west of Brenista, the overlying series of the Brenista flags is thrown against the breccias and underlying schists by a fault which is traceable inland in a N.N.W. direction. Between East Quarff and Fladabister, however, the relation between the two is seen in several fine exposures which show the gradual passage from the breccia into the overlying chocolate flags. But farther, about half-way between these two localities, the basement breccia, which is upwards of 200 feet thick on the shore, thins out inland to a few feet, and in some places disappears altogether, so that the Brenista flags rest directly on the underlying rocks. This interesting phenomenon evidently points to a gradual sinking of the area during the deposition of the successive members of this formation.

Returning to the shore section north of East Quarff, we find a gradually ascending series from the Brenista flags to certain coarse conglomerates seen in a small stream at the head of the bay of Gulberwick, which are totally different in character from the breccias already described. The included pebbles are well rounded and are to a large extent composed of different materials from the basement beds. These beds are traceable up the slope of the Gulberwick hollow to the road between Lerwick and Scalloway, where they form crags on the hill face. They are also traceable across the hills northwards to Rovey Head, about two miles north of Lerwick, where they are thrown against the metamorphic rocks by a fault which is well seen on the shore. From Rovey Head southwards to the ridge overlooking the head of Fitch Dale, this fault forms the boundary line between the metamorphic rocks and the conglomerates. It follows, therefore, that the underlying Brenista flags and the basement breccia have been thrown out along this line.

Again, on the shore south of Rovey Head, and to the east of Gulberwick, the Rovey Head conglomerates are succeeded by a thick series of coarse sandstones, passing into pebbly grits, with occasional conglomeratic layers. These have been termed by us the Lerwick sandstones, because they are most strikingly exhibited in the neighbourhood of the capital of Shetland.

The patches of Old Red Sandstone rocks which occur between Ocraquay and Aith's Voe, and between Sandlodge and Hoswick, are faulted against the metamorphic rocks, as described by Professor Geikie and Dr Gibson. The strata in these isolated areas, as well as in the island of Mousa, belong to the series of the Brenista flags. Near the fault they are highly inclined, but at some distance from it they dip towards the south-east, at angles varying from 15° to 20°. The well-known veins of copper and iron ore at Sandlodge, which we had ample opportunities of examining through the kindness of Mr Walker, occur in these rocks.

Again, at Levenwick, the fault is seen on the shore, which brings this flaggy scries into conjunction with the metamorphic rocks. It may be followed southwards along the base of the hills towards the Dunrossness Manse, where it probably dies out, as the flags succeed the basal breccias of Loch Spiggie without any apparent dislocation. Round Boddam, and southwards towards Lambhoga Head, the characteristic features of the Lerwick grits and sandstones are displayed, the underlying Rovey Head conglomerates being represented on the shore west of Sumburgh Head, and west of Boddam.

On the eastern side of the Mainland, therefore, the highest beds are represented by the Lerwick sandstones, and it is only when we pass to the east side of Bressay that the overlying series is to be met with. Along the eastern shores of Bressay, and in the island of Noss, the beds consist of grey, blue, and red flags, with occasional bands of breccia and reddish grey sandstones, which remind one forcibly of the flaggy series in Caithness and Orkney. The appearand of these beds encourages the hope that ichthyolites will yet be found in them, though a careful search failed to bring any to light. At the base of Noss Head we discovered a zone of dark shale, with limestone nodules, which strongly resenbles the well-known fish-bed on both sides of the Moray Firth.

The flaggy strata of Bressay and Noss are pierced by a remarkable series of volcanic pipes, which we shall refer to presently when we come to discuss the igneous rocks associated with this formation.

In the peninsular tract of country which lies between Weesdale and the western shores of Walls and Sandness there is a great series of rocks, which have hitherto been considered as forming part of the metamorphic series. At the north-west corner of this area a small strip of ground, bordering the coast at Melby House, about a mile and a half in length, is occupied by Old lied Sandstone rocks, which have been referred to by previous observers. The strata in this small patch consist of reddish sandstones, with dark blue flags and shales, which are faulted against the quartzites and shales of Sandness Hill.

With this exception, however, the strata in the tract now referred to consist of red and grey quartzites, with red and pale shales. The quartzites are traversed by joints in all directions, which are abundantly coated with peroxide of iron, and in many places they have a marked schistose character. We were fortunate enough in discovering an abundant series of plant remains in these altered rocks, some of which are tolerably well

preserved. Mr C. W. Peach has referred the plants to *Psilophyton and Lepidodendron nothum*, and regards them as identical with the plants occurring in the Old lied Sandstone rocks of Caithness and Orkney. It follows, therefore, that the rocks in which they are embedded, altered though they be, must be relegated to this formation.

Contemporaneous Igneous Rocks of Old Red Sandstone Age. —In the western district of North Mavine, between Stennis and Ockren Head, there is an important development of lavas and ashes, associated at certain localities with ashy sandstones and red flags, which belong to this period. These porphyrites and tuffs resemble in every respect the volcanic rocks of the same age in the Ochils. Excellent sections of these rocks are exposed in the coast-line from Braewick to Stennis, and thence to Ockren Head, where they have been tunnelled in a wonderful manner by the action of the sea. The structure of the area is comparatively simple, as the beds lie in a synclinal fold, the dip near Braewick being to the north of west, while along the western shore the porphyrites and tuffs dip to the south of east. On the west bank of Roeness Voe, about a mile from the mouth of the sea loch, the porphyrites are thrown against the intrusive quartz-felsite by a fault, and in Braewick Bay it is highly probable that the same relation exists between the two, though the evidence is obscured by the sandy beach.

In the Holm of Melby a bed of slaggy porphyrite occurs, dipping to the west; and again in Papa Stour Professor Geikie

See "The Old Red Sandstone of Western Europe," vol. xxxviii. Edin. Roy. Soc. Trans., p. 345.

has described a similar series of volcanic rocks, exposed here and there along the base of the cliffs underneath the sheet of pink porphyry. These are likewise associated with beds of sandstone and conglomerates, and are doubtless on the same horizon as the volcanic rocks of North Mavine.

On the eastern shore of Bressay, opposite the north end of the island of Noss, we discovered a bed of tuff, interbedded with the flags, which is probably connected with the volcanic pipes in that neighbourhood.

Intrusive Igneous Roclcs of Old lied Sandstone Age—In North Mavine, as well as in the districts of Delting, fondness, and Sandsting, on the Mainland, there is a seres of intrusive masses, which doubtless belong to this period. These intrusive rocks vary considerably in lithohgical character, but they all agree in possessing a large proportion of silica, while the felspar is almost invariably orthœlase. The dome-shaped mass of Roeness Hill is formed o this material, while northwards it extends to the shores of the Mainland, opposite the island of Uya. It likewise crosses the peninsular tract west of Hillswick to the Heals of Grocken, reappearing in the Drongs, and on the west site of Meikle Rooe. From the marked columnar structure which characterises these rocks on the banks of Roeness Voe and between the Heads of Grocken and Braewick Bay, as will as from the manner in which the Roeness mass spreads over the edges of the metamorphic rocks, we are inclined to believe that the granite and quartz-felsite in that district 3 an intrusive sheet, which was injected between the underying metamorphic rocks and the overlying Old Red Sandtone strata, which have been long since removed by denudation. The quartz porphyry of Papa Stour, which covers nearly the whole of the island, is an intrusive sheet injected along the lines of bedding of the Old Red Sandstone rocks, as numerous sections clearly show. Indeed, a small patch of red sandstone is still to be met with resting on the pink porphyry at the Horn of Papa. Though on trace of the once superincumbent strata is now visible on the Roeness mass, this is not to be wondered at, when we consider the great denudation which has taken place since Old Red Sandstone times.

In the district of Sandsting there is satisfactory evidence to prove that the granitic mass between Gruting and Skelda Voes has been injected along the lines of bedding of the altered Old Red Sandstone rocks. While the inclination of the granite mass is nearly the same as that of the quartzites and shales, it may frequently be observed cutting across the sedimentary rocks, and sending veins of pink felsite across the lines of bedding of the quartzites. We are inclined to believe that the metamorphism which the Old Red Sandstone rocks have undergone between Weesdale and Sandness may be due to the existence of masses of granite not far from the surface, for it is highly probable that the isolated masses of highly siliceous intrusive rocks in the west and north of the Mainland are connected underneath, though this cannot be proved to be the case on the surface.

On both sides of Noss Sound, in Bressay and Noss, we discovered a series of volcanic pipes tilled with a coarse agglomerate made up of fragments of the stratified rocks pierced by these vents. There is a singular absence of blocks of porphyrite in the agglomerate, but a thin vein of this rock is traceable for a short distance along the side of the old orifice.

Farther on the shores of Roeness Voe, as well as in Meikle Rooe, the quartz-felsites are traversed by a series of porphyrite dykes running in a north and south direction, which probably represent the last indications of volcanic activity during the Old Red Sandstone period in Shetland.

M'Farlane & Erskine, Printers, Edinburgh.

Südamerikanische Nova aus dem Kieler

Museum, Von Paul Leverkühn.

[Sondcrabdruck aus Cabanis Journal für Ornithologie, Jahrgang 1889; Januar-Heft.]

Im Frühling 1886 bot mir Herr Professor Dr. Möbius, damals Director des zoologischen Instituts der Universität zu Kiel (jetzt in gleicher Eigenschaft in Berlin) an, die grossen Schätze von Vogelbälgen zu bestimmen, welche seit den 40er Jahren in der Sammlung des genannten Instituts liegen. Durch andere Arbeiten in Anspruch genommen, begann ich erst im Winter mit meiner Aufgabe, mich durch einen Stock von ungefähr 10 000 Bälgen zu kämpfen, bestimmend, ordnend und eine beschreibende Bearbeitung einleitend. Die von mir bestimmten Gruppen sandte ich Autoritäten zu definitiver Identification mittelst sicheren Vergleichsmaterials, das mir in Kiel völlig fehlte. So sah Henry S e e b o h m in London die Turdiden, Prof. Dr. "Wilhelm Blasius in Braunschweig die Corviden und Icteriden, Dr. Gustav Hartlaub in Bremen die mir zweifelhaft gebliebenen Papageien durch. Zu meiner Freude wurden durchschnittlich Uber 95 Procent meiner Determinationen von den genannten Ornithologen anerkannt. Eine zusammenhängende grössere Publication kann in den nächsten Jahren noch nicht hergestellt werden, daher folge ich dem Rathe meiner Freunde, die gefundenen neuen Arten und Unterarten vorläufig bekannt zu machen, zumal viele Dutzend Nova veröffentlicht sind, zu welchen die Typen im Kieler Museum liegen könnten, nämlich wenn sie ihrerzeit be- schrieben wären. So ist es thatsäehlich wahr, was Seebohm über diese Sammlung schrieb: it has been buried for forty years! Da die Versendung der Suiten gewisse Unannehmlichkeiten im Gefolge hat, war es mir doppelt angenehm, dass auf meine Bitte mein Freund und Gönner Hans Freiherr von Berlepsch aus Hann-Münden sich entschloss, den Rest der von mir bestimmten Familien (Timeliden zum Theil, Tauben, Muscicapiden etc.) persönlich durchzugehen, und zu diesem Zwecke, sowie um mir die Colibris zu bestimmen, für 14 Tage nach Kiel zu mir kam. Nachher hat er meine Nova mit Stücken seiner reichen Sammlung verglichen und ihre Speciesdignität somit in besonders werthvoller Weise sanctionirt. Ihm, sowie den anderen namhaft gemachten Ornithologen, welche meine Arbeiten in liebenswürdigster Weise unterstützten, ferner Herrn Professor Dr. Möbius, der mir zuerst das Material anvertraute, und Herrn Professor Dr. B r an d t, Director des Zoologischen Instituts der Universität zu Kiel, welcher mir die Fortsetzung meiner Arbeiten zugesichert, bin ich zu grossem Danke verpflichtet und möchte diese Gelegenheit benutzen, um ihn auszudrücken! —

Was nun die Sammlung selber betrifft, so besteht sie zum grössten Theile aus dem Material, welches der verstorbene Professor Dr. Belm aus Kiel auf der Weltumsegelungsreise der dänischen Corvette „ Galathea“ in den Jahren 1845—47 und weiter auf seiner Landreise quer durch Südamerika Anno 1847/48 gesammelt hat. Gleich an Bord wurden die Bälge in vorzüglich schliessende Mahagonischränke verpackt, in denen sie noch heute ruhen — ein Umstand, dem die durchweg gute Erhaltung der Vögel zu danken ist. Professor Belm nummerirte die gesammelten Objekte und führte einen mit jenen Nummern correspondirenden Blätterkatalog, in welchen er Maasse, Beschreibungen, biologische Beobachtungen u. s. w. eintrug. Leider sind weder alle Exemplare, welche zu den Nummern seiner Notizen gehören, noch alle Blätter seiner Notizen, welche zu den vorhandenen Bälgen gehören sollten, verhanden. Alles irgend Wissenswerthe aus seinem Journal werde ich später, wenn ich, mit den Bestimmungen fertig, das gesammte Material bearbeite, publiciren. Ueber die wissenschaftlichen Ergebnisse der Expedition ist m. W. nichts gedruckt; eine Reisebeschreibung

Steen Bille, Beretning om Corvetten Galatliea's Reise omkring Jorden Kjöbenhavn 1849—51.

in dänischer Sprache (und übersetzt ins Deutsche) darf keinen Anspruch auf Wissenschaftlichkeit erheben; es werden darin vorwiegendmercantile Interessen berücksichtigt. Der für uns wichtige Theil des Itinerars geht natürlich nur soweit, bis Belm in Südamerika an Land ging. Von da ab fehlt mir vorläufig jede Kenntniss sener Route, doch hoffe ich, im Laufe der Zeit durch die Wittwe Seine Briefe etc. zu erhalten, um das Nothwendigste über seinen Weg festzustellen. Unter solchen Umständen machte es bei den Bestimmungs-arbeiten oft grosse Schwierigkeiten, das Habitat der Exemplare zu eruiren, da auf den Etiketten sehr oft Eingeborenen-Farnen angegeben waren, die kein geographisches Lexicon aufwies.

Unter den Drosseln fand ich eine neue Art, welche HSeebohm auf seinen Wunsch in den Proceedings

1887 No. XXVII, June 23, 1887 p. 557.

der Zoologiscien Gesellschaft in London beschrieb. In dem kleinen Aufsatz, velcher von meiner *Merula subalaris* Lev. handelt, sind ein paar störende Druckfehler untergelaufen, welche ich hier verbessern möchtc Zeile 12 v. o. muss es statt 10 th of August, 8 th of October, Zeile 14 v. o. muss es statt 11 th of July, 7 th of November, Zeile 16 v. o. muss es statt 9 th of July, 7 th of September, und daher auch Zeile 8 v. o. nicht July and August, sondern October and November heissen.

Eine exquisite Tafel der neuen *Merula* ist in Royal-Quarto von Keulemans in London hergestellt, welche in Seebohm's grossem Drosselwerke erscheinen wird. — Wohl infolge eines Missverständnisses ist in einer kurzen Notiz über die englische Publication von Prof. Dr. Cabanis im Journal für Ornithologie

bemerkt, See-bohm hätte die neue Form in Kiel gesehen; vielmehr konnte ich den Balg, welcher keine andere Bezeichnung auf der Orginaletikette trug, als die des Datums und Fundorts, nicht unter den bekannten Drosselarten unterbringen, sandte ihn nach London und bezeichnete ihn dem bekannten Ornithologen und ersten Drosselkenner Henry Seebohm als vermuthlich neu. Wenn das fragliche Stück in Berlin „zur Bestimmung“ gewesen ist, so ist es jedenfalls seinerzeit unbezeichnet

Der Grund, wesshalb diese Art, obgleich als neu erkannt, damals nicht annectirt wurde, ist ja in der vorstehend angezogenen Journal-Stelle deutlich angegeben. Der Herausgeber.
zurückgekommen, während einige Dutzend andere Bälge auf ihren Etiketten Aufschriften in Prof. Cabanis' Zügen tragen.

1. *Aphobus megistus* Lev., n. sp.

Diagn. *A. chopi* similis, sed major; imprimis rostro longiöre; nitore corporis aeneo magis conspicuo.

Hab. Bolivia (Santa Cruz et San Miguel).

Typ. Duo specimina in Mus. zool. Kiel, a Behno collecta asservantur.

11. Mai 1847. Orig. No. 1987 A

In den 5 Bänden handschriftlicher Notizen Behn's, welche das Kieler Museum besitzt, fehlen die zu diesen Nummern gehörigen Blätter. Lev.

S. Cruz.

17. Juni 1847. Orig. No. 2096 A*) S. Miguel.

Not. Im Ibis 1884 (p. 163 und 164) machte schon Ph. L. Sclater auf Grössenverschiedenheiten des „Tordo“ (*A. chopi*) aufmerksam : er unterschied eine stärkere südliche Form von Paraguay und Süd-Brasilien (*A. chopi*) und eine schwächere nördliche von Südost-Brasilien [Bahia, Pernambuco] (*A. sulcirostris*). Vermuthlich haben Dr. Sclater Bolivia-Exemplare vorgelegen, welche, nach den Behn'schen Stücken zu urtheilen, erheblich grösser sind als die Brasilianer, von denen das Kieler Museum eine grosse Serie aus verschiedenen Gegenden Brasiliens besitzt. Wenn Dr. Sclater aber vermuthet, dass die sudbrasilianischen Exemplare von *A. chopi* zu dieser grossen Form gehören, so beweist ein von Dr. von Ihering in der Provinz Rio Grande do Sul gesammeltes altes Männchen, im Museum Hans von Berlepsch, das Gegentheil. Dieser Vogel ist durchaus nicht von den kleineren Exemplaren aus Paranahyba, Rio Manso, Monte afeyre, Dvivadino

Die genannten Localitäten sind wohl in der Provinz Goyaz zu suchen. (H. v. B. in litt.) Lev.

verschieden. Ob nun der Paraguay vogel, auf dem der Name *chopi* (Vieil. ex Azara) basirt, zur grossen bolivianischen oder zur kleinen brasilianischen Race gehört, kann erst mit Sicherheit festgestellt werden, wenn Vögel aus Paraguay zur Vergleichung vorliegen. Im Britischen Museum

Cf. Cat. Brit. Mus. Vol. XI p. 405 (1886).

befindet sich ein „# ad.“, dessen Fundort „Paraguay?“ -fraglich-angegeben ist. Es scheint nach Seiater's Bemerkungen, dass dieser Vogel der grösseren Race zugehört. —

A. megistus unterscheidet sich von *A. chopi* durch bedeutendere Grösse, längere Flügel, längeren Schwanz, höheren Tarsus und namentlich auch durch viel längeren, stärkeren Schnabel. Die Sulci am Unterschnabel scheinen etwas tiefer zu sein. Auch der Ober- schnabel zeigt bei *megistus* einige von der Nasengrube as parallel mit dem Culmen laufende nicht sehr tiefe Sulci, welchebei *chopi* kaum angedeutet sind. Ausser diesen auffallenden Grössenifferenzen, welche am besten durch die unten folgende Maasstabell illustrirt werden, unterscheiden sich die Bolivia-Vögel auch durcbeinen viel ausgeprägteren mehr grünlichen Stahlschiller des ganze Körpers (namentlich auf Flügel und Schwanz). — Neben Sclater is teorbes

Ibis 1881 p. 339.

die verschiedene Grösse der *chopi* Exemplare aufgefallen denn er spricht von einem aus Nordost-Brasilien mitgebrachten Männchen als „einer kleinen Form dieser Species“. Wenn der brailianische Vogel sich als verschieden herausstellen sollte, so wär *unicolor* (Licht.) der für ihn in Anwendung zu bringende, weil älteste Name. Denn das Exemplar, welches Lichtenstein als *Icteru suniolor* Licht, im Berliner Doubletten-Verzeichniss

No. 178 p. 19 (1823)

aufführt, basirt auf dem brasilianischen Vogel, trotzdem Lichtenstein Azara ah synonym aufzählt.

Was die graphische Darstellung der *Aplobi* anlang, so sind die Abbildungen von *A. chopi* im Text des britischen Catlogs (1. c.) entweder in vergrössertem Maassstabe (?) oder, wenn in atürlicher Grösse, beziehen sie sich auf *A. megistus*, mit dem sie aarscharf übereinstimmen. Wir werden hoffentlich später eine Abhdung von *A. megistus* bringen. — Im Text des brit. Cataloges vemisst man zwei wichtige Literaturnachweise über *A. chopi*, nämlic:

Reinhardt, Bidrag til Kundskab om Fuglefaunaen ¡Brasiliens Campos p. 396 (in Vidensk. Medded.

Kjöbenhavn 870) und A. von Pelzein, Ornithologie Brasiliens III, 195.

Aphobus megistus Lev.

2. *Homorus Galatheae* Lev. n. sp.

Diagn. Corporis superna parte, alis, cauda pallide cinnamomeis; corpore subtus dilutiore; pileo rufescente-griseo, cristalli plumis elongatis exhibente; fronte anteriore cinnamomeo; primariis binis primis griseo-brunneis, ceteris basi extrema rufescenti griseo colore extus marginatis; frenis griseis nigro colore mixtis; rostro brevissimo, dimidia parte basali plumbea, apicali albicante; pedibus plum-beo-nigris.

Hab. Matto grosso. (Guyaba.)

Typ. Specimen typicum in Mus. Zool. Kiel, asservatur, collectum a Behno.

24. Juli 1847. Orig. No. 2144 A.

Das zugehörige Blatt fehlt. Aus dem zugefügten „A“ geht hervor, dass Belm mehrere Exemplare dieser Art sammelte. Lev.

No. des Abbalgen: 683. Cuyaba.

Dim. Long. tot. circ. 212 mm, alae 96, caudae 95, tarsi 27%, culminis rostri 19½.

Obs. H. cristato proximus, sed multo minor; necnon crista breviore, grisea, non rufa non cinnamomea. Species, quam primo visu distinguas.

Not. Diese augenscheinlich neue Species, von der sich ein als Weibchen bezeichnetes Exemplar unter den auf der Galathea-Expedition gesammelten Bälgen des Kieler Museums findet, unterscheidet sich durch die oben angegebenen Merkmale leicht von *H. cristatus* Spix, einer Art, von welcher ein Stück aus dem Mus. H. v. Berlepsch aus Bahia verglichen wurde. Vielleicht steht *H. Galatheae* Lev. noch näher dem *H. unirufus* (D'Orb.)

Voy. dans l'Am. mér. Oiseaux p. 259 „1835—1844“. Nach Coues Urnith. Bibliogr. II d instalment 1879 p. 254: „ostensibly 1847“.

aus Bolivia, woher D'Orbigny's Vogel stammt, während unser Exemplar in Matto grosso erbeutet wurde. Die D'Orbigny'sche Beschreibung differirt von der unsrigen in wesentlichen Punkten : D'Orbigny bezeichnet sein Exemplar als „roux uniforme assez vif, teinté de brun au milieu des plumes du dessus de la tête“. Es geschieht also der charakteristischen aschgrauen Färbung des Scheitels keine Erwähnung. Ausserdem scheint der D'Orbigny'sche *unirufus* noch sehr viel kleiner zu sein als unser *Galatheae*. (D'Orbigny: Al. 88 mm, Caud. 93, Rostr. 16, Long. tot. 230 mm.)

3. *Terenura elaopteiyoc* Lev. n. sp.

Diagn. *T. spodioptilae* ex Guiana Britannorum similis, sed remigibus omnibus extus olivaceo non griseo colore marginatis, remigibus intus atque tectricibus subalaribus flavo-albidis (non albo-griseis?).

Hab. Cayenne esse habitationem II. de Berlepsch e genere ac modo praeparationis iudicat; schedula-scilicet falso-affixa indicat „Bogota“.

Typ. Specimen unicum a. 1857 emptum ab Jamrach Londinensi in Mus. zool. Kiel, asservatur.

Dim. Long. tot. 85, al. 48½, caud. 37, rostr. culm. 12 ¾, tars. 13½ mm.

Not. Dieses einzige Exemplar einer anscheinend neuen Species, welche sich im Kieler Museum befindet, stammt der charakteristischen Präparationsweise — die Beine sind in den ‚Knieen‘ zusammengeheftet — nach zu urtheilen, aus Cayenne. Auf der Etikette findet sich schon der zweifelnde Vermerk: durch Jamrach angeblich aus Bogota 1857. Dieser Vogel stimmt im Wesentlichen mit der Beschreibung von *T. spodioptila* Sclater & Salvin

Ibis 188 1 p. 270, pl. IX Fig. 1.

überein, unterscheidet sich aber sehr wesentlich durch die olivengrünen statt aschgrauen Aussensäume der Schwingen. Die Innenfahnen derselben und die Unterflügeldeckfedern erscheinen weisslich gelb, was wohl bei der typischen *spodioptila* nicht der Fall sein dürfte, obwohl die Beschreibung hierüber nichts enthält. Der helle Augenstreif scheint weniger scharf markirt und mehr graulich als in der Abbildung Keulemans' von *T. spodioptila*. Die Bauchmitte erscheint ebenso weiss, wie die Kehle, während es in der Beschreibung von *spodioptila* heisst: „corpore (etc.) subtus cinereis, gula albicantiore“. Da die übrigen, der *spodioptila* nahe stehenden Arten (*T. callinota* Scl. aus Columbien und Veragua, *T. humeralis* Scl. & Salv. aus Ost-Ecuador) grüne Säume der Schwingen haben, so ist es nicht unwahrscheinlich, dass wir es hier mit einer vierten Form zu thun haben, welche die *spodioptila* Scl. & Salv. von Britisch Guiana in Cayenne vertritt.

4. *Trupialis militaris* (L.), subsp. nov. *falklandica Lev*.

Diagn. Simillimus militari, sed major, imprimis rostro fortiore, rectricibus externis extus dimidio apicali et apice ipso albo mar-ginatis, non apice obsolete pallide brunneo vittatis; subcaudalibus tectricibus similiter albo

colore marginatis neque obsolete fasciatis; lunula cervicali nigra magis conspicua et in guttur medium protracta.

Hab. Insulas falklandicas.

Typ. Specimen unicum in Mus. zool. Kiel, asservatur, emptum ab Jamrach a. 1862 Londinensi.

5. *Polioptila boliviana* Sel.

P. Z. S. Lond. 1852, p. 34 pl. 47.

species restituía.

B. Sharpe erklärt im Catalog des Britischen Museums

Vol. X p. 445. 1885.

nach dem Vorgänge Dr. Sclaters die *P. boliviana* Sel. für identisch mit *P. dumicola* (Vieil. ex Az.) Drei Exemplare des Kieler Museums:

stimmen zu gut mit der Originalbeschreibung in den Proceedings (l. c.) überein, als dass wir glauben könnten, *P. boliviana* sei mit *dumicola* zu verwechseln. Die fast reinweisse Unterseite mit leichtem, aschgraulichem Anfluge an der Brust, die viel hellere aschgraue, nicht blaugraue, Färbung der Oberseite, die weissen Federchen unter dem Auge, welche bei *dumicola* wie die übrigen Parthien der Kopfseiten schwarz sind, ferner der merklich längere Schnabel — bilden Charaktere, durch welche sich die alten Männchen der Species *boliviana* von denen der *dumicola* auf den ersten Blick unterscheiden lassen. Auch das Weibchen von *bolivianaM* differirt von dem Weib der *dumicola* des Museums Hans von Berlepsch durch reiner weisse Unterseite, sowie durch reiner weisse Zügel, Stirnwand und Umgebung des Auges, endlich durch den längeren Schnabel. Bereits Baird spricht sich in seiner Review of American Birds (1864 pag. 73 in Smith. Mise. Coll. 181) entschieden dahin aus, dass *P. boliviana* nicht mit *P. dumicola* zu identificieren sei.

Strassburg i. E. Juli 1888.
Paul Leverkühn.

G. Pätz'sche Buchdr. (Lipper & Co.), Naumburg a/S.

Wellington Philosophical Society. Anniversary Address Delivered by Walter L. Buller, C.M.G., D.Sc., &c.,
President.
On Saturday, August 7, 1875.
London: Printed by Taylor and Francis, Red Lion Court. Fleet Street. 1876.

Wellington Philosophical Society.

THE first General Meeting of the Society, for the present year, was held in the Provincial Council Hall on Saturday evening, August 7th, Professor Kirk, in the absence of the Vice-President, taking the chair.

New Members.

The following new members were admitted: — The Hon. Colonel Fielding, of London; John Ballance, Esq., M.H.R., Wanganui; Major Charles Brown, Taranaki; Henry T. Qarke, Esq., Under Native-Secretary; S. Herbert Cox, Esq., F.C.S., F.G.S., Assistant-Geologist, Government of New Zealand

The Chairman, in a few well-chosen remarks, then introduced the new President, Dr. Buller, C.M.G., F.L.S., F.G.S., &c.

The President's Address.

Dr. BULLER having taken the Chair, said :—

GENTLEMEN,—At the opening of each annual session of the Wellington Philosophical Society, something in the nature of an address is expected of the President; and as the Society has seen fit to elect me to this honourable post, I must endeavour, to the best of my ability, to fulfil its duties in this respect.

I understand that it is the custom here to open with a short address, reserving a more lengthy dissertation, on general scientific topics, for the close of the presidential term.

In selecting, then, a subject for the few remarks I shall offer this evening, I feel that I cannot do better than follow the example of my able predecessors in this Chair, by reviewing briefly the scientific work done by our Society during the past year (as recorded in the volume of 'Transactions of the New-Zealand Institute' just issued from the press). But, before doing this, I am anxious, with your indulgence, to step out of the beaten track and take a wider range, for the purpose of briefly noting the progress and development of scientific

research in this colony during a somewhat longer period.

My distinguished predecessor, the Hon. Mr. Man-tell, has on a former occasion recalled the circumstances under which, in 1851, the New-Zealand Society (the parent, as he termed it, of the New-Zealand Institute) was founded by his Excellency Sir George Grey. That Society flourished for a time, and promised to take firm root among the colonists; but immediately on the departure of its chief patron and promoter it languished, and ultimately became defunct through lack of funds. Years passed on, and a new Society was formed on the ruins of the old one; and of this I had the honour to be chosen Secretary. The original name of "The New-Zealand Society" was at first retained; but this was afterwards (at the instance, I believe, of Bishop Abraham) changed to that under which we have assembled this evening. It is just sixteen years this month since we held our first meeting in one of the upper rooms of the old Provincial Government Buildings—a very modest place compared with the one which, by the courtesy of his Honour the Superintendent, we are allowed to occupy this evening. Casting my mind back to those early efforts to kindle in our midst the torch of science, it seems to me that a glance (however hasty and imperfect) at the state of our knowledge at that time of the natural history and resources of the country, as compared with what it is at present, will best illustrate the rapid progress that has since been made in every department of natural and physical science.

At the time to which I refer, the scientific literature of the colony consisted of Dr. Hooker's 'New-Zealand Plora,' Dr. Mantell's chapters on New Zealand in his 'Fossils of the British Museum,' the 'Zoology of the Voyage of the Erebus and Terror,' Dr. Dieffenbach's two volumes of 'Travels' (which contained much information on geology and some valuable natural-history appendices), Professor Owen's early memoirs on *Dinornis* and its allies in the 'Transactions' of the Zoological Society of London, besides a few minor works and scattered papers in the 'Proceedings' of various learned bodies. With the exception of the botany, which had been explored at a very early date by Banks, Solander, Sparmann, and the two Forsters, and had afterwards been exhaustively treated by the accomplished Director of Kew, no department of New-Zealand biology had been, in any sense, properly worked. The lists of the fauna appended to Dieffenbacli's 'Travels,' although useful to students in the colony as a basis to work upon, were enumerations of such species only as were known to science, and were confessedly imperfect. In every section of zoology the number of recorded species has been considerably increased. For example, the whales and dolphins positively mentioned by that author as inhabiting the New-Zealand seas were only 4; the number has since been increased to 21, and new species are being continually added. Of the 84 species of birds enumerated, no less than 17 were of doubtful authority; the number of well-ascertained species has now reached 155, and of most of them the life-history has been exhaustively written. The 6 lizards have since increased to 14, not including one or two doubtful species. The list of fishes was then 92; it now comprehends 163 species, and fresh discoveries are being constantly made. Although the list of Mollusca even then included 240 species, the number has now increased to 502; the Radiata and Crustacea have been largely multiplied, while the list of insects has increased to nearly a thousand recorded forms. In botany large and important additions have been made in every section, chiefly through the zeal of local collectors in both islands. Dr. Hooker's 'Handbook of the New-Zealand Flora,' published in 1864, enumerates 935 species of flowering plants, to say nothing of the immense variety of ferns and lycopods, mosses and jungermannias, lichens, fungi, and seaweeds. The pages of our 'Transactions' contain many subsequent additions by Kirk, Buchanan, Travers, and other local botanists.

Of the physical geography and geology of the country comparatively little was at that time known, while a great part of the interior was still a *terra incognita*. Even the Southern Alps had not been explored, and nothing was known of those glaciers since discovered by Dr. Haast, which are said to surpass in magnitude and grandeur the well-known glaciers of the European Alps.

In the field of palaeontology, however, even he- affiliated body. Not only has the Institute been a rallying-point, so to speak, for the young scientific societies in various parts of the colony, but it has also, through its official branch (the Geological Survey), done much valuable work in every department of Natural and Physical Science. The volumes of geological reports issued year by year (all of them replete with original research), Dr. Hector's valuable treatise on Whales and Dolphins, the excellent synopsis of the Fishes of New Zealand compiled by Capt. Hutton, the critical lists of Mollusca by Dr. E. von Martens of Berlin (prepared at the expense of the Institute), and much other work of a similar kind bear testimony to the ability and activity of this department. And it is not too much to say that the growth and progress of the Institute is due in a very large measure to the individual zeal and energy of Dr. Hector.

From year to year the scientific work of the New-Zealand Institute has kept pace with the rapid progress of the colony; and the last volume of 'Transactions' (Vol. VII.) is in every way worthy of its predecessors, both as to bulk and quality. On a cursory perusal, it is evident that our Society has done its fair share of work during the year, no less than twenty-four of the papers selected by the Governors as worthy of publication having emanated from our Members.

As most of you are aware, our Vice-President, Mr. Travers, is one of the most industrious of our working

members; and the present volume contains a lengthy contribution from him, entitled "Notes on Dr. Haast's supposed Pleistocene Glaciation of New Zealand." The author dissents entirely from the learned Doctor's views as propounded in his Report to the Provincial Government of Canterbury in 1864, and since repeated; and following up his former article on the extinct glaciers of the South Island, he has now placed before us an able exposition of his own views on this subject. It is not within my province as President to express any opinion on the questions at issue, even were I competent to do so; but, without pledging myself to some of the views advanced, I can recommend the article to the careful study of all those who take an interest in the past physical history of "the land we live in."

Another important paper read before the Society during the past year is that by Dr. Hector on whales; and the excellent plates which accompany it, from photographs by Mr. Travers, add much to the interest of the article. It contains a full description of *Neobalæna marginata*, founded on a specimen which was captured among a large school of blackfish at Stewart's Island, and forwarded to the Colonial Museum by Mr. Charles Traill,—also of the "Sulphur-bottom" (*Physalus australis*), the skeleton of which is now in the Wellington Botanic Gardens,—and of that interesting form of ziphioid whale known as *Berardius hectori*, from a specimen cast ashore in Lyall Bay in January last.

It is to be hoped that Dr. Hector will be able to carry out his intention of publishing, while in England, a monograph of the Cetacea inhabiting the southern seas, for which, as he informs me, he has collected and taken home ample material. There is probably no other section of zoology in which a contribution of this sort would be more acceptable to the savans of Europe, owing to the present neglected state of its literature and the confusion of nomenclature in which many of the species are involved.

There is another article from the same pen, on New-Zealand ichthyology, which contains descriptions of no less than sixteen new species of fishes, all taken recently on our coast, thus proving that this field of investigation is far from being exhausted.

In the section Botany, the first article is a paper read by Mr. Buchanan in November last on the Flowering Plants and Ferns of the Chatham Islands, the materials being drawn from the collection in the herbarium of the Colonial Museum, nearly the whole of which was made by Mr. Henry Travers during his two expeditions to those islands in 1861 and 1871. The article throughout bears testimony to Mr. Buchanan's usual care and accuracy; and the illustrations (five in number) are very beautifully executed. That of the so-called Chatham-Island lily (*Myosotidium nobile*), a handsome plant with large glossy leaves and clusters of blue flowers, which I was fortunate enough to discover during a visit to the Chathams just twenty years ago, is especially noticeable.

Our late President, Dr. Knight, resuming a subject in which he has already made several important contributions to science, presents us with a vauable paper on New-Zealand lichens, and with another containing descriptions of some new species of *Gym-nostomum*, all the carefully drawn illustrations being from the author's own pencil.

The papers on chemistry have emanated, as usual, from Mr. Skey, the analyst to the Geological Survey, the value of whose work in this department of science has already been brought prominently before you by a former occupant of this chair.

I will not detain you longer, as there are several papers to be read; but I would just point out that the eminently practical treatise by Mr. Lemon on "duplex telegraphy," and the suggestive paper by Mr. McKay on the hot winds of Canterbury, show that other subjects have been discussed, and that the attention of our Society has not been confined to any particular branch of scientific inquiry— that, on the contrary, it has during the past year kept in view the avowed object of its existence, namely "the development of the physical character of the New-Zealand group—its natural history, resources, and capabilities."

Papers.

The PRESIDENT said he had received a letter from Dr. Hector, and lie was quite sure the Meeting would be glad to hear it read. The letter contained a series of very interesting ornithological notes made daring the voyage to England.

A paper was read from the Venerable Archdeacon Stock, containing remarks upon a large Bat that had been seen by him in 1854, which he believed to be a new variety.

Mr. Kirk stated that he had seen a large Bat at the Clarence River, but he had been unable to distinguish it from *Scotophilus tuberculatus.*

The PRESIDENT read a paper entitled "Notes on *Gerygone flaviventris*." The paper contained extracts from 'The Birds of New Zealand,' and observations in reply to a paper from Mr. Justice Gillies in last year's volume of 'Transactions.'

A paper entitled "Remarks on Dr. Finsch's paper on Ornithology, in Vol. VII. of 'Transactions of the

New-Zealand Institute,'" was also read by the President. The paper contained criticisms on Dr. Finsch's views respecting classification, as propounded in a paper read before the Otago Institute.

A discussion ensued, in which the author of the paper and Messrs. Kirk and Graham took part, on the question "What constitutes a species?" The President contended for the specific value of *Apteryx mantelli* of the North Island, on the ground that it was readily distinguishable from the other bird, and that the variation was *constant*; while Professor Kirk agreed with Dr. Finsch, who proposes to call it *Apteryx australis*, var. *mantelli*, considering that the bird discovered in the North Island is merely a variety of the species in the south (*Apteryx australis*), the slight difference between them being insufficient to warrant their separation.

Mr. C. C. GRAHAM, in proposing a vote of thanks to the President, said that the Society was fortunate in having at its head one who had so thoroughly identified himself with the furtherance of science in New Zealand. The able *résumé* contained in Dr. Buller's address gave a clear view of the rise and progress of science in this colony, and of its rapid development during the past few years. He asked the Meeting to join with him in congratulating their President on the scientific honours which had fallen upon him. Although born and bred in the colony, he had, through his devotion to science, achieved a position of great distinction, and was therefore entitled to the thanks of all who had the interest of the country at heart.

The vote was carried by acclamation.

Dr. BULLER expressed his thanks, and then intimated that at the next Meeting, which would probably take place in the new lecture hall at the Museum, a paper would be read by Mr. Carruthers on "Volcanic Action regarded as due to the retardation of the Earth's Rotation."

VII Jahresbericht (1882) des Ausschusses für Beobachtungsstationen der Vögel Deutschlands.
Separatabdruck aus Caban. Journ. für Ornithologie, Jahrgang 1884. Januar-Heft
Naumburg a/S. G. Pätz'sche Buchdruckerei (O. Hauthal).

VII. Jahresbericht (1882) des Ausschusses für Beobachtungsstationen der Vöge1 Deutschlands.

Verzeicliniss der Mitarbeiter.

I. Norddeutschland.

1. Westlicher Theil, Oldenburg, Hannover, Bremen, Hamburg, Schleswig, Holstein. Director C. F. Wiepken, Oldenburg, Grossherzogthum Oldenburg.

Lehrer Huntemann, Oldenburg, Grossherzogthum Oldenburg.

Organist H. Fick, Grasberg (Stade), Provinz Hannover.

Custos Fr. Böckmann, Hamburg.

Lehrer Paulssen, Flensburg, Provinz Schleswig-Holstein.

Gymnasiallehrer Rohweder, Husum, Prov. Schleswig-Holstein.

2. Mittlerer Theil, Altmark, Mittelmark, Priegnitz, Uckermark, Mecklenburg, westliches Pommern.

Lehrer Martius, Planitz bei Neustadt a. d. Dosse, Provinz Brandenburg.

Professor Dr. Altum, Eberswalde, Prov. Brandenburg.

Dr. Quistorp, Greifswald in Pommern.

3. Ocstlichcr Theil, Neumark, östliches Pommern, Posen. Stud. jur. Ziemer, Belgard in Pommern.

4. Provinz Freussen.

Förster Schmidt, Wondollek (Dlottowen), Kreis Johannisburg, Reg.-Bez. Gumbinnen, Provinz Ostpreussen.

Förster Spahling, Kurwien, Kreis Johannisburg, Reg.-Bez. Gumbinnen, Provinz Ostpreussen.

Förster Robitzsch, Norkitten, Reg.-Bez. Gumbinnen, Provinz Ostpreussen.

II. Mitteldeutschland.

5. Westlicher Theil, Rheinprovinz, Westfalen, Kurhessen. Baumeister C. Sachse, Altenkirchen, Reg.-Bez. Coblenz. Lothar Prinz von Isenburg-Büdingen, Ramholz, Kreis Schlüchtern, Reg.-Bez. Cassel, Provinz Hessen-Nassau.

Präparator Koch, Münster in Westfalen.

6. Mittlerer Theil, Harz, Thüringen, Anhalt, Provinz

Sachsen (südlicher Theil), Königreich Sachsen. Moritz Neumann, Grossenhain, Königreich Sachsen.

7. Ocstlichcr Theil, Schlesien und Riesengebirge. Beobachter fehlen.

III. Süd deutschland.

8. Westlicher Theil, Elsass-Lothringen, Pfalz, Gross herzogthum Hessen, Baden, Württemberg. Beobachter fehlen.

9. Ocstlichcr Tlieil, Baiern. Pfarrer Jäcke1, Windsheim, Bezirksamt Uffenheim, Königreich Baiern.

Die unterzeichneten Mitglieder des Ausschusses für Beobachtungsstationen der Vögel Deutschlands legen im Nachfolgenden den 7. Jahresbericht vor, der die Zeit vom 1. November 1881 bis zum 31. December 1882 umfasst.

Das eingelaufene Material wurde, wie im vorigen Jahre, in der Weise vertheilt, dass Dr. R. Blasius neben der Gesammt-redaction und dem allgemeinen Theile des Berichtes die Gattungen *Lusciola, Cyanecula, Erythacus, Ruticilla, Turdus, Saxícola, Pratíncola, Cinclus, Motacilla, Anthus, Accentor, Rcgulus* und *Sylvia* im weitesten Sinne, R. Taneré sämmtliche übrigeu Singvögel bis auf die Familie der Corviden, Dr. A. Müller die Corviden, sämmtliche Schwimmvögel, Raubvögel, Tauben und Hühner und J. Rohweder die Sumpf- und Schwimmvögel übernahm.

Die Beobachtungen aus Oesterreich-Ungarn werden für die Folge in unseren Berichten fehlen, da das auf Anregung Seiner Kaiserlichen Hoheit, des Kronprinzen Rudolf ge- bildete Comité für ornithologische Beobachtungsstationen der Vögel Oesterreichs und Ungarns dieselben in einem demnächst bereits für das Jahr 1882 unter Redaction des Herrn v. Tschusi zu Schmidhoffen erscheinenden Berichte in den Mittheilungen des ornithologischen Vereins in Wien veröffentlichen wird.

Die Reihe unserer Beobachter hat manchen werthvollen Zuwachs erhalten, ist aber noch immer sehr lückenhaft. Hoffentlich werden uns noch eine Reihe von Beobachtern ihre ornithologischen Notizen zur Bearbeitung einsenden und dieselben nicht durch Einzel-Publicationen zersplittern. Erst, wenn alle in Deutschland beobachtenden Ornithologen uns ihr Beobachtungsmaterial consequent zur Disposition stellen, wird es hoffentlich gelingen, manche Lücken in der Kenntniss der Vogelwelt Deutschlands auszufüllen. Dieser Plan kann wesentlich gefördert werden durch eine systematische nach denselben Principien arbeitende Beobachtung. Höchst förderlich würde es sein, wenn die österreichischen und deutschen Beobachter hierin dieselben Grundsätze verfolgten, da beide Länder, als Hauptbestandteile Centrai-Europas, in zoologischer Beziehung gewissermassen als ein Ganzes betrachtet werden können. Wir geben daher im Nachfolgenden nochmals die bereits im vorigeu Jahre abgedruckten für Deutschland wichtigsten Sätze aus der von Herrn v. Tschusi ausgearbeiteten Instruction wieder:

Als Beobachtungszeit ist das Kalenderjahr festgesetzt.

Um das Zusammenstellen des uns zukommenden ornithologischen Materials zu erleichtern, wird Folgendes der Berücksichtigung der Herren Einsender dringendst empfohlen:

- Foliobogen für das Manuscript zu wählen.
- Die Bogen nur auf „einer Seite“ zu beschreiben.
- Sich der systematischen Reihenfolge und der lateinischen Benennungen zu bedienen, wie sie das in Kürze erscheinende „Verzeichniss der Vögel Deutschlands“ enthält.
- Alles, was auf eine Art Bezug hat, unter dem Namen derselben zu vereinigen, und zwischen jeder folgenden Species einen mindesten einen Centimeter breiten freien Raum zu zu lassen, damit jede auf den einzelnen Bogen angeführte Art leicht abgetrennt werden kann.
- Die Manuscripte im Januar einzusenden, da in der ersten Hälfte des Februars mit der Bearbeitung derselben begonnen wird.

Bei den Einsendungen der Beobachtungsnotizen ist Folgendes besonders zu berücksichtigen:

I. Angabe der Grenzen dos Beobachtungs- Gebietes, wo möglich mit einer kurzen Schilderung der topographischen Beschaffenheit desselben.

II. Vorkommen.

1. Welche Vogelarten sind Ihnen vorzüglich bekannt geworden und welche landesüblichen Benennungen fuhren dieselben?

2. Welche Arten sind Ihnen als das ganze Jahr in derselben Oertlichkeit bleibend bekannt (Standvögel)?

3. Welche Arten verändern nach der Jahreszeit ihren Standort (Strichvögel)?

4. Welche Arten werden nur am Durchzuge (im Frühjahr oder Herbst oder zu beiden Zugzeiten) beobachtet (Durchzugsvögel)?

5. Welche Arten sind als aussergewöhnliche Erscheinungen zu betrachten, und welche Gründe halten Sie für die Ursache ihres Kommens?

6. Welche Arten sind bei Ihnen selten, sparsam oder häufig?

7. Welche Arten kommen gleichzeitig in der Ebene und im Gebirge vor und bis zu welcher Höhe steigen dieselben in diesem empor?

8. Haben Sie beobachtet, dass sich bei Ihnen eine Art auffallend vermehrt oder vermindert hat, dass mit der Vermehrung einer Art eine andere verschwindet oder sich vermindert; geschah dies, weil sich die Bedingungen, die jede Art an ihren Aufenthaltsort stellt, geändert haben, oder aus welchen anderen Gründen?

9. Fehlen sonst gemeine Vögel (z. B. Sperlinge, Schwalben, Elstern etc.) in Ihrem Beobachtungsgebiete und was betrachten Sie als Ursache dieses Fehlens?

10. Haben Sie Sommervögel überwinternd und Wintervögel über Sommer beobachtet und welche Arten waren es?

11. Finden sich bei Ihnen bei gewissen Arten bestimmte Farbenabänderungen, Bastarde oder Hybriden?

12. Haben Sie beobachtet, dass ein Vogel, der sich durch gewisse Eigenthlimlichkeiten von allen anderen seiner Art unterschied, durch mehrere Jahre zu demselben Orte zurückkehrte?

III. Bezüglich des Zuges ist zu notiren:

1. Das erste Erscheinen.

2. Das Eintreffen der Hauptmasse.

3. Das Eintreffen der Nachzügler.

4. Der Beginn des Abzuges.

5. Der Abzug der Hauptmasse.

6. Der Abzug der Nachzügler.

7. Bei welchen Arten haben Sie im Frühjahr einen Rückzug beobachtet und welche Gründe können denselben veranlasst haben? Betheiligten sich alle Individuen einer Art oder nur ein Theil derselben daran und wann und bei welcher Witterung erschienen sie wieder?

8. Die Zugrichtung der Vögel im Allgemeinen und der einzelnen Arten im Speciellen, so wie die Tages- oder Nachtzeit des Zuges.

9. Die Witterung und Windrichtung am Beobachtungstage, und bei ungewöhnlichen Vogelzügen auch die des vorhergehenden und folgenden Tages.

10. Welche Arten beobachteten Sie mit dem Winde, welche gegen denselben ziehend?

11. Welche Oertlichkeiten werden in Ihrer Gegend von gewissen Arten als Rastplätze aufgesucht? Sind dieselben nach den Jahreszeiten verschieden und was halten Sie als Grund des Besuches derselben?

12. Haben Sie darüber Beobachtungen angestellt, ob Männchen und Weibchen, junge und alte Vögel bestimmter Art gesondert oder zusammen ziehen; ob, wo ersteres der Fall, deren Zugzeit eine verschiedene ist?

13. Welche Arten erscheinen einzeln, paarweise, in Flügen oder in Schaaren?

14. Welche Arten sind bei Ihnen eingewandert oder verschwunden und welche Gründe halten Sie als Veranlassung dieser Veränderung? Wir machen hier speciell auf folgende Arten aufmerksam: Schwarzer Milan (*Milvus ater*), Röthelfalke (*Falco cenchris*), Blauracke (*Coracias garrula*), Gartenammer (*Emberiza horlulana*), Grauammer (*Emberiza miliaria*), Girlitz (*Fringilla serinus*), Staar (*Sturmis vulgaris*), Wachholderdrossel (*Turdus pilaris*), Steinröthel (*Petrocinrla saxatilis*) und Storch (*Ciconia alba*).

15. Wird die Zugrichtung bei Ihnen durch den Lauf eines Flusses, durch die Biegungen eines Thaies oder Gebirges bedingt? Wird dort, wo sich in der Zuglinie ein Gebirge befindet, dieses überflogen oder umgangen?

16. Welche Arten weichen einem solchen Hindernisse aus und welche überfliegen dasselbe?

IV. Briitegeschüft.

1. Wie oft brüten die von Ihnen beobachteten Vögel?

2. Wann fanden Sie die einzelnen Gelege und aus wie viel Eiern bestanden dieselben?

3. In welchen Zwischenräumen wurden die einzelnen Eier gelegt?

4. Wie lange dauerte die Bebrütung, und nahm auch das Männchen daran Theil, und wann löste es das Weibchen ab?

5. Bei welchen Eiern haben Sie Albinismus, Erythrismus und Melanismus beobachtet?

6. Legen junge Vögel anders gefärbte und geformte Eier als alte?

7. Welche Arten benutzen dasselbe Nest zu einer zweiten Brut im selben oder im folgenden Jahre und welche bauen stets ein neues?

8. Welche Oertlichkeiten werden von gewissen Arten als Nistplatz bevorzugt, in welcher Höhe fanden Sie die Nester und aus welchem Material waren dieselben gefertigt?

9. Bei welchen Arten haben Sie eine abweichende Nistweise, einen abweichenden Nestbau beobachtet und was halten Sie als die veranlassende Ursache desselben?

10. Sind Ihnen grössere Brut-Colonien, z. B. von Reihern, Möven, Seeschwalben, Saatkrähen, Uferschwalben etc., bekannt, wo befinden sich dieselben, aus wie viel Paaren bestehen sie beiläufig und haben Sie eine Vermehrung oder Verminderung beobachtet?

11. Sind Ihnen Horstplätze von Adlern und Geiern bekannt und wo befinden sich dieselben?

V. Biologische Beobachtungen aller Art,

so wie Beobachtungen über den Federwechsel der Vögel, wenn sie auf eigenen Erfahrungen beruhen, sind uns gleichfalls willkommen und werden Benützung finden.

Der Bericht ist in diesem Jahre zum ersten Male in einen allgemeinen und specieilen Theil getrennt.

In dem allgemeinen Theile soll ein Versuch gemacht werden, ein übersichtliches Bild über die Wanderungen der Vögel zu geben und zwar mit Heranziehung einiger weniger hervorragender Beispiele. Zu gleicher Zeit ist erstrebt worden, den Zusammenhang der Wandererscheinungen mit den meteorologischen Verhältnissen zu demonstriren. Seitdem wir sowohl in Deutschland selbst, als auch in den nördlicher und südlicher gelegenen Ländern, Skandinavien und Italien, regelmässige meteorologische Beobachtungsstationen haben und deren Resultate uns täglich mitgetheilt werden, wie z. B. in den vorzüglichen Wetterberichten der Wetterwarte der Magdeburgischen Zeitung von Hrn. Dr. Assmann, ist es möglich, derartige allgemeine Betrachtungen anzustellen. In dem vorliegenden Berichte ist hierzu nur ein Versuch gemacht; je mehr sichere ornithologische Beobachtungen wir aus unserem Vaterlande erhalten, je genauer und umfangreicher die Wetterwarten Europas hergestellt werden, desto mehr wird es auch gelingen, die Ursachen und die Veranlassungen der Vogelwanderungen in Deutschland zu ergründen.

In dem specieilen Theile sind, wie im vorjährigen Berichte, die einzelnen Vögel in systematischer Ordnung mit fortlaufenden Zahlen aufgeführt.

Indem wir allen Beobachtern, die Notizen uns mitgetheilt haben, unseren verbindlichsten Dank aussprechen, bitten wir, die für das ganze Jahr 1883 einzusendenden Beobachtungen im Laufe des Januar 1884 an Dr. R. Blasius (Braunschweig) einzuschicken.

Dr. R. Blasius.
Dr. A. Müller.
J. Roh weder.
R. Taneré.

I. Allgemeiner Theil.

Die Ankunft unserer ersten Zugvögel erfolgte im Allgemeinen im Jahre 1882 ziemlich früh. Während am 20. Februar über ganz Deutschland noch gelindes Frostwetter herrschte bei mässigen Winden. trat am 21. bei S.W.-Wind in Süddeutschland und W. und N.W", in Norddeutschland Regen und Erwärmung ein, der am 22. wieder eine geringe Abkühlung folgte. Am 26. stieg die Temperatur bei kräftigen Südwinden sehr bedeutend und ausser-gewöhnlich hoch (Münster +11°, Carlsruhe, Hamburg + 10°, Magdeburg, Berlin + 9°). Der Frühjahrsanzug der Singdrosseln erfolgte in Süd- und Mitteldeutschland in der letzten Februarwoche, in Altenkirchen am 24., in Braunschweig und Umgegend 24—27. Februar. In den ersten Tagen des Mirz trat wieder eine merkliche Abkühlung ein, am 5. März bei käftigen W. und S.W.-Winden Erwärmung. Um diese Zeit wurtoen bei Braunschweig auch wieder durchziehende Schwärme bewachtet und die ersten Frühlingboten an der Nord- und Ostsee, Ohoenburg und Flensburg 5. März. — Bei W. und S.W.-Winden fand dann am 10. und 11. März eine weitere auffallende, sich bs nach dem Nordosten Deutschlands erstreckende Erwärmung stitt (11. März Neufahrwasser + 9° und Swinemünde + 10°). in Ostpreussen wurden die ersten Singdrosseln am 14. bis 16. März beobachtet. —

Ein ähnliche ornithologische Erscheinung (früheres Ankommen in S.W.-Deutschland, mittleres in Mitteldeutschland und späteres in N.O.-Deutschland) zeigt sich auch bei der weissen Bachstelze, bei Wiudsheim in Baiern kamen sie am 26., Attenkirchen 24., Münster 25. Februar, bei Braunschweig und am Harz in den ersten Märztagen, in der Mark Brandenburg, bei Hamburg und Flensburg 7.-9. März und in Ostpreussen

21.—25. März an. —

Zu den frühen Zugvögeln können wir auch noch die Kriniche rechnen. Von fast allen Beobachtungsstationen wird ihe Zugrichtung von S.W. nach N.O. angegeben, die Hauptmasse der Kraniche scheint Deutschland in der Zeit vom 19. and 20. März überflogen zu haben, es herrschte wolkenloses, trockenes, ruhiges Wetter mit massigen südlichen Winden, aus dem Westen wie dem Osten Deutschlands haben wir nur um wenige Tage differirende Beobachtungen, Altenkirchen 19. und 20. März, Ostpreussen 20. und 21. März, die Isopiptese für die Kraniche war also ziemlich parallel dem Breitengrade.

Der erste unserer eigentlichen Sänger, der Weidenlaub-vogel, *PL rufa* wurde wohl durch, Mitte März unter dem Normalen in Deutschland liegende, Temperatur zurückgehalten. Wie die Kraniche scheint er mit den warmen Südwinden am 20. und 21. März bei uns eingerückt zu sein, in diesen Tagen wurde er in Süd, Mittel und Norddeutschland zuerst gesehen und gehört.

Das eigentliche Grosder Sänger wurde wohl durch die ausser-gewöhnliche in den ersten Wochen des April herrschende trockene Kälte und durch die bis zum 10. und 11. April im Allgemeinen herrschenden kalten N. und N.O.-Winde zurückgehalten. Mit dem 13. und 14. trat eine Wetteränderung ein, starke S.W.-Winde brachten Erwärmung und Regen, das Thermometer stieg durchschnittlich um 6—7°. Blaukelchen, Gartenrothschwanz, Müllerchen, Fitis, Kuckuk trafen im Allgemeinen Mitte April ein. —

Von unseren späteren Sommergästen ist die Thurmschwalbe mit einer derjenigen, die am sichersten beobachtet werden. Das Gros ist an ein und demselben Tage, am 2. Mai, eingetroffen in Windsheim in Baiern, Münster in Westfalen und in Braunschweig, was bei der ungeheueren Fluggeschwindigkeit der Thurmschwalben nicht zu verwundern ist. Am 29. und 30. April herrschten bei steigender Temperatur in ganz Deutschland kräftige südwestliche Winde, am 1. und 2. Mai war ruhiges, vorwiegend trübes, vielfach regnerisches Wetter.

Was den Abzug im Herbste anbetrifft, so pflegt die Thurm-schwalbe den Anfang zu machen. Es scheint, als wenn das Gros des Mauerseglers in den letzten Tagen des Juli aus Mitteldeutschland abgezogen ist. Vom 24. Juli an trat in Skandinavien, Dänemark und Deutschland eine allmähliche Abkühlung ein (am 24. Juli in Stockholm 22°, Kopenhagen 20°, Magdeburg und Leipzig 22" bei durchschnittlich mässigen westlichen und südwestlichen Winden; am 25. Juli in Stockholm 18°, Kopenhagen 18°, Magdeburg 17°, Leipzig 18° und ähnlicher Luftströmung, am 27. Juli in Stockholm 16°, Kopenhagen 19°, Magdeburg 16°, Leipzig 14° und kräftigen N. resp. N.W.-winden, von Haparanda an Uber Stockholm, südliches Schweden, Dänemark, Nord-, Mittel- und Ost-Deutschland), am 27. Juli wird aus Grossenhain in Sachsen gemeldet, dass das Gros fortgezogen sei bei N.-Wind und Regenschauern. In den folgenden Tagen trat noch weitere Abkühlung ein bei nördlichen Luftströmungen in Deutschland, namentlich im westlichen Theile, am 29. Juli zog das Gros aus Münster i/W. ab. Der Wind drehte allmählich nach W. und S.W., vom 2. August wird ein weiterer Massenabzug aus Münster gemeldet.

Das erste Abziehen von Kranichen wird vom 23. September aus Kurwien in Ostpreussen gemeldet. Am 22. September herrschten an der Ostsee, speciell an der pommerschen und preussischen Küste starke, vielfach stürmische nordöstliche Winde, die am 23. September schwächer wurden. Die Zugrichtung der Kraniche war eine südsüdöstliche. — Die Hauptdurchzüge von Kranichen wurden in der Zeit vom 24. bis 29. October in Mitteldeutschland beobachtet. Am 23. October herrschten mässige Südwinde, am 24. October schwache südliche und südwestliche Luftströmungen, die Kraniche zogen am 24. October bei Marienthal (Braunschweig) von O. nach W.; am 25. October waren wieder mässige, zum Theil stürmische S.W.-Winde aufgetreten, die am 26. October bei Regen in schwache südliche und südöstliche Luftströmungen übergingen und am 27. October bei Aufklärung des Himmels noch weiter nach O. drehten. Am 27. October zogen über den Südrand des Harzes 2 grosse Kranichflüge in der Richtung von N.O. nach S.W.

Von den späteren Zugvögeln liegen namentlich über die Graudrossel und den Weinvogel genauere Notizen vor. Der Zug der Grau drosseln begann Ende der 3. Woche Sep- tember und hat bis Mitte November angedauert. Die Tage vom 18.—20. September werden als Hauptzugzeit angegeben. Am 17. herrschen durchschnittlich südliche, am 18. östlich und südöstliche, am 19. und 20. östliche schwache Luftströmungen. — Der Weinvogelzug begann auch Ende September, die Hauptmassen scheinen aber in der ersten Woche November Deutschland passirt zu haben. Vom 2. November an herrschten durchschnittlich südliche, später nach S.W. drehende, allmählich an Stärke zunehmende Luftströmungen, die sich am 4., 5. und 6. November zu Sturm steigerten.

Von den hochnordischen Wintergästen liegen von der See-ktiste Beobachtungen über den Seidenschwanz vor. Einzelne Exemplare wurden am 18. und 22. November bei Oldenburg und am 20. November bei Flensburg geschossen. Nach der ausser-gewöhnlichen Erwärmung, die nach den starken Süd-, Südwest-und Weststürmen durch Deutschland und Skandinavien Ende der ersten Novemberwoche eingetreten war (6. November in Haparauda + 10°), erfolgte in der zweiten Novemberwoche allmähliche Abkühlung (10. November in Haparanda — 6°, 12. November — 22°), die vom 14. November an auch in Deutschland Temperaturen unter 0°

hervorbrachte, vom 20. November an begann es in Deutschland wieder wärmer zu werden. — Eine weitere Einwanderung vom Norden her scheint in der 4. Decemberwoche stattgefunden zu haben. Am 24. December wurden bei Oldenburg 8 Exemplare geschossen, in der Woche vorher war bei Haparanda und Petersburg sehr starke Kälte (ca. — 20° bis 25°) eingetreten, die erst Mitte der 4. Decemberwoche sich ermässigte.

II. Specieller Theil.

1. *Lusciola Luscinia* L. — Nachtigall.

Die ersten wurden im Frühjahre beobachtet bei Windsheim 30. April (selten, nur auf dem Durchzuge); Altenkirchen 28. April; Münster 15. April; Grossenhain 16. — 23. April; Walkenried 27. April; Lichtenberg 16. April (gesungen bis Mitte Juni); Braunschweig 24. April (vorher herrschten kalte scharfe Nordwinde, am

23. April trat Witterungswechsel ein mit warmem Südwinde); Marienthal 25. April; Oldenburg 24. April in grösserer Anzahl; Grasberg 26. April bei feuchtwarmem S.W.-Winde; Flensburg 4. Mai; Plänitz 22. April in grösserer Menge; Norkitten 25. April.

In Flensburg wird die Nachtigall von Jahr zu Jahr seltener.

2. *Cyanecula suecica* L. — Blaukelchen.

Ankunft in Kamholz 15. April (nach der Aussage alter Vogelfänger sollen sie dort nur am 15. und 25. April auf dem Durchzuge passiren!); Münster 30. März, die $ etliche Tage später; Grossenhain 10. April bei N.O.-Wind, Nachts Frost; Grasberg 24. April bei N.-Wind (vorher war das Wetter stürmisch und regnerisch gewesen).

Bei Münster waren die Blaukelchen (immer nur die weiss- sternige Form *leucocyanea* Chr. L .Brehm) häufiger wie früher, sie brüten dort ausser an Flüssen, wie Ems und Werse, häufig an ganz unscheinbaren Gräben und Tümpeln, wenn nur die ganze Umgebung für sie passt.

3. *Erytliacus rubeculus* L. — Rothkelchen.

Ankunft der Zugvögel in Windsheim 18. März; Altenkirchen 6. März; Ramholz 23. März; Walkenried 6. März; Allrode 18. März; Marienthal 4.—16. März; Oldenburg 5. März; Flensburg 11. März vereinzelt singend, 13. März fast in jedem Busche bei westlichem Winde und warmem Frühlingswetter; Norkitten 10. März.

In vielen Beobachtungsstationen waren sie den Winter Uber geblieben; so in Windsheim ein Rothkelchen im Garten vom 29. November bis 15. December 1881; in Marienthal mehrere Exemplare im Januar; in Greifswald blieben ungewöhnlich viel Rothkelchen, jedenfalls zurückgehalten durch die vielen Beeren an den Fliederbäumen, die bis in den späten Herbst an denselben hingen; in Oldenburg wurden sie ebenfalls den ganzen Winter hindurch beobachtet.

Herr Huntemann sah am 5. April an der Nordseeküste bei Seebad Dangart so viele Rothkelchen, wie noch nie zuvor, sie strichen direct dem N.O.-Winde entgegen.

In Altenkirchen wurden am 3. Mai 6 Eier gefunden; in Grossenhain fütterten die Alten am 28. Mai theils ausgeflogene, theils noch im Neste befindliche Junge der ersten Brut, am 2. Juli ausgeflogene Junge der 2, Brut; in Flensburg 14. Mai 6 und 3 Eier, 15. Mai 6 Eier.

Abzug in Marienthal 8. October bis 2. November; Windsheim 28. September bis 11. und 22. November; in Flensburg noch am 27. December angetroffen.

Eine sehr bedeutende Vermehrung der Rothkelchen wird berichtet aus Marienthal (jetzt 1 Paar auf 1 Hektar), Flensburg und Oldenburg.

4. *Ruticilla phoenicura* L. — Gartenrothschwanz.

„Rothsteert“ in Oldenburg.

Ankunft in Münster 15. April; Grossenhain 23. April; Oldenburg 12. April; Grasberg 22. April bei Regenluft, übrigens warmem stillem Wetter und von S.O. wehendem Winde; Flensburg und Plänitz 21. April; Norkitten 25. April.

In Grossenhaiu wurden am 25. Juni ausgeflogene Junge von den Alten gefuttert; in Oldenburg am 7. Mai Nest mit 4 Eiern gefunden; Nester in Flensburg oft im Walde im aufgeschichteten Fadenholze beobachtet.

Im Herbste wurden sie am 15, October noch in Flensburg beobachtet.

Bei Oldenburg scheint der Gartenrothschwanz an Zahl abzunehmen.

5. *Ruticilla Tithys* Scop. — Hausrothschwanz.

Ankunft in Windsheim 15. März; in Altenkirchen 24. Februar # da, 15. März # und # auf dem Hofe des Beobachters; Münster 15. März; Grossenhain 17. März einzeln, 19. März mehrfach; Kamholz 18. März; Schiesshaus 28. März; Walkenried 14. März; Allrode 21. März; Braunschweig 18. März einzeln, 21. März mehrfach; Marienthal 16. März; Oldenburg 21. März einzeln (S.O.Wind), 22. März mehrfach singend; Grasberg 21. März bei S.Wind (in der Nacht vorher leichte Regenschauer, am Morgen klares sonniges Wetter); Hamburg 5. April (soll schon eher dort gewesen sein!); Flensburg 1. April; Planitz 20. März.

In Windsheini flogen am 9. und 11. Juni die Jungen aus 2 Nestern ab; in Marienthal 29. Mai fast flügge

Junge; in Grosscnhain Beginn des Nestbaues 19. April, 30. Mai Ausfliegen der Jungen. Dasselbe Paar begann an demselben Brutplatze den Nestbau für die 2. Brut am 8. und 9. Juni, wurde anfangs von einem anderen später von diesem und seinem # angegriffen, schlug diesen Angriff glücklich zurück, hatte am 27. Juni Junge, die am 14. Juli ausflogen. In Flensburg wurden die Jungen häufig im Garten in den halbreifen Erbsen bemerkt.

Abzug: Marienthal 3. October; Allrode 15. October; Grossenhain in der Nacht zum 10. October (die Nacht war windstill, aber ziemlich finster, am 9. October S.S.O.-, am 10. Octobcr S.W.Wind); Windsheim am 15. October.

Bei Oldenburg ist der Hausrothschwanz entschieden häufiger geworden.

6. *Turdus merula* L. — Schwarzdrossel.

„Swartdrossel“, auch „Drôssel“ in Oldenburg.

Die Schwarzdrossel wurde an den meisten Beobachtungsstationen den ganzen Winter über gesehen, so in Windsheim, Braunschweig, Lichtenberg, Marienthal und Oldenburg.

Der erste Gesang wurde beobachtet in Grossenhain am 21. Februar, Marienthal am 27. Januar, Schicsshaus am 15. Februar und Flensburg am 2. März.

In Grossenhain war die erste Brut am 4. Juni, die 2. am 20. Juli ausgeflogen. In Lichtenberg wurde am 29. März ein Nest mit 4 Eiern gefunden; in Steterburg am 26. April die ersten Eier, am 1. und 6. Mai die ersten Jungen der 1. Brut, 2. Juli der 2. Brut. In Braunschweig begannen sie im Garten am 20. April zu bauen und am 28. April zu legen, in Marienthal war die erste Brut am 4. Juni flügge, die 2. am 28. Juli, die 3. kam nicht zur Welt, da wahrscheinlich ein Wiesel solche (3 Eier) in der Nacht vom 22. zum 23. August total zerstört und selbst die Madame nicht geschont hatte, wie zahlreiche Federn bekundeten. In Oldenburg wurden schon am 25. März fast flügge Junge beobachtet, bei Flensburg Ende Februar ein Nest mit 4 Eiern, ferner später 12. Mai, 20. Mai, 1. Juni und 29. Juli Nester mit Eiern.

Der Rückzug fand bei Lichtenberg in der letzten Hälfte des October statt.

Bei Oldenburg brüten die Schwarzdrosseln von Jahr zu Jahr in grösserer Anzahl.

7. *Turdus torquatus* L. — Schildamsel.

Beim Frühjahrsdurchzuge wurde sie noch Anfangs Mai einzeln in Oldenburg beobachtet; auf dem Herbstzuge in Flensburg im October häufig in Dohnen gefangen; bei Oldenburg Mitte October nur 2 Exemplare; bei Steterburg 2. October 2 Stück; bei Lichtenberg im October; bei Walkenried a/Harz am 11. October ein Paar; ähnlich in Altenkirehen am 4. October # und # dicht bei einander im Dohnenstieg.

8. *Turdus viscivorus* L. — Misteldrossel.

„Grauer Schacker“ in Oldenburg.

Im Winter wurden sie einzeln gesehen in Altenkirchen, Steterburg (Ende December 1882) und Norkitten.

Die Ankunft der Zugvögel wurde beobachtet in Grossenhain am 12. und 28. März einzeln, 31. März und 10. April in Schaaren bis zu 30 Stück; in Walkenried am 10. Februar; in Wieda am 25. Februar und Allrode 18. Februar.

Bei Grossenhain wurde am 23. April ein ziemlich fertiges Nest gefunden (3 Paare waren mit der Verfolgung einer Waldohreule beschäftigt!), am 7. Mai ein flügges Junges und am 21. Mai ausgeflogene Junge mit den Alten in Masse angetroffen; bei Flensburg brüteten sie in verschiedenen Wäldern, am 20. Mai wurde dort ein Nest mit ausgeflogenen Jungen und 1 verdorbenem Ei darin angetroffen; in Norkitten wurden am 22. Mai bereits junge ausgeflogene Misteldrosseln beobachtet.

9. *Turdus pilaris* L. — Wachholderdrossel.

Schacker wurden den ganzen Winter hindurch beobachtet in Allrode (17. Februar); Braunschweig (17. Januar grössere Schwärme!); Marienthal (5. Januar Züge von W. nach O., 27. Januar zahlreich am Waldrande entlang ziehend, 8. November in Schaaren von S.O. herkommend!); Oldenburg (Januar und Februar sehr grosse Züge, über 1000 Stück, 12. April Trupps bis 50 Stüek an der Küste); Hamburg Ende November bis zu 20 Stück; Flensburg (15. Januar auf einem Grasfelde, 20. Februar ungefähr 100 Exemplare, dann 11., 12., 13., 15., 23. und 26. März in kleineren und grösseren Schaaren angetroffen); Walkenried bis Ende April.

Ueber das Brüten berichtet Herr Pfarrer Jäcke1 aus Windsheim, dass die Wachholderdrosseln seit 1861 in dem mittelfränkischen Reviere Lellenfeld bei Günzenhausen brüten, und dass er am 25. Mai von einer dort brütenden Kolonie ein Nest mit 5 Eiern erhielt, das 2,62 M. hoch in der Gabel einer Föhrenstange stand. Auch in dem benachbarten Staatswald Brandlach brüten sie. Bei Grossenhain wurde ein Paar am 28. Mai, Futter sammelnd, beobachtet. Bei Belgard brüten sie nach Ziemer in ziemlicher Anzahl, jedoch immer nur einzeln, nicht in Kolonien, sowohl in Laub- als auch in Kiefernwaldungen. Die Nester stehen in einer Höhe von 3—6 M. auf allerlei Bäumen, Kiefern ebenso wohl, wie Erlen, Eichen und Buchen, am meisten wohl auf Birken. Bei Greiswald wurden schon im Sommer einzelne Flüge beobachtet, dis wohl jedenfalls in der dortigen Provinz ausgebrütet waren.

Auf dem Frühjahrszuge wurde bei Grossenhain am 12 März bei N.W.-Wind ein Zug von ca. 100 Stück in nordöstlicher Richtung abziehend beobachtet, am 19. März noch kleine Trupps angeroffen; auf dem Herbstzuge

wurden sie in Walkenried vom 6. October; in Seesen von Ende October an beobachtet.

Unser Beobachter aus Marienthal, Herr de Lamare, hält sie für den besten Wetterpropheten; wenn sie sich zu Zügen unter lautem Zwitschern zusammenschaaren, so steht ungünstige nasskalte Witterung oder Schnee in Aussicht.

10. *Turdus iliacus* L. — Weindrossel.

„Wienvägel“ in Oldenburg.

Auf dem Frühjahrszuge beobachtet in Altenkirchen am 26. Februar; Walkenried 23. Februar bis 29. April; Steterburg 20. Februar in grossen Massen; in den Hölzern bei Braunschweig 10. März, 15. März und 18. März; Marienthal 2.—8. März; Oldenburg 7., 8. und 9. April in grossen Massen; auf dem Herbstzuge in Oldenburg Ende October; Marienthal 24.-29. September und 8.—11. October, Steterburg 10. October bis 4. November; Seesen im letzten Drittel des September vereinzelt, in Masse erst in der ersten Woche November; Walkenried 26. September bis Anfang November; Altenkirchen 19. September.

Die meisten Beobachter erwähnen, dass im Jahre 1882 besonders wenig Weindrosseln durchgekommen sind; so wird dies namentlich berichtet von Ilolzminden, Marienthal, Oldenburg und Greifswald.

11. *Turdus musicus* L. — Singdrossel.

Ankunft im Frühjahr in Tückelhausen 28. Februar; Altenkirchen 24. Februar; Münster in den ersten Tagen des Februar; Grossenhain 14. März Nachts ein Zug bei kaltem N.W.-Winde; Schiesshaus 27. Februar; Wieda und Walkenried 26. Februar; Allrode 24. Februar; Lichtenberg 5. März; Steterburg 18. März; Braunschweig 27. Februar; dann später am 10., 15. und 18. März noch zahlreich in den umliegenden Hölzern auf dem Durchzuge bemerkt; Marienthal 7 März, am 9. März Durchzug von O. nach W.; Oldenburg 5. März nach N.O., dem Winde entgegen; Flensburg 5. Februar (1. Gesang!); Wondollek 16. März; Norkitten 14. März. —

Bei Steterburg wurden die ersten Eier am 22. April gefunden; in einem Garten bei Braunschweig waren am 25. März halbflügge Junge im Nest, die von einer Katze verzehrt wurden; bei Flensburg wurden gefunden 14. Mai Nest mit 4 Jungen, 1. Juni 5 Eier, 5. Juni kleine Junge, 29. Juni 4 befiederte Junge und 4 Eier; bei Norkitten am 22. Mai bereits Junge.

Herbstzug: Greifswald 20. September bis 20. October; Marien- thal 11. October Abzug der Brutvögel, 16. October Durchzug von N.W. nach S.O. und am 1. November von N.N.O. nach S.S.W.; Steterburg 24. September; Seesen Hauptdurchzug 18.—20. September, dann in geringerem Maasse ziemlich gleichmässig bis Mitte October und von da an mehr und mehr abgeschwächt bis Mitte November; Walkenried 31. October.

Sehr geringer Durchzug wurde beobachtet in Lichtenberg, Oldenburg und Greifswald, ein Abnehmen der Brutvögel wird gemeldet von Oldenburg.

12. *Turdus atrigularis* Temm. — Schwarzkehlige Drossel.

Bei Oldenburg wurde am 29. October ein # gefangen.

13. *Saxicola Oenanthe* L. — Steinschmätzer.

Sie erschienen bei Windsheim 9. April; Münster 8. April; Grossenhain 7. April; Oldenburg 6. April bei N.O.-Wind; Hamburg 8. April und Flensburg 13. April; Norkitten 21. April.

Am 3. Juni wurden ausgeflogene Junge bei Grossenhain beobachtet, am 9. Juni mehrfach; in Flensburg am 19. Juni flügge Junge in einem Neste in einem Steinkohlenhaufen.

Ans Münster und Grasberg wird ein auffallendes Seltenwerden des grossen Steinschmätzers berichtet.

14. *Pratincola rubicola* L. — Schwarzkehliger Wiesen-schmätzer.

In Altenkirchen wurde er zuerst am 19. März (ein #), in Münster am 18. März beobachtet. Bald nach der Ankunft in Altenkirchen begann es, kalt zu werden; am 22. März trat sehr starkes Schneetreiben ein.

Bei Oldenburg wurden am 15. Mai 2 Paare in Wildenloh angetroffen, und zwar unter Umständen, die unzweifelhaft darauf schliessen lassen, dass er dort Brutvogel ist. Am 29. April hatten sie in Altenkirchen Junge.

In Grossenhain am 3. September auf dem Herbstzuge in Kartoffelfeldern angetroffen.

In Münster waren sie in diesem Sommer weniger häufig, als in anderen Jahren.

15. *Pratincola rubetra* L. — Braunkehliger Wiesen-schmätzer.

Bei Oldenburg „Gierticker“ und „Vitick“ genannt.

Zuerst im Frühjahr beobachtet in Altenkirchen 5. April (# und #); Münster 19. April; Grossenhain 23. April; Oldenburg 20. März; Hindenburg 25. April (bei stiller ruhiger Luft und nördlichem Winde); Plänitz 22. April; Norkitten 1. Mai. Auf dem Herbstzuge am 8. September bei N.W.-Wind und schönem Wetter bei Grossenhain gesehen.

Bei Oldenburg in den Haidegegenden ist er häufig.

16. *Cinclus aquaticus* Bcbst. — Wasseramsel.

In Altenkirchen wurde am 20. März ein volles Gelege von 5 Eiern gefunden, ebenso am 14. April, am 20. April ein verlassenes Nest mit 2 Eiern.

Aus Ramholz wird berichtet, dass dort Anfang Mai 2 Nester mit Jungen ausgenommen wurden, um dafür

die Prämien Seitens des Casseler Fischerei-Vereins zu beziehen.

17. *Motacilla alba* L. — Weisse Bachstelze.

Bei Oldenburg „Quäksteert“.

Ankunft in Windsheim 26. Februar; Altenkirchen (wo einige den Winter Uber blieben, z. B. am 26. December beobachtet wurden,) 24. Februar; Münster 25. Februar; Grossenhain 16 März; Schiesshaus 1. März; Wieda 28. Februar; Walkenried 6. März; Allrode 1. März; Lichtenberg 4. März; Steterburg 8. März; Harien-thal 21. Februar; Oldenburg 5. März; Hindcnburg 18. Mirz bei O.-Wind (Nachts starker Reif, Tags Uber sonnig und varm); Hamburg 7. März; Flensburg 8. März; Plänitz 9. März; Wondollek 25. März; Kurwien 21. März; Norkitten 21. März.

Bei Grossenhain wurden am 30. April ausgeflogene Junge der 1. Brut und 10. Juni von der 2. Brut angetroffen; am 9. Juli bei Flensburg Nest mit Eiern in einem Strohhaufen; am 13. Mai bei Plänitz volles Gelege von G Eiern.

Abzug: Marienthal 1. November; Walkenried 14. October; Grossenhain 15. October, nachdem sich der einige Tage zuvor herrschende N.O. gelegt hatte (am 20. October, einem warmen Tage, bei S.W. wurden noch einzelne gehört!); Windslieim 29. October.

18. *Motacilla boarula* Penn. — Graue Bachstelze.

In Windsheim überwinterten einzelne, bei Münster sind sie Durehzügler, im Herbste und Winter treiben sich in der Regel einige Exemplare in der Stadt an der Aa und am Schlossgraben umher, die erste wurde beobachtet am 27. August, in Lichtenberg und Marienthal wurden sie als Sommervögel angetroffen, dort kamen sie am 17. März an, hier am 14. Februar und blieben bis 26. October, ähnlich in Grossenhain, wo die ersten bei heftigem O.-Winde am 2. April ankamen.

In Altenkirchen wurden am 10. April 6 kahle Junge gefunden, 15. April 5 frische Eier, 16. April ein Nest mit 6 zum Drittel bebrüteten Eiern und 6 Eier in einem alten Neste von *Motacilla alba*, 2. Mai 6 frische Eier, 23. Mai 6 zum Viertel bebrütete Eier, und 14. Juni 6 frische Eier; in Grossenhain 23. Juli Alte mit selbstständigen Jungen streichend.

Im Herbste am 3. September bei Grossenhain ziehend.

19. *Motacilla flava* L. — Gelbe Bachstelze.

Ankunft in Windsheim 13. April; Münster 16. April; Oldenburg 6. April (einzelnes Exemplar); Norkitten 21. April; Grossenhain 23. April bei S.-Wind und schönem warmem Wetter von S.W. nach N.O. durchziehend in Trupps von 4 bis 5 Stück.

Bei Grossenhain am 25. Juni mehrfach ausgeflogene Junge beobachtet.

Am 17. September wurden sie auf dem Durchzuge in Attenkirchen gesehen, am 3. September bei Grossenhain in kleinen Trupps Uber die Fluren streichend.

Bei Oldenburg ist sie nicht so häufig wie die weisse Bachstelze.

20. *Antlius aquaticus* Bebst. — Wasserpieper.

Bei Münster ist er Wintergast im Kanal und an den Wiesen.

21. *Anthus pratensis*. L. — Wiesenpieper.

Bei Braunschweig wurde der Wiesenpieper am 10. März auf dem Zuge beobachtet, bei Oldenburg im Januar, Februar und März häufiger an den Wänden von Gräben gesehen, wo er auch Saamen von *Molinia coerulea* zu fressen scheint; überhaupt ist er dort häufig und einzeln stets im Winter anzutreffen. Am 29. April wurde ein Nest mit 4 bebrllteten Eiern dort gefunden.

Bei Grossenhain zogen sie am 20. November 1881 bei herrlichem Sonnenscheine und 14° Wärme in Trupps bis zu 6 Stück von N.O. nach S.W. bei S.W.-Wind; am 10. und 12. März 1882 wurden sie dort wieder auf dem Frühlingszuge angetroffen, einzelne # am Nistplatz; am 1. October bei S.W.-Wind zogen sie von N.O. nach S.W. in kleineren Trupps durch, desgleichen am 8. October.

22. *Anthus arboreus* Bebst. — Baumpieper.

Bei Oldenburg „Heidlewing“.

Bei Windsheim leben ausserhalb des Waldes seit einigen Jahren mehrere Paare auf einem kleinen, eine Viertelstunde langen, mitten im Getraidelande liegenden Hügelzuge, dem sogenannten Weinthurm, der mit Weinreben, Hopfen, Klee und Getraide bebaut und auf seinem schmalen Rücken mit etlichen Nussbäumen, einem kleinen geschlossenen Bestände junger Lärchen, Föhren, Fichten und Birken, Dorn- und Quittengebüsch und auf dem Nordabhange mit einzelnen Obstbäumen bestockt ist. Ein Paar brütete dort mitten im Baumfelde, Kraut- und Getraidelande der Ebene und sang dort zum ersten Male am 22. April. In Münster kamen sie an am 15. April; Grossenhain 23. April; Oldenburg 19. April; Braunschweig 22. April; Norkitten 22. April.

Von Oldenburg wird berichtet, dass der Baumpieper jetzt dort häufiger sei, als früher.

23. *Anthus campestris*. Bebst. — Brachpieper

Bei Grossenhain wurde der erste am 23. April am Nistplatze angetroffen (Tags vorher herrschte S.O. -Wind!). Am 23. Juli wurden daselbst Alte mit Jungen in den Kornstoppeln futtersuchend beobachtet.

24. *Accentor modularis* L. — Flüvogel.

Einzelne Vögel bleiben den Winter hier, so in Altenkirchen, Münster, Oldenburg, Flensburg (4. Januar und 13. December gesehen); in Oldenburg blieb wohl ein Drittel aller Flüvögel im Winter dort, am 12. December pickten 2 Exemplare nahe an der Wohnung den ausgestreuten Saamen von *Polygonum lapathifolium*, einige Tage später bei hohem Schnee den Saamen der Brennnesseln.

Ankunft der Zugvögel in Altenkirchen 3. März (erster Ge- sang!); Münster Anfang März; Oldenburg 5. März. An diesem Tage bei W.-Wind war der Hand des Ilasbruches mit Flüvögeln förmlich übersät, sie stimmten das schönste Wettconcert an bei ausnehmend schönem schwülem Wetter. Bei Hamburg kamen sie am 15. März an, bei westlichen Winden und stillem sonnigem Wetter, bei Norkitten am 1. April.

Bei Altenkirchen wurden am 30. April und 3. Mai 5 resp. 4 frische Eier gefunden; bei Flensburg am 27. Juli mit kaum flüggen Jungen; bei Plänitz am 27. Mai ein Gelege von 5 Eiern.

Bei Oldenburg haben die Flüvögel entschieden zugenommen, unser Beobachter hat sie stets im Frühjahr zuerst am Morgen zahlreich gesehen und ist der Ansicht, dass sie bestimmt bei Nacht wandern.

25. *Regulus ignicapillus* Temm. — Feuerköpfiges Goldhähnchen.

In Altenkirchen am 3. April angekommen, bei Oldenburg aus einer Schaar von 6 Stück, die weiter strichen, 1 Exemplar am 2. Mai erlegt.

In Altenkirchen wurden gefunden am 12. und 16. Mai je 9 frische und am 21. Mai 9 stark bebrütete Eier.

Bei Altenkirchen und Oldenburg waren sie in diesem Jahre ziemlich selten.

26. *Regulus cristatus* Koch.— Gelbköpfiges Goldhähnchen.

Bei Windsheim wurden am 6. October 1881 die ersten Goldhähnchen in den Stadtgärten gesehen. Bei Grossenhain wurden sie am 6. November 1881 im Feldgehölz unter Führung von *Parus major* angetroffen, ebenso am 29. Januar (5° Wärme, W.-Wind) in Begleitung von *Certhia familiaris* und *Parus coeruleus*. In Oldenburg häufiger Standvogel, am 5. März grosse Schaaren im Hasbruche streifend, am 24. November hunderte im Wildenloh (bei S.O.-Wind).

27. *Sylvia nisoria* Bebst. — Sperbergrasmücke.

Bei Flensburg ist sie in den letzten Jahren nicht mehr bemerkt worden.

28. *Sylvia hortensis* Gm. — Gartengrasmüeke.

Ankunft in Münster 23. April; Braunschweig 4. Mai; Grosscnhain 7. Mai die ersten, 14. Mai mehrfach, 18. Mai alle Stände besetzt; Oldenburg 12. Mai.

In Grossenhain wurden am 20. Juni 2 Familien mit ausgeflogenen Jungen beobachtet, am 25. Juni ein eben erst fertiges Nest gefunden, am 8. und 23. Juli eben erst ausgeflogene Junge gesehen, in Flensburg 26. Mai Nest mit 4 Eiern, 17. Juni Nest mit 4 Jungen, 29. Juli Nest mit 3 Eiern.

Abzug in Grossenhain am 13. August das Gros fort mit Ausnahme einzelner, die noch ihre Jungen futterten; am 20. August noch Junge in Gemeinschaft der Alten angetroffen.

Von Oldenburg wird berichtet, dass sie dort viel seltener ge- worden sind; aus Flensburg wird folgende interessante Beobachtung mitgetheilt: „Am 21. Juni wurde in einer kleinen Buche ein Nest gefunden, am Nestrande lag eine Kreuzotter, welche das einzige Junge am Kopfe gepackt hatte und bemüht war, selbiges aus dem Neste zu schaffen. Das Elternpaar flog ängstlich schreiend im Busch umher, oft dem Räuber ganz nahe. Das Junge war noch nicht flügge; ob die übrigen Insassen des Nestes rechtzeitig entkommen, war nicht zu constatiren. 1881 wurde ein Knabe, der in ein Nest hineinfühlte, von einer darin liegenden Kreuzotter in die Hand gebissen.

In Grossenhain waren in Folge Abschiessens des *Lanius collurio* alle ständigen Grasmückenarten viel zahlreicher vertreten, als je zuvor.

29. *Sylvia atricapilla* L. — Mönch.

Ankunft: Altenkirchen 25. April; Frankfurt a/M. 15. April; Coblenz 16. April; Münster 23. April; Walkenried 21. April; Braunschweig 18.—21. April; Oldenburg 2. Mai (S.W.-Wind); Grasberg 10. Mai (bei N.-Wind eingetroffen, am Tage vorher stürmisch mit viel Regen); Hamburg 21. April.

In Grossenhain wurden am 25. Juni selbstständige Junge angetroffen, in Flensburg am 30. Mai Nest mit 5 Eiern, 19. Juni Nest mit 3 Eiern, die sämmtlich krankhafte Schaale hatten.

Aus Oldenburg wird berichtet, dass der Mönch dort von Jahr zu Jahr seltener wird.

30. *Sylvia cinerea* Brss. — Graue Grasmücke.

Alle Grasmücken heissen bei Oldenburg „Artschen“.

Ankunft in Münster 29. April; Braunschweig 4. Mai; Oldenburg 29. April; Flensburg 24. April.

Bei Grossenhain 2. Juli Nest mit 6 fast flüggen Jungen, 16. Juli Nest mit 4 schwach bebrüteten Eiern; bei Flensburg 27. August bis 8. September die ausgeflogenen Jungen in den Hecken und Erbsenbeeten.

31. *Sylvia curruca* Latli. — Müllerchen.

Ankunft in Windsheim 19. April; Altenkirchen 17. April; Münster 8. April; Frankfurt a/M. 15. April; Coblenz 16. April; Grossenliain 23. April; Walkenried 29. April; Braunschweig 18. April; Oldenburg 12. April;

Grasberg 14. April; Hamburg 15. April; Norkitten 4. Mai.

In Grossenliain wurden am 4. Juni ausgeflogene Junge von den Alten gefüttert; bei Oldenburg wurde am 12. Mai ein Nest mit 4 Eiern gefunden, ein Paar Tage später hat der Vogel nach Augenzeugen die Eier aus dem Neste getragen; bei Flensburg 20. Mai Nest mit 5 stark bebrüteten und 30. Mai Nest mit 4 frischen Eiern.

In Grossenliain am 10. September nur noch vereinzelte gesehen.

32. *Phyllöpneuste sibilatrix* Bebst. — Schwirrender Laubvogel.

Ankunft in Münster 23. April; Braunschweig 4. Mai; Oldenburg 30. April 1 Exemplar, 2. Mai bei W.-Wind sehr viele singend, offenbar Durchzügler darunter, da später dort weniger beobachtet wurden; Norkitten 3. Mai.

Bei Oldenburg ist er entschieden viel häufiger, bei Belgard (speciell bei Kl. Reichow) viel seltener geworden. Dies rührt bei Belgard offenbar von Veränderungen des Waldes her, indem einestheils der Boden durch Aufwachsen des Unterholzes zu kahl geworden, anderntheils durch Grüsserwerden der Schonungen zwischen alten Eichenüberständen eine allzudichte und zu hohe Verdeekung des Bodens vor sich gegangen ist.

33. *Phyllopneuste trochilus* L. — Fitislaubvogcl.

Ankunft in Münster 13. April; Braunschweig 19. April; Oldenburg 1. Mai; Grasberg 13. April (bei O.-Wind, mildem Wetter und bedecktem Himmel!); Norkitten 12. April.

Bei Grossenhain am 28. Mai eben ausgeflogene Junge beobachtet.

34. *Phyllöpneuste rufa* Lath. — Weidenlaubvogel.

Ankunft in Altenkirchen 23. März; Münster 22. März; Braunschweig 22. März; Oldenburg 20. März bei S.W.-Wind; Grasberg 26. März bei S.-Wind und feuchtem Wetter (am Tage vorher stürmisches Wetter mit Hagelschauern!); Hamburg 21. März; Norkitten 8. April.

Am 4. Mai wurden bei Oldenburg nackte Junge gefunden.

35. *Ficeclula hypolais* L. — Bastardnachtigall.

Ankunft in Münster 29. April; Grossenhain 6. Mai die erste,

doch noch sehr vereinzelt, (N.W.-Wind, schönes Wetter), 13. Mai überall; Braunschweig 5. bis 8. Mai; Oldenburg 15. Mai; Grasberg 18. Mai bei Nachtfrost, N.-Wind und bedecktem Himmel; Plänitz 11. Mai; Norkitten 8. Mai.

Bei Grossenhain am 18. Juni die ersten ausgeflogenen Jungen, am 23. Juli noch eben ausgeflogene Junge beobachtet; bei Plänitz am 10. Juni 5 Eier, bei Halberstadt 23. Mai fertiges Nest; bei Flensburg 9. Juli 3 Nester mit bebrüteten Eiern.

Abzug: bei Grossenhain am 20. August alle fort bis auf einzelne, die noch Junge fütterten, am 1. September noch einzelne angetroffen.

36. *Calamodyta phragmitis* Bebst. — Schilfrohrsänger.

Ankunft in Waikenried und Braunschweig 3. Mai; bei Oldenburg 30. April einzeln, 4. Mai allgemein; bei Plänitz I.Mai; Belgard Ende April und Anfang Mai.

Bei Plänitz wurde am 18. Mai ein Nest mit 6 Eiern gefunden; bei Belgard findet man von Mitte Mai an volle Gelege, meistens 5—6 Eier, in 1 Falle 7 Eier.

37. *Calamodyta aquatica* Lath. — Binsenrohrsänger.

Bei Kl. Reichow (bei Belgard) nur einmal am 16. August 1881 ein junges # auf dem Zuge beobachtet, bei Belgard selbst mehrere Male mitten im Sommer gesehen, am 22. Mai 1880 dort ein Nest mit 4 Eiern gefunden. Die Eier waren entschieden kleiner und abgestumpfter als die von *phragmitis*, stark 1 mm kürzer und 0,5 mm schmaler als kleine Eier von *phragmitis*. Das Nest stand etwa 0,25 M. über der Erde, war aussen mit etwas Moos durchfechten und innen mit ganz feinen Wurzeln glatt ausgelegt.

38. *Calamodyta locustella* Penn. — Heuschrcckenrohr-sänger.

Kam in Brannschweig an am 3. Mai; bei Belgard wurde bisher nur 1 Exemplar beobachtet (18. August) in einem Haferfelde und zwar ein junger Vogel; bei Planitz kommt er auf grösseren Wiesenflächen vor, am 23. Mai wurde ein Gelege mit 5 Eiern gefunden.

39. *Calamodyta palustris* Bebst. — Sumpfrohrsänger.

Ankunft in Münster 1. Mai; Walkenried 30. April.

Bei Flensburg am 9. Juli Nest mit kleinen Jungen; bei Plänitz am 27. Mai beinahe fertige Nester.

Bei Belgard ist *palustris* der bei weitem häufigste Rohrsänger, den man an allen einigermassen geeigneten Plätzen findet; sein Gelege besteht dort in der Regel aus 5 Eiern, 4 Eier findet man wohl nur bei Paaren, deren Nest und Eier schon einmal vorher zerstört sind. 2 mal wurde das Nest an ganz ungewöhnlicher Stelle gefunden, das eine stand auf einem horizontalen Weidenaste 2 M. vom Ufer entfernt, 0,25 M. über dem Wasser in einer Gabel ganz frei, das andere ebenfalls ganz frei in einem seichten Graben zwischen 4 Stengeln von *Scirpus lacustris*, enthielt am 10. Juni 2, am 11. 3, und am 14. 5 Eier.

40. *Calamodyta arundinacea* Gm. — Teichrohrsänger.

Ankunft in Münster 26. April; Walkenried 2. Mai; Braunschweig 3. Mai.

Bei Grossenhain am 2. Juli ausgeflogene Junge.

41. *Calamodyta turdoides* Mey. — Rohrdrossel.

Angekommen in Walkenried 30. April und Braunscbweig 3. Mai.

42. *Hirundo urbica* L. — Hausschwalbe.

Unbedingter Zugvogel auf allen Stationen.

Ankunft: In Windsheim am 18. April, am 20. bereits viele und am 3. Mai alle da; Münster 18. April; Walkenried 21. April; Wieda 10. Mai; Allrode 19. April; Braunschweig Ende April; Marienthal 14. April; Grasberg 28. April in sehr geringer Zahl bei S.W.-Wind; Plänitz 16. April.

In der Umgegend von Grossenhain haben die Schwalben im vorigen Jahre so stark gelitten, dass in Gehöften, wo früher an 20 Nester waren, nicht eine zu sehen; nur einige wenige Paare wurden am 28. Mai beobachtet.

Abzug: Bei Hamburg vom 15. — 23. October; Marienthal 1. October; Walkenried 10. October und in Windsheim 29. September; bei Münster wurden noch Ende October einige Exemplare beobachtet.

43. *Hirundo rustica* L. — Rauchschwalbe; Unbedingter Sommervogel.

Ankunft: In Tückelhausen am 8. April; Windsheim 13. April; Altenkirchen 19. März die erste bei S.W.-Wind, dann erst wieder am 12. April; Walkenried 8. April; Grossenhain 18. April eine Schaar von ca. 40 Stück bei S.S.O.-Wind. Bis zum 27. April daselbst nur wenige; Lichtenberg 16. April; Braunsclnveig

18. April; Marienthal 12. April; Oldenburg 14. April 1 Pärchen, 17. April das Gros; Grasberg 29. April bei S.W.-Wind; Hamburg 9. April; Flensburg 19. April; Plänitz 13. April; Kurwien und Norkitten 22. April.

Bei Grossenhain wurden am 28. Mai 3 Nester mit kleinen Jungen und am 25. Juni die ersten flüggen Jungen beobachtet.

Rückzug: Kurwien Mitte September, die letzten am 8. October; in Oldenburg noch Anfangs October Flüge von 10 Stück; Marienthal 30. September; Braunschweig am 21. October noch einige; Lichtenberg 23. September; Walkenried 10. October; Grossenhain 2. October bei S.S.W.-Wind; Windsheim 29. September, die letzten am 21. October.

44. *Hirundo riparia* L. — Uferschwalbe. Unbedingter Sommervogel auf allen Stationen.

Ankunft: Grossenhain 30. April die erste; Walkenried 19. April; Braunschweig 4. Mai; Plänitz 13. April.

In Grossenhain wurden diese Schwalben am 29. Mai beim Nestbau beobachtet; bei Münster am 25. Mai und bei Plänitz am 19. Mai angefangene und fertige Nester.

Der Rückzug ist nur aus Walkenried für Mitte October gemeldet.

An Zahl zugenommen hat die Art bei Oldenburg.

45. *Muscicapa atricapilla* L. — Trauerfliegenfänger. Unbedingter Sommervogel; an einigen Stationen nicht regelmässiger Brutvogel.

Ankunft: In Grossenhain 3. Mai ein #; Walkenried Anfang April; Wieda 23. April; Allrode 24. April; Oldenburg 20. April einzeln, 4. Mai sehr zahlreich auf dem Durchzuge; Flensburg 23. April und Norkitten 18. April.

Am 11. Juni wurde bei Flensburg das erste Nest mit 6 Eiern gefunden und zeigte sich die Art überhaupt in diesem Frühjahre daselbst häufiger.

46. *Muscicapa albicollis* Temm. — Halsbandfliegen-fänger.

Von dieser Art wurde nur bei Belgard in der ersten Hälfte und am 14. Mai je ein altes # auf dem Zuge beobachtet.

47. *Muscicapa grisola* L. — Grauer Fliegenfänger. Ankunft: Bei Windsheim 10. Mai; Walkenried Anfang April Norkitten 2. Mai.

Am 14. und 26. Juli bei Flensburg Nester mit Jungen angetroffen.

48. *Ampelis garrulus* L. — Seidenschwanz.

Zeigte sich am 18. und 22. November (je ein junges Exemplar geschossen) und 24. December (8 Stück erhalten, darunter 1 junges # mit rothen Schwanzspitzen,) bei Oldenburg, am 20. November bei Flensburg.

49. *Lanius excubitor* L. — Grosser grauer Würger.

Theils Stand-, theils Zugvogel.

Ist bei Münster als Brutvogel nur vereinzelt, dagegen im Winter häufiger. Bei Grossenliain am 19. März und 6. November je 1 Exemplar angetroffen, am 22. October bei S.O.-Wind ca. 30 Stück nmherstreichend. Oft bleiben, nach Herrn Sachse, die Männchen auch während des Winters im Brutbezirk, während die Weibchen und Durchzügler sich Mitte Februar einstellen.

Am 24. April in Altenkirchen beim Nestbau und am 5. Mai 3 Eier angetroffen; ebenso daselbst am 7., 10. und 14. Mai Nester mit 6—7 Eiern; am 18. Mai solche des zweiten und 26. Mai des dritten Geleges eines Paares; bei Allrode wurde schon am 12. Mai ein Nest mit flüggen Jungen gefunden.

Ueber die Mordgier dieses Vogels schreibt Herr St. jur. Ziemer aus Belgard: „Im Januar vorigen Jahres (81) stellte einer meiner Freunde im Belgarder Stadtwalde Sprenkel, um Dompfaffen zu fangen, und belegte den Käfig des Lockvogels mit Leimruthen. Als er nach kaum einer Stunde wiederkam, fand er 6 Dompfaffen in den

Sprenkeln, allesammt todt, drei davon etwa zur Hälfte aufgefressen, während dem vierten der Kopf fehlte und nur die beiden andern, mit Ausnahme einiger Bisswunden an den Köpfen, unversehrt waren. Einige Federn an den Leimruthen verriethen den Thäter. Nun stellte mein Freund die Sprenkel dicht um den Lockbauer, den er mit frischen Leimruthen versah, und entfernte sich. Nach einer halben Stande fand er, dass der Würger sich auch noch den Lockvogel geholt hatte. Zwei Tage darauf stellte er nun ein Schlagnetz an dieser Stelle auf und köderte dasselbe mit einem todten Vogel. Kaum hatte er sich 15 Schritt entfernt, da sass der Würger bereits unter dem Netze.“

50. *Lanius minor* Gm. — Schwarzstirniger Würger.

Nur aus Plänitz und aus Norkitten wird die Ankunft mit dem 8. Mai angegeben.

Nester mit frischen Eiern in Altenkirchen und Belgard am 6. Juni, und mit Jungen am 23. Juli bei Grossenliain. Aus Belgard wird berichtet, dass ein Weibchen, dem die Eier genommen, in ein gleichfalls seiner Eier beraubtes Wachholderdrosselnest noch 2 Eier gelegt hat.

51. *Lanius Senator* L. — Rothköpliger Würger.

Es liegen über diese Art nur Mittheilungen vor aus: Münster, woselbst sie sehr seltener Brutvogel ist und am 27. August ein Vogel im Jugendkleide erlegt wurde, und ferner aus Grossenhain, wo am 25. Mai ein Nest mit 6 Eiern in einem Birnbaum gefunden wurde, dessen Besitzer, nach Zerstörung desselben, noch wiederholt aufs Neue in der Nähe gebaut haben.

52. *Lanius collurio* L. — Rothrückiger Würger.

Ueber die Ankunft wird gemeldet aus: Altenkirchen 28. April; Grossenhaiu 2. Mai, bis zum 17. Mai bei kaltem N.O.- und N.-Wind nur selten einen beobachtet; Oldenburg 28. April und Norkitten 8. Mai.

Das erste Nest mit Eiern wurde bei Grossenhain am 21. Mai und die ersten ausgeflogenen Jungen am 29. Mai ebenda angetroffen; im Juli und August familienweise umherstreichend. Herr Neu mann beobachtete den Angriffeines männlichen Würgers auf eine alte Kohlmeise.

53. *Troglodytes parvulus* Koch. — Zaunkönig.

Stand- und Strichvogel, welcher an einzelnen Orten zugenommen hat.

Mitte April bei Braunschweig, 6. April bei Oldenburg fertige Nester; bei Flensburg am 13. Juni ein Nest mit 7 Eiern.

54. *Parus major* L. — Kohlmeise.

Stand- und Strichvogel.

Bei Marienthal hat diese Art ab-, bei Oldenburg zugenommen. Die ersten flüggen Jungen wurden bei Grossenhain am 21. Mai beobachtet.

55. *Parus ater* L. — Tannenmeise.

Bei Oldenburg ist diese Art die seltenste; bei Windsheim vom 20. October an beobachtet.

56. *Parus cristatus* L. — Haubenmeise.

In kleinen Trupps am 9. April bei Oldenburg; traf am 20. März bei Plänitz schon Anstalten zum Nestbau.

57. *Parus coeruleus* L. — Blaumeise.

Bei Oldenburg wurden Anfangs Januar nahe der Küste so grosse Schaaren von Meisen gesehen, dass alle Bäume damit bedeckt waren. Die ersten ausgeflogenen Jungen am 28. Mai bei Grossenhain.

58. *Parus caudatus* L. — Schwanzmeise.

Bei Oldenburg Standvogel.

Am 8. April bei Oldenburg, 17. Mai bei Flensburg und 25. April bei Plänitz fertige Nester; am 28. April bei Altenkirchen bebrütete Eier und am 25. Juni bei Grossenhain flügge Junge.

59. *Sitta caesia* M. & W. — Spechtmeise.

Am 10. Mai bei Flensburg # das # fütternd und am 28. Mai und 2. Juli bei Grossenhain ausgeflogene Junge. Bei Oldenburg häufig, ebenso

60. *Oerthia familiaris* L. — Baumläufer.

Bei Plänitz am 6. April beim Nestbau; 8. Mai bei Flensburg ein Nest mit 5 Eiern; ebenfalls ein solches mit 5 Eiern am 4. Mai bei Braunschweig, 1 M. hoch unter abstehender Borke einer alten Eiche; am 20. Mai bei Flensburg und am 25. Juni bei Grossenhain Nest mit flüggen Jungen.

61. *Alaucla arvensis* L. — Feldlerche.

Ankunft: Windsheim 14. Februar; Schiesshaus 15. Februar; Wieda 22. Februar; Grossenhain 25. Februar einzeln, 12. März zahlreich angekommen; Allrode 21. Februar; Braunschweig 24. Februar die erste, Anfang März alle angekommen; Marienthal 13. Februar; Grasberg 14. Februar der erste Gesang, S.W.-Wind; Hamburg 25. Februar; Flensburg 5. Februar in Menge, 19. Februar wohl 2—300 Stück auf einer Stoppel; Wondollek und Norkitten am 24. Februar. Bei Grossenhain, Walkenried und Flensburg sind während des ganzen Winters einzelne Feldlerchen beobachtet.

Abzug: Bei Marienthal am 2. November; Grossenhain vom 8. September bis 29. October, am letzteren Tage bei S.S.O.-Wind Trupps von 20—100 Stück; Windsheim vom 29. September den ganzen October

hindurch starker Zug.

62. *Alauda arborea* L. — Baumlerche, Haidelerche.

Ankunft: Bei Nürnberg 25. Februar; Altenkirchen 22. Februar singend; Münster 13. Februar. In den Jahren 1880, 1881 und 1882 dort bedeutend seltener wie früher, vermehrt sich aber jetzt anscheinend wieder; Walkenried 7. März; Flensburg 13. März; Wondollek 11. März.

Als Rückzugstermin ist für Walkenried der November angegeben.

63. *Alauda cristata* L. — Haubenlerche.

Standvogel in Windsheini, Oldenburg und Flensburg. Bei Walkenried von Anfang März bis in den November; bei Allrode am 13. März 2 Stück zum ersten Male beobachtet.

Bei Grossenhain wurde am 8. April ein Nest mit kleinen Jungen gefunden; am 28. Mai die Jungen der ersten und am 25. Juni die der zweiten Brut ausgeflogen.

64. *Alauda alpestris* L. — Alpenlerche.

Am 9. December wurden bei Flensburg 4 Stück auf einem Roggenacker beobachtet.

65. *Emberiza hortulana* L. — Ortolan, Gartenammer.

Ankunft: Am 23.—30. April bei Grossenhain; 4. Mai bei Oldenburg und 29. April in Grasberg bei S.W.-Wind. Im Ems-Gebiet stellenweise in manchen Jahren nicht selten, ebenso bei Oldenburg, wo er an manchen Orten oft häufiger ist, als der Goldammer, und woselbst er sich von Jahr zu Jahr vermehrt.

66. *Emberiza citrinella* L. — Goldammer.

Bei Oldenburg häufiger Standvogel.

Am 11. Mai bei Flensburg ein Nest mit 5 Eiern in einer Tanne; 24. Mai, 8. Juni und 26. August Nester mit Eiern, am 16. Juni solches mit Jungen; am 3. Mai bei Altenkirchen Nester mit vollen Gelegen und am 28. Mai bei Grossenhain ausgeflogene Junge.

67. *Emberiza miliaria* L. — Grauammer.

Standvogel bei Oldenburg.

Ankunft bei Tückelhausen am 12. März.

Am 17. Juli bei Flensburg Nest mit 4 Eiern und am 25. Juni 2 Nester mit fast flüggen Jungen bei Grossenhain. Bei Münster kam der Grauammer vor ca. 15 Jahren fast gar nicht vor, hat sich allmählich mit jedem Jahre vermehrt und ist an passenden Oertlichkeiten jetzt schon recht häufig; er scheint jedoch während des Winters fortzugehen, da in dieser Zeit noch keiner bemerkt wurde.

68. *Emberiza schoeniclus* L. — Rohrammer.

Bei Oldenburg häufiger Brntvogel.

Ankunft: Bei Grossenhain am 26. Februar 2 Stück, am 10. März # und # vereinigt; Flensburg am 4. März.

Ein volles Gelege wurde am 6. Mai bei Plänitz gefunden, und als Rückzugsdaten wurde für Grossenhain der 25. September mit S.O.-Wind und 1. October mit S.W.-Wind angegeben.

69. *Passer montanus* L. — Feldsperling.

Bei Flensburg wurden am 19. Mai Nester mit Eiern und am 27. Juli solche mit kleinen Jungen, und bei Grossenhain schon am 22. April ausgeflogene Junge der ersten, am 28. Mai solche der zweiten Brut angetroffen.

70. *Passer domesticus* L. — Haussperling.

Am 18. März hatten bei Grossenhain einige Paare bereits Eier, am 20. April Junge der ersten und am 28. Mai solche der zweiten Brut. Am 9. August wurden fast flügge Junge der dritten Brut vorgefunden; bei Oldenburg am 5. Mai flügge Junge. Dort haben sich beide Sperlingsarten so sehr vermehrt, dass sie für die Landleute zu einer grossen Plage wurden, indem sie zu Tausenden die Getraidefelder plünderten, so dass die Regierung das Erlegen derselben von Anfang August, bis 15. Februar frei gab.

Ueber ein Unwetter, das in Windsheim viel Schaden auch unter der gefiederten Welt anrichtete, theilt Herr Pfarrer Jäckel Folgendes mit: .,Durch ein am 3. September über die hiesige Stadt und Umgegend niedergegangenes Gewitter, das mit Sturm, wolkenbruehartigem Regen und strichweise von Hagel begleitet war, wurde die Vogelwelt schwer mitgenommen. Die cichtesten Regendächer der alten Linden und Kastanien unserer Allee vermochten die unter denselben nächtigenden Vögel nicht mehr zu schützen. Aufgescheucht suchten sie zum Theil dem jrausigen Unwetter durch die Flucht zu entkommen, wurden aber lurch die in Strömen niederschiessenden Wassermassen zu Boden gischlagen und fanden da ihren Tod. Unter einer lombardischen Pappel in der Stadt, nahe an meinem Hause, lagen am Morgen 14 todte Vögel, 27 andere brachte mir ein Knabe; es waren 11 Haussperlinge, 1 Feldsperling, 11 Buchfinken, 14 Stieglitze, 1 Ammerling, 1 Baumläufer und 2 Dohlen. Auch in einer nahe der Stadt gelegenen, von hohen Pappeln umgebenen Winterung hgen am Morgen eine Menge todter Stieglitze und anderer kleiner Vögel."

71. *Pyrrliula rubicilla* Pall. — Dompfaff.

Für Oldenburg als Durchzugsvogel bezeichnet.

Bei Altenkirchen und Münster nicht mehr so zahlreich wie früher; sie zeigten sich am 15. October bei

Marienthal; 5. März bei Oldenburg und hielten sich bei Kurwien noch bis Ende Mai auf.

Gelege mit frischen Eiern wurden in Altenkirchen gefunden am 13., 17. Mai und 9. Juni, mit stark bebrüteten am 29. Mai.

72. *Fringilla serinus* L. — Girlitz.

Am 15. April in Frankfurt, 16. April in Coblenz und 17. April in Marburg von Dr. R. Blasius beobachtet.

73. *Fringilla spinus* L. — Zeisig.

Vom Spätherbst bis Anfang Januar bei Altenkirchen; bei Marienthal im October; bei Oldenburg im Januar Flüge bis 50 Stück; bei Plänitz am 14. April ein Schwärm; bei Münster im Winter 1881/1882 äusserst zahlreich.

74. *Fringilla carduelis* L. — Stieglitz.

Bei Flensburg in diesem Jahre häufiger; in Wieda am 19. November bei heftigem Schneewetter 5 Stück beobachtet, woselbst sie sonst nicht vorkommen; bei Marienthal im September und November und bei Oldenburg während des ganzen Winters.

Nester mit Eiern wurden gefunden am 19. und 20. Mai bei Altenkirchen und Plänitz und mit Jungen am 28. Juli bei Flensburg; ausgeflogene Junge am 25. Juni und 23. Juli bei Grossenhain, und am 12. Juni bei Windsheim.

75. *Fringilla linaria* L. — Leinzeisig.

Bei Münster im Winter 1881/1882 äusserst zahlreich; bei Altenkirchen am 27. November und bei Wieda am 29. December grosse Schwärme beobachtet.

76. *Fringilla cannahina* L. — Bluthänfling.

Häufig bei Oldenburg.

Nester mit Eiern wurden gefunden am 12. Mai in Altenkirchen, 18. Mai bei Grossenhain, 7. Mai, 1. und 16. Juni bei Flensburg. Ausgeflogene Junge am 19. Mai und 10. Juni bei Grossenhain gesehen.

77. *Fringilla chloris* L. — Grünhänfling.

Ueberwintert mitunter bei Oldenburg.

Seine Ankunft erfolgte bei Grossenhain am 5. März mit südwestlichem Winde; bei Flensburg am 4. März.

Nester mit Eiern wurden gefunden am 16. Juni bei Flensburg und am 4. April bei Plänitz. Ausgeflogene Junge schon am 23. April und 17. Mai bei Grossenhain.

78. *Fringilla coelebs* L. — Buchfink.

Ankunft: Bei Grossenhain 1.—19. März; sang schon am 2. Februar bei Cöln; Schiesshaus am 25. Februar; Wieda 1.—6. März, einige SS haben dort überwintert; Walkenried im März; Marienthal 26. Februar; Grasberg 4. März; Flensburg 20. Februar; Won-dollek 6. März; Kurwien 15. März.

Nester mit Eiern wurden gefunden am 23. April bei Grossenhain, 29. April bei Oldenburg und am 24. Mai bei Flensburg. Flügge Junge am 12. und 28. Mai bei Grossenhain, am 26. Mai bei Marienthal und am 29. August bei Flensburg.

79. *Fringilla montifringilla* L. — Bergfink.

Bei Windsheim, Grossenhain und Wieda Ende October, im November an letzterem Orte in grossen Schwärmen; bei Flensburg am 8- December 6 Stück beobachtet.

80. *Coccothraustes vulgaris* Pall. — Kernbeisser.

Ein Nest mit 4 Eiern wurde am 17. Mai bei Flensburg gefunden.

81. *Loxia curvirostra* L. — Fichtenkreuzschnabel.

Kamen bei Wieda Anfang October vereinzelt vor.

82. *Sturnus vulgaris* L. — Staar.

Ankunft bei Windsheim 10. Februar; Münster Anfang Februar; Grossenhain 24. Februar die ersten, 26. Februar in Schaaren; Walkenried 18. Februar; Lichtenberg 12. Februar; Steterburg 16. Februar, am 26. Februar in grossen Massen; Braunschweig 17. Februar; Marienthal 4. Januar; Oldenburg 6. und 7. Januar die ersten, ebenso bei Grasberg; 7. Februar bei Hamburg; Flensburg am 3. Februar; Plänitz 5. Mai; Kurwien 28. Februar und bei Norkitten am 26. Februar.

Ausgeflogene Junge der ersten Brut wurden angetroffen bei Grossenhain am 21. Mai, Grasberg 22. Mai, Kurwien Ende Juni, der zweiten Brut bei Grossenhain am 30. Juni bis 12. Juli, Oldenburg am 14. Juli, Grasberg 10. Juli und bei Flensburg am 15. Juli. In Kurwien wurden noch niemals zwei Brüten beobachtet.

Rückzug: Bei Windsheim am 25. October; Grossenhain am 22. October das Gros, einzelne noch bis 29. October; Walkenried im November.

83. *Oriolus galbula* L. — Pirol.

Ueber die Ankunft wird berichtet aus: Altenkirchen am 1. Mai; Münster 3. Mai; Grossenhain 5. Mai, N.W .-Wind; Walkenried 21. April; Braunschweig 5. Mai (am 4. Mai war es daselbst äusserst warm (+ 20° R. im Schatten), Südwind, und noch kein Pirol da); Marienthal 7. Mai; Grasberg 24. Mai (Tags zuvor war warmer Gewitterregen); Flensburg 22. Mai; Plänitz 2. Mai; Wondollek 1. Mai; Kurwien 2. Mai und Norkitten 9. Mai.

Nester mit Eiern wurden am 4. und 12. Juni in Altenkirchen und am 4. Juni bei Grossenhain gefunden, an

letzterem Orte zwei so niedrig angebracht, dass man ohne grosse Mühe hineinsehen konnte.

84. *Corvus corax* L. — Rabe.

Bei Walkenried Anfang April auf dem Zuge beobachtet.

Marienthal: 18. März brütet; ein bei Oldenburg nistendes Paar bat in diesem Jahre den gleichen Horst bezogen; Flensburg: 15. März (6 Eier), 3. April (6 Eier) und 18. April (5 Eier); bei Norkitten begannen die Vögel am 6. März zu brüten.

Bei Marienthal beobachtete man am 18. November einen Raben auf einen angeschossenen Hasen stossen. Obwohl bei Flensburg fast jedes Jahr die Jungen weggeschossen werden, halten die Alten dennoch mit grosser Zähigkeit die einmal gewählten Brutplätze fest. In diesem Jahre nahm ein Rabenpaar den Horst von *Milvus regalis* in Beschlag, während letzterer einen nahen Horst wählte, in welchem 1881 ein Mäusebussard und 1880 ein Hühnerhabicht das Heim aufgeschlagen hatte. Trieb man den Milan vom Neste, so fuhren die Raben wüthend über ihn her und verfolgten ihn lange Zeit; interessant war es, dem eifrigen Kampfe zuzusehen, jeder suchte sich Uber seineu Feind zu erheben, um kräftigen Stoss auszuführen. Wenn auch beide Milane es mit nur einem Raben zu thun hatten, so verliess dieser dennoch nicht den Kampfplatz.

85. *Corvus frugilegus* L — Saatkrähe.

Von Grossenhain liegen folgende Zugbeobachtungen vor: 2. November 1881 ca. 50 Stück von N.O. nach S.W. ziehend (bei N.O.-Wind), 6. November 1881 2 Züge von ca. 100 Stück auf der Futtersuche umherstreichend (S.W.-Wind, + 10° R.), 20. November 15, resp. 25 Stück von N.O. nach S.W. Am 20. December ging ein Zug von ca. 100 Stück, darunter Dohlen und einzelne Nebelkrähen, von N.O. kommend und nach S.W. ziehend, bei heftigem S.O.-Wind durch.

An gleichartigen Beobachtungen aus dem Jahre 1882 erfahren wir aus Grossenhain: 1. März 2 Züge von ca. 100, resp. 150 Stück bei S.S.O.-Wind von W. nach O. in breitem Fluge hier durchziehend, 3. März ca. 200 Stück bei S.O.-Wind von W. nach O. hier durch, 4. März ca. 100 Stück von O. nach W. wieder zurück (schönes Wetter), 5. März heftiger Sturm und kalt. Ferner: 20. October ca. 2000 Stück von N.O. nach S.W., 21. October ca. 1500 in gleicher Richtung hier durch (S.O.-Wind, 6 Uhr früh), am Nachmittag desselben Tages folgen nur ca. 200 Stück, worauf innerhalb der Zeit vom 22. bis 27. October grössere Züge von ca. 200 bis mehreren Tausenden weiter nachfolgen.

Bei Steterburg beginnt bereits am 21. Februar der Nesterbau, am 3. März einige Nester fertig, 10. April die ersten Eier und Anfang Mai die ersten Jungen. In der Colonie traf man am 6. Mai viele Nester mit Jungen an, eine nicht minder grosse Anzahl mit Eiern (Gelege meist aus 4 Stück bestehend), die frisch besessen waren. Am 19. März fand man bei Grossenhain die ersten vollen Gelege, andere Paare waren noch im Legen begriffen und wieder andere hatten noch mit dem Nestbau zu thun. 23. April zahlreiche Nestjunge. Die Oldenburger Colonie hat bereits am 14. April besetzte Nester.

Zu beiden Seiten der Unterweser verschiedene Brutcolonien.

Neun bei Braunschweig geschossene Exemplare enthielten nur Weizenkörner im Magen.

86. *Corvus corone* L. — Rabenkrähe.

Brütend am 7. April bei Marienthal angetroffen; die erste flügge Brut im gleichen Gebiete am 2. Juni beobachte;. Bei Flensburg sind am 7. April 4 Nester besetzt, 16. Mai 4 Junge.

Aus Oldenburg erfahren wir eine starke Zunahme.

87. *Corvus comix* L. — Nebelkrähe.

Oldenburg: „Harskreie“.

Oldenburg: 6. April grosse Züge nach N.O. dem Wime entgegen Uber das Meer (Jadebusen) ziehend. Am 7. April nech ein Exemplar gesehen. Walkenried Ankunft 26. April.

Grossenhain: flügge Junge am 28. Mai, 2. und 23. Jili.

Bei Flensburg wurde dieses Jahr nur ein brütendes Paar angetroffen.

88. *Corvus moneclula* L. — Dohle.

In Windsheim verbleiben sie auch in den strengsten Wintern in der Stadt. Allrode: 25. Februar ca. 200—300 Stück von S.W.' nach N.O. ziehend; Grossenhain 13. Januar 20 Stück von S.O. nach N.W. ziehend (bei Ost-Wind), 25. Februar ca. 150 Stück auf der Futtersuche (darunter auch Saat-, Nebel- und Raben-Krähen).

Bei Flensburg fand man eine Brutstelle im Schornstein, und trotzdem das Nest zweimal entfernt worden war, baute der Vogel zum dritten Male und legte 5 Eier.

Bei Braunschweig schoss man eine Dohle mitten aus einer Saatkrähen-Colonie heraus. Sehr zugenommen hat die Art bei Oldenburg. Hier nistet sie auch in hohle Bäume, und man will beobachtet haben, wie eine Dohle 4 junge Staare aus dem Neste holte und auffrass. Auch schadet sie sehr durch Ausziehen der Erbsenkeime, die sie überdies noch liegen lässt. Auch bei Varel an der Jade recht häufig; sonst aber selten auf dem Lande.

89. *Pica caudata* K. und Bl. — Elster.

Oldenburg: „Häster, Heister“.

Brutbeobachtungen liegen vor aus Grossenhain vom 19. März (die Vögel bauen), 31. März (Nestbau

vollendet), 8. Juni (flügge Junge auf dem Markte), aus Oldenburg vom 14. April (2 Eier) und aus Flensburg vom 14. April (2 Eier). Aus Oldenburg erfahren wir, dass in der Nähe der Küste (Dangart) eine Elster auf einer nur 6 Fuss hohen Tanne brütete und das Nest nur 4 Fuss über dem Erdboden angebracht war, obgleich im gleichen Gebiete Tannen von 8 Meter Höhe vorkommen. In diesen haben aber *Falco tinnunculus* und *Buteo vulgaris* ihr Heim aufgeschlagen.

Bei Flensburg nimmt die Art ab.

90. *Nucifraga caryocatactes* L. — Nusshäher.

Bei Allrode beobachtete mau am 22. Februar zu wiederholten Malen Tannenhäher Nestmaterial tragend. Trotz sorgfältigen Nachsuchens war das Nest in dem 50jährigen Kieferbestande nicht zu finden.

Bei Marienthal hat der Vogel zugenommen. Herr Förster de Lamare tbeilt uns fernerhin mit, dass während der Tage vom 16. bis 22. November mehrere Exemplare in einem 25jährigen Kiefernbestande beobachtet wurden, wie solche mit dem Zerhacken von Kiefernzapfen beschäftigt waren. An der Aufmerksamkeit der Vögel scheiterten die Bemühungen desselben Beobachters, das Nest aufzufinden.

91. *Garrulus glandarius* L. — Eichelhäher.

Oldenburg: „Hager“.

Marienthal Stand- und Strichvogel zugleich. So beobachtete man einzelne Individuen den ganzen Winter hindurch, ebenso wie am 26. und 28. September Züge von 15 bis 20 Stück angetroffen wurden, die in der Richtung von S.O. nach N.W. strichen. Sehr zahlreich fanden sie sich im September und October in den Gärten bei Flensburg. Zugbeobachtungen aus Grossenhain melden: 23. April (5 Stück streichend angetroffen), 1. October (einzeln streichend), 10. October bei S.W.-Wind im Laufe des Nachmittags kleinere Trupps von 15 bis 20 Individuen (im Ganzen ca. 100 Stück) nach W. ziehend, 12. October (grössere Trupps bei heftigem S.W. durchziehend).

Flügge Brut am 11. Mai bei Marienthal, Gelege von 5 und 3 Eiern am 2. Juni bei Flensburg aufgefunden.

Bei Oldenburg stark zugenommen.

92. *Cypselus apus* L. — Mauersegler.

Ankunft: Windsheim 22. April (1 Stück), 1. Mai (3 Stück), 2. Mai (alle eingetroffen); Altenkirchen 1. Mai; Köln 20. April; Münster i/W. 21. April (1 Stück), 2. Mai (Hauptmasse); Allrode 18. Mai; Braunschweig 1. Mai (einzeln), 2. Mai (allgemein); Grossenhain 3. Mai früh (einzeln), Mittag (10 Stück) bei Nacht-Reif und S.O.-Wind; Grasberg 20. Mai; Belgard 16. Mai; Norkitten 4. Mai.

Abzug: Belgard Anfang August, einzelne Durchzügler noch Mitte August (1880: 21. August, 1881: 20. August); Flensburg 13. August; Grossenhain 27. Juli bei N.-Wind und Regenwetter (Gros fortgezogen), vom 28. Juli bis 9. August herrschte N.W.-oder N.-Wind und regnerisches Wetter und an manchen Tagen + 9° R., 1. September S.O.-Wind und schönes Wetter (9 Stück von N.O. nach S.W.),9. August N.W.-Wind Abends 6½ Uhr (ca. 250 Stück ziehen von N.O. nach S.W. hier durch); Münster i/W. 29. Juli und 2. August (Hauptabzug), 12. August (noch einige angetroffen); Windsheim 6. August (noch viele da), 13. August (Alles fort), 1. und 2. September (noch einzelne Nachzügler beobachtet).

Brüten wurden gefunden bei Altenkirchen am 28. Mai (3 frische Eier) und Flensburg am 2. Juni (4 Eier).

93. *Caprimulgus europaeus* L. — Ziegenmelker.

Ankunft: Altenkirchen 5. Mai; Marienthal Ende Mai; Grossenhain 20. und 21. Mai (je ein Stück angetroffen); Norkitten 15. Mai.

Abzug: Grossenhain 8. September (ein gegen den Tele- graphendraht geflogenes flügellahmes Exemplar); Marienthal inner-halb der Zeit vom 3. bis 8. September. Bei Flensburg nicht selten.

94. *Alcedo ispida* L. — Eisvogel.

Bei Münster i/W. nur vereinzelt, bei Walkenried Anfang September 2 Exemplare beobachtet (daselbst our Striehvogel), bei Marienthal vom 5. bis 7. December angetroffen und bei Flensburg Anfang October 1 Stück beobachtet. Bei Altenkirchen bleibt der Vogel auch während des Winters im Brutrevier.

Bruten erfahren wir aus Altenkirehen vom 10. April (5 frische Eler) und 9. Mai (6 frische Eier) sowie aus Ramholz, woselbst man am 25. Mai die Alten mit den Jungen antraf. Herr Martius (Plänitz) theilt uns mit: „Seit 2 Jahren gewahrte ich an unserem Flüsschen nur zur Herbstzeit einige dieser schönen Vögel. Nun traf ich dieses Frühjahr einmal ein Paar an. Am 1. Juni war sein unfertiges Nest aufgefunden und zerstört worden; am 21. Juni war 1 Meter von der alten Röhre entfernt eine zweite Neströhre fertig. Diese 1 Meter lange Röhre wurde von oben aus so durchgraben, dass man gerade den Kessel traf. Der er-griffene Vogel brütete auf 7 Eiern. Nun wurde die gegrabene Röhre fest verstopft, ohne dass dadurch die vom Vogel angelegte Röhre Noth litt, und das Nest innerhalb von Zwischenräumen von etwa 20 Tagen dreimal seines Inhaltes entleert. Ausser den 7 bereits erwähnten Eiern waren dem Nestkessel 6, 4 und zuletzt 3 Eier entnommen worden.“

95. *Coracias garrula* L. — Mandelkrähe.

Ankunft: Wondollek 25. April; Kurwien 26. April und Nor-kitten 15. Mai. Früher bei Oldenburg Brutvogel (1 Paar).

96. *Upupa epops* L. — Wiedehopf.

Ankunft: Windsheim 12. April; Münster i/W. 15. April; Walkenried 22. April; Lichtenberg 17. April (nur als Durchzügler bier); Braunschweig 4. Mai (gehört); Grossenhain 23. April (1 Stück gehürt); Marienthal 8. April (zuerst gehört); Oldenburg 6. April (1 Stüek an der Küste gesehen); Hamburg 8. April; Plänitz 20. April; Wondolleck 21. April; Kurwien 20. April; Nor-kitten 14. Mai.

Abzug: Walkenried 5. August.

Nestjunge fütternd beobaehtete man den Vogel bei Grossenhain am 28. Mai und traf ausgeflogene Junge ebendaselbst am 23. Juli an.

97. *Cuculus canorus* L. — Kuckuk.

Ankunft, resp. erster Ruf: Windsheim 19. April; Altenkirehen 14. April; Schiesshaus 27. April; Walkenried 20. April; Allrode 18. April; Lichtenberg 20. April; Braunschweig 1. Mai; Marienthal 26. April; Grossenhain 19. April; Oldenburg 28. April; Gras-berg 1. Mai; Flensburg 3. Mai; Planitz 28. April; Wondolleck 24. April; Kurwien 20. April; Norkitten 24. April.

Abzug resp. letzter Ruf: Grossenhain 6. September (1 Stück auf dem Zuge erlegt); Marienthal 13. Juli (zuletzt gehört); Lichtenberg 9. Juli (letzter Ruf); Walkenried 3. Juli.

Brüten wurden beobachtet bei Altenkirchen: 17. Juni 1 Kuckuksei mit 3 Eiern von *Turdus musicus*, Grossenhain 4. Juli ein ziemlich flügger Kuckuk im Neste der weissen Bachstelze, Plänitz: 28. Mai 1 Kuckuksei mit 5 Eiern von *Calamoherpe phragmitis*. Bei Oldenburg fand man am 24. Juli in einem Torfhaufen nahe dem Erdboden ein Nest von *Motacilla* alba mit 4 Nesteiern und einem gleichgefärbten Kuckuksei. Ein zweites, ähnlich gezeichnetes lag unten am Boden. Derselbe Herr (Revierförster B.) hatte früher einmal die Beobachtung gemacht, dass aus einem grösseren blauen Ei, welches in einem Rothschwänzchen-Neste lag, ein junger Kuckuk ausschlüpfte.

Bei Münster i/W. war er in diesem Jahre in Folge des massenhaften Auftretens von Raupen sehr häufig. So hielten sich in einem ca. 100 Morgen grossen Wäldchen ca. 12 Kuckuke auf, während unter normalen Verhältnissen das gleiche Terrain nur 1 Paar besetzt hält.

Bei Walkenried in diesem Jahre selten.

98. *lynx torquilla* L. — Wendehals.

Ankunft, resp. erster Ruf: Tückelhausen 7. April; Windsheim 15. April; Attenkirchen 13. April erster Ruf (kommt gewöhnlich einige Tage früher, ehe er ruft); Münster i/W. 17. April; Allrode 12. Mai; Braunschweig 14. April; Grossenhain 20. April; Grasberg 22. April; Norkitten 23. April.

Abzug aus Walkenried am 28. October. Bei Münster i/W. total verschwunden, aber bei Wettringen bei Rheine noch recht häufig; daselbst noch am 1. September beobachtet. Bei Flensburg in diesem Frühjahr häufiger.

Erste Brut bei Plänitz am 26. Mai.

99. *Picus viridis* L. — Grünspecht.

Flensburg am 11. Mai Nisthöhlen fertig, 21. Juni füttert ein weiteres Paar.

Bei Flensburg in diesem Frühjahr häufiger.

100. *Picus canus* Gm. — Grauspecht.

Standvogel für Marienthal.

101. *Picus martius* L. — Schwarzspecht.

Entgegen der Annahme, dass der Schwarzspecht ein grosses Revier einnehme und in diesem kein anderes Paar seiner Art dulde, theilt uns Herr Förster de Lamare (Marienthal) Folgendes mit: „Ich habe in meinem Begange (433 ha) im verflossenen Jahre vier Paare entdeckt und sogar am 18. August bemerkt, wie 4 Exemplare auf einen Bussard stiessen und diesen vertrieben. Die Thiere lebten friedlich neben einander.“

102. *Picus major* L. — Grosser Buntspecht.

Bei Windsheim kamen im December 1881 und den folgenden Monaten auffallend viele Buntspechte in die Gärten der Stadt, woselbst sie sich auf den im vorigen Winter (1879/1880) theil- weise abgestorbenen und wurmfrässig gewordenen Obstbäumen herumtrieben.

Bei Oldenburg hatte am 2. Mai ein Paar seine in einer Birke angelegte Nisthöhle bezogen.

103. *Pieus medius* L. — Mittlerer Buntspecht.

Bei Braunschweig am 4. Mai den Paarungsruf vernommen.

104. *Picus minor* L. — Kleiner Buntspecht.

Wie uns Herr Huntemann aus Oldenburg mittheilte, wurde während der Monate März und April jeden Tag ein Paar an einer Eiche beobachtet, später fehlten die Vögel, bis wieder am 12. Juli ein Exemplar angetroffen wurde. Sonst ist der Vogel bei Braunschweig sehr selten.

105. *Gyps fulvus* Gm. — Gäusegeier.

Wie wir aus Windsheim erfahren, wurde am 22. September ein sehr starkes Exemplar in Mittelfranken, Bezirksamt Hersbruck bei Rupprechtstegen (Gerhelm), geschossen.

106. *Aquila naevia* Gm. — Schreiadler.

Bei Braunschweig am 4. Mai seit 15 Jahren wieder einmal beobachtet.

107. *Haliaetus albicilla* L. — Seeadler.

Am 5. November 1881 wurde eiu Seeadler in Unterfranken bei Rentweinsdorf, im Winter 1881/1882 3 Stück bei München und am 16. Januar ein Exemplar an der Zusam bei Lauterbach (Schwaben) erlegt. Ferner bei Marienthal im November, bei Flensburg am 24. December je 1 Exemplar geschossen. In letzterem Gebiete war auch ein Individuum durch Gift umgekommen. Beide Vögel hatten weisse Schwanzfedern. Der erstere legte sich angeschossen auf den Rücken und drohete mit den Krallen. Dessen Gewicht betrug 4 kg. Bei Soest (Münster i/W.) schoss man am 29. October 1 # juv., nachdem dasselbe auf einen Jagdhund gestossen hatte; Mageninhalt: 1 *Corvus corone* und 1 *Talpa europaea*.

108. *Circaëtus gallicus* Gm. — Schlangenadler.

Aus Münster erfahren wir: 1 Exemplar im Juli 1881 bei Dülmen erlegt, ein weiteres am 1. August 1882 aus Wittlieh, Reg.-Bez. Trier, erhalten. Dasselbe, 1 # ad. in voller Mauser, hatte im Magen: 2 *Coronella laevis*, 2 *Anguis fragilis* und 1 *Arvicola glareola*.

Bei Flensburg wurde am 26. April dem Horste ein wenig bebrütetes Ei entnommen, nachdem aus demselben Horste vor Jahren ein junger Vogel ausgehoben worden war.

109. *Pandion haliaëtus* L. — Fischadler.

Bei Hollfeld in Oberfranken am 1. October 1 Exemplar erlegt, vereinzelte Durchzügler namentlich im September und October bei Münster i/W. beobachtet, am 3. Mai 2 Exemplare am Riddagshäuser Teiche angetroffen, im Juli und August bei Walkenried beobachtet, Ende September an den Frauenheimer Teichen ein $ und Anfang October ein # erlegt (Grossenhain). Im gleichen Gebiete am 27. October abermals ein Individuum angetroffen. Bei Marienthal vom 14. März bis 22. October verblieben.

110. *Pernis apivorus* L. — Wespenbussard.

Bei Münster i/W. die ersten Anfang Mai und die letzten am 26. September auf dem Zuge angetroffen. Ankunft bei Walkenried 2. April, Wegzug 16. October. Eine grosse Wanderschaar am 22. Mai bei Flensburg beobachtet.

Wie wir aus Altenkirchen erfahren, wurden am 11. Juni 2 frische Eier aufgefunden.

111. *Buteo lagopus* Gm. — Rauhfussbussard.

Bei Braunschweig den ganzen Winter Uber vertreten, bei Calvörde fehlte er diesen Winter (jedenfalls der milden Witterung wegen), bei Grossenhain wurde der Vogel an folgenden Daten beobachtet, resp. erlegt: 1881, 6. und 18. November, 27. November und 23. December; 1882, 1. März, 1. April und 31. October. Letzterer der erste in diesem Jahre. Alte Exemplare hatten nur Mäuse im Magen. Bei Flensburg am 12. November 1 Stück geschossen.

112. *Buteo vulgaris* Bebst. — Mäusebussard.

Vereinzelte Exemplare fanden sich den ganzen Winter Uber bei Braunschweig.

Brüten werden gemeldet aus Brauuschweig: 4. Mai: Gelege à 3 Eier (stark bebrütct), Gelege à 3 Eier und 1 Junges, Gelege à 3 Eier (letzteres frisch), Marienthal: 4. Mai flügge Junge, Grossenhain: 12. Juni flügge Junge, Flensburg: 14. April 4 Eier, 26. April 2 Eier, 29. April 2 Eier, 7. Mai Vogel vom Neste gejagt, 26. Juni flügge Junge.

Die bei Braunschweig untersuchten Horste standen sämmtlich auf hohen Buchen.

113. *Milvus regalis* Bp. — Königsweih.

Ankunft: Oettingen (Windsheim) 2. März, Tückelhausen 15. März, Walkenried 14. März, Allrode 7. März, Marienthal 1. März, Flensburg 18. März, Norkitteu 15. März.

Abzug: Grossenhain 9. November (noch 1 Stück beobachtet), Marienthal 8. November, Walkenried 18. October.

114. *Falco peregrinus* L. — Wanderfalk.

Bei Walkenried vom 26. März bis 14. October verblieben.

115. *Falco subbuteo* L. — Baumfalk.

Bei Grossenhain am 18. Mai am Nistplatz eingetroffen.

Flensburg: 17. Juni 3 Eier, 7. August flügge Junge. Diese verblieben mit den Alten wochenlang am Brutplatz. Am 11. September wurde die Familie zum letzten Male daselbst beobachtet. Altenkirchen: 20. Juni 2 Eier.

Ein Baumfalke, welchen man nach einer Rauchschwalbe und später nach einer Feldlerche stossen sah, verfehlte beide (Grossenhain).

116. *Falco aesalon* L. — Steinfalk.

Bei Grossenliain am 18. October 1 Exemplar beobachtet, bei Flensburg am 14. April 1 # ad. im Eisen gefangen.

117. *Falco tinnunculus* L. — Thurmfalk.

Oldenburg: „Stothawk, Duvenhawk“.

Bleibt bei Windsheim auch im strengsten Winter in der Stadt; bei Grossenhain am 19. März eingetroffen; bei Oldenburg, woselbst man am 18. November ein Exemplar erlegte, wurde der Vogel im Laufe des Winters 1881/1882 vielfach erlegt. Ankunft bei Norkitten am 19. März; bei Flensburg am 14. April (2 Exemplare) angetroffen. Bei Grossenhain am 8. October ein Exemplar beobachtet, desgleichen am 1. November bei S.W.-Wind und schönem Wetter deren mehrere.

Bei Windsheim brütet der Vogel in der Stadt.

Brutbeobachtungen werden gemeldet aus Grossenhain: 7. Mai 6 stark bebrütete Eier, 2. Juli flugfähige Junge, 4. August Junge bereits ausserhalb der Nester, jedoch erst zum Theil flugfähig.

Ein bei Grossenhain erlegtes # hatte den Magen mit Mäusen angefüllt. Sowohl bei Grossenhain, als auch bei Münster nimmt die Art an Individuenzahl ab.

118. *Astur nisus* L. — Sperber.

Ankunft und Abzug Walkenried: 2. April, resp. Mitte October.

Brüten erfahren wir aus Altenkirchen: 13. Juni 4 Eier, 14. Juni 7 Eier; Flensburg 14. Mai 5 Eier, 17. Mai 4 und 5 Eier, 24. Mai 4 Eier, 30. Mai 4 Eier, 2. Juni 4 Eier und 17. Juni ebenfalls noch frische Eier.

119. *Astur palum.barius* L. — Hühnerhabicht.

Flensburg 22. April 4 Eier, 7. Mai 3 stark bebrütete Eier, 26. Juni flügge Junge; Norkitten 10. April 3 Eier. Der Horst des vom 7. Mai datirten Geleges befand sich auf einer mächtigen Linde mitten im Walde und hatte die Nestmulde mit Tannen-grün ausgebettet. Das #, vom Neste streichend, wurde tödtlich getroffen, hielt sich aber doch krampfhaft am Aste fest und musste schliesslich heruntergeholt werden.

120. *Circus cineraceus* Mont. — Wiesenweihe.

Ein # am 20. November am hiessigen grossen Spitalteiche beobachtet (Grossenhain).

121. *Circus cyaneus* L. — Kornweihe.

Bei Münster i/W. sehr selten, dort am 5. April ein Exemplar beobachtet, bei Lichtenberg bereits am 24. Februar angetroffen, ziehend bei Flensburg am 15. April beobachtet.

122. *Circus aeruginosus* L. — Rohrweihe.

Die am 17. März am Nistplatze eingetroffenen Vögel verblieben bis 20. November (Grossenhain).

Ein Gelege von 4 Eiern fand man am 13. Mai bei Braunschweig. Ziemlich flugfähige Junge wurden am 9. Juli bei Grossenhain beobachtet.

123. *Bubo maximus* Sibb. — Uhu.

Im Spätherbst 1881 wurden, wie wir aus Windsheim erfahren, 3 Exemplare bei Allach, Hirschau und Etzenhausen erlegt.

124. *Otus brachyotus* L. — Sumpfohreule.

Münster i/W.: „Hawkuhle.“

Auf dem Herbstzuge bei Münster i/W. häufig; bei Flensburg erlegte man je 1 Exemplar am 7. October, 12. und 20. November und 7. December. Am 18. September das erste Exemplar auf dem Zuge angetroffen, am 28. desselben Monats und am 3. October deren je 3 (Grossenhain).

Von 2 am 30. October bei Münster i/W. erlegten Sumpfohreulen hatte die eine 2 *Alauda arvensis*, die andere, neben 2 Feldlerchen, noch einen kleineren Vogel, wahrscheinlich eine Meise, im Magen. Derselbe Beobachter, Herr R. Koch, theilte uns mit, dass er in den letzteren Jahren Gelegenheit gehabt habe, eine grössere Anzahl dieser Eulen auf den Mageninhalt zu untersuchen. Diese Untersuchungen haben ihm bewiesen, dass diese Species vornehmlich allerdings von Mäusen (besonders *Arvicola*) lebe, aber durchaus nicht Vögel absolut verschmähe. Bei keiner anderen Eule, natürlich *Bubo* ausgenommen, habe er Vogelreste im Magen vorgefunden.

125. *Otus vulgaris* Flem. — Waldohreule.

Windsheim: 7. Mai Junge im Flaumenkleide, Plänitz: 9. April 5 Eier, Grossenhain: 23. April bebrütete Eier, 26. Mai ausgeflogene Junge.

126. *Athene noctua* Retz. — Steinkauz.

Oldenburg: 9. April halberwachsene Junge im Jaderberg.

127. *Syrnium aluco* L. — Waldkauz.

Altenkirchen: 9. April 1 Ei, 16. April 1 Ei (in derselben Nisthöhle); Flensburg: 27. März 4 Eier (schwach bebrütet). Dieses betreffende Gelege fand sich in einem alten Bussardhorste. Herr P au Isen erwähnt ferner, dass dies das erste Mal wäre, eine derartige Nistweise angetroffen zu haben. Normal nistet der Waldkauz bei Flensburg meist in Baumhöhlen oder auch in alten Gebäuden.

128. *Strix flammea* L. — Schleiereule.

Interessante Brutbeobachtungen wurden aus Flensburg berichtet. Dort fand man am 8. April 3 Junge nebst einem Ei (5 Mäuse am Nestrande) und am 11. Mai ein volles Gelege von 6 Eiern. Diese wurden weggenommen, und hatte das Paar am 13. Juli ein weiteres Gelege von 8 Eiern auf derselben Niststelle.

Auffallender Weise ist das zweite Gelege stärker, als das erste, ein Umstand, welcher dem betreffenden Beobachter noch nicht vorgekommen worden war. Unter Zwischenräumen von ungefähr 48 Stunden folgten die Eier und entschlüpften diesen die Jungen, so dass das erst geborene Junge schon recht gross war, als das achte aus der Hülle schlüpfte. Während des Legens und Brütens wurden todte Mäuse in einen Nebenraum geschleppt, blieben jedoch längere Zeit unberührt liegen, bis sie später verschwunden waren.

Bei Grossenhain fand man am 26. September ein Nest mit 6 halbflüggen Jungen, die am 10. October ausflogen,

Bei Windsheim wurden während des Winters 3 Stück lebend in Taubenschlägen gefangen.

129. *Columba turtur* L. — Turteltaube.

Ankunft: Altenkirchen 1. Mai, Walkenried 3. Mai, Allrode 5. Mai, Marienthal 29. April, Hamburg 19. Mai, Wondollek 30. April.

Abzug von Walkenried 10. October, während bei Marienthal die letzten Tauben am 14. September und bei Flensburg am 13. und 17. August beobachtet wurden.

Grossenhain 25. Juni: Ein Paar eifrig mit Nestbau beschäftigt.

130. *Columba oenas* L. — Hohltaube.

Ankunft: Oeffingen i/Schwaben 2. März, Altenkirchen 1. Februar (in kleinen Flügen hier), Walkenried 2. März (2 Stück auf dem Durchzuge), Marienthal 2. März (Lockruf gehört), Wondollek 28. Februar, Norkitten 13. März.

Abzug von Marienthal innerhalb der Zeit vom 3.—6. October.

131. *Columba palumbus* L. — Ringeltaube.

Oldenburg: „Holtduwe“.

Ankunft: Altenkirchen 1. Februar (in kleinen Flügen hier); Schiesshaus 12. Februar; Walkenried 2. März (20 Stück auf dem Durchzuge), 14. März (nehmen Standquartier); Allrode 15. Februar; Lichtenberg 9. Februar; Braunschweig 24. Februar; Marienthal 16. März; Grossenhain 17. März; Flensburg 11. Januar (l Stück gesehen), 4. März (10 Stück auf dem Zuge), 11. März (15), 26. März (30) und 2. April (20 Stück auf dem Zuge); Norkitten 20. März.

Abzug: Lichtenberg 12. October; Marienthal Ende October (am 22- December noch 1 Exemplar gesehen).

Bei Oldenburg verblieb die Ringeltaube während des Winters 1881/1882 und wurde in grossen Schaaren sowohl im December, als auch Januar und Februar angetroffen. Zarte Kohlblätter bildeten einen Theil ihrer Nahrung.

Bei Münster wurden Anfang October noch nicht flügge Junge angetroffen, bei Flensburg am 21. April vom Neste gejagt, Grossenhain 15. April paarweise am Nistplatz.

132. *Coturnix communis* Bon. — Wachtel.

Ankunft bei Windsheim am 3. Mai.

Bei Münster war die Wachtel in diesem Jahre verhältnissmässig häufig, während sie in manchen Jahren fehlt. Bei Oldenburg fehlte sie diesen Sommer gänzlich und ist im Allgemeinen in den letzten Jahren seltener geworden, obgleich die Terrainverhältnisse im wesentlichen dieselben geblieben sind. Auch bei Grossenhain hat sie an Individuenzahl abgenommen.

Ein Gelege von 15 frischen Eiern wurde am 20. Juni bei Plänitz gefunden.

133. *Perdix cinerea* Lath. — Rebhuhn.

Grossenhain 26. Februar paarweise angetroffen, 15. Juni die ersten Jungen, 18. Juni deren mehrfach. Bei Flensburg fand man am 26. Juni im Kleefelde ein Nest mit 16 Eiern, die am Abend sämmtlich zerstört waren (wahrscheinlich vom Storch).

Ausführlichen Bericht über den Bestand etc. verdanken wir Herrn Pfarrer Jäcke1 und lassen wir dessen Mittheilungen wortgetreu folgen:

„Die Berichte Uber die Hühnerjagd lauteten aus allen Kreisen nicht gut, zum Theil sehr ungünstig. Namentlich in bergigen Gegenden traf man viele Gelthühner, resp. kettenlose alte Hühner an, ein Zeichen, dass viele Brüten durch den anhaltenden Regen zu Grunde gegangen sind. In ilachen Gegenden war der Bestand etwas besser, in einzelnen Lagen sehr gut. So traf ein hochbetagter, noch rüstiger Waidmann hiesiger Gegend (Obern-zenn) in 60 Jahren, während welcher er seine Jagd begeht, niemals mehr Feldhühner, als im heurigen Jahre. Jmmerhin ist das Jahr 1882 im Vergleiche zu dem. vorausgegangenen bedeutend besser gewesen. Der milde Winter war allem Wilde und die baldige Reife der Gerste sowie der Umstand, dass der Hagel viel Getreide auf dem Felde ausdrosch und nach der Aernte reiche Nahrung zurückliess, namentlich den Feldhühnern günstig, welche auch durchgängig sehr stark und wohl genährt befunden wurden.

Bei München wurde ein weisses Rebhuhn geschossen; nur an den Spitzen der Flügelfedern war einige Färbung bemerkbar. Die sämmtlichen übrigen Glieder der Kette, bei der sich dieses Huhn befand, waren alle normal befiedert.

Im Vorwinter 1882 kamen mehrere Hühner herein in die Stadt, eines setzte sich auf das Dach eines Hauses,

ein zweites wurde vor dem Postgebäude in eine Scheune gejagt und gefangen und ein drittes trieb sich zwei Tage hinter einander auf der Strasse vor meinem Hause und in meinem Garten umher."

134. *Phasianus colchicus* L. — Fasan.

Bei Marienthal war im November ein Exemplar erlegt worden.

Der Kropfinhalt eines am 20. November bei Münster elegten Exemplares (#) bestand ausschliesslich aus 411 Larven einer grossen Mückenart.

135. *Tetrao urogallus* L. —Auerhahn.

Herr Pfarrer Jäckel theilte Folgendes mit:

20. März. Oberfranken. Die Auerhahnbalz ist in vollem Gang. 3. April Unterfranken (Lohr) der erste Hahn, 15. April Bayreuth bei der Waldhütte ein Hahn, ebenda in der Wartei Neuenreuth am 16. ein Hahn, bei der Waldhütte am 22., auf der Wartei Jöslein am 27. je ein Hahn, am 29. auf letztgenannter Wartei 2 Hähne, 13. April Veldensteiner Forst, Revier Bernheck, Wartei Fischflein I ein Hahn, 13. April Frankenwald, Revier Kronach ein Hahn, 20. April Oesdorf bei Forchheim ein Hahn, 23. April Revier Gerlas, Forstamt Kronach ein Hahn, 26. April Oberbayern, Schiebdorf am Kochelsee ein Hahn, bis zu gleichem Datum auf dem Fürstlich Thum u. Taxischen Revier Neuenhammer 5 Hähne, 25. September Unterfranken, auf dem Revier Bundorf in den Hassbergen 1 Hahn erlegt.

136. *Tetrao tetrix* L. — Birkhuhn.

Oberfranken (Windsheim) 20. März Balz in vollem Gang; bei Grossenhain wurde der erste balzende Hahn am 14. April erlegt, am 16. April desgleichen. Mageninhalt bestand aus Moosspitzen, trocknen Pflanzentheilen mit ziemlich stark zerkleinerten Stengeln sowie ziemlich vielen, fast gleich grossen Quarzkörnern.

Bei Münster i/W. fehlte die Art früher gänzlich, und erst seitdem Moore und Haiden entwässert und mit Kiefern bepflanzt wurden, hat sich das Birkwild als Brutvogel angesiedelt und vermehrt sich trotz eifriger Verfolgung von Jahr zu Jahr; an passenden Oertlichkeiten bereits in erheblicher Anzahl vertreten.

137. *Tetrao medins* Meyer — Rackclhuhn.

Am 27. April 1882 wurde im bayerischen Oberlande auf dem Revier Marquartstein bei Traunstein, im Vorjahre auf dem Revier Forsthof im Nürnberger Reichswalde am 20. April 1881 und ebenda auf dem Revier Kraftshof am 29. September 1881 je ein Rackelhahn geschossen. (Jaeckel).

138. *Ardea cinerea* L. — Fischreiher.

Die ersten erschienen bei Walkenried am 17. März, bei Marienthal Mitte Februar, bei Flensburg am 1. März und bei Kurwien am 28. Februar. In den Kolonien von Upjever und im Buchenwalde Stühe in Oldenburg (daselbst horsteten über 200 Paare) hatten einzelne Reiher von 1881 auf 82 überwintert; auch dies Jahr blieben mehrere bis in den December. — In der Nähe von Flensburg, wo sich ein Stand von etwa 30 Horsten befindet, zwischen denen auch *Conus corax* und *Falco tinnunculus* sich angebaut haben, wurden am 9. Juli kaum flügge Junge gefunden. Von drei Gelegen aus dem Neuruppiner Forst war am 2. April das eine sehr stark, die andern beiden gar nicht bebrütet. — Auf dem Herbstzuge wurden Reiher beobachtet zu Grossenhain am 16. October Abends 7 Uhr bei leichtem Ostwind von N.O.—S.W.; bei Marienthal Anfang November; bei Altenkirchen am 16. September. — Im Kreise Schwaben und Neuburg wurden 1882 Prämien à 2 M. für 381 erlegte Fischreiher bezahlt. Einen sehr bedeutenden Beitrag hierzu lieferte eine im Bezirksamte Mindelheim bei Loppenhausen in der Gegend von Krumbach in einem prächtigen Fichten- und Buchenbestand von 8 bis 10 Tagwerk Fläche befindliche Kolonie, in welcher am 10., 14. und 20. Mai 178 Stück geschossen wurden, und zwar meist junge Vögel. Die Alten streifen hier aus der nur 10 Minuten von dem Dorfe Loppenhausen liegenden Kolonie zunächst nach der an Barben, Dickköpfen, Rothaugen und Edelkrebsen reichen Kamel, dann weiter nach der Mindel und Flossach, und zwar zu regelmässigen Tagesstunden, nämlich um 9 Uhr Morgens und um 3 Uhr Nachmittags. In der Gegend von Kurwien kommt der Reiher wenig vor; nur am Ufer des Masarischen Sees wurden mehrfach einige Stück gesehen, die das Dampfschiff bis aud 100 Schritt herankommen Hessen. Am 2. Juli wurden 11 Stück auf einer Insel in einem der Frauenhainer Teiche bei Grossenhain beobachtet.

139. *Ardea purpurea* L. — Purpurreiher.

Vom 7. bis 11. Mai wurden im Fürstlich Fuggerschen Jagdrevier Ottmarshausen in Schwaben fünf Purpurreiher geschossen, ein altes und zwei junge Männchen, ein altes Weibchen, welches nussgrosse Eier bei sich hatte, und ein junges Weibchen. 1881 wurden ebenfalls in Schwaben, bei Höchstadt an der Donau und bei Oettingen, zwei Stück erlegt.

140. *Ardea garzetta* L. — Seidenreiher.

Am 12. Juli wurde ein Exemplar an der Donau bei Regensburg geschossen.

141. *Buphus comatus* Pall. — Schopfreiher.

Bei Lichtenfels in Oberfranken wurde am l. Juli ein altes Männchen, am 6. desselben Monats in Oberbayern bei Rosenheini ein junger Vogel erlegt, welcher noch die flaumigen Anhängsel des Dunenkleides an den Federspitzen des Kopfes hatte.

142. *Botaurus stellaris* L. — Rohrdommel.

Am 11. März wurde bei Plänitz, am 2. April während heftigen Ostwindes bei Grossenhain der erste gehört; am 7. April machten sich bei letzterem Orte mehrere bemerklich. — Bei Windsheim wurde am 23. November ein Männchen erlegt und bei Münster, wo er im Herbst und Winter als Durchzügler nicht so selten ist, mehrere Exemplare im December.

143. *Ciconia alla* Briss. — Hausstorch.

In Oldenburg „Aebär“ und „Obär“ (H.).

Ankunft bei Oettingen in Schwaben am 2. März. Am 14. März umkreiste ein Storch das Nest in Windsheini, zog aber weiter; darauf erschien der erste Windsheimer am 1. April mittags 10½ Uhr, der zweite am 17.; ein fremdes Paar stellte sich nochmals am 19. ein. In Worms am Rhein traf der erste am 1. Februar ein. Bei Allrode zogen die ersten am 11. April durch. Bei Marienthal Ankunft am 21. April. Bei Calvörde, wo der Storch stark vertreten ist, erschien derselbe wie in andern Jahren Anfang April, begann sein Brutgeschäft und verliess die hiesige Gegend, bevor die Jungen ausgeschlüpft, sehr wahrscheinlich, weil die durch mehrwöchige Trockniss ausgedörrten Wiesen den Thieren zu wenig Nahrung boten. An zwei unserm Oldenburger Beobachter (H.) bekannten Stellen sind die Störche nicht wieder gekommen. Auch in Husum und in den wegen ihrer zahlreichen Storchnester berühmten Dörfern Seth und Silberstedt standen dies Jahr die meisten Nester, oft drei auf einem Dache, leer. In Flensburg wurde am 4. April der erste gesehen; bei Plänitz am 6. April; bei Wondollek am 24. März; bei Kurwien am 28. März, der zweite erst am 5. Mai, dann am 1. Juni einer, der wieder abzog. Auch bei dem letztgenannten Ort waren die Störehe in geringer Zahl vorhanden; ebenso ist in Königsberg der Storchmangel aufgefallen, die wenigen trafen spät ein, und viele Nester blieben leer. Ankunft bei Norkitten am 24. März; am selben Datum in Grossenhain, wo am April ein Zug von ca. 200 Stück passierte. In Frauenhain kam ein Männchen den 1. April bei Nordwestwind und schönem Wetter an seinem Nistplatz an, verschwand am 5. April und kehrte am 30. mit einem Weibchen zurück; das letztere verlicss jedoch bald wieder den Gemahl, der von nun an Wittwer blieb. Auch von hier wird bemerkt, dass dies Jahr nicht ein einziges Storchpaar zur Brut kam, so die Paare in den Dörfern Folbern, Göhra, Grossraschüitz, Kleinthiemig, Frauenhain und Naundorf. Bei Flensburg brütete das Weibchen noch am 16. Juli auf 2 Eiern; das Paar war erst im Juni auf dem Nest erschienen; später wurden Nest und Eier verlassen. — Auf dem Herbstzuge wurde Anfang November ein Stück 8 Tage lang auf den Rüderwiesen bei Grossenhain gesehen. Bei Flensburg hatten sich am 17. August 41 Stück auf einem Stoppelfelde versammelt, am 25. August wurde hier das letzte Exemplar beobachtet. Abzug bei Marienthal am 20. August. In Windsheim waren die Störche noch am 1. September auf dem Neste, andern Tags aber verschwunden; in den letzten Tagen ihres Dortseins übernachtete ein Stück auf dem alten Rathhause, ein anderes auf einem Klceblock vor der Stadt.

144. *Ciconia nigra* L. — Schwarzer Storch.

Ankunft bei Walkenried am 10. April, bei Allrode am 13. April; bei Flensburg wurde am 15. April das Weibchen auf dem Neste angetroffen. — Bei Oberaudorf in Oberbayern wurde am 30. Juli ein Waldstorch gcschossen, ein zweiter am 15. August bei Uflenheim in Mittelfranken. Aus Münster berichtet unser Beobachter: „Ein einziges Paar brütet in unserm grössten Waldcomplexe, der „Davert“, ca. 1 Meile von hier entfernt. Trotzdem in den letzten Jahren mehrfach die Jungen für den hiesigen zoologischen Garten ausgenommen, kehrte das Paar jedes Jahr wieder, während in früheren Jahren dasselbe bei ähnlichen Störungen 1 oder 2 Jahre ausblieb." Im Oldenburger Lande kennt Herr Huntemann vier Horste aus eigener Anschauung. In Alexwangen bei Pobethen in Ost-preussen hatte sich dies Jahr ein Paar eingefunden, und in der Kurwiener Wildniss wurde zum erstenmal seit 20 Jahren wieder ein Exemplar beobachtet.

145. *Fulica atra* L. — Wasserhuhn.

Wird in Oldenburg, wo es häufig ist, „Blässjacob“ genannt. — Ankunft bei Walkenried am 23. März; bei Eberswalde am 9. März; bei Grossenhain am 12. März, am 1. April daselbst 25 Stück beobachtet. — Bei Münster ist es im Frühling, Herbst und Winter ein nicht seltener Durchzügler, als Brutvogel kommt es dort merkwürdigerweise gar nicht vor. — Abzug bei Walkenried am 23. October.

146. *Gallinula chloropus* L. — Teichhuhn.

Wurde bei Walkenried Anfang April beobachtet. Am 5. Mai enthielt ein Nest bei Flensburg 9 Junge und 1 Ei; am 6. Februar wurde ein Exemplar in dieser Stadt auf einem Holzlager ergriffen.

147. *Ortygometra porzana* L. — Sumpfhuhn.

Bei Riddagshausen wurde am 10. Mai ein Nest mit 7 frischen Eiern gefunden.

148. *Ballus aquaticus* L. — Wasserratte.

Anfang April bei Walkenried gesehen. Bei Grossenhain hatte sich am 5. April ein Männchen am Telegraphendraht todtgeflogen; der Magen enthielt nur wenige Insekten. Bei Flensburg wurde am 8. December ein Exemplar gefangen, das durch die offene Thür in ein Weinhaus gegangen war, woselbst sich Haushühner Futter suchten.

149. *Crex pratensis* Bcbst. — Wachtelkönig.

In Oldenburg „Snarrendart“ und „Happesnart“. Ist daselbst häufiger Sommervogel. — Bei Marienthal

wurde der erste Ruf am 4. Juni gehört; bei Flensburg am 5. Juni; bei Grossenhain am 19. Mai. — Ausserordentlich viele Wachtelkönige gab es während der Hühnerjagd im Herbst 1882 auf Kleestücken, auf Kraut- und Rübenäckern in der Gegend von Windsheim; den letzten erhielt unser Berichterstatter am 6. October von Schwabheim bei Windsheim. Ebenfalls häufig war unser Vogel im September und October bei Münster, wo er in auffallender Weise manches Jahr zahlreich vorkommt, dagegen in anderen Jahren fast ganz fehlt. Bei Oldenburg wurde vor zwei Jahren einer in Dohnen gefangen.

150. *Nutnenius phaeopus* L. — Kleiner Brachvogel.

Bei Grossenhain am 7. Mai und mehrere am 23. Juli beobachtet; auf dem Durchzuge am 13. August; am 17. Abends zwischen 10 und ¼ Uhr bei leichtem Südwestwind und bedecktem Himmel zogen grosse Massen ziemlich tief über der Stadt hin von N. nach S.; die Vögel machten einen Heidenlärm, so dass die Leute aus den Häusern auf die Strassen eilten, um zu sehen, woher das Pfeifen rühre. Um 11 Uhr Regen. — Bei Flensburg am 15. August starker Zug in östlicher Richtung.

151. *Numenius arcuatus* L. — Grosser Brachvogel.

Ist bei Münster nur als Durchzügler, bei Wettringen beim Rheine als nicht seltener Brutvogel bekannt. Nach Huntemann's Beobachtungen überwintert er regelmässig an der Oldenburgischen Küste. — Am 17. April frisches Gelege von 3 Stück bei Wettringen. — Am 15. August sehr starker Zug über Flensburg nach Osten. Bei Grossenhain zogen am 9. August, Abends 11 Uhr bei Nordwestwind und bedecktem Himmel unter fortwährendem Pfeifen, ziemlich tief, grössere Schaaren durch; am 25. August gegen Abend wurden daselbst 10 Stück am kleinen Spitalteiche beobachtet.

152. *Limosa rufa* L. — Rothe Pfuhlschnepfe.

Auf der Halbinsel Zingst bemerkte Professor Altum die rothe Limose sehr vereinzelt, zuweilen zwei zusammen; am 19. September wurde die letzte gesehen und erlegt.

153. *Totanus ochropus* L. — Punktirter Wasserlänfer.

Nicht seltener Durchzugsvogel bei Münster, im Mai und Ende Juli und im August; am 27. Juni erhielt Koch aus Wettringen Männchen und Weibchen alt, ob diese dort gebrütet?

154. *Totanus calidris* L. — Rothschenkel.

In Oldenburg „Tüdick“; häutiger Brutvogel; angekommen am 7. April (H.).

155. *Totanus glottis* L. — Grünfüssiger Wasserläufer.

Am 12. September auf der Halbinsel Zingst beobachtet.

156. *Machetes pugnax* L. — Kampfhahn.

In Oldenburg „Strusshöhner“ (pl.), so auch in der Treeneniederung bei Husum, wo sie noch sehr häufig sind.

157. *Tringa cinclus* L. — Alpen-Strandläufer.

Bei Flensburg am 15. August und am 6. September stark ziehend. In einer Mittheilung über seine Strandjagd auf der Halbinsel Zingst schreibt Prof. A11 u m: „*Tr. cinclus* war am Strande stets zahlreich bis zu meiner Abfahrt am 22. September, meist Junge, einzelne Alte mit noch theilweisem Sommerkleide, nicht viele mit bereits beginnendem Winterkleide. Die Schnabellänge zwischen 3,0 und 3,5 Cm. wechselnd. Meinen früheren Beobachtungen, z. B. auf Borkum, gegenüber war es auffallend, dass ausser jenen einzelnen Alpen-Strandläufern das übrige Kleinzeug niemals einen Anfang des Winterkleides zeigte."

158. *Tringa minuta* Leisl. — Zwerg-Strandläufer.

Wurde im September auf Zingst nur ganz vereinzelt, und

159. *Tringa subarcuata* Güld. — Bogenschnäbliger Strandläufer, daselbst recht spärlich angetroffen. Von beiden nur Junge, ohne Andeutung eines andern Kleides.

160. *Tringa canutus* L. — Isländischer Strandläufer.

Vom 1. bis 13. September wurden täglich kleine Trupps von

2—5 Stück am Strande zu Wangerooge beobachtet, von denen verschiedene erlegt wurden; es waren nur junge Vögel, die sich so nahe kommen Hessen, dass man sie deutlich erkennen konnte (W.). Auch AI tum, der ihn auf Zingst überall, vereinzelt oder zu 2 bis 5 oder 6 Stück, aber stets isolirt, antraf, bemerkte ausschliesslich Jugendkleider.

161. *Calidris arenaria* L. — Sanderling.

Wurde auf Zingst am 18. September zum erstenmale beobachtet, nahm allmählich an Zahl zu, war in den folgenden Tagen gemein; unter vielen Jungen wurde nur ein altes Exemplar mit theilweisem Sommerkleide geschossen, nirgends eine Andeutung von Winterkleid.

162. *Telmatias gallinago* L. — Bekassine.

In Oldenburg „Stickupp“ und „Wildlamm“.

Ankunft bei Grasberg am 12. April mit S.O.-Wind, der scharfe Nachtfröste brachte. Bei Grossenhain wurden die ersten in ziemlich starker Anzahl am 12. März angetroffen. — Am 29. Mai wurden bei letzterem Orte die ersten flugbaren Jungen beobachtet. — Während des Herbstzuges waren in der Umgegend von

Greifswald die Bekassinen spärlich vertreten, mit Ausnahme des 10., 11. und 12. Octobers, an welchen Tagen grössere Mengen dieser Vögel gefunden wurden, so dass Förster S ch m i d t in Zinnowitz auf Usedom am 10. zwölf Stück schiessen konnte, Herr v. Homeyer-Murchin an jedem der drei genannten Tage mit seinen Jägern einige 20 Stück. Von Anfang des Monats October bis zum 20. wehten O.S.O.-Winde, mit Ausnahme des 10. und 11., an welchen Tagen der Wind aus W. kam. Bei Grossenhain zogen die Bekassinen, mit anderen Schnepfenarten untermischt, besonders am Abend des 20. August von 10—11 Uhr bei kühlem W.-Wind von N.O. nach S.W.; ein ähnlicher Durchzug erfolgte am 12. September Abends ¼ 10 Uhr bei S.O.-Wind und warmer, gewitterhafter Luft, von N.O. nach S.W. in mässiger Höhe; ein weiterer Zug am 23. September Abends 8. Uhr.

163. *Telmatias major* Gm. — Grosse Sumpfschnepfe.

Bei Grossenhain wurde am 2. April und am 8. August je ein Exemplar angetroffen.

164. *Scolopax rusticola* L. — Waldschnepfe.

Beobachtungen Uber den Frühjahrszug: Im Main- und Regnitzthal von Bamberg abwärts über Hassfurt in den Spessart kamen die ersten Fouriere des Zuges in den Tagen vom 2. bis 6. März an, das Gros zog swischen dem 11. und 13. d. M. durch. Von da an trat eine Pause bis zum 16. ein, von welchem Tage an eine Woche hindurch noch eine kleine Zahl von Nachzüglern bemerkt wurde; dann war Alles vorbei. Bei Nürnberg wurde die erste Schnepfe am 12. März, bei Tückelhausen in Unterfranken und bei Ansbach in Mittelfranken am 13. d. M. erlegt. Bei Altenkirchen hörte man am 24. Februar die erste murksen, am folgenden Tage wurde die erste auf dem Strich erlegt. Bei Rambolz zeigte sich die erste am 19. März. Bei Münster war der Frühjahrszug sehr spärlich. Bei Schiesshaus kamen die ersten am 8. März, bei Allrode am 7. März, bei Walkenried am 20. März, bei Wieda am 13. März, bei Steterburg am 8. März, bei Thune (Braunschweig) am 9. März, bei Marienthal am 6. März, bei Wondollek am 21. März, bei Norkitten am 14. März, bei Grossenhain am 10. März. Aus Oldenburg wird berichtet, dass auf noch keinem Frühjahrszuge so wenige Schnepfen gesehen und erlegt worden sind, wie in diesem Jahre, und andere Berichterstatter stimmen in diese Klage mit ein; an der ganzen Schleswigholsteinischen Westküste mögen kaum über zehn geschossen sein, etwas besser war es an der Ostküste, wo von Anfang März an einzelne erlegt wurden. Im Braunschweigischen war der Zug besonders in der Ebene ein sehr geringer; die meisten Schnepfen, die sich übrigens auch nur sehr kurze Zeit hier aufhielten, fielen auf den niedrigen Hügelgruppen, wie Elm, Oder, Asse und auf dem Harze ein; am 12. März wurden einzelne gesehen, am 18. beim Treiben im Oder viele gefunden (R. Blasius).

Ueber den Herbstzug wird aus Greifswald berichtet: Die Zahl der Schnepfen, welche in diesem Herbst in unserer Provinz einfielen, ist eine sehr kleine; bei der Suche sowohl als auf Treibjagden bekam man nur ganz vereinzelte zu sehen; obgleich die Reviere von vorzüglicher Beschaffenheit waren, infolge des vielen Regens im Spätsommer und Herbst (Qu.). Bei Flensburg blieben sie lange im Gebiet, Mitte November wurden in einem Revier 10 Stück geschossen, am 9. December noch ein Exemplar gejagt. In einem niedern Gestrüpp nördlich von Husum schoss ein Jäger während der Saison über 80 Stück. Bei Marienthal wurde die letzte am 16. November gefunden; bei Steterburg am 10. und 15. November je 2 Stück, die erste am 15. October; bei Walkenried vom 2. October bis in den November; bei Altenkirchen wurden am 3. November viele auf der Hubertusjagd angetroffen. Im Herbst 1881 wurden einzelne noch während des ganzen Novembers in Mittel- und Oberfranken geschossen; im Herbst 1882 waren sie in ganz Franken von Ende September bis Ende November auf Treibjagden sehr häufig; auf einer viertägigen Jagd im südlichen Oberfranken wurden vom 8. November an wenigstens 40 Stück angetroffen. — Bei Altenkirchen blieben manche den Winter über.

165. *Recurvirostra avocetta* L. — Säbelschnäbler.

Kömmt nach den Erfahrungen Huntemann's regelmässig Anfang October an der Oldenburgischen Küste in grossen Schaaren vor; in diesem Jahre vom 1. October an. Im Weselburener Koog (Dithmarschen) nisten alljährlich viele auf den Rübenfeldern der Zuckerfabrik; Dutzende von Nestern aber werden bei der Bearbeitung des Landes zerstört.

166. *Grus cinerea* L. — Kranich.

Ueber den Frühjahrszug liegen folgende Beobachtungen vor: Aus Altenkirchen 19. März ein grosser Zug, eine 2 Km. lange, dicht geschlossene Linie bildend, Abends 6 Uhr von S.W. nach N.O. (vergl. VI. Jahresbericht p. 68); am 20. März Abends 7½ Uhr ein Zug, der in der Dunkelheit nicht wohl anzusprechen war. Bei Münster wurden am 4. April mehrere kleine Züge beobachtet. Bei Walkenried am 7. März Nachmittags 10 Stück, 20 Stück und 20 Stück nach O.; am 18. März ca. 200 Stück nach O.N.O. Bei Wieda am 20. März ca. 60 Stück nach N.O. Bei Allrode am 9. März 45 Stück nach N.O., desgl. am 17. März Abends ein Zug, am 19. Abends 2—300 Stück und am 20. Nachmittags 4 Uhr ein Zug nach N.O. Bei Steterburg am 14. und 18. März. Bei Marienthal der erste Zug am 18. März von S. nach N., ferner am 20. März nach N.O. am 21. und 25. nach N.O., die letzten am 3. April (26 Stück) nach N. Bei Wondollek am 20. März. Bei Kurwien am 21. März. Bei Norkitten am 20. März. Am 12. April wurde ein junges Männchen bei Seftenberg, 7 Stunden nordöstlich von Grossenhain, erlegt.

Beobachtungen des Herbstzuges: Bei Kurwien erfolgte der Abzug sonst immer schon im August in kleinen Zügen; dies Jahr aber sah und hörte unser Berichterstatter erst am 23. September gegen Abend einen starken Flug bei ziemlich stiller Witterung, ein schwacher Wind wehte von O.S.O., die Kraniche zogen nach S.S.O. (Sp) Bei Marienthal wurde der Rückzug beobachtet am 24. October von O.-W., am 28. October von S.O.-N.W., am 29. October von N.W.-S.O. und die letzten (14 Stück) am 2. November von N.W.-S.O. Bei Steterburg am 13. November ein Zug (50 Stück) von O. - W. Bei Wieda am 27. October Mittags 2 Uhr ein Zug von 150 Stück sehr hoch nach S.W., ein anderer von ca. 100 Stück etwas niedriger; das Wetter war hell und klar, an den Tagen vorher und nachher theils hell, theils regnerisch, Bei Altenkirchen ästen sich am 26. December 1881 zwei Stück auf einem von drei Seiten von Wald umschlossenen Roggenfelde seit mehreren Tagen; das Männchen wurde erlegt, das Weibchen kreiste den ganzen Nachmittag über dem Roggenfelde, am andern Morgen war es verschwunden; in diesem Herbst (1882) wurden daselbst auffallenderweise Kraniche weder gesehen noch gehört,

167. *Otis tarda* L. — Grosse Trappe.

Bei Grossenliain wurden am 12. März 8 Stück, am 15. März 1 Stück und am 17. März 10 Stück beobachtet.

168. *Oedicnemvs crepitans* Temm. — Dickfuss.

In den Isarauen bei Rosenheim (Windsheim) wurden bei Treibjagden vom 1. bis 5. November 1881 4 Stück erlegt. Bei Plänitz beobachtet am 6. April.

169. *Haematopus ostralegus* L. — Austernfischer.

Am 23. September wurde bei Flensburg 1 Stück unter 18 *Larus canus* bemerkt; sonst besucht der Austernfischer den dortigen Hafen recht selten. Auf der Halbinsel Zingst von AI tum im September täglich beobachtet, Alte und Junge, die Jungen stark in der Mauser, zu 6 bis 8 beisammen.

170. *Vanellus cristatus* L. — Kibitz.

Beobachtungen über den, Frühjahrszug: Ankunft bei Altenkirchen am 8. März; bei Walkenried am 17. März; bei Steterburg am 16. Februar, am 1. März in grossen Mengen; bei Marienthal am 7. März; bei Grasberg am 4. März mit S.W.-Wind und bei stürmischem, regnicbtem AVetter; bei Hamburg viele am 1. März; bei Plänitz am 11. Februar; bei Norkitten am 27. Februar; bei Grossenhain am 26. Februar (13° Wärme), ferner am 12. März 50 Stück auf dem Durchzuge bei Kalkreuth, auch am 28. März 23 Durchzügler.

Bei Steterburg wurden die ersten Eier am 4. April gefunden; bei Braunschweig war die Haupt-Eierzeit Anfang April; im Iever-lande konnten die bekannten 101 Kibitzeier zum 1. April gesammelt werden; unter vier Gelegen mit zusammen 9 Eiern, die am 4. April an der Küste gebunden wurden, war eines bereits bebrütet. Bei Grossenhain am 15. März die ersten Eier. Daselbst am 9. Juli unter einer Schaar von 25 Stück am grossen Spitalteiche einzelne noch nicht ganz flugbare Junge. Das Oldenburger Museum erhielt ein Ei, welches nur einzelne wenige grosse Flecke (wie Klekse) enthält; unser Berichterstatter (H.) vermuthet jedenfalls richtig als Ursache dieser abnormen Zeichnung das wiederholte Wegnehmen der Eier.

Der Herbstdurchzug erfolgte bei Grossenhain vom 11. August bis zum 8. September; am 20. November bei Westwind, Regen und Schneegestöber und 2 Grad Kälte wurde daselbst ein junges Männchen erlegt. Von Damme, im Süden Oldenburgs, wird berichtet, dass der Kibitz den ganzen Winter dort geblieben ist.

171. *Squatarola helvetica* L. — Kibitz-Regenpfeifer.

War im Herbst und im Frühjahr bis Ende Mai sehr häufig an der Schleswigholsteinischen Westküste. Auf Zingst wurde er im September einzeln oder zu zweien angetroffen, nur im Jugendkleide.

172. *Charadrius pluvialis* L. — Gold-Regenpfeifer.

Erschien bei Norkitten am 1. April. Bei Münster zeigt er sich auf dem Durchzuge in grosser Menge; als Brutvogel kommt er bei Wettringen vor. Am 30. September wurden im Süden Oldenburgs Schaaren bis zu 30 Stück auf Aeckern gesehen.

173. *Charadrius hiaticula* L. — Sand-Regenpfeifer.

Auf der Halbinsel Zingst wurden im September kleinere Trupps angetroffen; die Erlegten trugen das Jugendkleid.

174. *Charadrius fluviatilis* Bchst. — Fluss-Regenpfeifer.

Am 14. August bei S.S.O.-Wind, Abends zwischen 10 und 11 Uhr ein starker Durchzug von Regenpfeifern und verschiedenen anderen Strandvögeln bei Grossenhain; desgleichen, aber bei Weitem weniger, am 15. August; Zugrichtung von NO.—SW.

175. *Charadrius cantianus* L. — See-Regenpfeifer.

In geeigneten Küstengegenden Oldenburgs brütet er noch ziemlich häutig; am 2. August wurde ein Gelege von 3 Eiern gefunden; am 5. August schlüpften aus 2 Eiern die Jungen aus.

176. *Strepsilas interpres* L. — Steinwälzer.

Von diesem an der Oldenburgischen Küste selten vorkommenden Vogel erhielt Wiepken am 6. September ein junges Exemplar von Wangerooge.

177. *Anser cinereus* M. u. W. — Graugans.

Durchzüge wurden beobachtet am 14. März von W. nach O. und am 19. October von S. nach N. bei Marienthal; bei Norkitten am 6. März.

178. *Anser segetum* Gm. — Saatgans.

Am 17. October, bei S.O.-Wind und etwas neblichtem Wetter, strich eine Schaar früh 8 Uhr südlich der Stadt Grossenhain eine halbe Stunde lang in unbestimmer Richtung umher. Bei Calvörde fehlte die Saatgans nebst andern, sonst regelmässig dort in der Ohre-Niederung erscheinenden Wintergästen, vielleicht infolge der überaus milden Temperatur im December und Januar. — *Anser brachyrhynehus* Baill. seheint nach den auf Führ gefangenen und gelegentlich auf dem Wattenmeer geschossenen Exemplaren öfter an der Schleswigschen Westküste vorzukommen (vergl. J. f. O. 1883 p. 76 f.). In Lebensweise, Stimme etc. habe ich keinen Unterschied zwischen ihr und *segetum* entdecken können. (R.)

Ueber „Wildgänse," ohne bestimmte Speciesangabe wird weiter Folgendes berichtet: Bei Altenkirchen am 24. März Nachmittags 5½ Uhr 50 Stück durchziehend; bei Allrode am 22. Februar Nachmittags 5 Uhr 40—50 Stück nach N.O.; bei Braunschweig Mitte März 16 Stück in keilförmigem Fluge von W.S.W, nach O.N.O. während eines sehr starken Weststurmes; bei Grasberg am 12. Januar mehrere nach S.W. (S.W.-Wind und offenes Wetter, am 14. folgte Frost), ebenso am 15. Januar bei gelindem Frost und starkem Nebel; bei Steterburg am 17. October mehrere Züge von O. nach W.; bei Walkenried am 4. October ca. 40—50 Stück nach W.

179. *Branta bernicla* L. — Ringelgans.

Bei Flensburg zogen am 26. Februar 5 Stück nach N.O.; am 14. Mai zeigten sich Schaaren von 20, 30, 10, 8 und 3 Sttick im dortigen Hafen; am 24. Mai zogen grosse Schaaren nach N. durch.

180. *Cygnus musicus* Bebst. — Singschwan.

Am 25. Januar zog ein Stück, von N.W. kommend, bei Marienthal durch.

181. *Cygnus minor* Pall. — Kleiner Singschwan.

Herr Wiepken berichtet aus Oldenburg: Auf dem Rückzüge im März und April sind meines Wissens hier keine gesehen und im Anfange Novembers nur ein Zug von einigen 20 beobachtet. Der ungewöhnlich niedrige Wasserstand ist wohl die Ursache, dass die kleinen Schwäne nur durchgezogen sind, ohne hier gerastet zu haben, wie sie es in günstigen Jahren thun, d. h. wenn die Wiesen überschwemmt sind. Bis wohin zieht *C. minor?* Er kommt hier so ziemlich Mitte October, bleibt in der Regel bis Mitte December, zieht dann in westlicher Richtung ab und kommt im März und April zurück.

182. *Cygnus olor* Gm. — Höckerschwan.

Herr Spalding fand in der Nähe Johannisburgs auf dem Russsee ein brütendes Paar; derselbe sah im August auf einem See bei Finkenstein in Westpreussen mindestens 50—60 Stück.

183. *Anas querquedula* L. — Knäckente.

Am 10. März wurden drei Stück auf dem Wiedbach bei Altenkirchen erlegt; am 23. April zeigten sich 14 Stück auf dem Priorteiche bei Walkenried; am 12. März 8 Stück durchziehend bei Grossenhain und am 7. April zwei Paare auf dem grossen Spitalteiche daselbst. Am 11. Mai wurde bei Riddagshausen ein Gelege von 8 Eiern gefunden.

184. *Anas crecca* L. — Krickente.

Bei Grossenhain wurden am 12. März 6 Stück angetroffen, am 7. April auf dem grossen Spitalteiche zahlreiche beobachtet und am 2. Juli Alte mit flugbaren Jungen daselbst gesehen.

185. *Anas boschas* L. — Stockente.

Am 1. Mai wurde ein volles Gelege bei Riddagshausen gefunden; 9 Eier bei Emersleben im Kornfelde, Uber 1000 Schritte vom Wasser entfernt. Im Forstort Langenberg, Revier Walkenried, wurde am 9. Mai im Eichenschälholzschlage, mitten im Bestand, ca. 80 Dkm. von der Wiede entfernt, in einer 1,2 M. in Brusthöhe starken und ca. 60 M. hohen Rothbuche ein Entenpaar bemerkt welches in einer sogenannten Twele in ca. 14 M. Höhe zu nisten versuchte. Nach zwölf Tagen wurde das Nest aber verlassen. (Ausserdem wurde in der gedachten Buche in einem Astloch ca. 8 M. hoch ein Hohltaubennest und in einem zweiten Loch, 12 M. hoch ein Baumläufernest gefunden. Auch ein verlassenes Nest von *Ciconia nigra* befand sich auf demselben Baum.) Am 3. Februar waren auf eisfreien Stellen der Röder bei Grossenhain einzelne Märzenten eingetroffen, am 12. Februar daselbst gegen 300 Stück, theilweise in Paaren, am 10. April wurde ein Nest mit 8 unbebrüteten Eiern gefunden und am 2. und 9. Juli Alte mit flugbaren Jungen angetroffen. — In der Nacht vom 21. zum 22. October (ziemlich kalter N.O.-Wind, sonst schönes Wetter) hatte ein grosser Zug Enten auf dem kleinen Spitalteiche (Grossenhain) Station gemacht, die ein aussergewöhnliches Leben verursachten, aber bis auf einzelne am nächsten Morgen abgezogen waren. — Während des sehr bedeutenden Hochwassers in der dritten vollen Woche des Novembers gab es bei Windsheim eine Menge von Wildenten, Schaaren bis zu 200 und darüber; auch nach dem Zurückgehen des Wassers waren sie in den stehengebliebenen Lachen weiter Wieseuflächen bei Burgbernheim, Ottenhofen, Schwebheim und Ipsheim noch sehr häufig. „Am 5. Februar wurde in der Isar eine hahnenfedrig werdende Ente geschossen; sie hatte einen grünen Kopf und an der

Vorderseite des Halses einige den weissen Halsring des Erpels andeutende weisse Federchen; der ganze Hals aber und die ganze Vorderseite, Brust und Bauch bis zum Schwänze, trug das Kleid der Ente, während der Rücken, der Flügel und die Flügeldeckfedern die des Erpels waren; die Partien unter den Flügeln, die unteren Theile des Rückens zeigten das weibliche Gefieder, wogegen der Steiss mit den schwarzgrünen Federn des männlichen Vogels bekleidet war. Aufgerollte Krückelfedern fehlten. Am 4. November jagte ein Raubvogel 7 Stockenten in den hiesigen Bahnhof, wo eben ein Zug rangirt wurde. Ein Entrich prallte mit solcher Vehemenz an die Maschine an, dass er betäubt herabstürzte und ergriffen wurde“ (Jäckel). Herr de Lamare's gezähmter Erpel (vergl. die vor: Berichte) machte auf 4 Wochen einen Abstecher mit einer Ente, kehrte dann aber auf den Hühnerhof zurück. Beginn der Frühjahrsmauser Anfang Mai, der Herbstmauser Ende August. Herr Professor Altum beobachtete auf der Halbinsel Zingst die beginnende Umfärbung im September.

186. *Anas acuta* L. — Spiessente.

Bei Altenkirchen wurden am 12. März 10 Stück beobachtet, davon ein Männchen erlegt.

187. *Fuligula nyroca* Güld. — Moorente.

Am 22. October wurde ein altes Männchen bei Grossenhain; erlegt. Am 11. Mai fünf Eier bei Riddagshausen gefunden.

188. *Fuligula cristata* L. — Reiherente.

Mehrere auf dem Durchzuge am 10. März bei Tückelhausen beobachtet und eine erlegt.

189. *Somateria mollissima* L. — Eiderente.

Am 14. März wurde ein Männchen im Prachtkleide im Flens-burger Hafen geschossen. (Die verschiedenen Entenarten, die bei strengem Winter so zahlreich in den dortigen Hafen kommen, haben sich bis Ende 1882 wenig blicken lassen; nur am 30. December stellten sich ungefähr 10 Stück Eisenten ein.)

190. *Mergus castor* L. — Gänsesäger.

Am 12. December wurden bei Oldenburg mehrere erlegt.

191. *Stema hirunclo* L. — Fluss-Seeschwalbe.

Bei Münster ist sie im Frühjahr, Herbst und Winter auf Flüssen und Teichen nicht gerade selten; einzeln auch wohl mal im Sommer, so wurden am 29. Juni 3 Stück erlegt. Auf der Insel Arngast brüten reichlich 20 Paare, doch nimmt die Colonie von Jahr zu Jahr ab, weil die Vögel durch Eiersucher gestört werden (ebenso ist es mit *St. minuta*.) Am 11. September wurden bei Stralsund, bei Barth und am Strande der Halbinsel Zingst grosse Mengen unserer Seeschwalbe angetroffen, bald nachher auch nicht ein Individuum.

192. *Stema minuta* Gm. — Kleine Seeschwalbe.

Am 16. Juli wurden 4 Stück bei den Frauenhainer Teichen (Grossenhain) nach S.O. streichend beobachtet.

193. *Stema nigra* L. — Schwarze Seeschwalbe.

Bei Oldenburg wurden am 5. Mai (N.W.-Wind) die ersten in reichlich 20 Exemplaren gesehen. Bei Grossenhain trafen die ersten am 29. Mai gegen Abend am grossen Spitalteiche ein.

194. *Larus ridibutidus* L. — Lach-Möve.

Auf dem 1348 Tagwerke Wasserfläche haltenden Wörthsee in Oberbayern, wo auf einer kleinen Sumpfinsel im See jährlich Hunderte von Lachmöven brliten und, wenn die Jungen flügge werden, Gegenstand der Jagd sind, wurden am 21. Juni, obwohl die Jungen schon vollständig flügge waren und bei Beginn der Jagd in beträchtliche Höhe sich aufschwangen, 470 Stück geschossen und nach München auf den Wildpretmarkt gebracht, wo sie, das Paar um 20 bis 25 Pfennige, in wenig Stunden verkauft waren. Der Jagdherr, Graf v. Törmig-Seefeld, liefert jährlich eine bestimmte Anzahl Möveneier an die königliche Hofküche. Auf dem 29 alte bayrische Tagwerke grossen Harnoldweiher bei Fronberg in der Oberpfalz, wo ebenfalls viele Lachmöven brüten, lässt der dermalige Jagdinhaber, Freiherr v. Künsberg Jagden nur abhalten, wenn die Jungen gut fliegen können, und wurden 1881 abgeschossen 634 Stück. (Jäckel.) Bei Münster ist sie im Frühjahr, Herbst und Winter nicht selten, im Sommer einzeln; am 23. Juni wurden 3 Stück geschossen. Bei Grossenhain trafen die ersten zwei Stück am 16. März in der Colonie am grossen Spitalteiche ein; den 30. März, Nachmittags, waren sie in sehr grosser Anzahl vorhanden; am 7. April wurden vereinzelte auf dem grossen und kleinen Spitalteiche angetroffen; am 30. April befanden sich 15 Stück in der Colonie; am 4. Mai zählte man mindestens 300 Stück, während am 29. Mai nur einige 50 vorgefunden wurden. Eier wurden dies Jahr bei einmaliger Abnahme nur 40 Stück vom Pächter gesammelt. Am 9. Juli waren die Jungen zum grössten Theile flugbar. Am 26. Juli wurden nur einzelne Möven in der Colonie angetroffen, das Gros war fort. Am 10. August, Nachts 12 Uhr, ging eine Schaar mit Geschrei bei Grossenhain durch, bei leichtem N.W.Wind und bedecktem Himmel von N.O. nach S.W.

195. *Larus canus* L. — Sturm-Möve.

Kommt bei Münster im Herbst, Winter und Frühjahr vor; wurde daselbst Mitte März in 4 Exemplaren erlegt. Bei Walkenried zeigten sich am 16. September 5 Stück auf dem Priorteiche. (Zwei grosse „Sturmvögel“, die am 4. Juli, vom Sturm verschlagen, bei Allrode erschienen und hinter dem pflügenden Bauer Würmer suchten, wie die Krähen, mögen wohl *L. argentatus* gewesen sein). Am 13. September auf der Halbinsel Zingst

viele Sturmmöven im Winterkleid, mit anderen Möven und Wildgänsen den Strand bis Trendel (Sandplatte an der äussersten Spitze) bedeckend.

196. *Larus marinus* L. — Mantelmöve.

Am 20. September standen auf Zingst die jungen (zweijährigen) Vögel in der ersten Mauser zum alten Winterkleide; der Schnabel war noch unschön, die Mauser jedoch bis auf einige hellgraue Federn vollendet.

197. *Lestris pomarina* Temm. — Raubmöve.

Am 21. September wurde ein junges Weibchen bei Altenkirchen auf dem Felde erschlagen (vergl. Orn. Centralbl. 1882, p. 177).

198. *Lestris parasitica* L. — Schmarotzer-Raubmöve.

Bei Altenkirchen wurde am 13. September ein junges Männchen erlegt (Centralbl. 1882 p. 177). Ein bei Forbach in Lothringen erlegtes Exemplar kam am 24. Februar in das Braunschweiger Museum.

199. *Lestris catarrhactes* L. — Grosse Raubmöve.

Am 28. September wurde bei Skassa (Grossenhain) ein junges Männchen geschossen; einige Tage darauf wurde daselbst ein zweites Exemplar erlegt. Im Magen der ersteren wurden nur Mäuse gefunden.

200. *Halieus carbo* L. — Kormoran-Scharbe.

Am 1. September wurde ein junges Männchen bei Lonningen im Oldenburgischen geschossen.

201. *Thalassidroma leucorhoa* Degl. — Sturmsegler. Am 20. November wurde in der Nähe der Stadt Oldenburg ein Männchen todt gefunden; dasselbe musste schon vor längerer Zeit umgekommen sein, da die Ftisse bereits eingetrocknet waren; 14 Tage vorher hatte ein starker Sturm aus N.W. geweht. Ausser diesem ist im Februar 1881 ein Exemplar beim Bremer Leuchtthurm gefangen. Sonst ist diese Art in Oldenburg noch nicht beobachtet, während *pelagica* nicht zu den grossen Seltenheiten gehört. (W.)

202. *Colymbus minor* L. — Zwerg-Steissfuss.

In Oldenburg „Pärkädel“.

Ankunft bei Grossenhain am 12. März. Bei Riddagshausen wurde am 1. Mai ein volles Gelege von 5 Eiern gefunden.

203. *Colymbus grisegena* Bodd. — Rothhalsiger Steissfuss.

Am 1. April zeigte sich ein Stück, am 7. April eine grössere Anzahl an beiden Spitalteichen bei Grossenhain. Am 4. Mai wurde ein Ei bei Riddagshausen gefunden.

204. *Colymbus cristatus* L. — Hauben-Steissfuss.

In einem Nest bei Riddagshausen fanden sich am 18. Mai 3 Junge und ein Ei. Auf dem grossen Teiche bei Frauenhain wurde am 2. Juli ein Paar beobachtet.

Addendum to "The Contrast Between Crystallization and Life."

Addendum to "the Contrast Between Crystallization and Life."

(PUBLISHED FOR THE VICTORIA INSTITUTE, 1874.)

Written in connexion with the British Association Meeting of 1879.

SOME disappointment may be felt that the recent meeting of the British Association (1879) has brought forth little that is new, and still less that is conducive to the material prosperity of the country.

The meeting appears to me nevertheless to have been an important one, as it has tended to lay bare to a certain extent the primitive rock of *nescience*, the knowledge of which must precede any real advance in *science*.

It is perhaps too much to expect of an assembly of wise men that they should be able to take all at once the grand position of the acknowledgment of ignorance; and yet there seems to have been some approach to such an admission.

It would be only too cheering to anticipate that in a future meeting our leading men of science could advance to as lofty a height as one in no respect their inferior in power of thought, "script (greek?)"

Rom. xvi. 27.

The inaugural address of the president is an admirable *resume* of all that recent researches have been able to discover in reference to *living matter;* with the exception of certain works of a most accurate observer, Dr. Lionel Beale,—to my thinking the most interesting of all.

Why no reference should be made to these may be conjectured, but must not be asserted. In the meantime it is satisfactory to learn that (as I have shown in the preceding paper),—

"It is quite true that between lifeless and living matter there is a vast difference, a difference greater far than any which can be found between the most diverse manifestations of lifeless matter. Though the refined

synthesis of modern chemistry may have succeeded in forming a few principles which until lately had been deemed the proper product of vitality, the fact still remains that no one has ever yet built up one particle of living matter out of lifeless elements—that every living creature, from the simplest dweller on the confines of organization up to the highest and most complex organism, has its origin in pre-existent living matter—that the protoplasm of to-day is but the continuation of the protoplasm of other ages, handed down to us through periods of indefinable and indeterminable time."

In other words, "*life* proceeds from *life*."

We have, it seems, made a great advance in *calling* living matter *protoplasm!* but of what makes the difference between living and non-living matter we are as much in the dark as ever. "When, however, we say that life is a property of protoplasm, we assert as much as we are justified in doing." *Life* is a property of *living matter*, and "there's an end on't."

Organization begins in the midst of this living matter from an invisible, intangible, inexplicable power acting upon the *protoplasm*.

Dr. Allman's observations on protoplasm form an admirable introduction to and comment on the subject of my paper:—

"I have chosen, then, as the matter of my address to you to-night, a subject in whose study there has during the last few years prevailed an unwonted amount of activity, resulting in the discovery of many remarkable facts, and the justification of many significant generalisations. I propose, in short, to give you in as untechnical a form as possible some account of the most generalised expression of living matter, "and of the results of the more recent researches into its nature and phenomena.

"More than forty years have now passed away since the French naturalist, Dujardin, drew attention to the fact that the bodies of some of the lowest members of the animal kingdom consist of a structureless, semi-fluid, contractile substance, to which he gave the name of Sarcode. A similar substance occurring in the cells of plants was afterwards studied by Hugo von Mohl, and named by him Protoplasm. It remained for Max Schultze to demonstrate that the sarcode of animals and the protoplasm of plants were identical.

The conclusions of Max Schultze have been in all respects confirmed by subsequent research, and it has further been rendered certain that this same protoplasm lies at the base of all the phenomena of life, whether in the animal or the vegetable kingdom. Thus has arisen the most important and significant generalisation in the whole domain of biological science.

"Within the last few years protoplasm has again been made a subject of special study; unexpected and often startling facts have been brought to light, and a voluminous literature has gathered round this new centre of research. I believe, therefore, that I cannot do better than call your attention to some of the more important results of these inquiries, and endeavour to give you some knowledge of the properties of protoplasm, and of the part it plays in the two great kingdoms of organic nature.

"As has just been said, protoplasm lies at the base of every vital phenomenon. It is, as Huxley has well expressed it, 'the physical basis of life.' Wherever there is life, from its lowest to its highest manifestations, there is protoplasm; wherever there is protoplasm, there too is life. Thus, coextensive with the whole of organic nature—every vital act being referable to some mode or property of protoplasm—it becomes to the biologist what the ether is to the physicist; only that instead of being a hypothetical conception, accepted as a reality from its adequacy in the explanation of phenomena, it is a tangible and visible reality, which the chemist may analyse in his laboratory, the biologist scrutinise beneath his microscope and his dissecting needle.

"The chemical composition of protoplasm is very complex, and has not been exactly determined. It may, however, be stated that protoplasm is essentially a combination of albuminoid bodies, and that its principal elements are therefore oxygen, carbon, hydrogen, and nitrogen. In its typical state it presents the condition of a semi-fluid substance—a tenacious, glairy liquid, with a consistence somewhat like that of the white of an unboiled egg. While we watch it beneath the microscope movements are set up in it; waves traverse its surface, or it may be seen to flow away in streams, either broad and attaining but a slight distance from the main mass, or else stretching away far from their source, as narrow liquid threads, which may continue simple, or may divide into branches, each following its own independent course; or the streams may flow one into the other, as streamlets would flow into rivulets and rivulets into rivers, and this not only where gravity would carry them, but in a direction diametrically opposed to gravitation; now we see it spreading itself out on all sides into a thin liquid stratum, and again drawing itself together within the narrow limits which had at first confined it, and all this without any obvious impulse from without which would send the ripples over its surface or set the streams flowing from its margin. Though it is certain that all these phenomena are in response to some stimulus exerted on it by the outer world, they are such as we never meet with in a simply physical fluid—they are spontaneous movements resulting from its proper irritability, from its essential constitution as living matter.

"Examine it closer, bring to bear on it the highest powers of your microscope—you will probably find disseminated through it countless multitudes of exceedingly minute granules; but you may also find it

absolutely honogeneous, and, whether containing granules or not, it is certain that you will find nothing to which the term organization can be applied. You have before you a glairy, tenacious fluid, which, if not absolutely homogeneous is yet totally destitute of structure.

"And yet no one who contemplates this spontaneously moving matter an deny that it is alive. Liquid as it is, it is a living liquid; organless aid structureless as it is, it manifests the essential phenomena of life."

We see clearly from the above that "the physical basis of life" is structureless, and that *organization* has nothing essentially to do with its characters. Yet with some inconsistency the learned Professor instructs us in the somewhat effete notion that all things proceed from *a cell*.

Script (Greek?) seemed to be the starting point, or near it, of the new philosophy, returning to the earlier doctrine of Thales, the Ionian, that all things originate from water; aid now we are carried by a cross gale some thousand leagues astray.

"When the protoplasm thus becomes surrounded by a cellulose wall it seldom retains the uniform arrangement of its parts which is often found in the naked cells. Minute cavities or vacuoles make their appearance in it; these increase in size and run one into the other, and may finally form one large cavity in the centre, which becomes filled with a watery fluid, known as the cell sap. This condition of the cell was the first observed, and it was it which suggested the often inapplicable term 'cell.' By the formation of this central sap cavity the surrounding protoplasm is pushed aside, and pressed against the cellulose wall, over which it now extends as a continuous layer. The nucleus either continues near the centre, enveloped by a layer of protoplasm, which is connected by radiating bands of protoplasm with that of the walls, or it accompanies the displaced protoplasm, and lies embedded in this on the walls of the cell."

I direct particular attention to the above admission, that the term Cell is often inapplicable. But the idea thus embodied is the very keystone of the arch, and if taken away, the whole attempted explanation of organic structure from previous organization falls to the ground.

"We have now before us a being which has arrested the attention of naturalists almost from the commencement of microscopical observation. It is the famous Amœba, for which ponds and pools and gutters on the house-roof have for the last 200 years been ransacked by the microscopist, who has many a time stood in amazement at the undefinable form and Protean changes of this particle of living matter. It is only the science of our own days, however, which has revealed its biological importance, and shown that in this little soft nucleated particle we have a body whose significance for the morphology and physiology of living beings cannot be over-estimated, for in Amœba wo have the essential characters of a CELL, the morphological unit of organization, the physiological source of specialised function.

"The term 'cell' has been so long in use that it cannot now be displaced from our terminology; and yet it tends to convey an incorrect notion, suggesting, as it does, the idea of a hollow body or vesicle, this having been the form under which it was first studied. The cell, however, is essentially a definite mass of protoplasm having a nucleus imbedded in it. It may, or may not, assume the form of a vesicle; it may, or may not, be protected by an enveloping membrane; it may, or may not, contain a contractile vacuole; and the nucleus may, or may not, contain within it one or more minute secondary nuclei or 'nucleoli.'

"Haeckel has done good service to biology in insisting on the necessity of distinguishing such non-nucleated forms as are presented by Protamœba and the other Monera from the nucleated forms as seen in Amœba. To the latter he would restrict the word cell, while ho would assign that of 'cytode' to the former."

The essential character of a cell is, then, that of "simple structureless protoplasm;" as they are, some of these simple cell-beings manage to "fashion for themselves an outer membranous or calcareous case, often of symmetrical form and elaborate ornamentation, or construct a silicious skeleton of radiating spiculæ, or crystal clear concentric spheres of exquisite symmetry and beauty."

But *how* do they accomplish these wonders? The answer seems to be that "in every one of these cases the entire body has the morphological value of a cell, and in this simple cell reside the whole of the properties which manifest themselves in the vital phenomena of the organism."

If you are not content with this explanation you assume to yourself the morphological value of "thinking protoplasm," and forget that you are only a listener. Your business is simply to receive and assimilate, like an *Amœba*.

Something works in the simple undifferentiated mass of protoplasm, leading it to all needful actions of self-preservation, or continuation of the species, or the clothing itself with a habitation of marvellous symmetry and beauty. It is an absolute monarchy within its own kingdom.

"Organization does not long rest on this low stage of unicellular simplicity, for as we pass from these lowest forms into higher, we find cell added to cell, until many millions of such units become associated in a single organism, where each cell, or each group of cells, has its own special work, while all combine for the welfare and unity of the whole.

"We have already seen that every cell possesses an autonomy or independent individuality, and from this

we should expect that, like all living beings, it had the faculty of multiplying itself, and of becoming the parent of other cells."

"Script (Greek?),"

Iliad, II. 204.

"the rule of many is not good," as sang old Homer in his day; but into this difficulty wo are plunged as soon as a more important structure has to be reared. All cells are *rulers* (Vignette) and yet all submit to one dictator (Script (Greek?))!

"The whole complex organism is a society of cells, in which every individual cell possesses an independence, an autonomy, not at once so obvious as in the blood cells, but not the less real. With this autonomy of each element there is at the same time a subordination of each to the whole, thus establishing a unity in the entire organism, and a concert and harmony between all the phenomena of its life.

"In this society of cells each has its own work to perform, and the life of the organism is made up of the lives of its component cells. Here it is that we find most distinctly expressed the great law of the physiological division of labour. In the lowest organisms, where the whole being consists of a single cell, the performance of all the processes which constitute its life must devolve on the protoplasm of this one cell; but as we pass to more highly organised beings, the work becomes distributed among a multitude of workers. These workers are the cells which now make up the complex organism. The distribution of labour, however, is not a uniform one, and we are not to suppose that the work performed by each cell is but a repetition of that of every other. For the life processes, which are accumulated in the single cell of the unicellular organism, become in the more complex organism differentiated, some being intensified and otherwise modified and allocated to special cells, or to special groups of cells, which we call organs, and whose proper duty is now to take charge of the special processes which have been assigned to them. In all this we have a true division of labour— a division of labour, however, by no means absolute; for the processes which arc essential to the life of the cell must still continue common to all the cells of the organism. No cell, however great may be the differentiation of function in the organism, can dispense with its irritability, the one constant and essential property of every living cell. There thus devolves on each cell or group of cells some special work which contributes to the well-being of all, and their combined Labours secure the necessary conditions of life for every cell in the community, and result in those complex and wonderful phenomena which constitute the life of the higher organisms."

Here we have realised the complete democracy of cells, united with absolute subjection (in spite of all their irritability) to *something* which regulates all the division of labour, and orders everything for the common good;—a perfect model of government, in fact, and one which never is interfered with through the obstructiveness of any part. How is it there is so much good sense in the individual cells, and so much folly as is often found in the structure when completed?

There is "a special charm in those broad generalizations, no "doubt," and perhaps the audience were so carried away by this charm as to believe that *one* particle of protoplasm could develop into a man, although they had just been told the contrary by the Professor:—

"Recent researches, indeed, render it almost certain that fertilization, whether in the animal or the vegetable kingdom, consists essentially in the coalescence and consequent loss of individuality of the protoplasmic contents of two cells."

There must, it seems, be *two* cells concerned, and a fusion of two into one, and these two must be of different and even opposite qualities, or there would be no result.

What, then, becomes of the unity of protoplasm, and what of the unicellular theory? And what of "the great law of "*Evolution*, which is shaping the destiny of our race? "

Protoplasm, it appears, "lies at the base of every vital "phenomenon," but "to suppose that all protoplasm is identical "where no difference cognizable by any means at our disposal "can be detected would be an error. Of two particles of "protoplasm, between which we may defy all the power of the "microscope, all the resources of the laboratory to detect a "difference, one can develop only to (sic) a jelly-fish, the other "only to [into] a man; and one conclusion alone is here possible, that deep within them must be a fundamental difference "which thus determines their inevitable destiny, but of which "we know nothing." (!)

We might have responded,

"Well hast thou said, Athena's wisest son,
All we can know is, nothing can be known,"

if the President had been content to rest there; but unfortunately he proceeds to explain the incognizable thus, "and "can assert nothing beyond the statement that it must depend "on their *hidden molecular constitution."*

Fine words to blind the vulgar eye, and to conceal the absolute ignorance hinted at above. But common sense does not rest satisfied with this evolutionist *non-explication;* since the Professor propounds as *facts* things which the vulgar mind is quite competent to pronounce *fictions*—for example, the hatching of an *unimpregnated* egg (compare p. 20).

"There is one form of cell which, in its relation to the organic world, possesses a significance beyond that of every other—namely, the egg. As already stated, the egg is, wherever it occurs, a typical cell, consisting essentially of a globule of protoplasm enveloping a nucleus (the "germinal vesicle"), and with one or more nucleoli (the "germinal spots") in the interior of the nucleus. This cell, distinguishable by no tangible characters from thousands of other cells, is nevertheless destined to run through a definite series of developmental changes, which have as their end the building up of an organism like that to which the egg owes its origin. It is obvious that such complex organisms as thus result—composed, it may be, of countless millions of cells—can be derived from the simple egg cell only by a process of cell multiplication. The birth of new cells derived from the primary cell or egg thus lies at the basis of embryonic development. It is here that the phenomena of cell multiplication in the animal kingdom can in general be most satisfactorily observed, and the greater number of recent researches into the nature of these phenomena have found their most fertile field in the early periods of the development of the egg."

The context shows that any reference to the male element would have disturbed the continuity of the argument.

The statement I have previously quoted differs in this, that it is the female which is studiously ignored ("*one* particle of *protoplasm* can develop to a man"), though we have always been accustomed to think that *her* help was absolutely necessary.

The duality of sex is indeed, of itself, fatal to the evolutionist doctrine.

The British Association teaches us through its President that "all recent research has been bringing out in a more "and more decisive manner the fact that there is *no dualism* "in life—that the life of the animal and the life of the plant "are, like their protoplasm, in all essential points identical."

This proposition, if very true, can scarcely be esteemed new; since all the world knows that (if Darwinism be correct) there is no essential difference between a *cow* and a *cabbage*. We have even, in the human race, some examples of beings who display in youth considerable powers of locomotion and a certain manifestation of will and choice; but after they marry and settle, lead what might seem a rather vegetative kind of existence.

It is pleasant to find admitted in this discourse, that even the amoeba "*cannot grow as a crystal would grow* [*increase*], *by accumulating on its surface molecule after molecule of matter."* Very true! as will be seen in the "contrast" I have drawn; but then why attempt to throw learned dust in our eyes, as if "hidden molecular constitution" could explain all the mysteries of propagation? for example, the continuation of the specialities of both parents in equal shares in the offspring; so that the most striking intellectual peculiarities (even) are transmitted, say from father to daughter, or even to grandson, again crossing the sex or vice versa,. To tell us that all this depends on the "molecular constitution" of "*oxygen, carbon, hydrogen,* and *nitrogen,"* as "the principal elements of protoplasm," is to insult the reason with which (*pace* the evolutionists) the Divine Being has been pleased to endow us.

I have shown with what mathematical and unchanging exactness atoms and molecules act in all their chemical combinations. How is it that in life they play mischief with us by transmitting not only hereditary diseases, but even far more deplorable tendencies?

Lastly, I am glad to perceive that wo may pretty safely write *requiescat in pace* on the tombstone of our young acquaintance "Bathybius," alluded to in this pamphlet (compare p. 3-3).

"The President had alluded to a certain thing to which he (Professor Huxley) had given the name of 'Bathybius,' and it was said, with perfect justice, he had brought Bathybius into notice. At any rate he had christened it, and he was in a certain sense its earliest friend. A number of admirable persons had taken the little thing in hand and made much of it. He had hoped, indeed, that his young friend Bathybius would turn out a credit to him, but he was sorry to say as times had gone on Bathybius had not verified the promise of his youth. (Laughter.) In the first place, he could not be found when he was wanted; and, in the second place, when he was found, all sorts of things were said about him."—Times. "His own judgment was in an absolute state of suspension about it."

—Nature.

Another very important admission is "that the term *'cell'* has been so long in use that it cannot now be displaced from our terminology, and yet it *tends to convey an incorrect notion."* No doubt it does, as I have shown in the treatise referred to (compare p. 21). Let the term then be abandoned! Thus one bubble after another bursts, as the stream of time hurries us forward. Pass another five years, and critics will perhaps have occasion to remark that other theories of great promise—

"Are melted into air, into thin air,

And like the baseless fabric of this vision
Leave not a rack behind."
LORD'S MEADE, *October* 7th, 1879.

The quotations, with one exception, are taken from *Nature*.

The Victoria Institute, or Philosophical Society of Great Britain, 7, Adelphi Terrace, Strand, London, W.C.

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Ueber Farbenvarletäten bei Vögeln. Von Paul Leverkühn.

[Sonderabdruck aus Cabanis Journal für Ornithologie, Jahrgang 1889; Juli-Heft.]

III.

(Aus den Museen in Metz, Strassburg und Colmar.)

(Siehe Seite 120—136.)

Die nachfolgenden Notizen, unsere dritte

I. Aus den Museen in Hannover, Hamburg und Kopenhagen. In Cab. Journ. f. Ornith. 1887 S. 79 ff. 11. Aus den Museen in Bremen, Göttingen und Kiel. Ebd. 1889 S. 120-136.

Materialsammlung zum Studium des Albinismus und verwandter Erscheinungen, wurden theils im städtischen Museo zu Strassburg i. E., theils in der Sammlung des Museum Unterlinden in Colmar, theils endlich in der städtischen Sammlung zu Metz und der kleinen Collection des Petit-Séminaire zu Montigny-les-Metz auf Touren im Juli 1888 zusammengetragen.

Für freundliche Unterstützung bei der Herbeischaffung der Objecte, sowie für anderweitig liebenswürdiges Entgegenkommen sind wir den Herren Director Dr. Döderlein in Strassburg, Dr. Faudel in Colmar und Abbé Friren in Montigny zu Danke verpflichtet. —

In der Aufzählung bedeutet „M“ Metzer, „St“ Strassburger, „C“ Colmarer Sammlung; nur wenige andere Fälle sind ausserdem angeführt. Denjenigen Arten, welche bislang in unsern Albinobeiträgen noch nicht genannt sind, ist in dieser Liste ein Stern (*) beigefügt. —

Ueber die Farbenaberrationen des Metzer Museums legte Malherbe einige Notizen nieder in der „Statistique du département de la Moselle“ (publiée sous la direction de M. le conte L. E. de Chastellux; par décision de M. le conte Malher. Tom. I. Zoologie, par M. Alf. Malherbe. Metz 1854), woselbst er auch dann und wann Exemplare seiner Privat-Sammlung erwähnt. Ueber den Verbleib dieser letzteren konnten wir nichts Näheres in Erfahrung bringen. Auf die Malherbe'schen Notizen ist in der nachfolgenden Bearbeitung hingewiesen. Leider giebt Malherbe keinerlei nähere Notizen noch Beschreibungen der von ihm erwähnten Exemplare; viele von ihnen waren im Metzer Museum nicht mehr aufzufinden, so dass für ihre ehemalige Existenz nunmehr nur die Autorität des grossen Malherbe gilt; sie sind wahrscheinlich mit anderen Theilen der Malherbe-Collection nach Paris gewandert. —

In der Sammlung zu Metz konnten nur sehr flüchtige Aufzeichnungen gemacht werden, da ein Herausnehmen der fraglichen Stücke an dem Tage, als wir dort waren, sich nicht machen Hess. Die ornithologische Abtheilung der naturhistorischen Sammlung dort ist in einem sehr traurigen Zustande. Die Etiketten tragen alle verblichene, meist nur französische Bezeichnungen, fast stets ohne Habitat! Seit Malherbe's Zeiten († 1865) ist nichts für die Sammlung gethan. Malherbe hat seinerzeit grosse Suiten gesammelt, namentlich Spechte, von denen er bekanntlich eine Menge neu beschrieb.

In : Hém. de la Soc. Roy. de Liège 1846. Travaux de la Soe. d'Hist. nat. de Metz 1848—60. Rev. zool. 1845, 49, 50, 52, 54. Mém. de l'Acad. nat. de Metz 1849 etc.

Die Typen seiner Arten finden sich zum grössten Theile in Metz, ohne als solche besonders bezeichnet zu sein.

Prof. W. Blasius verhiess in seiner einen Arbeit über *Ale. impennis* (III. Jahr.-Ber. Ver. Naturf. Braunschweig 1881—83 S. 106—7 Anm.) ein Verzeichniss dieser zu geben.

Auch sein grosses Werk (von dem beiläufig auch das naturhistorische Museum in Strassburg ein Exemplar besitzt) „Monographie des Picidés“ (Vol. I—IV. 1861 — 1862. Mit 700 Bildern auf 121 Tafeln) ist in der übrigens an naturhistorischen, speciell zoologischen Werken nicht sehr reichen Bibliothek der Stadt vertreten.

Im Gegensatz zum Metzer hat das Strassburger ornitho-logische Museum seit Dr. Döderlein's Zeit einen besonderen Aufschwung erlebt.

In der Festschrift für die 58. Versamml. der Naturforscher 1885 gab Döderlein einen Ueberblick Uber die Entwickelung des Museums (4°. S. 59—68). Fernere Mittheilungen aus seiner Feder finden sich in der kleinen Schrift „Naturhistorisches Museum der Stadl Strasshurg. Bericht über die Zool. Abtb. des Museums für die Jahre 1886—89.“ Vögel S. 11 fl.

Ausgezeichnet ausgestopft, stehen die Vögel leider in den engen Räumlichkeiten ein wenig gedrängt, doch ist durch den in Aussicht stehenden Neubau in dieser Beziehung baldige Aenderung zu erwarten. Bei jeder Familie sind Verbreitungskarten aufgestellt, welche Herr Dr. Döderlein ebenso wie die durchwegs eingeführten lateinischen und deutschen Etiketten durch den Institutsdiener mit einer einfachen Druckmaschine drucken lässt. Von besonders reich vertretenen Gruppen führen wir die Paradiesvögel an. Aus Abessinien, von Wilhelm Schimper in den Jahren 1849—52 gesammelt, sind reiche Serien vorhanden; ebenso schöne Sammlungen aus Gabûn, vom Senegal, aus Spanien und Algier, von Chile, Gnatemala, Californien u. s. w. Prachtvolle Suiten von *Aq. repax, Nisactus fasciatus, Gyp. bcirbatus* (9 Stück) *Bubo* (13 sp. darunter *B. nigrescens*) finden sich unter den 10 000 Exemplaren der Sammlung.

Das ‚Museum Unterlinden‘ in Colmar, das wir am 29. Juli 1888 besuchten, zeichnet sich durch gut ausgestopfte Exemplare aus. Besonders die Vögel des Elsass sind reich vertreten; das Bemerkenswertheste in

dieser Hinsicht ist durch G. Schneider in Basel unlängst mitgetheilt.

Ornis. III. 1887. S. 509—558.

Eine interessante Suite Wasservögel sam melte ein Herr Firm in an den Ufern der Rhône und Saône, theilweise Arten, welche jetzt nur noch sehr selten dort erleg werden. Ein schöner *Stringops habroptilus*, ein ebensolcher *Nestor produetus* ziert die Sammlung exotischer Vögel. — Eine kleine Eiersammlung stammt aus älterer Zeit, —

Das kleine Naturaliencabinet in Montigny-les-Metz welches zum „Petit-Séminaire“ einer Klosterschule gehört, bietet für den Ornithologen wenig. Die Exoten, Geschenke der Jesuiten sind alle ohne Heimathsangabe. Auch die einheimischen haben meist keine Etiketten. Aus dortiger Gegend ist eine *Scops giu* aufstellt; ein Pullus von *Strix flammea*, ebenso wie ein solcher der Metzer Collection, ist weiss, bis auf die Schleiergegend, in deren Mitte — um die Augen — sowie an deren Peripherie bräunliches Gelb vorherrscht.*) Drei alte Exemplare sind unten weiss; auch in der Metzer Sammlung befinden sich zwei derartig gefärbte Stücke. —

1. *Corvultur albicollis*.

Vergl. Ueber Farbenvarietäten etc. II. a. a. O. S. 121—23.

M. Cap der guten Hoffnung. Reinweiss. [Leider ist die in Metz gemachte Notiz nicht ganz erhalten, so dass wir in Zweifel sind, ob die Identification der Etikette eine richtige. Das Exemplar wäre nochmals nachzusehen.]

2. *Buteo vulgaris*.

C. a) Ein schönes Exemplar aus Colmar im Jahre 1888 hat die ganze Unterseite rein weiss.

St. b) Coll. Eugène Pougnet. Orig. Nr. 4. Harprich in Lothringen. Weiss, sehr schwach ins Crême-farbige ziehend. Auf den Flügeln und sehr schwach auf dem Schwänze ist die Querbänderung angedeutet. Die äussersten drei Primären sind einfach grauschwarz am distalen Ende.

3. *Strix flammea*.

M. und Montigny Pulli, (a—g.) Vgl. o. S. 247.

St. Pulli, h) coll. Schimper. 1831. Ganz weisse Dunen. An den Flügelstumpfen die Federeben der Unterseite gelb. Die Kiele der Oberseite blau, der Unterseite aschfarben grau. Die Federn um das Auge besonders zum Schnabel hin von einem gelblichen Tone. Kiele blau. Der Schleierrand rothbraun.

i) Coll. Eugène Pougnet. Orig. Nr. 600. 17. August 1882. Landorf (Lothringen).

Weiteres Stadium als h). Weiss, mit einem geringen Stich in's Crème-farbene. Flügel: aus den langen Spulen blicken graue Federköpfe, nur hier und da sieht ein wenig Gelb daraus hervor. Schleier: Braun um das Auge, weiss in der Verlängerung der Mundspalte. In der Ohrgegend ein weisser Tuft. Der Schleier bildet einen rechten Winkel, dessen Seiten von der Schleiergrenze welche die Verlängerung der Mundspalte bildet, und von der- jenigen, welche senkrecht zur Schnabelspalten - Richtung vom Kopf herab zieht, ausgemacht werden.

k) Coll. Eugène Pougnet. Orig. Nr. 1052. Rémilly. 7. September 1885. (Gleichzeitig interessant wegen der späten Nistzeit, was ja schon oft beobachtet; vgl. für den Monat *August*: Cab. J. f. O. 1877. 323. [Rohweder.] *September*: ebd. 1878. 415. [Sachse.] ebd. 1884. 36. [Neumann.] *October*: Corr. Bl. zool. min. Ver. Regensburg 1850. 53. [Jäckel.] — Rhea II. 184. [Derselbe.] — Cab. J. f. O. 1854. 173. [Ders.] *November:* Cab. J. f. O. 1854. 92. [v. Rödern. Gloger.] ebd. 1864. 15. [Krüper.] ebd. 1864. 220. [Holtz.] Mitth. naturw. Ver. Neuvorpommern u. Rügen. III. 1871. 37. [Ders.] Seebohm, Hist. Brit. Birds. I. 150. [Norgate.] Corr. Bl. zool. min. Ver. Regensburg 1851. 186. [Jäckel.] Cab. J. f. O. 1854. 173. 1886. 184. [Ders.] *December:* Seebohm, Hist. Brit. Birds. I. 150. [Waterton.])

Weiter entwickelt als h) und i). Weiss. Flügel wie beim alten Vogel (grau marmorirt und gelbbräunlich). Schleier wie beim Alten — nur an der Aussenseite des dem Auge zunächst befindlichen Theiles des Schleiers weiss. Rand des Schleiers dunkel braungelb. Rücken: ein dickes Büschel normal adult gefärbter Federn. Der Schwanz bricht in den Farben der Alten durch.

4. *Otus brachyotus*.*

St. Coll. v. Hinüber.

Die vom † Oberamtsrichter v. Hinüber gesammelten und dem Strassburger Museo vermachten Exemplare stammen zumeist aus Hannover. Lev.

1874. Orig. Nr. 8. Alles, was beim normalen Kleide auf der Oberseite gelb bis braungelb, hier mattgelb. Unterseite: Grundfarbe weiss statt gelb, mit normalen Längsflecken (die etwas schmaler als gewöhnlich); diese Schaftflecken hören an der Stelle der Insertion der Beine auf; von hier: alles weiss. „Hosen“ do. (=Lauf und

Zehenbefiederung).

5. *Hirundo rustica*.

[M. Nach Malherbe's ‚Zoologie' in der Statistique du département de la Moselle (Metz 1854, S. 405) ist ‚une variété albino' im Metzer Museum, die wir indess nicht wieder entdeckt haben.] St. a) Coll. Eug. Pougnet. Orig. Nr. 449. 26. Juli 1881. Destry (Lothringen). Silberweiss; Füsse und Schnabel hellgelb. Auf den Flügeln ein Schimmelschmutz, wie auf so vielen Exemplaren der Kieler Sammlung.

Vgl. Farbenvarietäten II. A. a. O. S. 123. no. 4. Ki. c.

b) Strassburg 1840. Orig. Nr. 3253. Das Rostroth der Kehle, die Augenflecken des Schwanzes und die dunkle Färbung der Oberseite ist angedeutet, letzteres durch ein schmutziges Aschgrau. Dieses Exemplar rechnen wir ebenfalls zu den „Uebertünchten". Schnabel und Füsse hellgelb.

6. *Hirunclo urbica*.

St. Orig. Nr. 3254. Strassburg 1850. Weiss; Schnabel und Füsse hellgelb.

7. *Hir. riparia*.

M. Malherbe führt eine weissliche Varietät an (a. a. O. S. 405), die wir nicht mehr vorfanden.

8. *Sturnus vulgaris*.

C. a) Orig. Nr. 508. Elsass. Kopf, Rücken, Oberseite theilweise weiss mit einzelnen metallischen Federn untermischt. Flügel und Schwanz normal; einzelne weisse Federn in den Oberflügeldecken.

St. b) August 1865. Strassburg. Zimmer ded. Oben incl. Flügel und Schwanz weissgrau; die Secundären und grossen Flügeldecken haben fahlbraune Contouren. Unten: Kinn, Kehle weiss. Rest der Unterseite, bis auf die Bauchseiten, wo die reg. Färbung verwaschen, „übertüncht", zum Vorschein kommt, grauweiss. — Schnabel schwarz, Füsse hornbraun.

c) Elsass Nr. 1842. Auf dem Kopf, Hals und Unterrücken manche weisse Federn. Kinn, Kehle weiss; auf der Brust, Bauch und den Flanken ebenfalls viele weisse Federn.

Das Exemplar legt soeben sein erwachsenes Kleid an, wie die stahlgrünen, auf dem Rücken durchgebrochenen Federn beweisen. Schnabel gelb.

d. e. f. g) Diese Serie ist wohl kaum den Farbenvarietäten zuzuzählen, sondern seilt mehr weniger normale Jugendkleider dar: d) 15. Juli 1854. Strassburg. Kehle weiss. Auf der Brust weisse Federn untermischt; übrige Unterseite graubraun. Oben dunkler, Flügelsäume lichter. Schnabel schwarz.

e) Der jüngste der drei e. f. g) # 1859. Strassburg. Oben graufahl; auf dem Unterrücken haben die Federn schwarze, in's Metallische auslaufende Enden mit lichtbraunen Säumen. Kinn, Kehle, Brust- und Bauchmitte weissgelblich, einzelne Federn der Bürzelgegend, viele auf den Flanken, einzelne Unterschwanzfedern regulär metallfarben mit weissem Ende. Schnabel schwarz.

f) Etwas älter als e) 28. August 1856.? Strassburg. Das Metallische auf dem Rücken nach dem Kopf zu weiter ausgebreitet; die Metalltropfung der Unterseite bis an die Oberbrust (Kehle) ausgedehnt, nur in der Medianlinie eine bräunlich geschäftete Federparthie übrig lassend. Subcaudalen wie beim Alten. Schnabel schwarz.

g) Der älteste der drei. 25. August 1854. Strassburg. Alles wie bei f), nur intensiver und ausgedehnter; die lichtbräunliche Mittelfärbung der Unterseite zu einem ½ cm schmalen Streifen reducirt —

9. *Corvus corone*.

St. # Zool. Gart. Berlin 1884 erhalten. Blendend silberweiss. Schnabel und Füsse ganz mattgelb. (Iris roth.)

9a. *Corvus cornix* X *corone*.

M. Ein Exemplar; ob aus dem Lande?

10. *Pica caudata*.

M. a) Weiss ohne jedes Schwarz. Malh. a. a. O. S. 413.

b) Alle schwarzen Theile dunkelrussbraun.

St. c) Coll. v. Hinüber. 1874. Nicht der gewönliche Elsteralbinotypus: während in der Regel diese Albinos

an Stelle des normalen Schwarz ein mattes Braun haben, zeigt das Exemplar St. c) ein schönes silberglänzendes mattes Grau, welches am intensivsten und angenehmsten auf dem Hals und Brust, weniger rein auf dem Unterrücken und sehr matt und unrein auf dem Schwanz ausgeprägt ist. Der letztere ist wie gewöhnlich bei Albinos

Vgl. unsere Farb.-Var. II. a. a. O. S. 127.

dieser Art zerschlissen. Schnabel und Füsse sind normal. —

11. *Garrulus glandarius*.

C. a) Elsass. Fuss hellhornfarben, Schnabel dunkelhornfarben. Unten duff-weiss. Oberseite, Schwanz und Bürzel, Flügel und Schwanz, Rücken ganz weiss. Am reinsten weiss die Flügel. Auf dem Oberkopf einige bräunliche Sprenkeln. Nacken herrlich sanft weinröthlich angehaucht Backen und Ohrgegend weinröthlich. Kleine Flügeldecken ebenso.

M. b) Juv. Ganz weiss. Malh. a. a. O. S. 413.

12. *Lanius collurio*.*

13. *Muscicapa grisola*,

M. Zu Malherbe's Zeiten befand sich ein Albino vom Fliegen- fänger im Metzer Museum, mehrere vom Würger dort wie in seiner Privat-Sammlung (a. a. O. S. 412 und 413).

14. *Accentar modularis*.

M. Malherbe (a. a. O. S. 409) kannte eine „variété blonde“ im Metzer Museum.

15. *Troglodytes parvulus*.

M. Malherbe (a. a. O. S. 409) kennt einen Albino im Metzer Museum, der zur Zeit unserer Visite nicht mehr vorhanden war.

16. *Sylv. hortensis*.

M. Malherbe (a. a O. S. 407) spricht von einer hübschen albinotischen Varietät, welche er in seiner Sammlung hätte.

17. *Turdus merula*.

C. a) #. Gefangenschaft. Kietzheim. Schwanz bis auf eine Feder weiss. Ein Fleck inmitten der Stirn, 3.—8. Schwanzfeder weiss. Sonst normal.

M. b) c) Weiss, d) Blassgelb. Malherbe bemerkt von ihnen, sie seien im Mosel-Departement erlegt; auch besitze er mehrere albinotische Exemplare in seiner Privat-Sammlung (a. a. O. S. 412).

18. *Turdus torquatus*.

C. a) # Die erste äussere Schwanzfeder, einige Federchen auf dem Rücken, einige Federn vor dem Auge und auf dem Kopf und den Kopfseiten weiss, sonst normal.

b) Orig. Nr. 188. Kopf weiss bis auf einige wenige schwarze Federn. Unten gross weiss getropft, ebenso auf dem Unterrücken; die 2 mittleren Schwanzfedern weiss.

c) Orig. Nr. 187. Bauch, Hals ringsum, die 1., 2. und eine halbe Schwanzfeder, nur rechts, weiss. Unterrücken, Kopf verwaschen weisslich.

St. d) S (ad.) Auf dem Oberkopf ein weisses Federchen, auf dem Hinterkopf und dem Nacken zusammen etwa ein Dutzend weisse Federchen. Sonst normal. — Das Stück stand in einem Schranke, der vom 12. bis 27. September 1871 durch Granaten beschossen ist. Daher Schnabel defect durch Granate.

e) Coli. v. Hinüber. Nicht ganz alt.

In der Richtung der Augenspalte des rechten und im hinteren Winkel des linken Auges dort 4, 5, hier eine kleine weisse Feder. Sonst normal.

f) 17. October 1852. (Strassburg.) (ad.) Der ganze Kopf mit Ausnahme von Kinn und Kehle und dem Oberkopf (die normal schwarz) mit zahlreichen weissen Federchen untermischt.

g) October 1862. # (Kroener. Strassburg.) Auf dem Oberkopf zwischen den beiden Augen auf dem Kinn einzelne weisse Federchen. Analgegend und Tarsus weiss. Anstatt der ‚Torques' ein Gemisch weisser und schwarzer Flecken.

Obs. Eine schöne Suite Ringdrosseln ausserdem (13 Stück) vom ersten Nestkleid bis zum ältesten Männchen hin zeigen alle mehr weniger weissliche Säume an den Flügeln und Flügeldeckledern. Ist das die Norm? Auch auf der ganzen Unterseite finden sich von den jüngeren Individuen zu den älteren abnehmend weisse Federränder. Dieselbe Frage! — Als Habitat ist Schweiz, Elsass und Schwarzwald angegeben. — Schon längst war uns aufgefallen, dass zu allen Jahreszeiten selbst ganz alte Ringdrosseln mit. ziemlich breiten weissen Federrändern und eigenartig gescheckt aussehender Unterseite vorkommen, worüber wir im Herbst 1883 in Halle mit dem vortrefflichen Kenner Herrn Wilh. Schlüter uns unterhielten.

Es bedarf wohl nicht der Erwähnung, dass wir die Frage, Ist das die Norm' niederschrieben, bevor wir den Stejneger'schen Aufsatz gelesen! —

Lev.

Wir besitzen in unserer Sammlung ein höchst wahrscheinlich vom Gebirge stammendes, auf dem Dohnenstrich bei Hannover erbeutetes derartiges Exemplar. Mittlerweile ist die uns beunruhigende Frage durch einen ausgezeichneten norwegischen Ornithologen, welcher seit Jahren sich in Nordamerika niedergelassen hat, Herrn Leonhard Stejneger, wissenschaftlich behandelt und unsere Vermuthungen, dass es sich um eine zweite constante Form handelt, die nie die breiten Ränder verliert, vollauf bestätigt. Da schon Vater Brehm im Handbuch (1831, S. 377) diese Ringdrosselform abgetrennt hatte, hat Stejneger dessen Namen für die Ge-birgsform *T. alpestm* beibehalten (Proc. Un. Stat. Nat. Mus. Washington 1886, S. 365 ff.). Sein Verfahren ist in Europa gutgeheissen durch von Tschusi-Schmidhoffen (Schwalbe XII. 1888, S. 78 f.) und durch Seebohm (Ibis 1888, S. 309 ff.).

In diesem Falle ist unbedingt die trinäre Nomenclatur anzuwenden und die Gebirgsform *Merula torquata alpestris* (C. L. Br.) zu benennen; die Methode, solche Formen als ‚Varietas' in Verzeichnissen etc. einzuführen, halten wir für entschieden verwerflich, weil dadurch der Begriff Varietät, selbst wenn ihm das Epitheton ‚constant' vorgesetzt wird, verschoben wird. —

Sehr interessant würde es sein, zu erkunden, ob die auf dem Teutoburger-Wald, also in einer Höhe von nur ca. 420 Metern, im Sommer angetroffene und wohl mit Gewissheit brütende Ringdrossel der *Alpestris*-Form zugehört. Unser verehrter Freund Schacht in Feldrom bei Horn in Lippe wäre wohl am ersten in der Lage, diese Frage zu lösen, wozu wir gerne anregen möchten. —

19. *Turdus musicus*.

M. a. b) Isabelline. Malherbe führt ausserdem Exemplare seiner Privat-Sammlung an. (a. a. O. S. 412.)

20. *Turdus iliacus*.

C. a) Aus Mauirtz. Auf dem Rücken, im Schwanz und auf den Flügeln viele weisse Federn. Kopf nach unten ganz weiss. „Gescheckt."

M. b) c) Isabelline. Malh. a. a. O. S. 412.

St. d) Coll. v. Hinüber. Ganze Oberseite mattgelblich. Aussenfahnen der Primären und Secundären weiss. Schwanz gelblich-weiss. Augenstreif, Kinn-, Kehl- und Brustfärbung, ebenso die der Flanken angedeutet; alles was beim normalen dunkel gefärbt, hier fahlrostgelblich. Die Axillaren lebhafter und ausgebreiteter rostlich. Bauch silberweiss. Schnabel und Füsse hellgelb.

21. *Ruficill a phoenicurus*.*

22. *Luscinia minor*.*

M. Malherbe führt je einen Albino auf. (a. a. O. S. 408 und 406.)

23. *Dandalus rubecula*.

M. a) Malherbe berichtet (a. a. O. S. 407) von mehreren albinotischen Exemplaren in seiner Privat-Sammlung und im Metzer Museum. Letztere waren bei unserem Besuch nicht auf zufinden.

St. b) Coll. Saucerotte.

Die nachgelassenen Papiere des bekannten Trocbilidologen Saucerotte werden im Naturhistorischen Museum zu Strassburg aufbewahrt. Sie enthalten keine unpublicirten ornithologischen Notizen und bestehen

zum grösstes Theile aus Excerpten. Lev.
1843. Orig. Nr. 4191. Russland. Partiell albinotisch am Kopf: Oberkopf rein weiss, Hinterkopf und Nacken weiss und grau abwechselnd. Ohrendecken weiss; im „Roth“ der Kehle einzelne weisse Federchen; ein schräges weisses Band zieht sich von rechts unten nach links oben bis an die Nasenfedern.

c) Col. Saucerotte. Lothringen. Das ‚Roth‘ der Kehle normal. Die Befiederung der ganzen Oberseite dagegen matter als normal, Schwanz fahlbraun, Schwungfedern gelbbräunlich, die letzten Secundären nahezu weiss. Schnabel und Füsse regulär.

24. *Saxicola oenanthe*.

25. *Pratíncola rubetra**

Zu Malherbe's Zeiten war von beiden Arten je ein Albino im Metzer Museum, (a. a. O. S. 409.)

26. *Motacilla alba*.

M. a) Malherbe führt 2 albinotische Exemplare für das Metzer Museum an. (a. a. O. S. 410.)

St. b) Coll. v. Hinüber. Reinweiss, bis auf die 6 mittleren Schwanzfedern, welche schmutzigbraun (beim normalen diese: schwarz!). Auch die weissen Schwanzfedern haben auf den Innenfedern ein ebensolches braunes Colorit, welches an Ausdehnung von der Mitte nach aussen abnimmt. Füsse normal. Schnabel hellgelb. (Iris roth.)

27. *Anthus arboreus*.*

C. a) Orig. Nr. 345. Mattgelbweiss auf Nacken, Rücken Schwanz, Flügel. In's Rothbraungelbliche ziehend am Kopf und unten.

b) Ohne Etikette. Einzelne ganz weisse Federn auf der Unterseite, dem Kopf, den Flügeldecken und dem Schwanz. „Gescheckt.“

M. c. d) Malherbe führt 2 blonde (—hellgelbe) Varietäten für das Metzer Museum an. (a. a. O. S. 410.)

28. *Anth. pratensis*.*

M. Auch den Albino dieser Art, den Malherbe (a. a. O. S. 411 namhaft macht, konnten wir nicht wieder auffinden.

29. *Alauda arvensis*,

M. a. b) Weiss.

c) Unten weiss; oben und Flügel grau wie gewöhnlich.

d—1) Isabelline, Kehle rothgelblich. Ob diese Suite aus einem Jahre und von einer Localität, ist nicht aus den Etiketten ersichtlich.

m) Schwarz. Malherbe führt eine schwarze, 4 weisse und 6 blonde Varietäten auf, auch mehrere aus seiner Sammlung, (a. a. O. S. 417.)

St. n) Coli. Saucerotte. 1847. Orig. Nr. 5237. Ganze Oberseite rostbraun; Schwingen lichter, die erster Steuerfeder bis auf einen sehmalen inneren Streifen, die zweite nur auf der Aussenfahne weiss. Deutlicher weisser Augenstreif, der sich jenseits des Auges Uber das Ohr hin undeutlicher fortsetzt. Kinn, Kehle, Bauch, Unterschwanzdecken weiss gelb, Brust in's Röthliche ziehend. Schnabel hellgelb, Füsse normal.

30. *Emberiza citrinella*.

M. a) Eine gelbe Varietät nach Malherbe, (a. a. O. S. 416.)

St. b) Wielersweiler bei Albersdorf. Lothringen. 1884. Werckla ded. Unten einen Ton matter als normal, oben sehr viel matter. Auf dem Kopf keine schwarzen Federschäfte; auf dem Rücken haben die meisten Federn schmale weisse Säume; Enden der Flügeldecken, der Schwungfedern, Aussenränder aller Steuerfedern — weiss. Das normale Rothbraun der Secundärschwingen schwach angedeutet. Von dem regulären Rostroth des Bürzels ist nichts zu sehen.

31. *Emberiza schoeniclus*.*

St. Nr. 1860. Strassburg. Pickel ded. Sehr matt gefärbt; Schwingen bis auf den proximalen Theil, der fahlbräunlich, ferner die äusserste Steuerfeder weiss; die 2. Schwanzfeder auf der Aussenfahne und am distalen Ende der Innenfahne weiss, von dort abnehmend zur Federaxe hin, so dass ein keilförmiger Flecken entsteht. Die reg. schwarzen Kopfparthien fahlbraun; Schwanz aschbraun, Seiten, die normal braun gestrichelt, verwaschen weissgelb. Das weisse Nackenband, der Augenstreif und die weissen Züge, von der Schnabel ecke zu der Kehlseite, sehr gut zu erkennen, breiter und intensiver entwickelt.

32. *Passer montanus*.

M. a) Weiss. Malh. (a. a. O. S. 416.)
b) Isabelline. .

33. *Passer dornesticus*.

C. a) Juv. Schmutzigweiss. Zum Unterrücken hin grau. Schwanz fast normal. Das Braun des Rückens ist ganz schwach angedeutet
b) Weiss.
c) 10. März 1867. Die 2., 3., 5., 6., 8., 9. Primär-, die 1., 2., 4, 5. Secundär - Schwingfeder links, die 2., theilweise 3., 5., 8. Primär-, die 1., 3. Secnndär-Schwingfeder rechts reinweiss. Sonst ganz normal.
d) #. Orig. Nr. 2110. Matt gefärbt auf der Unterseite, oben die Grundfarben angedeutet. Varietas brunnescens. Montigny-les-Metz. Weiss. — Malherbe bespricht das häufige Vorkommen von Leucismus bei dieser Art und erzählt, dass ein Herr von Courcelles im Schloss von Montigny-les-Metz mehrere Jahre junge weisse Spatzen gehalten hätte, welche im Käfig gross geworden bei der ersten Mauser ihr reguläres Gefieder wiedererhalten hätten. — In seiner Privat-Sammlung sowie im Metzer Museum befanden sich damals mehrere Albinos. — (a. a. O. S. 415 und 416.)
St. e) Durch Schneider in Basel. Reinweiss. Füsse und Schnabel hellgelb.
f) A. 1854. Elsass. Reinweiss. Füsse und Schnabel hellgelb. (Iris roth.)

34. *Lig. chloris*.

M. a. b) Nach Malherbe (a. a. O. S. 416) besass das Metzer Museum ein weisses und ein jonquillegelbes Exemplar.

35. *Fr. coelebs*.

36. *Fr. montifringilla*.

M. Von ersterem führt Malherbe ein, von letzterem mehrere albinotische Exemplare auf für das Metzer Museum und von letzterem auch für seine Privat-Sammlung.

37. *Carduelis élegans*.

C. a) September 1876. Bouxville. Kopf, Rücken weiss. Das Rostbraun der Unterseite nur angedeutet, das Roth des Kopfes am Schnabel schwach angedeutet.
b) Melanismus partialis. Kopf statt roth schwarz.
c. d. e) Ausserdem sind noch 3 Stieglitze in der Colmarer Sammlung, deren Kopfroth einem mehr weniger intensiven Hochgelb Platz gemacht hat. Ob Exemplare aus Gefangenschaft?
M. f) Zu Malherbe's Zeiten war ein albinotisches Exemplar im Metzer Museum, (a. a. O. S. 414.)
St. g) Alte Sammlung. 1846. Elsass. Die reg. rothe Stirn mit viel Weiss untermischt

38. *Pyrrhula europaea*.

M. a) Unten weissgrau; Schwanz normal,
b) Schwarz.
Malherbe erzählt, ein schwarzer Gimpel in seiner Sammlung stamme aus einer Kreuzung zwischen Canarienvogel und Gimpel (a. a. O. S. 415.)

39. *Lin. cannabina*.

M. Zu Malherbe's Zeiten befand sich ein Albino im Metzer Museum, (a. a. O. S. 415.)

40 *Padda orycivora*.

C. Blendend weiss. [Wir führen diese äusserst zahlreich gezüchtete weissliche Spielart nur der Vollständigkeit halber an. Fast alle Museen besitzen davon. Auffällt, dass die Stücke regelmässig reinweiss sind; gescheckte sind uns noch nicht vorgekommen. Wir werden nur über solche in Zukunft mittheilen.]

41. *Phcisianus colchicus*.

C. a) # weiss. Am Hals unten einige weisse Flecken, ebenso auf dem Rücken und an den Flanken.

b) Bastard zwischen Jagdfasan und Haushenne. Hals weiss, Rücken weiss gescheckt.

St. c) #. Tirol. Weiss.

d) #. Elsass. 1865. Weiss; am Hals 2 kleine schwarze Federchen; die Spitze und die Aussenfahne je einer Feder der Flügeldecken rechts schwärzlich; die der auf der Aussenfahne farbigen benachbarte lichtschwarz besprenkelt. —

e) # Elsass. Weiss. Einige Flügelfedern mit dunkeln, licht-bis dunkelbraunen Schäften. Auf dem Ober- und Unterrücken einige wenige Federn mit dunkelbraunem Centrum und gelblichen Rändern. —

Ausserdem stehen mehrere sehr beachtenswerthe Exemplare des in Elsass als wild anzusehenden Jagdfasans, welche einen breiten weissen Ring um den Hals tragen und sich somit sehr dem typischen *Phas. torquatus* nähern, der indess nie in halbverwildertem Zustande gehalten resp. ausgesetzt ist Die Exemplare datiren von dem Anfange der 50 er Jahre her. Kröner

Aperçu des oiseaux de l'Alsace et des Vosges. Strasbourg 1865. 8", 43 S. (S. 22.)

schreibt in seiner ziemlich unbekannten und seltenen Avifauna des Elsass eine scheinbar nicht zutreffende Bemerkung Uber diesen Punkt: „Le faisan de collier, originaire de l'Inde, provient du croisement du faisan commun avec le faisan à collier de la ehine."

Diese Tbatsache ist um so beachtenswerter, als der im Handel sonst als ‚Ringfasan' bezeichnete Vogel stets als Kreuzungsproduct zwischen *Ph. colchicus* und *Ph. torquatus* in ungezählten Ver-bastardirungen anzusehen ist; vom englischen berichtet dies z. B. Seebohm (Ibis 1887, S. 168).

Wir betonen ausdrücklich, gestützt auf die Angaben des Kais. Oberförsters in Strassburg, Herrn Baron von Berg, u. A., dass der chinesische *torquatus* nie ausgesetzt ist, so dass wir es entweder in den Rheinwaldungen des Elsass mit einer neu entstehenden Form von *torquatus* zu thun haben, oder aber annehmen müssen, dass die sich vermischenden Formen (die westliche *Ph. colchicus* westlich, die östliche *Ph. torquatus* östlich vom Meridian Calcuttas nach Seebohm) derartig „interbreeding species" sind, dass man sie nicht subspecifisch zerlegen darf, sondern als in und neben einander vorkommende Formen ansehen muss. Dieser dann einzig in der Vogelkunde dastehende Fall verdient grösste Aufmerksamkeit! —

42. *Perdix cinerea*.

C. a) Coll. St. Firmin, Rhône oder Saône. Fast weiss. Die Oberflügeldeckfedern mattaschblaufarben; Flanken matt schwarz, in breiten Abständen gewellt. Bauch und Nacken gelbbräunlich. Brust weiss. Schwanz matt aschfarben; die Spitzen der Federn bräunlich. Oberrücken und Schultern sehr matt weinfarben.

b) „Variété marron à cou blanc." Coll. St. Firmin, Rhône oder Saône Kopf ringsum rostbraun. Halsseiten jederseits weiss. Der ganze Rest des Gefieders dunkel rostbraun (maroon), Läufe hell mattbraun. Auf den Flügeln einzelne weisse Schäfte. Schwanz etwas heller. Bauch weisslich.

c) Coli. St. Firmin (ut sup.), Kopf ringsum rostbraun (genau dieselbe Farbentönung wie C. b.), etwas dunkler als C. b) Ganzer Rest des Gefieders mit Ausnahme des Schwanzes schwarzbraun. Die Schäfte der Flügelfedern weiss. Ebenso einzelne weisse Schäfte auf Rücken. Läufe fast weiss. Schwanzspitzen weiss; dann folgt eine dunkelbraune Parthie, welche in matteres Braun übergeht. Bauch weisslich.

M. d) Weisslich oben, rothbraune Flecken unten.

e) Ganz weisslich. Malh, a. a. O. S. 421.

f) (Im Naturaliencabinet in Montigny-les-Metz.) Gescheckt.

St. g) Strassburg. 1865. „Gescheckt." Auf der ganzen Oberseite viele reinweisse Federn eingestreut; Flügel und Seiten regulär. Auf der ganzen Unterseite ebenfalls viele weisse Federn untermischt. Jenseits des schwarzen Flecks auf der Unterbrust der Rest ganz weiss. Schwanz mit Ausnahme zweier Federn der linken Seite, die normal braun, ganz weiss. Schnabel mattgelb, Füsse normal.

h) Coll. # Saucerotte. 1852. Frankreich. „Perdrix des montagnes." Orig. Nr. 46.

Sehr ähnlich den 2 Colmarer Stücken: Kopf und Hals ringsum braungelb; ganzer Rumpf incl. Flügel und Schwanz dunkelschwarzbraun („maroon"), manche Federn mit weisslichen Schaftenden und weisslichen

Federendchen. Aussenfahnen der Primären fahler; die „Hosen“ (Schenkelfedern) sind nahezu weiss. Schnabel und Füsse normal.

43. *Coturnix dactylisonans*.

C. a) Coll. St Firmin. Ob Albino? Normal, nur die (normal) hellen Parthien der Unterseite nahezu weiss, mit schwach gelblichem Anflug. Nach oben zu die weissen Schaftstriche deutlicher.

M. b) Weiss. Malh. a. a. O. S. 421.

44. *Meleagris gallopavo*.

St. (#) ohne Etikette. (Ex captiv.) Hals und Kopf rostbraun (wie *Perd. cinerea* St. h). Diese braune Färbung ist einzelnen Federn auf dem Rücken, den Fahnen der Schwingen und Oberschwanzdeckfedern hie und da mitgetheilt. Schwanz: dunkelbraun mit helleren braunen Aussensäumen.

45. *Numida ptilorhyncha*, Licht.*

St. W. Schimper. Coll. 1842. Orig. Nr. 28. Abessynien. Einer der interessantesten Albinos der Sammlung; er bildet ein Pendant zu der am Ende unserer ersten „Farbenvarietäten“ aufgezählten Reihe

Farbenvarietäten I. A. a. O. S. 85

von *Pic. major* etc.

Das normale Gefieder ist wie mit dünn aufgetragener weisser Farbe überstrichen. Anormal ausserdem ist die Färbung der Primären, welche sämmtlich rein weiss, ferner der Seiten von Brust und Bauch, und des Unterbauchs endlich eines in die Quere gezogenen Flecken oberhalb der normalen (aber „übertünchten“) Brust — welche Stellen alle weiss sind. Während bei der regulären *Num. ptüorhyncha* die Fleckung auf den Primären und Secundären getropft zu nennen ist, sind bei dem vorliegenden Exemplar die weissen Tropfen zu Strichen ausgezogen, so dass in der Beziehung das Stück sich *Num. mdeagris* nähert.

Die Halsparthie ringsum, die normal von struppigen schwarzen Federn bedeckt sein sollte, ist blassgelblich (?) und nackt gewesen (da angemalt) nicht mit Sicherheit anzugeben!). Füsse blasser als regulär, die Schilderung gelb; Schnabel und nackte Theile des Kopfes scheinbar normal.

46. *Fulica atra*.*

M. Zu Malherbe's Zeiten war ein albinotisches Exemplar im Museum, (a. a. O. S. 425.)

47. *Scolopax rusticula*.

C. a) 4. November 1862. Baden.

Isabellfarben (wie Göttingen. Nr. 35 Färb. Var. II.). Oben dunkler, normales Gefieder stark angedeutet; alles ist mattbräunlich überflogen. Schnabel ganz hellgelb. Füsse gelb.

M. b) Zu Malherbe's Zeiten befand sich ein rein weisses Exemplar im Museum, (a. a. O. S. 424.)

48. *Gallinago scolopacina*.

C. a) Coll. St. Firmin. (Rhône oder Saône.) Unten sehr matt, die Flecken duff. Oben ist das normale Gefieder angedeutet. Schwingen weiss, Schwanz da weiss, wo normal braune Stellen.

M. b) Zu Malherbe's Zeiten befanden sich 2 albinotische Exemplare im Museum, (a. a. O. S. 424.)

49. *Anas bouchas*.

C. a. b) Gemar (Entenfang). # und #. December 1879. Beide Exemplare sind zusammen gefangen. In den plastischen Verhältnissen im grossen Ganzen mit der typischen Wildente übereinstimmend, zeichnen sie sich durch etwas stärkeren und längeren Körper aus. Auf dem Kopt ist das # stellenweise blaustahl schillernd; beim # ist dieselbe Farbenanordnung in matterer Tinte und weniger ausgebreitet vertreten. Das # ist unten etwas gelblich gewellt, der Rücken schwarz (beim # letzterer grauschwarz) bis an den Schwanz. An den Weichen sind einzelne schwärzliche Federschäfte. Alles übrige weiss.

50. *Cairina mosehata*.*

St. a) 1850. Ex capt. Strassburg. Kopf, Hals, Brust, Rücken mit weissen Federn untermischt. Spiegel weiss.

b) 1860. Bastard von *C. moschata* und *An. boschas*. (Ex capt.) Strassburg. Bedeutend kleiner als moschata typ. Kinn und ein schmaler Federsaum, der sich von dort in der Richtung der Mundspalte hinzieht, ein Streif, der sich durch's Auge zieht, einzelne Federn auf dem Kopf, dem Oberrücken und viele auf der Brust — weiss. Spiegel: stahlblau. Ganzes übriges Gefieder: oben: stahlgrün auf braunem Grunde, unten: braun, auf der Oberbrust ganz schwach in's Violette spielend.

Für unsere Verzeichnisse neu sind in dem vorliegenden Beitrage Albinos von folgenden Arten beschrieben: *Corv. albicollis, Ot. brachyotus, Lan. collurio, Rut. phoenicurus, Lusc. minor, Prot, rubetra, Anth. arboreus, pratensis, Emb. schoeniclus, Fr. montifringilla, Lig. chloris, Num. ptilorhyncha, Fulic. atra, Coir, moschata*.

Unter den angeführten 134 Stücken von 50 Arten sind besonders beachtenswerth die Dunenjungen von *St. flammea* (vergi, unsere Farb.-Var. II, S. 121 — 123), ferner die Exemplare von *Sylv. hortensis* (vergi. Farb.-Var. I, S. 85. Notiz 3), *Pass, domesticus* juv. (vergi, ebenda Notiz 1. Farb.-Var. II, S. 133 Nr. 34), *Phos, col-chicus*, bei welch letzterem oben im Text das Nähere nachzulesen. — Strassburg i. E., April 1889.

[*From the* QUARTERLY JOURNAL *of the* GEOLOGICAL SOCIETY *for November* 1880.]

The Glaciation of the Orkney Islands.

The GLACIATION *of the* ORKNEY ISLANDS. By B. N. PEACH, Esq., F.G.S., of the Geological Survey of Scotland, and JOHN HORNE, Esq., E.G.S., of the Geological Survey of Scotland.

[PLATES XXVI. & XXVII.]

I. INTRODUCTION.

In a former paper which we communicated to the Society on "The Glaciation of the Shetland Isles," we endeavoured to show how the evidence supplied by the striated surfaces, the *roches moutonnées*, and the dispersal of the stones in the Boulder-clay points to the conclusion that Shetland had been glaciated by Scandinavian ice. It was further argued that during the climax of glacial cold the Scandinavian and Scotch ice-sheets coalesced on the floor of the North Sea, and that the great outlet for the combined ice-sheets was towards the north-west by the Pentland Firth and the Orkney Islands.

In the course of the autumn of 1879 we visited nearly all the Orkney Islands for the purpose of continuing our researches with reference to the extension of the ice in the North Sea in the Glacial period. In the paper now presented to the Society we purpose to give a summary of the results of our observations. At the outset we may state that they furnish a remarkable confirmation of the conclusions already arrived at regarding the westerly and northwesterly movement of the ice. Moreover, the presence of stones in the Boulder-clay, which must have been derived from the mainland of Scotland, and the discovery of abundant remains of marine shells in the same deposit, though in a fragmentary state, are of the utmost importance in guiding us to a satisfactory solution of the question.

No description of the glacial phenomena of Orkney has hitherto been published

Since this paper was written, our friend Mr. Amund Helland has sent us a copy of his paper "Ueber die Vergletscherung der Färoër Inseln," which appeared in the 'Zeitschrift der deutschen geologischen Gesellschaft,' 1879. We are glad to see that Mr. Helland has arrived at the same conclusions as ourselves regarding the north-westerly movement of the ice in Orkney, from independent observations made in the course of last year.

. Some references were made by Professor Geikie to the existence of *roches moulonnées* with striated surfaces, Boulder clay, and valley moraines in the islands in an article which appeared in 'Nature'

'Nature,' vol. xvi. p. 414.

. This article was written in reply to a letter by Samuel Laing, Esq., M.P., in which he asserted that there is no evidence that Orkney had participated in the general glaciation of Britain

'Nature,' vol. xvi. p. 418,

. So far from there being any lack of evidence regarding the glaciation of these islands, we hope to show that they contain abundant proofs of having undergone severe glacial conditions. Our observations, however, completely confirm Sir. Laing's statement that there are no raised beaches in the islands indicating changes of the relative levels of sea and land since glacial times.

II. GEOLOGICAL STRUCTURE.

The geological structure of the islands is comparatively simple. From Stromness on the Mainland northwards to Inganess there is an axis of ancient crystalline rocks on which the representatives of the Old Red Sandstone rest uncouformably. These crystalline rocks consist of a fine-grained granite and a grey micaceous

flaggy gneiss, which occupy a strip of ground about four miles in length and about a mile in breadth. They arc prolonged southwards in the island of Graemsa. With this exception the whole of the Orkney-Islands are occupied by Old Red Sandstone strata. In the island of Hoy representatives of both the upper and lower divisions of this formation are met with, and here they are separated by a marked unconformity; but in all the other islands the beds belong to the lower division.

Throughout the islands there is a remarkable uniformity in the character of the strata belonging to the lower division. They consist mainly of hard blue and grey calcareous flagstones, which are so typically developed in Caithness. Fortunately, however, the highest beds of the Orcadian flagstone scries are totally different in character from those just described, being composed of coarse siliceous red and yellow sandstones and marls. The sandstones are full of false-bedding, and frequently conglomeratic, containing pebbles of granite, quartzite, gneiss, and other crystalline rocks.

The distribution of this arenaceous series has an important bearing on the question of the ice movement. On referring to the map accompanying this paper (Pl. XXVI.), it will bo seen that it forms a well-marked zone, running nearly north and south through the centre of the group. The relations which these siliceous sandstones bear to the flagstones are best seen in Eda, where they cover the greater part of the island, and where they form smooth flowing hills upwards of 300 feet in height. The sandstones lie in a syncline, the axis of which runs north and south, and on both sides of the island they rest conformably on the flagstones. In the islands which lie to the west and north-west of Eda, viz. Fara, Westra, Papa Westra, Egilsha, and Rowsa, the strata consist wholly of blue and grey flagstones, which are inclined at gentle angles. Though there are many minor undulations, yet on the whole there is a gradually descending scries towards the western headlands of Rowsa and Westra.

In Stronsa and Sanda the arenaceous series and the underlying flagstones are repeated by a scries of faults, which are laid down on the map.

The south-east corner of Shapinshay is occupied by these sandstones, where they are associated with a dark green slaggy diabase, which forms part of an ancient lava-flow. They reappear on the south shore of Shapinshay Sound, and cross the Mainland in a narrow strip from Inganess Head to Scapa Bay. They are continued also along the north-west shore of Scapa Flow as far as Orphir Kirk, and they likewise extend along the eastern shore to Howquoy Head, near St. Mary's. These sandstones and marls are brought into conjunction with the flagstones of the Mainland by two great faults, which we have traced on the ground; but in Cava, Fara, Flota, South Ronaldshay, and Burra they graduate downwards into the flagstones, and are regularly interbedded with them. As the result of careful mapping of the coast-sections in the southern islands, we have come to the conclusion that Scapa Flow occupies the centre of a geological basin, towards which the strata are inclined on almost every side, and round whose shores the highest members of the Lower Old Red Sandstone in Orkney are to be found. We have elsewhere stated our reasons for believing that the Orcadian flagstones, with the conformable sandstones and marls, are the equivalents of the higher subdivisions of the Caithness series

" The Old Red Sandstone of Orkney," by B. N. Peach and J. Horne Trans, of the Phys. Soc. Edinb. vol. v. 1880.

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It ought to be clearly borne in mind that to the north-west of the great fault which extends from Houton Head eastwards by Scapa to the bay east of Work Head, the Old Red strata consist wholly of flagstones, save the conglomeratic beds, which repose unconformably on the crystalline axis, north of Stromness.

The physical features as well as the geological structure of Hoy are somewhat different from those which obtain in the other islands. Instead of a low undulating tableland, terminating seawards in a bluff cliff or sloping downwards to a sandy beach, which is the dominant type of Orcadian scenery, the island of Hoy forms a prominent tableland, trenched by a series of deep narrow valleys, which arc occasionally flanked by conical hills upwards of 1500 feet high. These narrow valleys must have been admirably adapted for nourishing a series of local glaciers towards the close of the Glacial period, as is evident from the long moraines now strewn over the hill-slopes.

The greater portion of the island is occupied by coarse false-bedded sandstones, which are but the counterpart of the Upper Old Red Sandstones at Dunnet Head, in Caithness. Near the base of this division occur some contemporaneous volcanic rocks, which are admirably exposed on the noble cliff in the north-west of the island and at the base of the Old Stan of Hoy. The whole series rests unconformably on the flagstones; and in the south-west portion the upper division is brought into conjunction with the lower by a fault which extends from Melsetter to the coast-line opposite Risa island

The geological structure of Hoy was solved by Professor Geikic and Mr. B. N. Peach in 1874. See "The Old Red Sandstones of Western Europe," Trans. Boy. Soc. Edinb. vol. xxviii. p. 411; also The Old Man of Hoy," Geol. Mag. decade ii. vol. v. p. 49.

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III. GLACIATION.

The glacial phenomena of Orkney completely establish the double system of glaciation which we found to obtain in Shetland. There is satisfactory evidence for maintaining that during the primary glaciation the Orkney Islands must have been overridden by a mass of ice which moved from the North Sea to the Atlantic; but towards the close of the Glacial period, when the great *mer de glace* had retreated from the Orcadian coast-line, local glaciers must have lingered for a time in the valleys of Hoy and in some of the more elevated parts of the Mainland.

Though these islands do not comprise any districts that might be compared with North Mavine or the promontories of Lunnasting in Shetland, which are dotted all over with finely preserved *roches moutonnées* and rock-basins, nevertheless a careful search along the cliff-tops reveals numerous instances of glaciated surfaces and ice-markings. The latter, however, are not so abundant as we found to be the case in Shetland, which may be satisfactorily explained by the rapid disintegration of the flagstones when long exposed to atmospheric waste.

In the island of Westra the average direction of the striae in the eastern part of the island is W. 20°–30° N. Close by Noltland Castle, at the roadside, the trend is W. 20° N., on the north-west face of Cleat hill N.W., and immediately to the east of the same hill W. 30° N. At Rackwik, on the eastern shore, the ice-markings vary from W. to W. 20° N., while in Tuquoy Bay they point W. 10° S.

A careful examination of the striated surfaces on the hills west of Pierowall proves that the ice must have been slightly deflected as it impinged on the eastern slopes, the lower portion moving in the direction of the northern coast-line, while the higher strata streamed westwards over the hill-tops towards Nonp Head and Russitaing. On the north-eastern face of the hill south of Ourness several examples were noted pointing N. 30°–35° W., but in the gap between the hills the direction is W. 5° S.

Perhaps one of the most interesting features connected with the glaciation of Westra is the freshness of the ice-markings on Nonp Head (240 feet) and along the cliff-tops to the south. A few yards to the north and south of the highest point of this bold headland, finely preserved stria; were observed on grey flags, where the thin Boulder-clay had been recently removed by the action of the sea, trending W. to W. 3° N. Above Ramna Gio the direction varies from W. 10° N. to W. 10° S.; at Russitaing, W. 20° S.; near the Red Hare, W. 10° S.; near Inganess, W. 15° 8. to W. 18° N.; and again, in the bay south of Inganess, a well-marked instance points W. 12° N.

In some parts of the island of Eda the proofs of glaciation are marvellously fresh, more especially on the surfaces of the harder sandstones. From the finely glaciated surfaces and numerous *roches moutnnnées* in the centre of the island north of Lonton it is evident that the ice must have overtopped the hills in its northwestward march. On the east slopes of the Stennie hill the direction of the striæ is W. 20°–25° N., and not far to the south W. 40° N.

Along the eastern coast, between Calf Sound and Lonton Bay, the ice-markings point N. 20°–30° W., while between the Kirk of Skail and the Veness promontory the average direction is W. 35°–40° N. In one remarkable instance, on the shore about a mile to the south of the Kirk of Skail, striæ were observed on a highly inclined rock-face trending north and south, while on the cliff-top the direction is W. 35° X., the former being evidently due to local deflection. Along the western coast the general direction of the ice-movement is in perfect harmony with that just described. In the neighbourhood of Warness, which forms the south-west promontory of the island, the trend is W. 13° N., while to the west of the Wart of Eda, on the cliff-tops, it varies from W. 28° N. to W. 43° N.; and again, to the north of Seal Skerry, W. 40° N. One of the best examples to be met with in the island occurs in the bay east of Fara's Ness, where a small stream enters the sea. This burn has cut down through a deposit of shelly Boulder-clay to the polished pavement on which it rests; and along the stream-course the firm lines produced by the ice-chisel may bo seen to advantage on the glaciated surfaces of the sandstones. The direction of these instances is N. 27° W., but on the shore, close by the mouth of the stream, the trend is W. 38° N.

Notwithstanding the widespread covering of blown sand which envelops the greater portion of the island of Sanda, we succeeded in finding abundant traces of the ice-movement. In the Burness peninsula striated surfaces are numerous along the coast-lino, about a dozen instances occurring between Hermaness Bay and the Holms of Eyre, which, with one or two exceptions, point W. 10°–15°N. To the west of Loch Roo the direction is W. 25° N.; and not far from the Saville boulder, on the eastern shore of the peninsula, the trend is N.W.

On the shores of Kettletoft Bay the average direction is W. 10°X.; inland from this bay towards the Free Church it varies from W. 20°–40° N., while in Bacaskeal Bay it is N. 32° W. This north-westerly movement is equally borne out by the evidence obtained in the southern part of the island; for in the bay west of Hack Ness

the ice-markings point N. 30° W., and on the western shore between Spur Ness and Stranquoy N. 8°–17° W.

The island of Stronsa likewise supplies conclusive evidence regarding the direction of the ice-movement; for in Odin Bay, where an important section of Boulder-clay occurs, which we shall describe presently, the striæ point W. 15°–35° N.; between Kirk-buster and Finga the trend is W. 10°–40° N., at Burgh Head W. 40° N., and north of Holland W. 40° N. On the western coastline, on the shores of Rousholm Bay, the direction varies from W. 41° N. to N. 40° W.; and on the shores of Linga Sound it is W. 40° N. It is of the utmost importance to note the perfect agreement in the trend of the ice-markings in different parts of this island, because it indicates a persistent movement in one determinate direction.

A careful examination of the striated surfaces on Shapinshay confirms in a remarkable manner the evidence regarding the ice-flow during the primary glaciation in the northern islands. Along the west coast, between Galtness and Stromberryness, the direction varies from W. to N.W., while on the shores of Veantro Bay, which indents the northern part of the island, the markings point N.W. and N. 35°–40° W. Further along the eastern coast-line, between Gioness and the school-house, the direction is W. 30° N., and the same trend is observable southwards towards the church; near Foot stria: were noted pointing N. 30° W., and close to Haco's Ness N. 20° W.

It is impossible, within the limits of this paper, to describe the various instances we met with in the Mainland, and we will therefore merely indicate the general trend in different parts of the island. On the glaciated surfaces of granite and gneiss north of Stromness numerous examples occur trending W. lo°–20° N. and W. 12° S. Immediately behind the town the direction varies from W. 8°–40° N., while on the moorland between Yesnabae and the Loch of Stennis, as well as at the Ring of Brogar, the same variation is observable from W. 12° N. to N.W.

On the hill-slopes overlooking Gorsness and the island of Gairsa the average direction of several examples is N. 25°–30° W., and along the coast-lino from Irland Bay to Houton Head the trend varies from W. 12°–42° N. One instance occurs in Irland Bay pointing W. 32° S., which probably belongs to the later glaciation.

In Kirkwall Bay, a short distance to the east of the pier, beautifully striated flagstones may be seen where Boulder-clay has been recently removed by the action of the sea, the striæ running N. 6° W. and N.N.W.; and so also on the surfaces of the flagstones in the Scapa Quarry the direction is N. 8° W. Along the shore from Scapa to Howquoy Head the average direction of several examples is N. 30°–35° W., and near St. Mary's the trend varies from N.W. to N. 25° W.

In the southern islands striæ are not so abundantly found, owing to the readiness with which the soft yellow sandstones and marls crumble away when long exposed to the denuding agencies. In South Ronaldshay several examples occur, the general direction of which is W. 20° N. These may be seen on the cliff-tops near Stow Head and Halcro Head by removing the coating of Boulder- clay. Even on the cliffs of the island of Hoy, overlooking the Atlantic, striated surfaces have been observed by Professor Geikie at a height of 600 or 700 feet above the sea-level.

The evidence now adduced regarding the ice-movement proves beyond all doubt that the islands have been glaciated in one determinate direction, independently of their physical features. A glance at the striæ map accompanying this paper (PI. XXVII.) shows the remarkable uniformity of the ice-flow in the different islands. Here and there, where local causes interfered with the general movement, slight deflections are met with; but, on the whole, the prevalent direction varies from W.N.W. to N.N.W. A careful examination of the numerous striated surfaces convinced us that the ice-sheet must have crossed the islands from the North Sea to the Atlantic. Indeed no one who reflects for a moment on the physical features of the islands could reasonably attribute the striations to a local radiation of the ice. If we except Hoy, these scattered islands contain no mass of elevated ground which is capable of giving rise to a local ice-sheet. So far from this being the case, we shall have occasion to refer to the absence of any indications of the existence of local glaciers in most of the islands towards the close of the Glacial period, a phenomenon which is doubtless due to this very cause. On the contrary, when we view the persistent northwesterly trend of the striations in connexion with the physical features, when we consider that the glaciated surfaces along the cliff-tops, as well as the *roches moutonnées* on the hill-slopes, prove that the islands must have been overflowed by the ice, we cannot resist the conclusion that the ice-movement during the primary glaciation originated beyond the limits of Orkney.

Fortunately the dispersal of the stones in the Boulder-clay amply confirms the foregoing conclusions regarding the north-westerly movement of the ice, while the presence of Scotch rocks in the same deposit enables us to demonstrate that the ice-sheet which crossed this group of islands must have radiated from the mainland of Scotland.

IV. BOULDER-CLAY.

This deposit is not spread over the general surface of the low undulating tablelands in the form of a more or less continuous covering. It occurs mainly round the bays, whore it frequently attains a considerable depth, while the inland districts are covered with a thin clayey soil, duo to the decomposition of the underlying flagstones. We shall have occasion to describe one or two sections of Boulder-clay which may be traced continuously along the shore for half a mile, and which are quite undistinguishable from the Lower Boulder-clay of Scotland. Occasionally thin patches of this deposit are to be found on the cliff-tops, containing well-striated stones and foreign rocks, clearly indicating that the islands must have been overflowed by the ice.

In the island of Westra the Boulder-clay is sparingly distributed, but some excellent sections are to be met with round the bays in the southern districts. At Rackwik, near Stangar Head, it consists of a tough tenacious gritty clay, which is chiefly made up of red sandstone fragments, about 80 per cent, of the larger blocks being composed of sandstones which are foreign to the island. Some of these blocks, which arc finely smoothed and striated, measure six feet across. The deposit rests on the grey flagstones, and some small subangular fragments derived from the underlying rocks are likewise included; but the great majority of the stones consist of sandstones which we identified as belonging to the island of Eda. Crossing the peninsula to the shores of Tuquoy Bay, similar sections arc presented, resting on grey flagstones, the included blocks being composed of the underlying rocks, red sandstones, quartzites, and chalk-flints. It is important to note that the red sandstone blocks do not form such a large percentage at this locality, but that they gradually diminish in number as wo recede towards the north-west. On the slopes of Cleat hill fragments of granite, quartzite, diorite, and dolerite are associated with the flagstones in this deposit; while still further north, near the church, blocks of red and white honeycombed sandstone and small pink granite stones were observed in the Boulder-clay in addition to the local rocks.

Along the west coast hardly any Boulder-clay is to be met with; but some thin patches arc to be seen on the cliffs at Nonp Head, containing well-striated stones derived from the flagstones of the island. Occasional smooth blocks of Red Sandstone occur in the hollows amongst the debris of the underlying rocks, which arc, in all likelihood, the relics of the onco existing Boulder-clay.

Now it is evident, on a moment's consideration, that the gradual decrease in number of the red sandstones in the Boulder-clay, as we traverse the island from the south-eastern headlands towards the west coast, indicates that the ice-flow must have been *towards* the Atlantic; and when wo consider that these sandstones nowhere occur *in situ* in Westra, and that they could only have been derived from the adjacent islands of Eda and Sanda, we are forced to conclude that the ice-movement must have been altogether independent of the islands.

Along the east coast of Eda the Boulder-clay is not so abundant as in some of the more sheltered bays on the opposite side of the island, which is satisfactorily accounted for by supposing that the rocky slopes facing Eda Sound were exposed to the full sweep of the *mer de glace*. Here and there, however, patches do occur, as on the north shore of Lonton Bay, where the deposit contains smoothed and striated chalk-stones, along with blocks of red and white sandstones and grey flagstones. Its most noteworthy feature is the presence of worn fragments of marine shells, which are scattered irregularly through the stony clay. Similar sections occur in the bay of Calf Sound near the pier, and also along the west coast near the Wart of Eda, where shell-fragments were likewise observed.

Perhaps the finest section of this deposit in Eda occurs along the 'banks of a small stream which flows into the bay about a mile east of Fara's Ness on the west coast. The stream has cut down through the stony clay to the finely grooved pavement of sandstone, so that the glacialist can examine thoroughly the nature of the deposit. It consists of tough red clay, packed with smooth and striated stones scattered irregularly through the section. There is no trace of stratification in the deposit, as it retains the same tumultuous character throughout. The stones are beautifully striated along the major axis, and arc mainly composed of the underlying red and yellow sandstones, varying in size from an inch to several feet across. In addition to these wo noted smooth chalk-stones, chalk-flints, and subangular blocks of the grey flagstones. The most interesting feature, however, is the occurrence of small worn fragments of marine shells which are scattered indiscriminately through the deposit; they are smoothed and striated precisely in the same way as the stones in the Boulder-clay, as if they had been subjected to the same abrasion.

Shelly Boulder-clay was also observed on the west coast of Sanda, between Spur Ness and Stranquoy: and sections of the same deposit are to be found in Bacaskeal Bay. In the Burness peninsula, near the Holms of Eyre, the shore is bounded by low cliffs of purple shales and flags, with a coating of Boulder-clay, which is just sufficient to cover the surface of the rocks. It is chiefly composed of fragments of the underlying rocks, but likewise contains fragments of sandstone, granite blocks, and smoothed stones of gneiss and schist, all of which, except the sandstone, are foreign to the island.

In Stronsa several important sections were met with both on the east and west sides of the island. On the shores of Linga Sound, not far from the narrow isthmus of Aith, a soction of shelly Boulder-clay occurs resting on grey sandstone, the deposit being upwards of 25 foot thick, and comprising chalk, chalk-flints, and white

quartz, in addition to the blocks derived from the flags and sandstones of the island. Further, on the north-east corner of Rousholm Bay a thin coating of this deposit rests on the flagstones, which are bent over to the north-west in the direction of the ice-flow.

One of the best exposures of Boulder-clay in Orkney occurs on the eastern shores of Odin Bay, in Stronsa, where it forms a continuous cliff for nearly half a mile. At intervals the section is obscured by a grassy covering, but every succeeding storm washes anew the face of the cliff, and exposes a fresh surface for examination. The deposit, which varies from 20 to 30 feet in depth, consists of a tough gritty clay of a reddish colour, full of well-smoothed and striated stones, which are mostly of small size. There are few largo boulders to be seen, the largest rarely exceeding a foot in diameter. There is not the slightest trace of stratification from one end of the section to the other, as the stones are disposed irregularly through the clayey matrix. By far the greater number of the included blocks have been derived from the flagstones and the sandstones which occur in the neighbourhood; but the following rocks are likewise represented:—granite, pink porphyritic felstone, gneiss, schist, quartzite, white quartz, dark limestone, with abundant plant-remains, which is probably of Calciferous-Sandstone age, oolitic limestone, oolitic calcareous breccia, fossil wood (probably oolitic), chalk, and chalk-flints, all of which are foreign to the island. When we come to collate the evidence regarding the primary glaciation, we shall discuss the probable localities from which these blocks were derived. At present it is sufficient to state that the evidence is clearly in favour of their having been carried from the mainland of Scotland.

Equally important is the presence of numerous fragments of marine shells throughout the deposit. Though we examined the section with the utmost care, we did not succeed in dislodging a complete shell; indeed so worn are the fragments that it was with the utmost difficulty that we obtained specimens sufficiently well preserved for determination. Nearly all the fragments are smoothed and striated, like the stones in the Boulder-clay; and there can be little doubt that these characteristics are due to the very same cause in both cases. Amongst the broken shells we detected fragments of *Cyprina islandica, Mytilus*, and *Mya truncata;* but a careful search, after severe storms, by some local collector would certainly increase this list considerably.

In the island of Shapinshay shelly Boulder-clay occurs at various localities on the east coast, as at Kirkton, where it contains finely striated chalk-stones. The best sections, however, occur along the western shore, and especially in the bay south of Galtness, where it forms a bluff cliff washed by high tides. This cliff furnishes valuable evidence regarding the ice-cam', inasmuch as we noted amongst the included stones blocks of the slaggy diabase which occurs *in situ* in the south-east corner of the island, along with striated fragments of the sandstones which are associated with the volcanic rocks. In this section smooth blocks of chalk and oolitic limestone, with numerous fragments of marine shells, were also observed.

If we traverse the Mainland from Scapa and Kirkwall westwards, by the Loch of Stennis, to the crystalline axis north of Stromress, similar conclusive evidence regarding the north-westerly movement of the ice is obtained from the Boulder-clay. On referring to the map of Orkney, it will bo seen that the narrow zone of red and yellow sandstones which crosses the Mainland from Inganess to Scapa extends south-westwards along the shore as far as Orphir Kirk. Now, in the shelly Boulder-clay in Kirkwall Bay, to the east of the pier, striated blocks of red sandstone are commingled with the flagstones in the clayey matrix. The latter are by far the most numerous, and arc likewise beautifully scratched along the major axis; but the sandstone blocks constitute a fair percentage of the included stones. From the lithological charactcr of these blocks, we had no hesitation in concluding that they had been derived from the sandstones to the east of Kirkwall.

Again, in the sections occurring on the coast between Houton Head and Irland Bay, the observer cannot fail to note the gradual increase in the number of the sandstone blocks in this deposit as he approaches Houton Head, a phenomenon which is quite intelligible when he remembers that the striations along the shore point W. 12°–42° N., the latter being the prevalent direction. Indeed at Houton Head the ice-markings are nearly parallel with the coastline, so that the sandstone blocks could not possibly have come from Hoy. Blocks of the same rock are strewn on the hill-slopes above Gorsness, to the north-east of Maes Howe. It is a significant fact that not a single block of the granite or gneiss which occurs *in situ* to the north of Stromness and in the island of Graemsa is to be found in the Boulder-clay between Irland Bay and Houton Head, or anywhere to the east of the axis of crystalline rocks; but as soon as the western limit of these rocks is crossed, numerous blocks of granite and gneiss are strewn on the slopes and along the cliff-tops between Brak Ness and Inganess. Had the ice-movement been *from* the north-west, the phenomena would have been precisely the opposite of those we have described.

In the southern islands this deposit is not abundant; but in South Ronaldshay, on the shores of Water Sound, cast of St. Margaret's Hope, we observed patches of it containing blocks of sandstone, flags, and chalk, with comminuted shells. In this instance the shells, when being dislodged, crumble readily to a white powder.

Our friend Mr. It. Etheridge, Jun., who kindly examined the shell-fragments we obtained in the Boulder-clay sections in Orkney, informs us that, on account of the fragmentary character of the material, it is

impossible to determine many of the specimens. He has, however, named the following :—

Mr. II. B. Brady, F.R.S., has also kindly determined the following species of Foraminifera from the same deposit:—

V. MORAINES.

One conspicuous feature connected with the Glacial phenomena of Orkney is the remarkable absence of any traces of local glaciers except in Hoy and the Mainland. When we consider the abundance of moraine heaps in all the more important islands of the Shetland group, this difference seems all the more striking; but when we remember the marked contrast between the physical features of the two groups of islands, the difficulty at once disappears. As we have already indicated, the only mass of elevated ground which would be capable of nourishing a series of local glaciers, after the great *mer de glace* had melted back from the Orcadian coast-line, occurs in Hoy. Hence we find that in the valleys which drain the group of conical hills in the north of that island moraines occur in abundance and also of great size. Professor Geikie has already described several examples which also came under our notice

'Nature,' vol. xvi. p. 415.

. In the valley to the east of Hoy hill a moraine mound, nearly half a mile long and from fifty to sixty feet high, runs across the mouth of the glen. It would seem that the later glacier which filled the valley did not succeed in scooping out the *moraine profonde* belonging to the primary glaciation, as the moraine matter rests on stiff sandy Boulder-clay. Further, in the hollow below Coulax hill several concentric heaps were observed which extend across the valley, indicating pauses in the retreat of the glacier.

In the Mainland also the moory ground between Finstown and Maes Howe is dotted all over with conical moraine heaps, evidently deposited by the glaciers which moved off the northern slopes of the Orphir hills. On the east side of the range of hills that runs north from Finstown several parallel moraine ridges may bo observed not far from Ellibister. Again, in the peninsular tract to the south-east of Kirkwall, a splendid series occurs in a valley situated about three miles north of Graemshall. At the point where the highroad from Roseness joins that from St. Mary's to Kirkwall, the concentric arrangement of the moraine heaps is admirably displayed.

VI. ERRATICS.

Boulders do not occur very plentifully in Orkney; but we felt convinced, from an examination of those we met with, that they must have been mainly distributed during the primary glaciation. In Westra blocks of granite and quartzite arc found on the slopes of Cleat hill; and rounded stones and boulders of red sandstone from Eda occur in the southern district as well as along the western shores.

In the north of Sanda, at Saville, a remarkable boulder of gneiss is met with, which has been described by previous observers. It measures × 6 × 2½ feet above ground, but its base is buried underneath the surface. Professor Heddle, who has made a minute examination of this boulder, states that it docs not appear to be a British rock. He gives the following description of it in a recent number of the 'Mineralogical Journal'

Mineralog. Journal, vol. iii. p. 174.

:—" It consists in greatest amount of white finely striated oligoclase, the crystals of which are penetrated by fine filaments of actinolite, glassy quartz in much smaller amount, dark green finely foliated lustrous hornblende in well-marked crystals, very little of a pale-green mica, a minute amount of a pale-brown mineral, which may, but does not appear to be sphene, and a speck or two apparently of thorite. The mass also contains a single crystal of pale-green apatite four or five inches in length by over an inch in width, and this apatite contains imbedded cryptolite."

He states that the only Scotch rock resembling the Saville boulder which he is aware of is to be found in Sutherlandshire; but it has orthoclase as its felspar, and does not contain apatite. Should this boulder really prove to be of Scandinavian origin, its presence has an important bearing on the question! of the extension of the ice in the North Sea. Some smaller blocks of gneissose rocks occur in the neighbourhood. A few boulders of conglomeratic sandstones occur in Eda, which may be purely local.

On the Mainland blocks of white and reddish-grey sandstone are strewn on the hill-slopes north of Finstown and on the moory ground south of Maes Howe, which have been derived from the north-west shore of Scapa Flow; and so also along the west coast, between Brak Ness and Inganess, north of Hoy Sound, boulders of granite and gneiss are met with on the flagstone area to the west, of the axis of crystalline rocks.

VII. CONCLUSION.

The evidence now adduced regarding the glacial phenomena of Orkney is of the utmost importance in solving the question of the extension of the ice in the North Sea. We have already referred to the remarkable uniformity in the trend of the ice-markings throughout the islands, which, with certain exceptions, vary from W.N.W. to N.N.W. From the manner in which these striations maintain their persistent north-west trend, irrespective of the physical features of the country, it is evident that the agent which produced them must have acted independently of the islands.

Nay, more, the dispersal of the stones in the Boulder-clay leaves no room for doubt that the ice-sheet must have crossed the islands from the North Sea to the Atlantic. It is no doubt true that the lithological varieties of the Orcadian rocks are not so numerous as in Shetland, and hence the corroborative evidence of the northwesterly movement is not so abundant. Still in those cases where the geological structure of the ground permitted us to test with certainty the direction of the ice-carry, we were driven to the conclusion that the ice-flow must have been towards the Atlantic. In Westra the Boulder-clay sections contain striated blocks of red and white sandstone, which have been derived from Eda, and it is particularly observable that they diminish in number as we move towards the north-west. In Shapinshay blocks of the slaggy diabase from the south-east corner of the island occur in the Boulder-clay near Galtness; and so also in the Mainland, the red and white sandstones which cross the centre of the island are represented in the *moraine profonde* on the shore between Houton Head and the Loch of Stennis. Yet, again, to the west of the axis of crystalline rocks at Stromness, smoothed blocks of gneiss and granite are found in considerable abundance.

Fortunately, however, we have additional evidence which enables us to demonstrate, not only that the ice-movement must have been from the North Sea towards the Atlantic, but, what is of still greater moment, that the ice which glaciated Orkney must have come from Scotland. In the numerous sections of Boulder-clay described in this paper we have had occasion to refer to the occurrence of smoothed and striated stones of dark-grey limestones full of plant-remains, oolitic limestone, calcareous breccia, chalk, chalk- flints, fossil wood, pink granite, porphyritic felstone, &c., all of which are foreign to the islands.

According to the opinion of Mr. Carruthers, F.R.S., the blocks of dark-grey limestone with plant-remains in all probability belong to the Calciferous Sandstone series. He has identified a well-marked specimen of *Lepidostrobus* in one of the blocks, though it is not distinct enough to bo named specifically. Lithologically the boulders resemble some of the thin limestone bands in the Cementstone series of Central Scotland; and the nearest locality to Orkney where these rocks occur *in situ* is in the county of Fife. With reference to the Secondary rocks, Professor Judd, F.R.S., states that, besides the chalk and chalk-flints, he detected amongst our collection some specimens which resemble some of the Secondary rocks of Scotland. Two specimens of the calcareous breccia from the Boulder-clay in Odin Bay "very closely resemble parts of the Upper Oolites of Sutherland," and two other blocks are probably from the same locality. Moreover, he adds that the specimens of oolitic limestone very possibly come from some part of the Secondary series in Scotland.

In addition to these, wo observed, in the Odin-Bay section, large blocks of a remarkable rock which seems to be petrified wood. It has a curious fibrous structure and is very calcareous; indeed under the microscope it appears to be mainly made up of crystals of calcite, though occasionally there are portions where the structure is still retained. Blocks of the same rock, however, occur in the Caithness Boulder-clay, which show traces of organic structure under the microscope. On dissolving a small piece of the rock a large residue of coaly matter was obtained, which ignited with a strong flame. It would appear that this rock is largely burnt for lime in Sutherlandshire, where it is washed out of the Oolitic shales.

In all probability most of the blocks of granite, felstone, gneiss, quartzite, and schist which occur throughout Orkney, save those in the Stromness district, have been derived from the northeast of Scotland, though they possess no special characteristics which might enable us to identify them with any particular locality.

Now it ought to be borne in mind that chalk, chalk-flints, and various rocks of Jurassic age are found in the Boulder-clay of Caithness, and also in the same deposit in the low grounds of Banffshire and Aberdeenshire, where it possesses the same physical characters as in Orkney, and likewise contains fragments of shells. It seems perfectly reasonable to conclude, therefore, that the Boulder-clay in these widely separated localities must be ascribed to a common cause, or, in other words, to the action of land-ice. Indeed no one who attentively examines the sections in Orkney would ascribe them to the action of icebergs or coast-ice. We have already discussed the objections to the marine origin of the Shetland till, and the very same arguments apply with equal force to the present case.

Moreover, on referring to the chart showing the probable path of the ice in the North Sea, which

accompanies this paper (PI. XXVII.), it will be seen that it is impossible to escape this conclusion. The ice, which radiated from the north-east of Scotland, not only filled the basin of the Moray Firth, but likewise spread over the low grounds of Banffshire and Aberdeenshire. The researches of previous investigators point to this conclusion; and quite recently, during the prosecution of the Geological Survey of the south side of the Moray Firth, additional facts have transpired which tend to confirm it. Further, in the neighbourhood of Dunbeath, on the Caithness coast, the stria; gradually swing round till they run parallel with the shore, eventually bending inland till they point towards the northwest, in harmony with the trend of the ice-markings in Orkney. Clearly, then, the ice must have been deflected so as to override the low grounds of Caithness, as pointed out long ago by Dr. Croll. Similarly in Forfarshire and Kincardineshire, the ice which moved off the south-east slopes of the Grampians, on reaching the coastline, was bent round in a N.N.E. direction, as indicated on the chart. A glance at the chart will also show how the land-ice was deflected along the south-east coast of Scotland, as described by our colleague Dr. James Geikie, F.R.S. Now these marked deflections undoubtedly point to some opposing force which was capable of overcoming the seaward motion of the Scotch ice-sheet. Had it been allowed to follow its natural pathway then the phenomena would have been widely different.

The results of our investigations in Shetland prove that the Scandinavian *mer de glace* not only invaded the North Sea, but likewise overlapped that group of islands in its march to the Atlantic. The presence of this mass in the bed of the German Ocean furnishes a satisfactory explanation of the phenomena above referred to; for the two ice-sheets must have coalesced on the sea-floor, and the combined ice-field would naturally take the path of least resistance. In other words, one portion would flow north-westwards by the Orkney Islands, while the southern portion would flow in the direction of the English coast, as laid down on the chart. In all probability the dividing line would be somewhere opposite the basin of the Forth.

We can quite well understand therefore how the Scotch ice-sheet, as it crept outwards along the bed of the Moray Firth towards the North Sea, must have pushed along the marine shells and silt which it encountered on the sea-floor. These would be commingled with the *moraine profonde* which had gathered underneath the ice-sheet; and the shells would ultimately be smoothed and striated precisely like the stones in the bottom moraine. Hence the occurrence of Scotch rocks together with shell-fragments in the Orkney Boulder-clay is what we would naturally oxpect; and in the light of the foregoing reasoning all difficulty as to the explanation of the phenomena disappears. It is not necessary for us to assign the precise localities from which the various foreign rocks have been derived; it is sufficient for our present purpose if we show, as has been done, that they may have come from the basin of the Moray Firth or the eastern counties of Scotland lying to the north of the basin of the Forth. The presence of blocks of limestone of Calciferous-Sandstone age in the Odin-Bay section in Stronsa seems to indicate that a portion of the ice which crossed Fife was deflected to the north; and even if the Saville boulder should prove to be of Scandinavian origin, its position in the north of the group is quite in keeping with the path which would be followed by the Scandinavian ice.

It is a significant fact that nowhere in the Shetland Boulder-clay did we find a vestige of the Secondary rocks of Scotland; and though the evidence is merely negative, it nevertheless confirms the foregoing conclusions. We are inclined to believe also that the absence of marine shells in the same deposit, which we noted in our previous paper, may probably indicate that a portion of the present sea-floor round Shetland formed dry land during the climax of glacial cold. We see, therefore, how the glacial phenomena of Orkney furnish a striking confirmation of the views advocated by Dr. Croll more than ten years ago.

Though we visited nearly all the islands of the group and traversed the greater part of the coast-line, we found no trace of gravel kames or raised beaches indicating recent changes in the relative level of sea and land.

Explanation of the Plates.

PLATE XXVI.

Glacial Chart of the Orkneys.

PLATE XXVII.

Chart showing the probable path of the ice in the North Sea.

The Glaciation of the Shetland Islands.
[*Extracted from the* GEOLOGICAL MAGAZINE, February, 1881]
TRÜBNER & Co., 57 and 59, Ludgate Hill, London.

The Glaciation of the Shetland Isles.

[*Extracted from the* GEOLOGICAL MAGAZINE, Decade II. Vol. VIII. No. 2, p. 65, February, 1881.]
By B. N. PEACH, F.G.S., and J. HORSE, F.G.S., of the Geological Survey of Scotland.
Reply to Mr. Milne Home's Presidential Address before the Edinburgh Geological Society, May, 1880.

IN his valedictory address as President of the Edinburgh Geological Society, at the close of the session 1879-80,

1 Trans. Edin. Geol. Soc. vol. iii. part 3, p 357.

Mr. Milne Home reviewed our recent paper on "The Glaciation of the Shetland Isles."

2 Quart. Jouni. Geol. Soc. vol. ixxv. p. 778.

In his address he not only called in question our conclusions regarding the direction of the glaciation of these islands, but likewise referred to the discordance between the observations of Mr. C. W. Peach and ourselves. As much of this adverse criticism is based on a misconception of the real nature of the evidence bearing on the question, we are anxious to reply to some of the points in the address which might mislead those who are unacquainted with the subject.

In our paper we endeavoured to show that there were at least two periods of glaciation in these islands; the one being coincident with the climax of the Ice age, during which the islands were buried underneath the Scandinavian *mer de glace*, while the other was characterized by local glaciers which radiated from the high grounds in the ordinary way. We stated as the result of a careful examination of the striated surfaces, and specially of the dispersal of the stones in the Boulder-clay, that, during *the primary glaciation*, the Scandinavian ice-sheet abutted on the eastern seaboard of Shetland with a W.S.W. and S.W. trend, and after reaching the crest of the Mainland, it swung round to the N.W. and N.N.W.

With reference to this statement, Mr. Milne Home makes the following remark: "Even on the east coast of the Shetlands, -where the striations should show a N.E. direction, there is no uniformity in that direction. Near the south end of the group, viz. at Bressay and Lerwick, as the arrows on the map show, the direction of the striæ is not from N.E. to S.W., but from N.W. to S.E."

No reference is made in the foregoing sentence to the fact that the south-easterly striæ at Lerwick and at certain localities in Bressay belong to the period of local glaciation. Neither is any allusion made to the existence of cross-hatches along the shore at Lerwick; the older markings running S.W., and the newer ones S. 40° E. Moreover, we distinctly pointed out in our paper, that the southwesterly movement of the ice-sheet during the primary glaciation in the Lerwick and Quarff districts is placed beyond doubt, by the occurrence of striated blocks of Old Red Sandstone grits and flags in the Boulder-clay on the west side of the island near Quarff. On the other hand, we indicated that the presence of striated fragments of schists and slates from the Cliff Hills, in morainic deposits in the neighbourhood of Lerwick, points to a local radiation of the ice which was only powerful enough to invade the north-western part of the island of Bressay.

Regarding the direction of the ice-flow in Unst, Mr. Milne Home says: "Also at the north end of the group of islands, viz. in Unst, though the authors of the paper represent by contour lines, and also by the text, the direction of the movement to have been from N.E. to S.W., considerable doubt must bo felt on that point because of the contrary testimony of Sir. C. W. Peach, as given in the British Association Reports for 1864. Mr. Peach states 'that ruts and striae fell under his notice in North Unst, on the cliff at Hagdale in Haroldsnick Bay; the direction being nearly W.N.W. and E.S.E.' Mr. Peach says 'that in ascending the Muckle Heog Hill, which reaches a height of at least 500 feet, he found the W.N.W. end vertical and polished, to the depth of 150 feet.' "

The discrepancy between the observations of Mr. C. W. Peach and ourselves may be best explained by quoting from a letter dated November, 1880, which he has kindly forwarded to us, and which he has permitted us to use in our reply to this address. "I send you a copy of my paper on Shetland, read before the Royal Physical Society, Edinburgh, in which I stated that the stria; on the Muckle Heog, Unst, ran nearly W.N.W. and E.S.E. In the closing sentence of that paper I also stated that all the bearings are by compass, no allowance

having been made for variation. This should be taken into consideration and the deviation allowed for as far as Shetland is concerned. Since I wrote that paper, having seen much more of the glaciation of Scotland and thought more about it, I have seen cause to alter my opinion as to the direction of the drift over Shetland, viz. the opposite of what I inferred in my paper to the Royal Physical Society. At the time I wrote (1864), I was much puzzled, when examining the Boulder-clay near Hammer in Balta Sound, to find mingled with the striated stones of serpentine, numerous striated stones of gabbro from Balta Island; and then at the haunted burn of Watlea, where the black shales are exposed and in which lies the Boulder-clay containing smoothed and striated stones of serpentine in abundance, when beyond the Skaw to Saxaford Hill I met with no trace of serpentine or gabbro stones, although I searched rather carefully. I now feel quite satisfied, that although I noticed the bearing of the striæ right, I was wrong as to the direction the drift came from. At that time I was full of dredging matters, and my mind ran so much after Hydrozoa, Polyzoa, Crustacea, Mollusca, etc., that I had little time for examining the glaciation of the islands, and hence the oversight and neglect of the warnings of Hammer and Watlea, for which I am sorry."

The candid admissions contained in this letter enable us to account for the discordance between the recorded observations of Mr. C. W. Peach, in 1864, and ourselves. We visited the locality at Hagdale, referred to by Mr. Peach, sen., and confirmed the accuracy of his observations so far as the magnetic readings are concerned. When due allowance is made for the magnetic deviation, the *true* direction of the ice-flow at Hagdale is nearly E. and W., as noted by us. Along the eastern seaboard of Unst, however, the striæ vary from W. to W. 30? S.; the westerly trend being more prevalent in the northern part of the island. From the foregoing letter it is also evident that Mr. C. W. Peach had observed certain facts connected with the dispersal of the stones in the Boulder-clay which unquestionably point to the westerly movement of the ice. He noted the occurrence of gabbro stones from Balta Island in the Boulder-clay at Hammer, and striated serpentine fragments in the Boulder-clay at Loch Watlea to the *west* of the serpentine area. These facts are not referred to in any of the papers which ho wrote on the subject at that time, doubtless for the simple reason that they are inexplicable on the hypothesis which he then adopted of an ice-movement from the W.N.W. and N.W. Had he found time, in the midst of his dredging operations, to traverse the western shore of Unst, between Woodwick and Belmont, he would have met with still more convincing proofs of this westerly movement in the presence of serpentine and gabbro stones in the Boulder-clay, which must have been carried across the water-shed. Indeed, so abundant are these striated fragments in this deposit on the west coast, that it is impossible to escape the conclusion, that the ice must have crossed Unst from the North Sea to the Atlantic.

In 1868, Mr. C. W. Peach informed Dr. Croll

GEOL. MAG. 1870, p. 212.

that a minute examination of the shelly Boulder-clay of Caithness, continued for several years, had led him to the conclusion that the ice must have crossed the low grounds of that country from the S.E. towards the N.W. His faith in the north-westerly movement in Unst seems then to have wavered, but no subsequent opportunity was afforded him of re-visiting Shetland to examine the evidence anew.

To quote further from the address: "Mr. Peach is a geologist of such experience and strict accuracy that observations by him need no corroboration; but Professor Geikie, in an article in 'Nature,' of 17th September, 1877, refers to the foregoing report by Mr. Peach, and says that from his own observations he can speak confidently as to the correctness of Mr. Peach's determinations." In the article referred to. Professor Geikie confirms Mr. Peach's determinations only with reference to the occurrence of abundant striated rock surfaces, and Boulder-clays with striated stones, in the Shetland islands, the existence of which had been doubted by S. Laing, Esq., M.P. He carefully avoids expressing any opinion regarding the direction of glaciation of these islands, and so far as we are aware he has never published any opinion on this question.

Mr. Milne Home further says: "With regard to the west coast of the islands, where the markings are N.W. and S.E., the authors state that these indicate a movement from the S.E. But the nature of the evidence to show that the movement was from the S.E. and not from the N.W. is not given."

We are at a loss to understand how any one who has attentively read our description of the Boulder-clay sections, could possibly conclude that the nature of the evidence for the north-west movement on the west side of the Mainland is not given. We described with considerable minuteness a series of Boulder-clay sections

Quart. Journ. Geol. Soc. vol. xxxv. p. 796, et seq.

extending across Northmavine from Ollaberry by Hillswick, Braewick. Tanwick, to the Grind of the Navir and similar sections along the banks of Roeness Voe. On referring to the map accompanying our paper, it will be seen that the lithological varieties of the rock-masses along these lines of section are so distinct as to render it an easy matter to determine the direction of the ice-movement, from the dispersal of the stones in the Boulder-clay. We distinctly indicated that the ice-carry between the diorite area east of Hillswick and the cliffs north of the Grind of the Navir was *towards the north-west*. We pointed out that the quartz-felsite and granitic area was invaded by the diorite stones, and the area occupied by the contemporaneous porphyrites and tuffs was

invaded by the diorite and quartz-felsite stones; the relative ingredients diminishing in number in proportion to the distance from their parent source. Furthermore, in the peninsular tract which lies to the west of Weesdale, we stated that corroborative evidence is obtained of this north-westerly movement on the west side of the Mainland. To the east of the north and south bounding fault which crosses the peninsula from Aiths Voe to Bixetter and Selie Voes, no trace of the altered Old Bed Sandstone rocks are to be found, either in the Boulder-clay or on the surface, while numerous blocks of the epidotic syenite and the associated gneisses and schists are met with to the west of the fault. And so also in the island of Papa Stour numerous striated blocks of the altered Old Bed rocks from Sandness Hill are commingled in the *moraine profonde* with fragments of the local porphyry and contemporaneous diabase porphyrites, while in the neighbourhood of Melby the Boulder-clay sections may be searched in vain for blocks derived from Papa Stour. It requires only a moment's reflection to see that the phenomena would have been precisely *the reverse* of what we have just described, had the ice-movement been *from* the north-west, as Mr. Milne Home imagines. Indeed, as we stated in our paper, "the evidence obtained from the Boulder-clay along these lines of section completely refutes the theory that these north-westerly striæ could have been produced by ice coming from the North Atlantic."

Mr. Milne Home concludes his review by stating that "the authors of this paper, besides maintaining that the Shetlands were glaciated by a *mer de glace* from Scandinavia, have gone so far as to suggest that the whole of Scotland underwent a glacial invasion from the same quarter; and they give reasons for this opinion which are not very intelligible."

The only ground for this statement is the following sentence in the conclusion of our paper: "The land-ice which glaciated *Scotland* could only have come from Scandinavia, as the striated surfaces clearly point in that direction." Owing to an unfortunate printer's error, for which we are sorry, the word Scotland in the foregoing sentence has been substituted for Shetland; an error which is self-evident to any ordinary reader after a careful perusal of the context. We do not believe that any part of Scotland was ever over-ridden by the Scandinavian *mer de glace;* indeed, there is not the slightest evidence in support of such an hypothesis. So far from this being the case, we have advanced sufficient evidence to prove that the Scotch ice-sheet must have spread far enough over the floor of the North Sea as to over-ride the Orkney Islands.

Quart. Journ. Geol. Soc. vol. xxxvi. p. 648.

We have now disposed of the various points in this address which are likely to mislead the general reader. We have spent our annual holidays for four years in working out the glacial phenomena of Shetland, Orkney and Caithness, with a view to determine the question of the extension of the ice in the North Sea during the Glacial period. In the course of these traverses we have amassed a great amount of detailed evidence, which cannot readily be incorporated in the pages of a scientific publication like the Quarterly Journal of the Geological Society. We have had to content ourselves with merely summarizing the evidence. We can only state, however, that our repeated traverses have left no escape from the conclusion, that *during the climax of the Glacial period*, the direction of the ice-movement in Shetland, Orkney, and Caithness was from the North Sea and the Moray Firth towards the Atlantic.

Stephen Austin and Sons, Printers, Hertford,

[*From the* PROCEEDINGS OF THE ZOOLOGICAL SOCIETY OF LONDON, December 12, 1865.]

ON TWO NEW SPECIES OF SOUTH AFRICAN SAXICOLÆ.

BY Dr. G. HAUTLAUB, FOR. MEMB. ZOOL. SOC.

In a small collection of birds from different parts of the Cape Colony recently submitted to my examination by Mr. E. L. Layard I find two apparently new species, which I describe as follows :—

- *Major; cinerea, remigibus fuscis; corpore subtus vix pallidiore; tectricibus caudce superioribus albis; rectricibus 4 intermediis fusco-nigris, ternis lateralibus albis, apice late fusco-nigris, quarta nigricante, basi alba; rostro et pedibus nigris*.

  Long, circa 7#, rostr. 7#, al. 4#, caud. 2# 10#, tars. 13½#.

  Hab. Karroo; Afr. mer. (*Layard*).

- *Minor; cinerea, gutture pectoreque pallidioribus; abdomine imo, crisso et subcaudalibus albis; remigibus fuscis, primo apice conspicue emarginato-attenuato; rectricibus 4 mediis fusco-nigris, ternis lateralibus pogonio externo albis, interno fuscis, extima apice tota fusca, quarta apice latius fusca; rostro et pedibus nigris.*

  Long. 6 1/3#, rostr. 6#, al. 4# 1#, caud. 2# 10#, tars. 14#.

  Hab. Karroo (*Layard*).

Obs. Primo aspectu simillima precedenti, sed minor, cauda alis et tarsis pro mole longioribus, subcaudalibus albis; rectricum coloribus alio modo dispositis.

Studien. über einige südamerikanische Vögel nebst Besehreibungen neuer Arten.

Das permanente internationale ornithologische Comité ist hoch erfreut, die nachfolgende Arbeit in seinem Organe veröffentlichen zu können, da es sich mit um die wissenschaftliche Verarbeitung einer grossen ornithologischen Sammlung handelt, die der verstorbene Professor Dr. Behn aus Kiel auf der Weltumsegelungsreise der dänischen Corvette »Galathea« in den Jahren 1845—1847 und auf einer sich anschliessenden Landreise quer durch Südamerika in den Jahren 1847 und 1848 zusammengebracht hat und die bis vor wenigen Jahren, allerdings vorzüglich aufbewahrt, aber für die Wissenschaft ungenützt, im Museum zu Kiel lagerte. Gewiss ist dadurch ein werthvoller Beitrag zur Kenntniss der Verbreitung der Vögel auf unserer Erde geliefert.

Professor Dr. R. Blasius, Pr. P. I. O. C.

Von Hans v. Berlepsch und Paul Leverkühn.

Mit 2 Tafeln.

Im Anschluss an eine kleine Arbeit über südamerikanische Vögel des Kieler Museums

Paul Leverkühn Südamerikanische Nova aus dem Kieler Museum. In: Cab. Journ. f. Ornith. XXXVII, 1889, p. 101 —109. Darin neu beschrieben: *Aphobus megistus, Homorus Galatheae, Terenura elaopieryx, Trupialis militaris falklandica*.

übergeben wir im Folgenden die Resultate unserer gemeinsamen Studien in der reichhaltigen Kieler Sammlung, welche zum grössten Theile vom verstorbenen Prof. Behn auf der Expedition der Galathea zusammengebracht wurde. Das Material, welches durch Herrn Prof. Dr. Brandt, Director des Zoologischen Instituts der Universität Kiel, dem Einen von uns zur Bearbeitung übergeben ist, wurde uns in liberalster Weise zu vergleichenden Studien auch nach auswärts zur Verfügung gestellt, wofür wir nicht verfehlen, an dieser Stelle unseren verbindlichsten Dank zu wiederholen! —

Die behandelten Arten sind in systematischer Reihenfolge nach dem Catalogue of the Birds in the British Museum (Vol. I—XII. XIV) und, soweit sie in diesem Werke noch nicht erschienen sind, nach Sclater und Salvin's Nomenclator avium neotropicalium aufgeführt. Ein alphabetischer Index ist zur Erleichterung des Auffindens am Schluss angefügt. — Die sorgfältig genommenen Masse sind stets in Millimetern angegeben; der Schnabel (»rostr. culm.«) ist, soweit von Federn entblösst, auf der Höhe des Culmen, nicht längs der Mundwinkel gemessen.

1. Chasiempis sandwichensis (Gm.).

(Tab. I, fig. 3.)

= *Chas. sclateri Ridgw. Proc. U. S. Nat. Mus. 1882, pag. 337.*

= *Chas. ibidis Stejn. Proc. U. S. Nat. Mus. 1887, pag. 88.*

Sharpe Cat. Brit. Mus. Birds. IV. 1879, pag. 232.

Gestützt auf ein sehr reichhaltiges Material, welches Behn auf einer der Sandwich-Inseln (Oahu) sammelte, sind wir in der Lage, den Nachweis führen zu können, dass sowohl die Ridgway'sche Species *Ch. Sclateri* als die zum Entsetzen der englischen Ornithologen auf eine Abbildung im »Ibis« (1885, pl. I, fig. 2) basirte Stejneger'sche Form *Ch. ibidis* wieder mit der alten Gmelin'schen Art *sandwichensis* zu vereinigen sind. Schon der Umstand, dass alle drei vermeintlichen Species *sandwichensis, sclateri* und *ibidis* (= *maculata* Gm.) von Behn in derselben Localität, auf der Insel Oahu, und in ein und demselben Monat gesammelt worden sind, weist darauf hin, dass es sich nur um Altersstadien einer Art handeln kann. Wenn diese Formen auf besondere Inseln der Sandwich-Gruppe beschränkt wären, so würde die Annahme, dass wir es mit Repräsentativ-Unterarten zu thun hätten, eine begründetere sein; dem entsprechen aber die bekannt gewordenen Thatsachen nicht!

Die Geschlechter der *Chas. sandwichensis* sind nicht verschieden, wie mit Sicherheit aus den Untersuchungen frischer Vögel hervorgeht, welche Behn, Knudsen, Deppe u. A. angestellt haben. Ausgefärbte Vögel der Behn'schen Serie, auf den Original-Etiketten als Männchen und Weibchen bezeichnet, sind völlig identisch. Dagegen wird der Vogel mit braunem Bürzel, röstlicher Kehle und röstlichen (statt weissen) Säumen der Oberflügeldeckfedern und der Tertiärschwingen, welchen Sclater und Andere als das Weibchen von *Ch. sandwichensis* angesehen haben, lediglich als Jugendkleid zu betrachten sein. Unter den Kieler braunbürzeligen Vögeln befinden sich verschiedene Uebergänge von der typischen *sclateri* (resp. *ibidis*) zu dem *sandwichensis*-Kleide. Die Exemplare 1275 P. und 1275 R. des Kieler Museums verbinden vollständig die

rothbürzelige Form (*sclateri, ibidis*) mit der weissbürzeligen (*sandwichensis*), indem bei ihnen die Oberschwanzdeckfedern bereits rein weiss erscheinen, während der Unterrücken noch rostfarben ist. Auch zeigt sich bei diesen Stücken bereits eine weisse Mischung an den rothgelben Spitzen der Oberflügeldecken; die meisten Tertiärschwingen endlich weisen bereits fast ganz weisse Spitzensäurne auf. Es scheint darnach, dass das Alterskleid durch allmälige Verfärbung, nicht durch Mauser angenommen wird! — An diesen beiden Exemplaren ist die schwarze Farbe der Basis der Kehlfedern weiter ausgedehnt; bei anderen Stücken findet sich dasselbe in geringerem Maasse.

Andererseits hat das Weibchen im *sandwichensis*-Gefieder 1275 O. noch einige röstliche Federn im weissen Bürzel und röstlichweisse Spitzensäume der vorderen längsten Oberflügeldeckfedern; ebenfalls röstlichweissen (statt rein-weissen) Stirnrand.

Typische *Ch. sclateri* sind wohl die Männchen 1275 D und 1275 H, bei welchen der ganze Oberkopf und die Kopfseiten so intensiv röstlich gefärbt sind, dass der rostfarbene Superciliarstreifen wenig auffällt, und bei welchen ein schwärzlicher Rand der oberen Ohrdecken kaum vorhanden ist. Diese Vögel dürften etwas älter sein als die übrigen mit rostfarbenem Bürzel, welche wiederum als typische *ibidis* zu betrachten sind, da in Folge der mehr bräunlichen Scheitelfärbung der rostfarbene Superciliarstreif mehr hervortritt und auch die obere Partie der Ohrdeckfedern — so auch bei 1275 K — entschieden schwärzlich erscheint, (cf. Abb. im Ibis l. c.) Alle Vogel mit rostfarbenem Bürzel, welche uns vorlagen, haben unverkennbare Zeichen von Jugend in der Structur des Gefieders.

Auch in Bezug auf die Oberseite findet grosse Verschiedenheit zwischen den einzelnen Exemplaren statt; so zwar, dass nicht zwei sich vollständig hierin gleich sind.

Auf dem Manuscriptblatt, welches zur Nr. 1275 gehört, findet sich folgende an Ort und Stelle von Behn gemachte Notiz: »Elepaio in Hawaischer Sprache [auch nach Wilkes Narrat. IV, p. 99]. Mit blauer Schnabelwurzel des Unterkiefers. Schnabel oberhalb schwärzlich hornfarben, an der Wurzel blau; Schnabelspitze dunkel hornfarben; Füsse bläulich hornfarben; Iris dunkelbraun. Bei anderen Exemplaren war der Unterkiefer an der Wurzel und in seiner ganzen Länge gelb bis auf die hornfarbene Spitze. — Diese Art ist sehr häufig in den Bergwaldungen der Insel, so dass man sie oft nicht schiessen kann, da sie zu nahe sitzen. Sie tragen den Schwanz im Affect steil aufrecht. Im Magen fanden sich Insecten. Oahu, 8. October 1846.«

Maasse.

Lfde. Nr. Orig.-Nr. Präp. Coli. Geschlecht und Alter Ort Datum Long, tot. al. caud. rostr. tars. 1 1275 A 6 Behn Kxp. Gal Oahu Ssndw. I. 8. Oct 1847 137 70 69½ 12½ 23¾ 2 1275 B 9 do. do. 9. 142 72½ 70½ 12 24 3 1275 D do. juv. do. 20. 139½ 64½ 64½ 11¼ 23½ 4 1275 F. 19 do. Juv. do. 14. 125½ 61½ 56 12 22½ 5 1275 F 3o do. do. 16. 13o 64¾ 63½ - 22 6 1275 h 68 do. — do. Oct. 1847 135 65 64 — 23½ 7 1275 i 44 do. do. 19. Oct. 1847 138 64½ 64½ 12¾ 23 8 1275 K 51 do. do. 20. » » 129 61½ 60½ 23½ 9 1275 L 53 do. juv. do. do. 135 63½ 63 11½ 22 10 1275 M 31 do. do. 10. Oct. 1847 13o 62 61½ — 23 11 1275 N 104 do. do. 29. » 13o 68½ (66) _ 24¼ 12 1275 O 108 do. do. do. 127 65½ 65½ — 22¾ 13 1275 P 104 do. do. 3o. Oct. 1847 139 69 67½ 25½ 14 1275 Q — do. do. Oct. 1847 134 64¾ 64¾ — 23½ 15 1275 Q (g?) 31 do. juv do. 10. Oct. 1847 13o 62 61½ 23 16 1275 R do. do. Oct. 1847 135 65 64 — 23½

Die Abbildung ist nach dem Exemplar 1275 R (lfd. Nr. 16) hergestellt.

2. *Merula subalaris*, Lev.

Proc. Zool. Soc. Lond. 1887, pag. 557.

Die von uns schon im Journal für Ornithologie (1889, p. 103) corrigirte Angabe Seebohm's über das Habitat dieser von Leverkühn zuerst unterschiedenen neuen Art können wir jetzt durch eine genaue Ortsbestimmung Pelzeln's in seinen Beiträgen zur Ornithologie Brasiliens (I. 1868. Itiner. p. VIII) dahin ergänzen, dass Jatubá — wie Natterer geschrieben hat, mit dem Zusatz: »Pouzo im Sertao« (Raststation in den Pampas) — oder Jutuba, wie Behn hier angibt, während er einen *Sublegatus platyrhynchus* (Scl. et Salv.) Orig.-Nr. 2266 A ganz deutlich Jatuba signirt — auf der Route zwischen den Städten Goyaz (Villaboa) und Cuyaba zwischen Rio Araguay und Rio Manso, ungefähr auf dem 36. Grade westl. Länge (von Paris) und ungefähr auf dem 16. Grad südl. Breite gelegen ist.

3. Troglodytes furvus. (Gm.), subsp. n. rex. Beri, et Lev.

Diagn. *Tr. furvo* e Guiana simillimus, differt tectricibus supracandalibus et rectricibus distincte rufescentioribus; dorso etiam rufescentiore; *T. furvo hornensi* (Less.) forsitan maxime affinis, sed corpore inferiore ut in *furvo typico* rufescenti-albo (haud colore salmonum, qui dicuntur pisces).

Hab. Bolivia cisand: Samaipata.

Typ. Mus. Kiel. Behn coll.

Maasse.

Lfde. Nr. Orig.-Nr. Präp.-Nr. Coll. Geschl. u. Alter Ort Datum Long. tot. al. caud. rostr. tars. 1 1946 A 383 Behn Exp. Gal. Samaipata 24. Apr. 1847 118 55½ 48½ 14½ 18½, 2 1946 B 385 do. do. do. 120 53½ 47 13 18¾ 3 1946 C 396 do. do. 25. Apr. 1847 122 53½ 47 3½ 19

Not. Diese Form des *Tr. furvus* zeigt keine Spur von schwärzlichen Binden am Rücken und ist daher keineswegs mit *Tr. tecelatus* Lafr. et d'Orb. zu identificiren, welche Art auf die Vögel vom transandeanen Bolivia und Peru basirt ist. Die uns vorliegenden Vögel aus dem östlichen Bolivia, welche Alcide d'Orbigny als *Tr. platensis* Wied aufführt, bilden eine Form des in Guiana typischen *Tr. furvus*, welche dem *Tr.furvus hornensis* (Less.) aus Chile am nächsten steht, sich aber durch mehr röstlichweisse nicht salmfarbig überlaufene Unterseite unterscheidet, sowie durch etwas grössere Dimensionen. Der echte *Tr. furvus* aus Guiana und *Tr. furvus Wiedi* Berl. (= *platensis* Wied necauct.) ist sehr viel kleiner und hat die Oberschwanzdeckfedern und den Schwanz selbst kaum lebhafter röstlich gefärbt als die übrige Oberseite, während bei der neuen Subspecies (*Tr. furvus rex*) und bei *Tr. furvus hornensis* die lebhaft rostfarbigen Oberschwanzdecken und die Farbennuance des Schwanzes einen scharfen Contrast gegen die Färbung der übrigen Oberseite bilden. Auch der Rücken erscheint röst-licher und nicht so graubräunlich als beim typischen *Tr. furvus*.

4. Hylophilus brunneiceps, Scl.

Cat. Brit. Mus. Birds. VIII. 1883, p. 31o.

Von dieser sehr seltenen Art, welche bisher nur in Nord-Brasilien (Pelzein, Orn. Bras. II. 1869, p. 70) und Cayenne (Sclater, P. Z. S. 1866, p. 322. Nom. av. neot. 1873, p. 12. Ibis 1881 pi. XI, fig. 1, p. 3o5) nachgewiesen wurde, befindet sich ein durch J. G. W. Brandt bezogenes Exemplar aus Angostura im Kieler Museum.

Maasse.

Coll. Geschlecht u. Alter Ort Datum Long, tot. al. caud. rostr. tars. (J. G. W. Brandt) ..... Angostura (185o erhalten 116 57 45½ 13½ 16¾

5. Basileuterus cinereicollis, Scl.

Sharpe, Cat. Brit. Mus. Birds. X 1885, p. 382.

Von dieser seltenen Species befindet sich ein Bogota-Balg, vom Naturalienhändler L. W. Schaufuss in Dresden erworben, im Kieler Museum, welcher mit der Sclater'schen Originalbeschreibung (P. Z. S. 1864, p. 166) und derjenigen Sharpe's im Britischen Katalog genau übereinstimmt.

Maasse.

Orig. Nr. Coll. Geschlecht u. Alter Ort Datum Long, tot. al. caud rostr. tars. 628 ..... (Schaufuss) ..... Bogota ..... 1864 erhalten 125½ 73 65 11½ 21½

6. Polioptila boliviana, Sel.

Diese Species wurde durch uns restituirt, siehe Cab. J. f. O. 1889, p. 109.

7. Anthus calcaratus, Tacz. Spec. rest.

Sharpe, Cat. Brit. Birds. Mus. X. i885, p. 610.

Drei Vögel des Kieler Museums unterscheiden sich von zwei Exemplaren des *A. correndera* Vieil, durch merklich längeren Schnabel und viel mehr ockerröstliche Färbung des ganzen Gefieders. Das Weiss an den äusseren Schwanzfedern ist weit mehr ausgedehnt, so dass an einigen Exemplaren die äusserste Schwanzfeder fast vollständig weiss erscheint, während bei *A. correndera* der grössere Basistheil der Innenfahne fast bis zum Spitzen-Drittel schwarzbraun gefärbt ist. Auch die Tarsen sind etwas länger. Die Primären mit Ausnahme der ersten Schwinge haben rostgelbliche statt schwefelgelbe, bezw. grünliche Aussenränder.

Taczanowski's Art *A. calcaratus* (Proc. Zool. Soc. Lond. 1874, p. 507), welche er nach Vorgang Sclater's (Ibis p. 363) in der Ornithologie du Pérou (I, p. 458) wieder 1878, mit *A. correndera* vereinigt, möchte sich zweifellos auf unsere Exemplare beziehen, wie schon aus Taczanowski's Beschreibung der Schwanzzeichnung etc. hervorgeht.

8. Arremon flavirostris, Sws.

Scl. Cat. Brit. Mus. Birds. XI. 1886, p. 274.

Swainson's und Sclater's Beschreibungen passen auf unseren Vogel, nur hat derselbe auf dem Culmen nicht eine schmale Linie (»line of black« Swains. Anim. in Menag. 1838, p. 347), sondern den grössten Theil, die obere Hälfte des Oberschnabels schwarz gefärbt. Diese Species fehlt dem Britischen Museum. (Sclater, l. c.) Es wäre erwünscht, das Kieler Exemplar mit dem Typus (vielleicht im Mus. Cantabr. wo viele S wainson'sche Typen aufbewahrt werden) zu vergleichen.

Swainson gibt nur »Brasilien« als Heimath an; das Exemplar im Berliner Museum soll von Cametá am unteren Amazonas stammen. Sta. Maria, wo unser Vogel gesammelt wurde, liegt vermuthlich in Goyaz.

Maasse.

Orig-Nr. Präp.- Nr. Coll. Geschlecht u. Alter Ort Datum Long. tot. al. caud. rostr. tars. 2294 A 1171 Behn Exp. Gal. Sta. Maria 3./11.1847 166½ 87 72½ 14¾ 75½

9. Molothrus maxillaris, Lafr. et d'Orb.

Scl. Cat. Brit. Mus. Birds. XI. 1886, p. 335.

Zwei männliche Vögel des Kieler Museums aus Les-bato, durch Behn auf der Expedition der »Galathea« gesammelt, besitzen die charakterische Schnabelform, welche Alcide d'Orbigny für seinen *M. maxillaris* angibt und in seinem Reisewerk (Voy. mir. Am. Ois. pl. LII, fig. 3) abbildet. *M. maxillaris* unterscheidet sich in der That von *M. bona-riensis* lediglich durch die eigentümliche Schnabelbildung. Der Schnabel ist stärker, höher und länger als bei *M. bona-riensis;* der Oberschnabel ist an der Basis der Schneide viel tiefer eingebuchtet, biegt sich dann convex nach dem Unterschnabel hinab und steigt zur Spitze sanft wieder an, während bei *M. bonariensis* und allen Verwandten die Oberschnabel-Schneide von der Mitte an entschieden abwärts gebogen ist. Man kann ihn daher durch folgende Diagnose, welche sich von der *Lafresnaye*'sehen (Syn. av. in Mag. zool. 1838, p. 6 und Voy. mér. Am., p. 367) durch prägnante Kürze auszeichnet, charakterisiren:

- Diagn. *M. bonariensi* coloribus simillimus, differt rostro crassiore, altiore, longiore, tomiis maxillae basi concavis, medio convexis, dein ad apicem ascendentibus.

Lesbato scheint nach den Datumsangaben in Bolivia zu liegen, wie auch das d'Orbigny'sche Exemplar aus Cocha-bamba aus Bolivia stammt.

Sclater meinte nach flüchtiger Prüfung des Lafres-naye'schen Originals in Philadelphia, es handele sich um eine Schnabeldeformität (1. c., Note) — eine Auffassung, welcher schon Cassin (Proc. Ac. Sc. Philadelph. 1866, p. 21) hinlänglich entgegengetreten ist. Unsere beiden Exemplare, die ersten in einer europäischen Sammlung (Sclater, Ibis 1884, p. 9 et l. c.), bekräftigen die Cassin'sche Motivirung der Artselbstständigkeit.

Maasse.

Lfde. Nr. Orig.-Nr. Präp.- Nr. Coli. Geschlecht u. Alter Ort Datum Long. tor. al. caud. rostr. tars. caud.grad. 1 1922 A 337 Behn Exp. Gal. Lesbato 15. 4. 1847 203 116½ 83½ 20 1/5 27½ 2½ 2 1922 B 338 do. do. do. 188 116½ 63 (ptil. mut.) 20¼ 26½

10. Cnipolegus orenocensis, Berl.

Ibis 1884, p. 433, pl. XII. Scl. Cat. Brit. Mus. Birds. XIV. 1888, p. 47.

Ein Exemplar dieser äusserst seltenen, bisher als Unicum im Museum Hans v. Berlepsch vertretenen Species wurde von J.G.W. Brandt in Hamburg erworben und trägt auf der Etikette die Bezeichnung »Angostura«. Dieser Vogel ist entschieden älter und ausgefärbter als das Original im Mus. H. v. B.; es hat überall eine mehr schwärzlich-aschgraue Färbung und fast gar keinen olivengrünen Anflug im Gefieder. Auch zeigt es durchweg grössere Dimensionen.

Aus der interessanten Localität Angostura stammen noch eine Anzahl anderer Arten des Kieler Museums, welche sämmtlich von dem Naturalienhändler J. G. W. Brandt bezogen wurden und zum Theil noch nicht aus dem Orinoco-Gebiet nachgewiesen sind; z. *B. Hylophilus brunneiceps* Scl., (cf. supra), *Lipaugus simplex* (Licht.), *Dcndrobates rufieeps* (Spix) [?] (*Kirtlandi* (Malh.), *Celeusgrammicus* (»Natt«) Malh., über welche wir das Nöthige bei jeder Art in systematischer Reihenfolge hervorheben.

11. Euscarthmus latirostris, Pelz.

Scl. Cat. Brit. Mus. Birds. XIV. 1888, p. 81.

Diese in den Museen noch seltene Art wurde von A. von Pelzeln nach einem weiblichen Exemplar aus Borba am Rio Madeira beschrieben (Orn. Bras. pp. toi, 173). Im Mus. H. v. B. befindet sich ein Exemplar vom oberen Amazonas (?Ost-Ecuador), welches H. von Berlepsch mit dem Natterer'schen Typus verglich und übereinstimmend fand. Von diesem letzteren nun unterscheidet sich der Behn'sche männliche Vogel aus Cuyaba durch kleineren, schmaleren und kürzeren Schnabel und blassere Färbung des ganzen Gefieders.

Wahrscheinlich ist es ein jüngerer, nicht ganz ausgefärbter Vogel. Der Fundort Cuyaba dehnt den Verbreitungskreis dieser Art bedeutend nach Süden aus.

Maasse.

Orig.-Nr. Präp - Nr. Coll. Geschl. u. Alter Ort Datum Long. tot. al. caud. rostr. tars. 2132 651 Behn Exp. Gal. Cuyaba 18. Aug. 1847 96 45 35 12½. 19½

12. Serphophaga verticata, Burm. Spec. rest.

Scl. Cat. Brit. Mus. Birds. XIV. 1888, p. 102 partim.

Dieser Vogel, ebenso wie ein Exemplar aus Cordova (Argentin.) im Museum Sclater, welches H. von Berlepsch untersuchte, unterscheiden sich von Exemplaren der *S. sub-cristata* (Vieil.) aus Süd - Brasilien durch einfarbig weisses Abdomen ohne eine Spur von gelbem Anflug.

Sclater machte im Britischen Katalog (l. c.) auf diesen Unterschied aufmerksam.

Da die beiden in Frage stehenden Vögel augenscheinlich zu *S. verticata* Burm. (Cab. J. f. O. 1860, p. 246) (aus Paraná) gehören, sind sie unter diesem Namen von *S. sub-cristata* zu trennen.

Maasse.

Orig.-Nr. Coll.-Nr. Coll. Geschlecht u. Alter Ort Datum Long. tot. al. caud. 1 rostr. tars. 2958 A 495 Behn Exp. Gal. Rio Grande 22. Mai 1847 97 48½ 46½ 87¾ 15½

13. Elainea cristata. Pelz. Spec. rest.

Scl. Cat. Brit. Mus. Birds. XIV. 1888, p. 142.

Unbegreiflicher Weise zieht Sclater im Katalog (l. c.) diese gut charakterisirte Art als fragliches Synonym zu *E, albiceps* (d'Orb. et Lafr.). Wie schon Pelzeln in seiner Beschreibung (Ornith. Bras. pp. 107, 177) ausführt, ist *E. cristata* vielmehr mit *E. pagana* Licht, zu vergleichen. *E. albiceps* hat durchaus keine verlängerten und erectilen Haubenfedern, während bei *E. cristata* dieselben noch viel stärker entwickelt sind, als bei *E. pagana*. Ausserdem entfernt sich *E. albiceps* von *E. pagana* und Verwandten durch reinweisse Bauchmitte und schmäleren, schwächeren Schnabel. *E. cristata* unterscheidet sich von *E. pagana* durch die eigenthümliche volle Form der Haube ohne eine Spur von Weiss darin und durch die auffallend kürzeren Flügel- und Schwanzfedern, sowie durch die heller olivengraugrüne Oberseite des Körpers.

Vögel im Mus. H. v. B. aus British - Guiana sind vielleicht subspecifisch von *E. cristata* verschieden, da sie dunklere schwärzliche Oberseite, dunkler aschgraue (statt fahlgraue) Stirn und schwarzbraune (statt mattbraune) Haubenfedern, mehr graulich überlaufene Brust und Bauch und längeren, mehr gebogenen Schnabel, sowie in grösserer Ausdehnung schwarzgefärbten Unterschnabel besitzen. Sollte sich die Britisch-Guiana-Form, von welcher sich Männchen und Weibchen im Mus. H. v. B. von den Merume Mountains (H. Whitely coli.) befinden, als constant verschieden erweisen, so reserviren wir ihr die Bezeichnung: *E. lophotes* Berl. MS.

Maasse.

Orig.-Nr. Präp.- Nr. Coll. Geschlecht u. Alter Ort Datum Long. tot. al. caud. rostr. tars. 224 A 896 Behn Exp. Gal. La-vrinhas 3o. Aug. 1847 140 71½ 63 11¾ 16¾

14. Elainea spectabilis, Pelz.

Scl. Cat. Brit. Mus. Birds. XIV. 1888, p. 136.

Von dieser gut charakterisirten, aber, wie es scheint, häufig übersehenen Art befinden sich vier von Behn 1847 gesammelte Exemplare im Kieler Museum. Sclater sagt im Katalog (1. c. not.), er kenne die Species nicht.

Wie A. von Pelzeln in seiner Beschreibung (Ornith. Brasil., p. 176, ausgeführt hat, unterscheidet sich *E. specta- bilis* von *E. pagana* Licht, durch bedeutendere Grösse, sehr viel längere Flügel und Schwanz und längeren stärkeren Schnabel. Pelzeln lag nur ein Exemplar (#) vor, welches kein Weiss in der Haube zeigte. Von den Kieler Vögeln trägt nur der Jaragua-Vogel keine Spur von Weiss, der von Goyaz hat eine schwache Andeutung, während die Exemplare von Araguaya und Maria Rosa deutliche weisse Basen der hinteren längsten Scheitelfedern aufweissen; in dieser Beziehung stimmen sie also mit *E. pagana* überein. — Das Exemplar von Maria Rosa (Nr. 4) unterscheidet sich von den drei anderen durch merklich längeren Schnabel, stimmt aber im Uebrigen vollständig mit ihnen überein.

Maasse.

Lfde. Nr. Orig.-Nr. Präp.- Nr. Coll. Geschlecht u. Alter Ort Datum Long. tot. al. caud. rostr. tast. 1 2262 A 944 Behn Exp. Gal. Araguaya 14./9. 1847 175 90 79½ 11½ 21½ 2 2262 B 979 do. Goyaz 28./9. 1847 170 92 82 12½ 21½ 3 2262 C 1045 do. Jaragua 9./10. 1847 178 91½ 85½ 12¾ 19¾ 4 2262 D 972 do. Maria Itosa 25./10. 1847 165½ 91½ 82 13¾ 20¾

15. Sublegatus platyrhynchus, Scl. et Salv.

Scl. Cat. Brit. Mus. Birds. XIV. 1888, p. 158.

Phyllomyias platyrhyncha, Scl. et Salv., wurde nach Exemplaren aus Goyaz (Natterer Coli.) beschrieben (Nom. av. neot. pp. 48, 159), eine Form, mit welcher die Behn'schen Exemplare aus Matto Grosso völlig identisch zu sein scheinen. Bahia-Bälge im Mus. H. v. B. weichen in der Färbung etwas ab durch dunkler bräunliche (nicht fahl olivengraubraune) Oberseite, namentlich dunkleren Scheitel und mehr hellgraue (statt weissliche) Kehle und Gurgel-dieses Colorit dehnt sich nicht wie bei den Matto Grosso-Vögeln über die Oberbrust hin aus. Auch haben die Bahia-Vögel etwas längeren, gestreckteren Schnabel und dunkleren Unterschnabel. Es ist jedoch nicht unmöglich, dass diese Unterschiede blos individueller Natur sind.

Sclater und Salvin haben in ihrem Nomenciator (l. c.) diese Species unter zwei verschiedenen Namen: *Phyllomyias platyrhyncha* und *Sublegatus murinus* »Spix« verzeichnet, wieH. von Berlepsc h zuerst nach Untersuchung der Scla ter'-schen Exemplare gefunden hat. Sclater bestätigte dies auch später im Katalog (I. c.). Sclater zieht zu derselben Art *Muscipeta incanescens* Pr. .Max. (Beitr. III. 1831, p. 898) als Synonym mit einem Fragezeichen, wobei er, wie es scheint, gänzlich übersehen hat, wasLa wrence im»Ibis« 1876(pp.497, 498) über das typische Exemplar von *Muse, incanescens* im American Museum of Natural History in New-York mittheilt. Nach den von Lawrence angegebenen Maassen ist es unmöglich, dass *Muse, incanescens* mit *Suhl, platyrhynchus* zusammenfällt. Dagegen bezweifeln wir nicht im Mindesten, dass es sich um eine *Phyllomyias*-Art handelt, von welcher das Mus. H. v. B. drei Exemplare aus Bahia besitzt. Ein Exemplar derselben Species theilte H. von Berlepsch vor ca. 15 Jahren Herrn Philip Lutley Sclater mit, welcher den Vogel als neu ansprach und *Ph. Berlepschi* MS. benannte. Es scheint dies dasselbe Exemplar zu sein, auf welches er seine Beschreibung (P. Z. S. 1887, p. 49 und Cat. XIV, p. 123) aus Bahia gegründet hat! Es würde somit *Ph. Berlepschi* als synonym zu *Ph. incanescens* Pr. Max zu betrachten sein

Im Bullet. Am. Mus. N. H. vol. II. Juni (1889) pag. 147 hat Mr. J. A. Allen die gleiche Anschauung zum Ausdrucke gebracht. Unser Manuscript wurde dem Herausgeber dieses Journales im Juni 1889 druckfertig eingeliefert, in welcher Zeit Mr. Allen's Aufsatz noch nicht vorlag.

. Diese Art ist eine typische *Phyllomyias*, welche sich von *S. platyrhynchus* durch sehr viel kleineren und anders geformten Schnabel und überhaupt viel kleinere Dimensionen, sowie durch die olivengrauen (statt weisslichen) Flügelbinden u. a. m. hinlänglich unterscheidet. — Dass *Plat. murinus* Spix nicht mit einem *Sublegatus* zusammenfallen kann, sondern wahrscheinlich mit *Phyll. semifusca*, oder deren brasilianischen Subspecies *Ph. semifusca superciliaris*, Reinh., identisch ist, hatte H. von Berlepsch schon früher in brieflicher Mittheilung Mr. Sclater auseinandergesetzt und ist erfreut zu sehen, dass diese Ansicht von Sclater im Katalog zum Ausdruck gebracht ist.

Den Typus von *Ph. murinus* Spix konnte H. von Berlepsch im Münchener Museum nicht auffinden; dieses wie manches andere Spix'sche Original scheint verloren gegangen zu sein.

Maasse.

Lfde. Nr. Orig.-Nr. Coll.-Nr. Coll. Geschlecht u. Alter Ort Datum Long. tot. al. caud. rostr. tars. 1 2130 A 644 Behn Exp. Gal. Cuyaba 18. Juli 1847 120 67 60½ 7¼ 15½ 2 2130 B 656 do. 9 do. 22. Juli 1847 116 66 57½ 7¼ (15½) 3 2130 C 657 do. 9 do. 22. Juli 1847 120 64 (54½) Incompl. 8¼ 17½ 4 2266 A 920 do. Jatuba 7.Sept. 1847 120 65 58 8¾ 16¾

16. Cnipodectes subbruneus, Scl.

Scl.. Cat. Brit. Mus. Birds. XIV. 1888, p. 179.

Sclater trennt im Katalog (l. c.) den Vogel vom oberen Amazonas (Chamicuros etc.) als *C. minor* ab; das Kieler Exemplar von Chamicuros hat indess grössere Dimensionen als ein typisches *C. subbrunneus*-Stück von Babahoyo in West-Ecuador im Mus. Scl., welches H. von Berlepsch untersuchte.

Maasse.

Coll. Geschl. u. Alter Ort Datum Long. tot. al. caud. rostr. tars. ..... J.G. W.Brandt ad. Chamicuros 178 92½ 83 16¾ 17

17. Myiarchus tyrannulus (St. Müll.), subsp. n. chlorepiscius

Script (Greek?)= viridis, Script (Greek?) = desuper adumbratus.

, Berl, et Lev.

Diagn. *M. tyrannulo* (ex Venezuela et Bahia) simillimus, sed corpore supra pallidiore magis viridi tineto fere, ut in M. Pelzeini Beri.

Hab. Matto-Grosso (Cuyaba).

Typ. Mus. Kiel. Behn. coll.

Maasse.

Lfde. Nr. Orig.-Nr. Präp.- Nr. Coll. Geschlecht u. Alter Ort Datum Long tot al. caud. rostr. tars. 1 2109 A 599 Behn Exp. Gal. San Miguel 19-Juni 1847 183 92½ 86 17¾ 17¾ 2 2109 B 686 do. Cuyaba 25. Juli 1847 200 97 95 20 21½ 3 2109 C 785 do. do. 29. Juli 1847 183 92 84 20¼ 22

Die Mattogrosso-Vögel unterscheiden sich merklich von Vögeln aus Porto Cabello (Venezuela) und Bahia (Brasilien) durch den sehr viel helleren, grünlicheren und graulicherer. Ton der Oberseite, namentlich des Scheitels. In dieser Beziehung gleichen sie sehr dem *M. pelzelni*, Berl., von dem sich ebenfalls durch Behn gesammelte Exemplare aus Goyaz im Kieler Museum befinden, *M. pelzelni* ist jedoch leicht durch den gänzlichen Mangel von Rostroth im Schwanz und den viel kleineren Schnabel zu unterscheiden. Die in Goyaz von Behn gesammelten Vogel gehören bereits zu der Bahia-Form, welche wiederum, und zwar in der Schwanzfärbung, vom typischen *tyrannulus* abweicht. (Das Rostroth am Innensaume der äussersten Schwanzfeder jederseits fehlt.) *M. bahiae*. MS.

18. Myiarchus pelzelni, Berl.

Scl. Cat. Brit. Mus. Birds. XIV. 1888, pag. 255.

Ein Exemplar aus Pontinho (? Govaz)stimmt vollständig mit typischen Exemplaren des Mus. H. v. B. überein. Ein zweites Exemplar des Kieler Museums, von Jungjohann gesammelt, stammt aus Bahia, dem bisher einzig bekannten Fundort dieser Species. Im Ibis (1883, pag. 139) erklärte sich Sclater »quite inclined« zu glauben, dass die Art unterscheidbar sei, während er im Katalog (1. c.) ihre Dignität wieder anzweifelt, . . . »not quite certain that this form is anything more than a variety of *M. ferox* (Gm.)«. Wir indess sind von der Güte der *M. pelzelni* nach wie vor überzeugt! —

Maasse.

Lfde. Nr. Orig.- Nr. Präp.- Nr. Coll. Geschlecht u. Alter Ort Datum Long tot al. caud. rostr. tars. 1 2148 C, 899 Behn Exp. Gal. ... Pontinho 1. Sept. 1847 182 89 82 19½ 19½ 2 ... ... Jungjohann Bahia 1842 192 89 85½ 18¼ 18¾

19. Heterocercus, sp. —.

Scl. Cat. Brit. Mus. Birds. XIV. 1888, pag. 324.

Ein anscheinend weiblicher Vogel mit einfarbig grünem Scheitel, trägt eine Etikette J. G. W. Brandt's a. d. J. 185o, auf welcher als Fundort »Angostura« vermerkt ist. Wir zweifeln keineswegs an der Richtigkeit dieser Angabe, weil die Präparationsweise des Exemplares genau übereinstimmt mit derjenigen eines *Cnipolegus orenocensis*, Berl., von der sich ebenfalls ein aus derselben Quelle im gleichen Jahre bezogenes und mit »Angostura« bezeichnetes Stück im Kieler Museum befindet (cf. supra). Eine *Heterocercus*-Art ist bisher für Venezuela nicht nachgewiesen worden; nach Sclater's Schlüssel der *Heterocercus*-Arten (1. c.) müsste unser Vogel zu *H. lineatus*, Strickl., gehören, weil er entschieden schwarze (nicht olivengrüne) Kopfseiten hat; indessen weicht er erheblich von Strickland's Original-Beschreibung (in Jardine's Contrib. Ornith. 1850. pl. LXIII., pag. 121) des Weibchens von *H. lineatus* ab. Die Kehle ist entschieden dunkelaschgrau, wie solches für das Weibchen von *H. flavivertex*, Pelz. (Scl. l. c. pag. 325) angegeben ist — und nicht rein weiss, wie man nach Strickland's Beschreibung (»lower parts as in the male«) vermuthen muss; der Rest der Unterseite ist fahl röstlich, an der Brust etwas oliv überlaufen — nicht tief kastanienbraun, wie dies Strickland angibt.

Da das Orinocco-Gebiet viele ihm eigenthümliche Arten, besitzt, von denen wir wahrscheinlich erst einen geringen Theil kennen, so ist es nicht unmöglich, dass der dortige *Heterocercus* von dem *H. lineatus* aus dem Gebiete des oberen Amazonenstroms specifisch verschieden ist.

Eine nähere Begründung dieser anscheinend neuen Art kann jedoch erst dann erfolgen, wenn das männliche Geschlecht derselben vorliegt. Sollten sich unsere Vermuthungen bestätigen, so schlagen wir als neuen Namen für diese Art vor: *Heterocercus angosturae*, Berl. et Lev.

Maasse.

Coll. Geschlecht u. Alter Ort Datum Long. tot. al, caud. rostr. tars. (J. G. W. Brandt) ..... Angostura ..... (1850 erhalten) 141½ 80½ 52 13¼ 14½

20. Lipaugus simplex, Licht.

Scl. Cat. Brit. Mus. Birds. XIV. 1888, pag. 356 (wo nähere Lit-teratur verzeichnet).

Durch ein Exemplar des Kieler Museums aus Angostura wird diese Art zum ersten Male aus dem Orinocco-Gebiet nachgewiesen (cf. supra).

Maasse.

Coll. Geschlecht u. Alter Ort Datum Long tot. al. caud. rostr. tars. (J. G. w. Brandt) ad. Angostura ..... (1850 erhalten) 220 98 95½ 19¾ 20½

21. Synallaxis albigularis, Scl. spec. restit.

Scl. P. Z. S. 1858, pag. 63.

Zwei Exemplare des Kieler Museums von Behn bei Monte alegre (Govaz?) gesammelt, gehören wohl zweifellos zur echten Temminck'schen *S. albescens*, welche sich auf Natterer'sche Exemplare aus Süd-Brasilien gründet (Pl. col. 227. Fig. 2. Livr. 38). Sie weichen ganz bedeutend von Vögeln aus Guiana, Venezuela und Peru ab; es muss daher *Syn. albigularis*, Scl., eine Art, welche auf Vögel vom Rio Napo basirt ist und die Sclater später wieder mit *S. albescens* vereinigte (Proc. Zool. Soc. 1874 p. 9), als Species restituirt werden. — Sclater scheint die echte *albescens* aus Süd-Brasilien gar nicht gekannt zu haben, da er im *Catalogue of American Birds* (1862, p. 151), woselbst er *albigularis* noch als besondere Art betrachtet, unter dem Namen *albescens* Vögel aus Trinidad aufführt, welche eben zur nördlichen Species und nicht zur brasilianischen zu rechnen sind.

S. albescens, Temm., unterscheidet sich von *S. albigularis*, Scl., durch die schmutzig - weisse, an den Seiten etwas rostlich überlaufene Unterseite, ohne eine Spur von einem aschgrauen Tone an der Oberbrust und olivenbräunlichem Anflug der Körperseiten. Die Färbung des Rückens und der Oberschwanzdeckfedern ist entschieden röstlich (statt olivenbraun); die Unterschwanzdecken rostgelblich (statt olivenbraun); die äusseren Schwanzfedern deutlich roströthlich überlaufen, namentlich an den Aussenfahnen. Ueberhaupt haben die Schwanzfedern einen viel röstlicheren Ton, das Braun der Stirn ist weniger, das Zimmetbraun der Oberflügeldecken mehr ausgedehnt; die Färbung der letzteren erstreckt sich auch auf die exponirte Basis der Schwingen etwa 8 *m*/*m* weit — hiervon ist bei *S. albigularis* nichts zu sehen! Auch im Uebrigen sind die Säume der Schwingen intensiver röstlich. Der Schwanz ist erheblich kürzer, die Flügel sind etwas kürzer.

Maasse.

Lfde. Nr. Orig.-Nr. Präp.- Nr. Coll. Geschlecht u. Alter Ort Datum Long. tot. al caud. rostr. tars. 1 2317 B 1184 Behn Exp. Gal. Monte alegre 31. 10. 1847 159½ 57½ 85½ 10¾ 18½ 2 2317 C 1161 do. do. 1.11. 1847 139 55½ 69 11¾ 17

22. Synallaxis cabanisi, n. sp. Berl. et Lev.

Diagn. *S. brunneicaudali*, Scl. (*seu brunneicaudae*) affinis sed cauda rufescentiore, dorso magis olivaceo-brunneo, quam fulvo tineto. Loris genis gulaque multo clarioribus albescentibus griseo-variis. Corpere reliquo subtus magis rufo-brunneo neque ardesiaco tineto, abdomine medio rufescente albo (non griseo). Alis extus laetius cinnamomeo-brunneis, secundariis etiam pogonio interno dimi-dio basali cinnamomeo-tinctis; rostro breviore.

Hab. Peru.

Typ. Mus. Kiel ex Mus. Neufchât. 1850.

Dim. Long. tot. 145½, al. 62, caud. 67, (incompl.) culm. rostr. 12¾ tars. 22.

Note. Taczanowski zieht in seiner Ornithologie du Pérou (II. 1884, pag. 122) *S. ruficapilla* Tschudi (Fauna peruan. Aves., pag. 239), als synonym zu *S. frontalis*, Pelz. Ein Exemplar des Kieler Museums, vom Neufchâteler Museum 185o im Tausch erworben, ist mit *S. ruficapilla*, Tsch., bezeichnet und durfte wohl als eine der Tschudi'schen Typen anzusehen sein

Im Jahre i85o muss seitens des Neufchâteler Museums ein grösseres Tauschgeschäft mit dem Kieler Museum abgeschlossen worden sein, da eine erhebliche Anzahl Bälge des letzteren die obenangeführte Notiz stets von derselben Hand geschrieben tragen. In Neufchâtel konnte ich nichts Näheres darüber erfahren, sah auch in der dortigen Sammlung keine Behn'schen Vögel. Lev.

. Dass Tschudi's Vogel nicht zu *ruficapilla Vieillot* gehört, wird schon aus des Letzteren Beschreibung (Nouv. Dict. XXXIII. (32) 1819, pag. 310, und Enc. Méth., pag. 622, und Gai. des Ois., pl. 174) klar, aber auch

mit *S. frontalis* hat der Tschudi'sche Vogel nichts zu thun. Vielmehr steht er der *S. brunneicauda*, Scl., am nächsten und dürfte mit den Vögeln, welche Jelski in Centrai-Peru sammelte (*S. ruficapilla*, Jelski, MS.) und die Taczanowski als *S. brunneicauda* aufführt, identisch sein.

Der Tschudi'sche Vogel unterscheidet sich von zwei Exemplaren der *S. brunneicauda* aus Britisch-Guiana, im Mus. H. v. B., einer Art, deren Typus von Rio Napo in Ost-Ecuador stammt, durch folgende Merkmale: der Peru-Vogel hat einen viel heller rostfarbenen Schwanz und viel heller röstlich-olivenfarbenen Rücken; die Zügel, die unteren Backen und die Kehle sind viel heller weisslich mit grauer Mischung (statt schwarz mit aschgrauer Mischung). Der übrige Unterkörper ist mehr röstlich-olivenbraun (statt schwärzlichbraun) gefärbt, die Bauchmitte ist röstlich-weiss (statt aschgrau). Das Zimmetbraun der Flügeloberseite hat eine grössere Ausdehnung und erstreckt sich auch auf die Basishälfte der Innenfahnen der Secundärschwingen, was bei den Guiana-Vögeln durchaus nicht der Fall ist. Auch ist der Schnabel merklich kürzer. Leider befindet sich der Vogel stark in der Mauser und ist nicht ganz ausgefärbt. In der zimmetbraunen Scheitelfärbung befinden sich noch einige olivenbraune Federn des Jugendkleides, so namentlich auf einer Seite der Stirn. Hierauf dürfte sich der Passus in Tschudi's Beschreibung beziehen: »das Gesicht, zuweilen auch die Stirn graubraun«. Das mag die Veranlassung gegeben haben, dass Tschudi's *S. ruficapilla* (nec Vieill.) auf *S frontalis* gedeutet wurde.

Das Rostroth des Scheitels endlich erstreckt sich nicht bis auf Theile des Oberrückens und auf die Scapularfedern, wie dies bei *S. brunneicauda* stattfindet.

Wir benennen diese Species dem hochverdienten Professor Dr. Cabanis zu Ehren. Der ausgezeichnete Mitarbeiter an dem ornithologischen Theile der »Fauna Peruana« bemerkte auf der Etikette unseres Exemplares bereits: »Zeigt Verschiedenheiten; ob specifisch?«

23. Synallaxis heterocerca, sp. n. Berl. et Lev.

Syn. striaticeps Lafr. et D'Orb. Syn. av. 1. pag. 22. 1837, partim.

Diagn. *S. striaticipiti* similis, sed minor, alis caudaque multo breviori-bu s, dorso toto griseo- brunneo (haud fulvo) lavato, tectricibus caudae superioribus concoloribus (haud cinnamomeo mixtis); rectricibus intermediis pogonio interno in parte apicali fuscis (haud ut in S. striaticipite unicoloribus cinnamomeis); plumis frontalibus rufescenti-albo (haud fulvo) marginatis; tectricibus alarum superioribus clarius brunneo-cinnamomeis, hypcchondriis et subcau-dalibus griseo-brunneis, haud fulvo-brunneo lavatis; secundariis rufescenti-brunneis, haud griseo-brunneo tinctis.

Hab. Argentina (Cosquin Cordova).

Typ. Mus. H. v. B. (3 specim.).

Maasse.

Lfde. Nr. Orig.-Nr. Präp.- Nr. Coll. Geschl. u. Alter Ort Datum Long. tot. al. caud. rostr. tars. 1 .... E. W. White ad. Cosquin Cordova (Argentina) 27.7. 1882 134 60 65 14¾ 18 2 .... do. ad. do. 15. 8. 1882 129½ 62 68 14¾ 18½ 3 do. ad. do. 12.6. 1882 127 61½ 62½ 15 17½ Syn. striaticeps. 4 1892 A 241 Behn Exp. Gal. Chuquisaca (Bolivia) 3o. 3. 1847 153½ 67½ 75½ 15 17¾ Form. al. S. heterocerca. Primar: 3 longiss:4<3 (½ m/m), 2 = 5, 1 < 2 (5 m/m) = Secundar: S. striaticeps. Primar: 5 longiss: 4 < 5 (½ m/m), 3 <4 (½ m/m) med. inter 5 + 6, 2 < 5 (14 m/m) = Secundar.

Note. D'Orbigny's Beschreibung (l. c.) bezieht sich augenscheinlich auf den Bolivia-Vogel. Allerdings setzten Lafresnayeund D'Orbigny in ihrer Synopsis avium (1837) den Fundort Corrientes in Argentina voran, indess lagen ihnen vielleicht Vögel von dort gar nicht vor, da D'Orbigny in seiner Reise (Voy. dans l'Am. mér. Ois., pl. 14., fig. 1, pag. 241, 1847) schreibt: »Nous avons rencontré cette espèce d'abord au Sud de la province de Corrientes (Rép. d'Arg.) en hiver«. Es kann also sein, dass D'Orbigny den Vogel dort nur gesehen hat und sich nachher in Bolivia, als er ihm wieder begegnete, dessen erinnerte. Auch die D'O rb i gny'-schen Maasse beziehen sich unbedingt auf die grosse Bolivia-Form (Flügel 68 *m*/*m*). *S. heterocerca*, wie wir die Argentina-Form nennen wollen, unterscheidet sich ganz bedeutend von der typischen *S. striaticeps*, von der wir ein durch Behn gesammeltes Kieler Exemplar aus Chuquisaca zur Vergleichung benutzten. Die drei durch White gesammelten Stücke der neuen Art zeichnen sich durch erheblich geringere Grösse in Flügel und Schwanz aus; ferner ist die Schwanzzeichnung sehr different; während *striaticeps* einen einfach zimmetrothen Schwanz führt, hat *S. heterocerca* die mittleren Schwanzfedern an der ganzen Innenfahne und dem Spitzenviertel und die nächstfolgenden beiden Paare im Spitzenwinkel schwarzbraun gefärbt. Der Vorderscheitel hat weiss-liche Säume und zeigt bei weitem nicht die deutlich bräunlich überlaufene Farbe der *S. striaticeps*. Die Oberflügeldecken sind rostrothbraun; die Secundären und Tertiären sind olivengraubraun gesäumt, während bei *striaticeps* röstlichbraune Säume der Secundärschwingen und ganz röstlichbraun überlaufene Tertiärschwingen sich finden. Der Rücken, die Hypochondrien und die Infracaudalen sind graubraun, indessen bei *striaticeps* diese beiden röstlich olivenbraun überlaufen, jener fahl röstlich - gelbbraun

erscheint. Endlich tragen die Supracaudalen die Rückenfarbe — dagegen sind sie bei *striaticeps* zimmetroth gemischt; die Unterflügeldecken sind bei letzteren reinweiss, bei *S. heterocerca* gelblich-braun gefärbt.

Auf der White'schen Original-Etikette zum Exemplar Nr. 3 findet sich die Notiz: »Iris rufous brown«.

Sclater gibt für *S. striaticeps* an mehreren Stellen (P. Z. S. 1859, pag. 193, 1874, pag. 21. Argent. Ornith. I. 1888, pag. 182) als Habitat »Paraguay« an, eine Mittheilung, welche wohl auf Irrthum beruht.

24. Homorus galatheae, Lev.

(Tab II fig. 1.)

Von dieser neuen Art geben wir eine Abbildung nach dem Kieler Exemplar (1. c. pag. 107) aus Cuyaba.

25. Dendrornis lineatocapilla, n. sp. Berl. et Lev.

(Tab. I fig. 1.)

Diagn. *D. chunchotambo* (Tschudi) sive *ocellatae* (Spix) ut videtur proxima, differt pileo lineis angustis (haud maculis lacrymiformibus) signato; in fundo brunnescentiore (haud plumis nigro-marginatis) dorso superiore vix lineis criniformibus striato; gula juguloque magis fulvo tinctis, pectore etiam angustius striato; rostro rectiore et validiore.

Hab. Angostura.

Typ. Mus. Kiel ex J. G. W. Brandt.

Dim. (Ad.) Long. tot. 231, al. 101, caud. 87½ rostr. 33¾, tat's. 21½.

Note. Diesen Angostura-Vogel verglichen wir mit einem Original-Exemplar von *D. chunchotambo*, Tschudi aus dem Kieler Museum (»Peru«, Tschudi'scher Typus; aus dem Neufchäteler Museum) und mit einem Exemplar, von Stolz mann am 10. Februar 1880 in No.-Peru gesammelt (Orig. Nr. 1402), aus dem Mus. H. v. B. Er unterscheidet sich sehr auffallend von ihnen durch die schmalen Striche (statt Thränenflecke) auf dem Scheitel, durch die sehr feine Linienzeichnung des Oberrückens und durch die schmäleren hellen Streifen auf der Brust; auch sind Kehle und Gurgel lebhafter rostgelblich gefärbt; der Schnabel viel gestreckter, gerader und ein wenig stärker.

Dr. Sclater ist der Ansicht, dass *D. chunchotambo* Tschudi (Faun. Per., pag. 241, tab. XXVII, fig. 1) als Synonym zu *D. ocellata* Spix (Av. Bras., pag. 88, tab. XCI, fig. 1) gehöre (P. Z. S. 1871, pag. 86); wir ziehen jedoch den sichereren obgleich späteren Namen, dessen Original uns vorliegt, jenem vor, da aus der mangelhaften Beschreibung und Abbildung im Spix'schen Werke keine sicheren Resultate zu ziehen sind. Dies würde erst durch eine Ver-gleichung des Typus im Münchener Museum mit *D. chunchotambo* möglich werden.

Die beigegebene Tafel stellt unser Exemplar aus Angostura dar.

26. Myrmotherula behni, n. sp. Berl. et Lev.

(Tab. I fig. 2.)

Syn. = M. unicolor Scl. et Salv. (nec MéSnétr.) Nom. av. neotr. 1873, pag. 72. Salv. Ibis 18S5, pag. 426.

Diagn. M. Behni toto corpore obscura (ardesiaco-grisea) exceptis tantum gula juguloque medio nigris; tectricibus alarum superioribus dorso concoloribus.

Hab. Colombia, S. Fé de Bogota.

Typ. Mus. Kiel et Mus. H. v. B.

Maasse.

Lfde. Nr. Typ. Coll. Geschlech u. Alter Ort Datum Long. tot. al. caud. rostr. tars. 1 2 Mus. H. v. B. Mus. Kiel H. White-ly jun. (Jamrach) ad. () Roraima 35oo' hoch Bogotá (nach Präp.) 28. 11. 1883 (1862 erhalten) 102 80 55 54 40 31½ 11 13½ 18 13¾

Obs. M. unicolori Mén. affinis sed corpore multo obscuriore, ardesiaco (non albescenti griseo); rostro et longiore et validiore; alis longioribus; cauda attamen breviore; tectricibus subalaribus griseoalbis (non pure albis).

Note. Diese neue Art, welche wir dem hochverdienten † Prof. Behn widmen, dessen zahlreiche Entdeckungen leider nicht zur geeigneten Zeit bekannt geworden und infolge dessen von Anderen fructificirt worden sind

Cf. Leverkühn, Südam. Nova aus dem Kieler Mus. — Cab. J. f. O. 1889, pag. 101 —102.

, ist von Sclater und Salvin unrichtigerweise auf *M. unicolor*, Ménetr., gedeutet worden. Die echte *M. unicolor* war diesen Autoren nicht bekannt. Herr Dr. P. L. Sclater hat sich erst kürzlich nach Einsicht einer typischen *M. unicolor* des Mus. H. v. B. aus Santa Catharina (Coll. Schlüter) überzeugt, dass die von ihm für identisch gehaltenen Vögel von Columbien und Britisch-Guiana einer anderen, neuen Species angehören. In der That unterscheidet sich diese nördliche Species sehr leicht von *M. unicolor* durch die sehr viel dunklere,

schwärzlich aschgraue (statt weissgraue) Körperfärbung, durch den sehr viel längeren und stärkeren Schnabel, sehr viel längere Flügel und kürzeren Schwanz. Auch sind die Unterflügeldeckfedern mehr aschgrau gemischt (statt einfarbig weiss). Die Backen sind etwas weisslich gestriegelt, aber nicht so entschieden silberweiss, wie bei *unicolor;* das Schwarz der Kehle scheint weiter bis zur Mitte der Oberbrust ausgedehnt; die Beine sind dunkler gefärbt. — Die Tafel stellt den Bogotá-Vogel aus dem Kieler Museum dar.

27. Grallaria haplonota, Scl.

(Tab. II fig. 2.)

Ibis 1877, pag. 442.

Ein Exemplar dieser sehr seltenen, bisher nur in zwei Stücken — in den Mus. Scl. und Salv. & Godm. — bekannten Art, durch den Naturalienhändler J. G. W. Brandt in Hamburg bezogen, mit der Ortsangabe »Caracas« stimmt gut zu der S c 1 a t e r'sehen Original-Beschreibung. (Ibis. 1877, pag. 442). Da diese Species bislang noch nicht abgebildet ist, geben wir eine, das Kieler Exemplar darstellende Tafel.

Maasse.

Coll. Ort Datum Long. tot. al. caud. rostr. tars. ..... (J. G. W. Brandt) Caracas ..... 1855 erhalten 174 108 45 24½ 46½

28. Grallaria imperator, La fr. subsp. nov. intercedens., Berl, et Lev.

Diagn. *G. imperatori* similis, sed minor; imprimis rostro breviore et pallidiore, pectore et ventre superiore distinetius fusco transvittatis 4istinguenda.

Hab. (Bahia) [ex praep.].

Typ. Mus. Kiel. (ad.).

Dim. Long. tot. 200, al. 122, caud. 52, culm. rostr. 25½, tars. 53 Mm.

Note. Das Kieler Exemplar bildet eine Uebergangs-form zwischen *G. varia und imperator* (typ.); es ist grösser als varia und kleiner als *imperator* und zeigt auf der Unterbrust und der oberen Bauchgegend deutliche Querbänderung; die ganze Unterseite ist blasser. Der Schnabel ist merklich, die Tarsen sind etwas kürzer.

29. *Thalurania watertoni*, Bourc.

Bourcier gab als Habitat für diese Art: »Mibiri Creek, 40 Meilen von Essequibo, in Britisch-Guiana« an (Rev. zool. 1847, pag. 2 56 und P. Z. S. 1847, pag. 44). Seitdem ist die Art nicht in Guiana nachgewiesen, obgleich die Vögel dieses Landes in den letzten Jahren durch die grossen Sammlungen Whitely's gut bekannt geworden sind; auch ist ein anderer Fundort für diesen in den Museen noch recht seltenen Colibri nirgends erwähnt. — Zwei Exemplare des Kieler Museums (# ad. und # semiad.) tragen die Fundortsangabe Pernambuco mit der Notiz: »1855 durch Sigel«; ebenso befindet sich im Mus. H. v. B. ein junges Männchen aus Pernambuco, welches sich in einer kleinen Collection von sicheren Pernambuco-Vögeln (darunter *Calliste fastuosa*, Less.) befand. Ferner erhielt das Mus. H. v. B. im Jahre 1888 durch M. Eugen Simon in Paris ein schönes ausgefärbtes Männchen dieser Art, welches nach Art der Bahiabälge präparirt ist und nach M. Simon's Angabe in einer grossen Schachtel voll *Eupetomena macrura*, Gm., aus Bahia vorgefunden wurde. Endlich fand H. v. Berlepsch kürzlich bei einem Schmuckfedernhändler weitere zwei Stück unzweifelhafter Bahiabälge. Somit steht es fest, dass diese Art im östlichen Brasilien, von Bahia bis Pernambuco, heimisch ist, und es ist mehr als wahrscheinlich, dass die Angabe Bourcier's (Britisch - Guiana) auf einem Irrthum beruht.

Maasse.

Lfde. Nr. Typ. Coll. Geschlecht u. Alter Ort Datum Long tot. al. caud. rostr. caud furc. 1 Mus. H. v. B. () juv. Pernambuco (fide Beckmann) .... 114½ 58¼ 52 19¾ 27½ 2 do. ad. Bahia (fide Sim.) 125 58¾ 65½ 19¾ 41½ 3 do. ad. Bahia (nach Prap.) 126 56½ 63½ 18½ 39¼ 4 do. ad. do. (do.) 127¼ 57 66½ 19¾ 42½ 5 Mus. Kiel Siqel ()ad. Pernambuco 1855 114½ 57½ 49 20¼ 23½ 6 do. do. ()ad. do. do. 127 56½ 55 21 27½

30. Agyrtria nitidifrons, Gould.

Ein Exemplar im Kieler Museum trägt auf der Etikette den Vermerk »durch Kalkmann 1855 von Pará«; es ist in derselben charakteristischen Weise präparirt (mit lang ge- zogenem Halse), wie andere Vögel des Kieler Museums, welche dieselben Fundorts- und Quellenangaben aufweisen. Die Heimat dieser Art war bislang unbekannt. Gould ver-muthete Venezuela (P. Z. S. 1860, pag. 308. Intr. Troch. 1861, pag. 153. Mon. Troch. V. part. 23. 1. Sept. 1861, pl. CCXCVII). Durch das Kalkmann'sche Exemplar ist das eigentliche Habitat dieses schönen Colibri's unzweifelhaft nachgewiesen.

Der Kieler Vogel unterscheidet sich ein wenig von der Gould'schen Abbildung und Beschreibung, da nur die Stirn (nicht der ganze Scheitel) mit bläulich-grünen, lebhaft schillernden Schuppen bedeckt ist. Auch sind Kehle und Gurgel im Grunde weiss mit grünen Flecken gezeichnet, so dass das Weiss überall hervortritt, während bei Gould's Abbildung diese Theile einfarbig grün erscheinen. Um sicher zu gehen, sandten wir das Exemplar an Mr. Osbert Salvin in London, damit dieser eine Vergleichung mit dem Gould'schen Original im Britischen Museum vornehme. Mr. O. Salvin erwiderte: »not so bright on the head and more spotted on the breast, otherwise agrees with the type of *A. nitidifrons*«. — Die in Rede stehende Art möchte *A. affinis* Gould von Rio Janeiro am nächsten stehen, mit der sie in der Zeichnung von Kehle und Gurgel am meisten überJ einkommt, während sie sich durch den lebhaft schillernden Vorderscheitel leicht von ihr unterscheidet.

Maasse.

Typ. Coll. geschlecht u. Alter Ort Datum Long. tot. al. caud. rostr. caud. furc. Mus. Kiel; Kalkmann (ad) Para 1855 98 48 27½ 15 1/5 1¾

31. Antrostomus maculicaudus (Lawr.)

Ein unzweifelhafter Bogotäbalg dieser höchst seltenen Art, von Jamrach 1862 bezogen, mit der speciellen Angabe »Bogotá« auf der Etikette, stimmt im wesentlichen

Die folgenden Abweichungen könnten individueller Natur sein: An Stelle des von Lawrence »gesprenkelt grau« bezeichneten Bandes auf dem Nacken findet sich ein rostfarbig gesprenkeltes; die mittleren Schwanzfedern haben keine schwarze Grundfarbe mit deutlichen aschgrau gesprenkelten Bändern, sondern sind aschgrau mit schwarzen Bändern. An den äusseren Schwanzfedern sind nicht 2 Reihen weisser Flecken — wie sie Sclater l. c. auch in einem Holzschnitt darstellt — sondern ihrer drei vorhanden.

gut mit der Original-Beschreibung von *Stenopsis maculicaudus* Lawr. (Ann. Lyc. Nal. Hist. New-York. VII. 1862, pag. 459.), überein. Das Original Lawrences soll von Pará stammen, eine Angabe, die sehr der Bestätigung bedarf. Vielmehr ist anzunehmen, dass *Antrost. maculicaudus* nur ein Bewohner der Anden ist, da er auch von H. Whitely jun. bei Cos-nipata in Süd-Peru (P. Z. S. 1873, pag. 186) in einer Höhe von 235o Fuss gefunden und gesammelt wurde. Auch die Exemplare im Britischen Museum sollen von Bolivia stammen (P. Z. S. 1866, pag. 588. Scl. et Salv. Nom. Av. Neot. pag. 96). In Bogotá-Collectionen ist die Species bisher nicht nachgewiesen.

32. Dendrobates rufieeps (Spix), an D. kirtlandi, Malh.?

Das Kieler Exemplar dieser zum erstenmale im Orinocco-Gebiet gesammelten Art stimmt im allgemeinen mit der Beschreibung von *D. rufieeps* (Spix) überein (Av. Bras. I pag. 63. Tab. 56, fig. 2—3). Jedoch scheint die Spix'sche Art helle Striche auf den Oberflügeldecken zu tragen, welche unserem Angostura-Vogel fehlen. Bei ihm sind sie nur an den Spitzen düster-blutroth gefärbt. Vielleicht ist der An-gostura-Vogel zu Malherbe's *Mesopicus kirtlandi* zu ziehen, als dessen Habitat Brasilien angegeben ist (Malherbe, Mon. des Picid. Text. vol. II. 1862, pag. 54). In der Original- beschreibung heisst es »Toto corpore supra olivaceo-imma-culato, remigibus rectricibusque fuscescentibus« — ein Citat, welches Sund evall beiläufig ungenau reproducirt (Consp. av. picin. 1866, pag 39). Auf der Abbildung (1. c. Pl Vol. III. IV. pl. LVIII fig. 1. 1863), welche den Vogel halb in einem hohlen Baume steckend darstellt, sind nur die höheren Partien der Oberflügeldecken sichtbar, sie zeigen keine Striche.

Lfde. Nr. Typ. Coll. Geschlech u. Alter Ort Datum Long. tot. al. caud. rostr. tars. 1 Mus. Kiel. (J.G.W. Brandt) Angostura .... 180 95 65 21¾ 15 2 (Mus. Metz ?) Malh. Tvp. (D. kirtlandi) ..... Brasil. .... 160 98 57 21 —

33. Celeus grammicus (Malh. ex Natt.).

Malh. Mém. de la soc. roy. des sc. Liége 1845, pag. 69. Mon. Pic. vol. II. pag. 18. vol. III. pl. LI. fig. 4—6.

Ein Weibchen aus Angostura dieser (zum erstenmale von dort hiemit nachgewiesenen) Art stimmt mit Vögeln aus Ost-Ecuador (2 #) im Mus. H. v. B. überein, bis auf Schwanz und Flügel, welche kürzer sind, und bis auf die zimmetbraunen Partien der Schwingen, welche überall deutliche Bänderung zeigen, welche bei den Ecuador-Vögeln fehlt.

Maasse.

Coll. Gesehlecht u. Alter Ort Datum Long tot. al caud. rostr. tars J. G. W. Brandt Angostura 202 123½ 17½ 20¾ 20½

34. Baryphthengus ruficapillus (Vieill.).

Ein unzweifelhafter Bahiabalg, durch Jungjohann 1844 gesammelt, stimmt in jeder Beziehung mit Vögeln aus Santa Catharina im Mus. H. v. B. überein. Dieser »Motmot« war bisher nicht nördlicher als bei Rio Janeiro nachgewiesen worden. Auf der Etikette befindet sich die Notiz: »Iris dunkel rothbraun«. (Ad.) Long. tot. 460, al. 152½, caud. 238, rostr. 44¾, tars. 29 Mm.

35. Chloroenas plúmbea Vieil. subsp. n. bogotensis, Berl. et Lev.

Diagn. *Chi. plumbeae* similis, sed pileo antico, capitis collique lateribus gula pectoreque fortiter vinaceo tinctis, abdomine etiam vinaceo, subcaudalibus vinaceo brunneis (haud plumbeis), cervice magis amethystino - vinaceo maculis vinaceis clarioribus; mento rufes-centiore.

Hab. Colombia. (Santa Fé de Bogotá, ex praep.)

Typ. Mus. Kiel. Jamrach, London. 1862.

Dim. Ad. (#) Long. tot. 177, al. 185, caud. 148. rostr. 18¼, tars. 24 Mm.

Note. Das Kieler Exemplar, von Jamrach in London 1862 erhalten, unterscheidet sich von vier Stücken im Mus. H. v. B. aus Brasilien durch dunkelbraune, fahlröstlich-ge-randete Unterschwanzdecken. Kinn, Kehle, Kopfseiten und Brust haben ein viel mehr röthliches Colorit; die ganze Oberseite ist namentlich stark am Vorderscheirel weinroth überlaufen. Die Rückenfedern haben ebenfalls »irisirende«, schwach metallisch glänzende Farben, welche den vier brasilianischen Exemplaren überhaupt fehlen.

Im vorstehenden wurden als neu beschrieben die Species: *Synallaxis cabanisi, Synallaxis heterocerca, Den-drornis lineatocapilla, Myrmotherula behni*; die Subspecies: *Troglodytes furvus rex, Myiarchus tyrannulus chlorepiscius, Grallaria imperator intercedens, Chloroenas plumbea bogotensis*; reservirt die Arten: *Elainea lophotes, Myiarchus bahiae, Heterocercus angosturae* und restituirt die Arten: *Anthus calcaratus, Serphophaga verticata, Elainea cristata, Synallaxis albigularis*.

Hann., Münden, Freiburg i. B. April 1889.
Hans v. Berlepsch.
Paul Leverkühn.

Ornis 1890. Taf. 1.

1. Dendrornis Lineatocapilla, *Berle & Leo n. sp.*
2. Myrmotherula. Behni, *Berle & Leo n. sp.*
3. Ghasiempis Sandwighensis, *Gm.*

Ornis 1890. Taf. II.

1. Homorus Galatheae, *Lev. n. sp.*
2. Grallaria Haplonota, *Salts.*

Index.

Tafeln.

Vignette *Southland and its Resources* Being a Paper on the Resources of the District
Of Southland, Otago, New Zealand.
By *Mr W. B. Scandertt*.
Read at a Meeting of the Southland Institute, Invercargill, on 18th September, 1883, together with comments by Members.
Vignette Invercargill, N.Z. Henry and John Feldwick, General Machine Printers, Dee Street.
MDCCCLXXXIII.

Southland and its Resources

Being a Paper By
Mr W. B. Scanderett,

Read at a meeting of the Southland Institute, on the 18th September, 1883; together with comments by members.

A meeting of the Southland Institute took place on Tuesday evening, the 18th September, in the Supreme Court buildings, Invercar-gill, the President, Mr J. T. Thomson, F.R.G.S., in the chair. Amongst those present,

besides several ladies, were the Revs. P. W. Fairclough and T. O'Callaghan, Drs Closs, Galbraith, and Wardale, and Messrs G. Bailey, T. B. Bennett, W. E. Bews, H. Garswell, R. F. Cuthbertson, T. Denniston, A. Dolamore, G. Froggatt, J. Garmson, J. B. Greig, W. S. Hamilton, W. Handyside, J. E. Hannah, J. Harvey, F.R.G.S., J. Johnstone, J. H. Kerr, J. Kingsland (Mayor), R. Macleod, J. Manson, J. T. Martin, T. Pratt, R. H. Rattray, W. R. Robertson, Watson Shennan, John Thomson, W. Todd, G. Trew, G. Webber, T Waugh, and others.

The President stated that the object of the meeting was to hear a paper by Mr W. B. Scandrett on "Southland and its Resources."

Mr Scandrett, who was well received, said—

The Southland district, commencing at a point on the south-east coast of the South Island of New Zealand known as Chasland's Mistake, and which lies about half-way between the mouth of the Mataura and Clutha rivers, stretches northwards to Lake Wakatipu. Its natural western boundary is somewhat west of the River Waiau, although the western boundary of the County of Southland extends only to the Waimatuku and Oreti rivers. The natural features of this large district vary considerably, the extreme north and west being mountainous, whilst the southren portion comprises undulating country, plains and forest.

Southland comprises the sub-districts of Toi-Tois and Waimak Valley, with its township of Fortrose; Wyndham, Edendale, and Tuturau, with the township of Mataura; Waikaka, Chatton, Otama, and Knapdale, with the townships of Gore and Gordon; the Hekonuis, Waimea Plains, Waikaka, Nokomai, and Athol districts. In the central district is the valley of the Oreti, including Mararoa, Dipton Winton, and Waianiwa; whilst to the west lie Otautau, the Waiau country, Longwood, Orepuki, and the old township of Riverton.

The whole district is well watered, the Mataura, with its numerous tributaries, running nearly parallel with the eastern boundary, from as far north as Lake Wakatipu; in the centre of the district the Oreti, with the many minor streams adding to the volume of water it daily carries to the sea, and on the west the important Aparima and Waiau rivers, with the many water-courses which flow into them, effectually preventing the necessity for irrigation in that portion of the country.

The climate of Southland is undoubtedly healthy and invigorating, approximating to that of the south of England, with a much milder winter, and altogether without the fogs which so often overcloud all parts of Britain.

This immense stretch of country, approaching in extent to five million acres, was, comparatively late in; the history of the colonisation of New Zealand, occupied by those pioneers of civilisation, the squatters or run-holders. The soil of the district is particularly well adapted for raising rich and nutritive grasses for feeding sheep and cattle, the hills especially forming dry and healthy runs in summer time, on which stock thrive and increase in the most satisfactory manner. The laws of the Coleny in the early days permitted tracts of land from ten thousand acres upwards to be taken up as rims for grazing cattle and sheep. Amongst the earliest settlers in the Southland district who still follow that vocation, although they have changed the tenure of their holdings from leaseholds into freeholds, are—Mr Alexander McNab, of Knapdale; Dr Menzies, of Dunalister; Capt. Francis Wallace Mackpnzie, the present M.H.R. for the Mataura district; Messrs Peter and David McKellar, Captain Stevens, and others. Other settlers who maybe classed as pioneers still reside in the district, and amongst these may be mentioned Mr John MacGibbon, the senior partner of the firm of Messrs John MacGibbon and Sons, who was occupied twenty five years ago in ferrying the traveller across the Mataura river, and who still lives in the locality of his old occupation to this day.

The squatters or run holders devoted them-selves almost exclusively to raising stock and producing wool, and for years the only exports consisted of the last named staple; and the wealth which wool annually brought into the country in those days, assisted the progress of the infant settlement in a manner that can be appreciated best when we look over the statistics of exports and the census returns for the same period showing the population of Southland.

As population increased in the Colony, it became desirable to subdivide the runs into areas suitable for farms, and, as may have been anticipated, the lands on the banks of the Mataura river were eagerly sought after "by intending settlers. It seems singular that those who desired to buy land thereabouts had to enquire into and study different sets of land laws, there being a different set for each side of the Mataura river. If land was required on the east bank, away one had to ride to Dunedin to lodge an application and conform to the law as it then stood, whilst if another person required a section on the west bank of the river he had to proceed to Invercargill. This anomaly, so far as application for land on the east bank of the river is concerned (and that is only about thirty miles from Inveroargill), still exists, although, fortunately, for the best interests of the Colony there is now only one land law, and this is so comprehensive that a settler can easily decide what system and regulations under it will suit him best. There can be little doubt, however, that the Waste Lands Board of Southland should be empowered to deal with all lands within the Southland County, instead of intending buyers or settlers being compelled to proceed over 100 miles to Duncdin to lodge their applications, and wait on the Otago Land Board to grant them.

Extensive Estates.

Early in the history of Southland nearly the whole of the available land, for many miles on the western bank of the Mataura river, was purchased by a large company of Home capitalists, now known as the New Zealand and Australian Land Company, who brought into cultivation, or laid down in English grass, many thousands of acres of land. That this Company promoted the prosperity of the men who were our first settlers by affording them ample and remunerative employment cannot be doubted, and is generally acknowledged. For many years past, however, those persons who have had the welfare of the country at heart have greatly regretted to see the vast tract of fertile pastoral, and agricultural land stretching from the Mataura Bridge, southward and westward, past Edendaie, carrying, comparatively, no population. During the past two or three years, the Company who own these splendid estates have subdivided and sold nearly the whole of their Southland holdings, and consequently we are likely soon to see smiling: farm homesteads, alive with young Now Zealanders, where heretofore cattle or sheep have grazed in luxurious plenty, and it will be readily admitted that such tracts of country are better fitted to maintain by the aid of improved agriculture, as we hope to see them contain, a large population of men and women.

The New Zealand Agricultural Company, who own the large tract of country between Gore and Lumsden, are entitled to commendation for the efforts they are making in the settlement of their splendid freehold property.

Its Growth.

The hindrance to the rapid advance of the Southland district in the past arose, as it does now, more from the sparseness of the population than from any other cause. The early efforts of the Provincial Government of Southland to promote the settlement and prosperity of the district were, I believe, honourably conceived, and this, although mistakes may have been made in adopting experimental undertakings, such as the wooden railway to the Makarewa, and possibly, at such an early period, the Invercargill-Bluff railway, instead of husbanding the means of the province until its financial resources were more fully developed: or perhaps better still, of improving, with the funds available, the Port of Invercargill. Still these were points upon which a divergence of opinion would almost at any time inevitably arise. The Bluff-In-vorcargill railway is doubtless necessary for the ocean-borne traffic, and is a work that sooner or later would have been constructed; still if half the amount expended at that time, on that undertaking, had been expended in improving the waterway from Foveaux Straits to Puni Creek, the ships which now discharge at the Bluff wharves would be unloading off Tay street, or by the railway station, whilst the Bluff-Invercargill line would certainly have been constructed under the Colonial Public Works Policy.

Resources.

The resources of the Southland district are indeed manifold, and its future importance can scarcely be over-estimated. For many years to come no doubt its agricultural and pastoral interests will be those chiefly promoted, for, although manufacturing industaies will arise, yet this southern portion of New Zealand presents a field for agricultural and pastoral pursuits, either separately or combined, unequalled in the colonies. I was recently shown an estimate which well illustrated the kind of farming that does pay and that should be successfully followed in many, if not all, parts of the Southland district. This estimate was based on the sale of wheat .at 3s 9d per bushel, oats at 2s per bushel, fat cattle at 20s per 100lbs, and wethers at 12s each; and it would probably satisfy any intending settler, with capital varying from .£1000 to £5000, that mixed farming offered a safe and increasing return for the investment. Moreover, there is a greater certainty about mixed farming in Southland than in any other part of New Zealand, as shown by the published statistics, for sheep are always saleable, and the annual returns from wool certain; whilst as to the production of gram, Southland yields on an average 29 bushels of wheat to the acre, to Auckland, Taranaki, "Wellington, and Marlborough's 18 bushels, Canterbury's 22, and Hawkes Bay's 25 bushels.

In oats, Southland produces 30 bushels to the acre, to Auckland, Taranaki, and Nelson's 18 bushels, Wellington, Hawkes Bay, and Marlborough's 20, and Canterbury's 24 bushels.

In barley, Southland produces 26 bushels to Auckland's 17, and Canterbury's 20 bushels.

Over a long series of years, 11 bushels per acre has been a high average yield of wheat in Australia, but in a moderately favourable season a Southland farmer may fairly expect to realise fully 40 bushels per acre, if his farm is in good condition. It is thus seen that Southland is one of the best agricultural districts in New Zealand, and compares favourably, with any of the Australian colonies.

Small Farms.

The man who will in time become the average colonist can settle down in many parte of the Southland district on land known as agricultural deferred payment blocks, and If he has saved two or throe hundred pounds, as working men may do in the course of five or six years, and is still steady and industrious, there is a very fair future before him. Having secured his land, he will proceed to erect a mouse for his family, a stockyard for his cattle, with milking shed for his cows; he can fence a small area for a paddock, plant a few acres of potatoes for domestic use, and for sale, sow some turnips for winter feed for his cattle, and whilst these are growing he can find work with the neighbouring settlers, some of whom will want fencing, ditching, or ploughing done. As years roll on he will be fairly established; and almost independent, and will become an employer of labour himself, and others can take up land on similar terms, and do as he has done.

our forests.

Next to the cultivation of the soil, the extensive forests of Southland may be classed as one of the best resources of the district. Within a radius of thirty miles of Invercargill can be counted fully thirty sawmills, employing, on an average, thirty men. As many of the hands are married, and, assuming, as the statistics of the colony permit, that each of these married men has, with his wife and family, an average on the whole of four souls depending on him, we can conclude that the forests by the sawmills alone are maintaining a population bordering on, if not exceeding, four thousand persons. But the advantage which the possession of forests gives to a district where settlement is proceeding, cannot be assessed alone by the men employed at the sawmills, for the settler is able to purchase the timber for his house at a moderate price, and fencing is reduced to a rate which would make the heart of a settler on the Canterbury plains, or in the treeless districts of Central Otago, leap with joy. The sawmills, too, furnish freight for our railways, and for numerous coasting vessels, whilst no I inconsiderable quantity of sawn timber is sent by the intercolonial steamers to Australia

Baek for Tanning- Leather

Is an industry which is developing largely from the possession of .forests, one firm alone, Messrs J. Kingsland and Co., of this town, exporting to the Northern tanneries hundreds of tons of red pine or rimu and karamai (birch) bark for tanning leather, exclusive of the large quantity which is used in our local tanneries—and Messrs Kingsland and Co. use over 150 tons themselves per annum. Some better system of-collecting the bark is required, and it might be worth the consideration of the Waste Lands Board whether sawmillers should not be compelled to cut the bark off the red pine trees, and utilise or sell it, instead of allowing it to be burnt on the slabs, which usually form the first cut of the circular saw.

Tanneries.

The possession and increase of our herds of cattle allows meat to be sold to consumers at such a price as to place beef on every man's table. This, of course, encourages a large consumption, and the cattle utilised for food provide hides for leather of a quality and size which has already caused the Southland tanned hides to bring the highest market rates; and there is practically no limit to the extension of this important industry, for over 10,000 green hides are annually exported from the South Island to Britain, the tan- neries not being sufficiently numerous to manufacture leather from the hides available in the colony.

Frozen Meat

The system of exporting meat by the freezing process to Britain, the great market of the world, will be a means of utilising the resources of the Southland district which till recently could not have been anticipated. It opens out a prospect of a certain market for tat stock, especially sheep, that will be both steady and permanent. It is doubtless true that the trade and the machinery at present employed are only in their infant stage, and that very great improvements will be made in many details both in connection with the economical working of the machinery on the voyage, and in the arrangements for distributing the meat amongst consumers throughout Britain. But the principle of freezing meat and maintaining it fresh and sweet for human consumption has been tested and proved, and, as the trade is developed, the risks of loss by imperfect machinery or unsuitable ships will be greatly diminished. To the sheep farmer the system offers a guarantee that his surplus stock will find a ready market at a price which should indace him to maintain his flocks at the highest carrying capacity of his land.

Coal

Will play an important part in the future of New Zealand, and the whole of the Southland district will share in the prosperity which must follow the systematic working of our coal measures. A cheap and economic fuel is a necessity in profitably working many industries. The coal measures at the Night-caps are the only mines in Southland that are efficiently worked. In the Government returns for the year 1882 it is shown that 6730 tons was the output for that year. The coal is classed under the head of hydrous, and it is a pitch coal; its structure is compact, has a smooth fracture, does not desie pact on exposure, nor is it absorbent of water, and it burns freely. This mine could probably be wrought very economically if the proprietors were to adopt Messrs Sebastian, Smith, and Moore's system of coal getting by compressed lime. I will explain it. "Cartridges are employed consisting of nearly pure lime, 2½ inches diameter, which, by hydraulic pressure, are reduced from 7 inches to 4½ inches in length, the density being thus nearly doubled; when slaked in an unconfined space, these occupy about fire times their original bulk. The shot holes are drilled by means of a light boring machine. The cartridges are then enclosed by tamping in the same way as powder, and they are slaked by means of a small force-pump. The time occupied in drilling a hole three feet deep is 10 to 30 minutes, according to the hardness of the coal. On the removal of the sprags, which are left in, the coal falls clean from the roof in large masses ready for loading, practically making no small. The following are among the principal advantages claimed for this system. There is no smoke or noxious smell of any kind. The roof is not shaken by this process; no vacuum is created, as is the case with a blown-out shot; and the coals in falling produce much toss dust, thereby reducing the danger which is generally admitted to arise from the air of a mine being heavily charged with small particles of coal. Skilled labour is unnecessary, and the coal can be got with much less exertion to the collier than by wedging. After pumping the water into the charged holes the men need not discontinue working, as is the case with gunpowder, for, simply moving away from the face of the coal while the sprags are being taken out, all risk of injury from falls is avoided." A comparative result of coal-getting by the above system, and by labour at fifty different collieries, was as follows:—Men working 320 hours in the ordinary way of wedging brought out 628 tons. By using the lime patent, men working 219 hours brought out 768 tons.

It is werthy of extensive record that the engines on the Southland section of the New Zealand railways are driven with Nightcaps coal.

But not alone at Nightcaps will the district have wealth brought from the hidden treasures underground, for extensive coal measures await development at Orepuki, which is not a greater distance from Invercargill than the Nightcaps, and in addition to the coal, which appears to be of the same character, class and quality, extensive beds of shale overlie the coal measures. These have been more or less tested, and are found to produce an excellent lubricating off and a food light burning oil, whilst the shale will be without doubt extensively used for gas making purposes, as it will raise the standard of gas for illumination to a high degree of excellence. For some time past the engineer of the Municipal Gasworks has been experimenting with Southland coal, with the object of using it, either solely or partly, with Grey-mouth coal for the production of gas, and he appears confident that it can be economically employed for that purpose; and as the railway will be completed to within a short distance of the coal seam there within the ensuing twelve months, a supply of Orepuki coal will be then available for local consumption. Whilst noting all these favourable points in regard to local coal, I wish to guard myself from being suspected of being interested in any local company, by pointing out that, however good these coals are, for local consumption, we shall not be in a position to export them coastwise, as the price obtainable outside of the district would not be sufficient to enable them to compete with Newcastle or West Coast coals, when railway and ship's freight were added. The production and consumption will therefore entirely depend on the requirements of the Southland district. But local coal should effectually, by reason of the price it ought to be sold at, prevent imported coal finding a market, in Southland.

Paper Manufacture

Must now be classed as one of the resources of the Southland district, seeing that the brown wrapping paper is chiefly made from the native tussock grass. The paper manufactory at the Mataura Falls is well worth the attention of visitors to Southland: the several processes which the raw materials undergo until the pulp is ready to enter the machines and the paper is drawn off the cylinders ready for use, are most interesting. The Company who own these works are now beginning to reap the reward of the patience and outlay that has been necessary to carry on this industry to its present success. They had great difficulties to overcome, caused perhaps principally by not procuring at the outset the newest and most approved machinery. In any future undertaking whore machinery is required, the promoters should not fail to obtain the very best plant available, and introduce skilled workmen for the undertaking.

Woollen Manufactories

Will doubtless, within a reasonably short time, become a popular branch of local industry. Suggestions have been made by Mr J. T. Martin and other prominent citizens that a joint stock company should be formed to manufacture woollen goods, and recently a representative committee was appointed in Invercargill to consider what steps should be taken to give effect to the suggestions. These gentlemen, although favourably disposed to the undertaking, reported that the present time was somewhat inopportune for the formation of a joint stock company. When the present stringency of the money market has passed away, and this season's wool exported, another good harvest gathered, and the export of frozen meat further developed, they ought to bring about that desirable consummation; this promising industry should be again brought into prominence. I have lengthy notes as to the best kinds of wool, machinery, buildings, and plant required for this industry, but I have laid them by, as this paper appeared to be extending to a limit that might overtax the patience of the Institute to listen to.

Building Stone

At Waimea Plains, Mataura, Castle Rock, Dipton, Waiau, and Limestone Plains, of excellent quality, is known to exist. Several circumstances have combined to delay working these deposits, except for buildings in the several localities. But business enterprise will in due course ensure these quarries being efficiently and profitably worked. Mr Blair, Engineer-in-Chief of the South Island, in a report, says that the granular limestone found in Southland exists in a broad zone extending across the country from the Mataura to the Waiau. It belongs to the same class as the famous Oamaru stone, but is much harder and heavier, and will absorb only one-third the quantity of water that the same quantity of Oamaru stone will absorb. He says, also, that this Southland stone, unprotected, is far more impervious than the Oamaru stone when covered with oil, and he further points out that the imperviousness of the Southland stone has boon well proved at the residence of Mr G. M. Bell, Waimea Plains. A nine-inch wall on the south or shady side of the house was papered on the bare stone, and no damp was ever observable.

Lime

For building purposes and for agriculture is now being pretty extensively supplied from Winton. Mr Blair's table, marked No. 1, in his work on the Building Stones of Otago, contains analyses of New Zealand limestones that furnish rich lime, with English and foreign types. I find, too, that Dr Hector places the Winton limestone as the first in Otago, the analyses showing that 98-100th parts are composed of lime and carbonate of lime, whilst Oamaru lime contains only 90-100ths of the same mineral. Here then is an excellent raw material for builders and agriculturists.

Bricks

Are now manufactured in several parts of Southland. Unfortunately none of our brickmakers have yet adopted, in the manufacture, the patent systems which are in operation in other parts of the colony, but from the large number of brick buildings which are now being constructed the opinion can be safely formed that a patent brick manufactory would find sale for all the bricks which it could manufacture, and at say 35s to 40s per 1000. Patent bricks are almost impervious to water. Professor Hutton, in his Economic Geology, points out too the fireclay is found in most of our Southland coal measures.

Dairy Produce.

Too little attention has been paid to the production of dairy produce, and yet wher ever dairying has been carried on as a business, intelligently and systematically, it has been most remunerative to those engaged in it. For several years past attention has been called to the necessity for combination in dairying under the American factory system. The Government have been alive to the advantages of this combination, for they have engaged a gentleman of considerable experi- ence as inspector of dairy produce factories, who has furnished a report, accompanied by plans of buildings, utensils, and machinery required to work cheese and butter factories. These factories are very simple, and an intelligent man should be able to grasp the work required of him very quickly. I recently visited the Edendale factory, which is worked on the American principle, and is owned by the New Zealand and Australian Land Company. Mr Bowron, the inspector, in his report, says:—"There are at present several cheese factories at work in New Zealand, in Auckland, Wellington, Canterbury, and Southland; while

several others are projected, and will be started during the coming season. The venture can hardly be overdone, as the market for cheese, of good quality, is unlimited. Few countries, if any, are better adapted for dairy purposes than New Zealand, and the Government, to assist this industry, have offered a bonus of £500 for the first 50 tons of cheese made on the American factory principle, for export. To say all that New Zealand is capable of producing is impossible. With a vast extent of unbroken lands, it is no romance to say that millions of cows may be kept where at present few exist. Two acres and a half will sustain a cow summer and winter; two and a half million acres will keep one million cows: the produce of each cow would not be less than 5 cwt. of cheese, valued at 6½d per lb. or £60 per ton, producing a revenue of £15,000,000 per annum. New Zealand factories will find that it will be for their interest to manufacture cheese from 20lb. to 30lb. in weight at the beginning of the season, when the milk does not, come in so freely and is not so suitable for large cheese. Small cheese, with proper care and a little artificial heat, will be ready for market in ten weeks, so the first made will be disposed of to meet the requirements of the British market. The summer months are regarded as the proper cheese-making season, but there is no reason why cheese should not be made all the year round in this climate, provided there be sufficient feed for the cows. November, December, and January are the months when cheese is little sought after in the London market, and forced sales never pay. April, May, and June are the best months. The previous year's stock is all used up, and the cheese merchants are glad to take the first supply which comes to market. New Zealand can send thousands of tons of fine ripe cheese just at the time when there will be no competitor. This is a great point in favour of New Zealand."

Butter.

The butter industry, Mr Bowron says "Is not of less importance than the cheese. No great amount of skill or expensive machinery is required. When a number of dairies send their cream to a factory it is churned and made into fresh butter every day for the local markets, and the surplus is salted for foreign consumers. There is not so much risk in shipping butter as in shipping cheese to distant markets. A steady temperature of 40 degrees Fahr. would be required. One cwt. of butter would not require more room in the vessel than one cwt. of cheese. The butter would realise in London £7, and the latter £4 2s."

Ham and Bacon Curing.

To the above industries should be added that of ham and bacon curing. There are two or three extensive bacon curing establishments in Canterbury and the northern districts, where the business has been extended into highly profitable Undertakings, Mr Bowron gives excellent advice and information, in the report from which I have previously quoted, relative to the selection of pigs and the method of feeding. He says: "If the feed is wrong, all the best arrangements and appliances can never make good bacon. York "hams for flavour and quality are held in high repute all over the world, and this is mainly attributed to the mode by which the pigs are fed. The curing process is exceedingly simple, and the hams will keep for years without any deterioration, and retain their fine flavour to the last."

In regard to the cure of bacon in New Zealand Mr Bowron says:—Ice may be said to be out of the question; but the refrigerator is preferable to ice. A chamber of 70degs. Fahr. can be reduced to 30deg. Fahr. zero, in twenty minutes. In hot weather a chamber reduced to about 40deg. Fahr. is all that is required. By this method the trade in bacon would be revolutionized, and a quality second to none would be manufactured for the markets. It is clear that a large remunerative trade may be done in bacon fed and cured well." To show the value of the freezing process he states:—"After pork has been in salt twelve days, four sides may be placed in a box with a little salt, and shipped off to England. In fact, the bacon would cure on the way; all that would be required is a chamber with a temperature of from 40degs. to 50degs. Fahr." He says again, New Zealand is as fine as any climate in the world for breeding and feeding pigs, and bacon will at no distant date form an important. part of colonial merchandise and a source of wealth. The quantity of bacon imported into the United Kingdom for 1880 and 1881, was 8,222,713 cwts., valued at £3 10s per cwt. or 7 ½d per lb."

Fish Curing and Preserving

ought, at no distant date, to become an important industry. All authorities agree that the New Zealand waters teem with fish in abundance nearly all the year round. Dr. Hector says there is no reason to complain of useful varieties, and that out of 160 sea fishes on the coast of New Zealand we have nearly as many varieties fit for food as are brought to market in the British Isles. The ports of Invercargill, Bluff, and Riverton offer every facility for carrying on an extensive deep-sea fishing business: the local market is also growing apace for the disposal of fresh fish, whilst for export of cured and preserved fish the Australian market is open to a large supply.

In the last annual report of the secretary to the Marina Department laid before Parliament, Mr Seed states, "The importance of conserving our fisheries, with the object of providing a valuable and wholesome contribution to the food supply of the people, must be patent to everybody. This subject has of late years received much attention in the United Kingdom, the United States of America, and also in the Dominion of Canada, where the Government have founded several public establishments for the artificial reproduction of fish for the purpose of restocking the rivers."

In the official report of the Commissioner of Fisheries for 1882 it is stated that the produce of the Dominion Fisheries for the year was valued at £3,217,734, and that the value of the fish exported was £1,379,777. These figures alone show how largely the fisheries of Canada contribute to the wealth of the country, and there is no reason to doubt that, under proper management, those of New Zealand will, in the future, also become an important element in the welfare of the colony.

Oyster Farms.

Closely allied to fish curing, and especially so as regards the employment of the fishing smacks on the coast, is the conservation and improvement of the valuable oyster beds in Foveaux straits. Mr Pearson has almost ex-hausted this question in his interesting report which was presented to the Provincial Council of Otago in 1875. He shows the value of the oyster beds by referring to the cutter Fly, 18 tons register, which some years ago sailed into Oyster Cove, Stewart Island, and filled up in four tides by shovelling the oysters up into the hold of the vessel. Returning to Dunedin the owner realised £350, the purchaser clearing the oysters out of the cutter. The Stewart Island oyster is highly esteemed in Melbourne, and with suitable welled crafts there is no reason why we should not in time have a large and profitable trade with Australia.

Then again there are the fish with which the rivers and lakes of this district are being stocked. I recently tasted a splendid river trout which turned the scale before it was cooked at 7lbs, and from the accounts given by residents in several parts of the district a few years will so increase the supply of trout that they will become available for daily consumption.

Gold Mining

has been successfully followed as an industry in the Southland district for many years. No extensive finds of rich nuggets have been made, but at Orepuki, Longwood, Round Hill, Nokomai. and Waikaia, miners systematically prosecute a search for the precious metal. Each of these localities contains what if known as "wages ground;" men can always earn on an average fifteen shillings and more a day. On the beach between Bluff Harbour and Mataura river one or two parties of six men have been working for the past two years, and there are miles of beach open to working men to follow that class of occupation. The party dig the beach up and wash the material excavated, saving the gold, and when one patch of beach becomes exhausted they remove a little further off; after a strong south-east wind and swell the beach is levelled by the deposits from the sea, and the locality can again be washed up; and the process appears likely to last for many years.

It may be of interest to those who have expended time and money on the quartz reefs at Longwood to know that Professor Hutton thus speaks of the country west of Riverton: —" Gold in small quantities is found throughout this formation, but the Longwood range is the only place in which it occurs to any considerable extent. The gold of the Orepuki district must have come out of those rocks, as it is found up the valley of the Waimeamea, a small river rising in the Longwood ranges."

Shipbuilding.

The district has other resources or industries, which as time passes and capital accumulates, will be developed, and foremost amongst these, both at Riverton and Invercargill, and Stewart Island, "shipbuilding will be found, especially for vessels suitable for the coasting trade. Several schooners have been built in the New River. At Stewart Island, whore timber for all parts of a vessel is plentiful, a larger number have been constructed, one or two being of considerable size.

Ironsand

abounds on Stewart Island, particularly between Half Moon Bay and Patorson's Inlet. A parcel was sent some years ago to Melbourne, and the assayers for the Victorian Government, and the Oriental Bank, after smelting and manufacturing a steel bar from it, reported that it was not only superior to the Taranaki sand, but contained a sufficient quantity of gold to pay the expense of smelting. In view of the success lately achieved at Auckland in smelting the Manakau iron-sand, our local deposits may become of great importance.

Pottery, Glass, Etc.

Professor Hutton, in his valuable work on the geology of Otago and Southland, states that "an excellent deposit of clay is found in Stewart Island which would be suitable for superior porcelain ware. Veins of 'potash felspar' also have been found, and in sufficient quantity for use; and the large per centage of alkali it contains makes the stone an excellent flux for glazing pottery." The same writer points out that the establishment of glass works is an undertaking that could hardly fail to be remunerative, the material being available at our doors.

Specialties.

It is a satisfactory feature to note, that the local manufactures of specialties, which the district requires in an increasing ratio, have not been overlooked. All kinds of compositions for destroying insect life on sheep have been imported into New Zealand, but there is a fair prospect now that the products of the two local establishments, and the only two in the colony, for the manufacture of an improved composition for destroying scab and other insects on sheep will be not only extensively used in Southland, but will be largely exported to other parts of the colony. Indeed, I am informed that these sheep dips are already being used amongst sheep farmers northwards as far as Hawkes Bay.

Local Manufactures.

I think it is scarcely sufficiently known the great advance industrial occupations have made during the past few years in several of the larger towns of the colony. There is no reason why industrial enterprise should not succeed equally well in Invercargill, especially industries in which timber is used. At the Melbourne Exhibition in 1881 the specimens of drawing-room, bedroom, and office furniture, made of New Zealand red pine, totara, and silver birch attracted great attention, and were worthy of competition with the best European made exhibits. Machine-made household appliances and utensils, such as doors, tubs, buckets, ovens, grates, pumps, bells, rope, brushware, and other domestic requisites, were largely exhibited, and the manufacture of these in Invercargill will, doubtless, in time, increase to at least the requirements of the district.

Iron Foundries

are important industries, and those who have inspected the first-class steam engines, machinery, manufacturing plant, and other ironwork, which the Invercargill workshops have made, will not need to be told that in this branch of trade, Invercargill workmen can hold at least their own with any other district.

Rabbit Skins.

There is an opening, I regret to say, for business enterprise to experienced furriers, in utilising some of the immense number of rabbit skins now annually exported, for there will be always a large number available every year whatever measure may be adopted to rid the colony from the rabbit pest. I have heard it said that the rabbits were rather an advantage to the colony than otherwise, in consequence of the employment they gave to men to assist in their destruction. But those who think so entirely overlook the fact that these men are not producers at all, that their labour is so much extra cost in the production of sheep and wool, which would have been produced without that labour to the great advantage and saving to the colony, and that their Employment in other industries, whether in tilling the soil or in working on our extensive forests, would have assisted the extra productions, which is the only means by which the colony can attain to greatness.

I have not yet exhausted the eatalogne of articles that can be produced from the raw materials which nature has abundantly blessed this colony with, but I fear to trespass further on your time under this head.

The Harbours

of the Southland district will aid its development in a marked degree. Its present chief port, Bluff Harbour, is universally known as one of the finest ports of the colony, and freights are insured to that harbour at the same rates as to the other first-class ports of New Zealand. Invorcargill has, however, another harbour—the port of Invercargill. In the early records of Southland it is shown that many vessels used to enter and discharge their cargoes in this port, but on the opening of the railway between Invercargill and the Bluff, the trade was diverted into that channel and the New River Harbour was allowed to fall into disuse. Its harbour staff was depleted and

every effort made to concentrate trade at the Bluff. How the Invercargill merchants permitted this policy to be adopted is unaccountable. During the past few years a feeling has almost universally forced itself upon the inhabitants of the district that the waterway connecting Invercargill with the ocean ought to be utilised, that a great loss is annually borne by the community in the cost of freights from the Buff to Invercargill and Invorcargill to the Bluff, which need not, and ought not, to be submitted to. Those opinions fortunately exist in the governing body of the New River Harbour, and the first steps are now being taken for improving the channel so that vessels prosecuting the intercolonial trade should load and discharge at Invercargill, and save at least seventeen miles of railway carriage. This is an important matter to the whole district, and especially to the farmers, as a groat portion of the grain exported is shipped to the neighbouring colonies, and the cost of carriage between In- vercargill and the Bluff is a direct loss to them. In imports the loss is distributed over the whole community. It is not too much to expect, therefore, that united action by the whole community will eventually cause the port of Invercargill to be so improved that ocean going vessels will be lying alongside our wharves within sight of the principal streets of Invercargill.

Immigration

is essentially necessary to enable the great resources of the Southland district to be fully developed; not an introduction of working men only, although a very large number of our best settlers and many of our public men originally worked for wages. A recent writer on New Zealand, referring to self-made men, says—" Perhaps Invercargill is more remarkable for this class of men than any other town in New Zealand, where three-fourths of the merchant class are self-made men. All honour to the industry and perseverance of such citizens. They have the pith and stamina of prosperous communities, and if they will continue to exert their influence in the direction they have hitherto done they will not only sustain the trade of Otago in its present prominent position, but increase it to the extent of their own requirements, a point which New Zealand has not yet reached." The real working man, whatever his occupation may be, will assuredly succeed in the end, but if any large number of immigrants were introduced a risk would arise From the possibility of flooding the labour market. A continuous stream of immigration on the nominated system, and the dissemination of information throughout the United Kingdom, especially in the agricultural counties, of the price of land in New Zealand, the facilities for reaching any part of the colony by steam or rail, the advantages offered by our system of State schools and High schools for the education of children and youth, the average yield of crops and the average market price of grain and live stock, would tend to induce people to make this colony their home, and thus aid in developing its resources.

Agricultural and Pastoral Societies

have already assisted the progress of the Southland district by inspiring a healthy spirit of emulation. The several exhibitions, whether they have been at Gore, Wyndham, Riverton, or Invercargill, have brought together so many excellent exhibits that farmers and settlers generally have been astonished on finding how many others had stock or implements superior to their own. This information has a beneficial influence, and excites a healthy rivalry, which is advantageous to the community.

The Newspapers of New Zealand

have assisted the rapid development which we can see the colony is making more perhaps than any other institution. Every important centre now has its daily or weekly rewspaper, and it would well repay every resident in those centres to bear a tax to support the local organ of public opinion. It chronicles and gives importance to every movement which has for its object the welfare of the district: every important industry is promoted, inventions or improvements made public, and the wants of the district made known. It provides a medium for inducing competition by making known the requirements or wants of the residents, it leads or guides public opinion, criticises the doings of its public and governing bodies, supports or restrains the action of public men, and is really the indispensable institution of a community.

The Future.

I have said that when the present commercial depression shall have passed away, steps might be successfully taken to commence a joint stock company for the manufacture of woollen goods. These monetary depressions come periodically, although not at equal intervals. That they are caused very much by speculative transactions, commercial and territorial, cannot be doubted. On the whole, although inconvenient, they are useful; for the Anglo-Saxon race, especially when transferred to a new country, are enterprising and

progressive. The same hope of success that inspires men to achieve greatness, induces them to venture a good deal off the beaten track, and too freely to discount the future. But these depressions compel men to take stock of their position, and to strike a balance; the temporary cheek inducing cautious and sounder action. The future prospects of Southland are indeed bright. It is a district teeming with unfound wealth, with a climate temperate, invigorating, and healthy. With land available for and awaiting the plough, it needs nothing but stout hearts and willing hands. A steady and constant stream of men and women can find in Southland the means of obtaining a comfortable livlihood, whatever their state may be, with the almost certain prospect of gaming before old age has been reached, a moderate independence, and with the knowledge that they are assisting to build up in this South Pacific indeed a greater Britain.

Mr Scandrett having resumed his seat amidst applause,

The President said it was now open to any member to discuss the valuable and interesting paper which they had just heard.

Mr Hanan, remarked that in his opinion Mr Scandrett had spoken more favourably of the Nightcaps coal than its merits deserved. He had experimented with it, and found that it would not give enough heat to fuse iron. It was principally useful for domestic purposes. The coal was of recent formation, and had been upheaved before it had matured into the anthracite coal used for smelting iron. As to the timber supply, he supposed that Seaward Bush would only last some years longer, and then where would we look for more? There were about thirty sawmills at work within a certain radius, and the timber would soon be exhausted. Like the Prodigal Son, we were spending our fortune without providing for the future. In time we would have to fall back on the Longwood Ranges, and then Riverton would go ahead, and Invercargill in a measure be depressed, as the timber would be shipped from the former place.

Mr Carswell said that Mr Scandrett was to be congratulated on the subject he had chosen. It was scarcely to be expected that he should agree with all that had been advanced, but it had been made plain to everyone present that in the words of a writer who had been quoted it was not a question of what the settlers could do, but rather what might they not do, so varied were the resources of the land in which they lived. Under these circumstances there was room for surprise that they had not been more prosperous, and, in his opinion, one reason for that was because they had not depended sufficiently on their own resources.

Mr Bailey also joined in congratulating Mr Seandrett on the lucid manner in which he had dealt with the subject. He did not intend to traverse any of the statements made, but there were many points that Mr Scandrett could not be expected to find room for in a paper. Here was one that might be worthy of consideration. The establishment of the industries and the development of the resources mentioned would require a great deal of capital and united effort. There were in the district a large number of small settlors, especially under the deferred payment system. The Land Board had lately rather encouraged the taking up of five-acre allotments, and the question might be asked— "What were settlers of that kind to do? In many cases their holdings were too far from town to enable them to undertake daily work in it; the areas were not sufficient for successful farming, and were also too numerous to admit of market gardening being carried on. What opening was there for them? He thought that if the matter were considered there were many valuable industries which they might take up. There was bee keeping, for example. Honey at Homo was worth from 3d to 14d per lb, according to quality. This year it was a drug in the local market, and could have been bought in a quantity for 3d per lb. The reason was that there was too much for local consumption, and yet not enough for export. If a large quantity were produced it would bring a higher price, because it would be bought for export. The same remark would apply to beeswax, which was worth three times as much m the Home market as it was here. Another tiling was the growing of herbs. America exported to all parts of the world an immense quantity of herbs and medicinal roots and barks, all grown on small holdings. The climate of Southland was well suited for such an industry, and there were many sheltered localities in the district that could be utilised in the way mentioned. A good deal might be done in the way of encouraging such an industry by the formation of a society, which could introduce seeds in to the district and furnish them to small holders. By that means the subject would be brought before the public.

Mr Denniston, after referring to the able way in which Mr Scandrett had treated a very important subject, said that with Mr Carswell, who had anticipated him on that point, he would ask—How was it that, with such a district, they were not better off than they were? That matter required elucidation, and might perhaps be dealt with in another paper.

Mr Kingsland, who was equally well pleased with the paper, thought that they had more reason to congratulate them- solves on being as well off as they were, rather than to fool dissatisfied at not being more prosperous. After giving interesting particulars about the value of some New Zealand barks for tanning purposes, Mr Kings-land said that Mr Hanan had somewhat under-valued the coal products of the district. He had only looked at them from one point of view. The experiments now being made by the Gas Engineer gave the following results:—A ton of Nightcaps coal gave 7900 feet of 16-candle gas at a cost of 20s perton

delivered at the works. A ton of Newcastle yielded 9000 feet of 15-candle gas at a cost of 34s. So far, results were in favour of the Nightcaps coal for gas-making, provided the cost of purifying could be kept down to the price of Newcastle coal. In the case of the Nightcaps coal, however, there was no residual product in the shape of coal tar, which was a loss of 3s per ton of coals, nor was there any coke. The coal gave a standard of light slightly above the London standard; 16-candle gas was the standard there, and the Nightcaps coal gave 16 seven-tenths. From West Coast coal they obtained 19-candle gas, but that, as would be seen, was a much higher standard than they had in London. For gas-making alone it might, therefore, be anticipated that the Nightcaps coal would, in the end, be of value.

Mr J. T. Martin said he was surprised at the quantity of information the paper contained. He hoped that before long energetic steps would be taken to establish a woollen factory. It would find employment for the youth of both sexes. The number of persons employed by the Kaiapoi Factory, including the clothing department, was fully 600, and the establishment of similar industries here would be a lasting benefit to the district.

The Chairman said that in 1841 Mr Tuckett, Chief Surveyor of the New Zealand Land Company, was sent to Southland to report upon its applicability for settling the Free Church settlers. He reported that the place was utterly unfit for habitation—that it was, in fact, a mere bog. That was a great mistake, and it was astounding that a man in his position should hare made it. In consequence of it the Free Church settlers were not sent here, but to Dunedin. Had they come here, he believed Invercargill would have now been a town of 60,000 inhabitants, with its shipping near the railway station. Why they had not been so prosperous in the past was, in his opnion, due to the fact that Southland was not formed into a Province under the first Constitution.

Mr Scandrett, in replying, expressed his gratification at the manner in which his paper had been received. The question had been asked—Why are we not more prosperous? His reply was, firstly—That the present depression was not local, but general; and, secondly, we want more people. By and bye they might hope to have more influence as a district. At present large centres exerted more influence than small ones, to the detriment of the latter. For example, the people of Southland, after years of agitation, had only succeeded in getting a little under £5000 towards the construction of the Seaward Bush Railway, which would be of great benefit to the district. In Dunedin recently an outcry was made because there was some risk to carts in crossing the railway line to get on to one of the wharves. The result was that tenders were almost immediately called for the construction of a bridge over a street, at a cost of £25,000, whereas a caretaker would have been all that was necessary, and the money could have been laid out on reproductive works. In the same way Bluff Harbor was at first ignored in the proposal to subsidise direct steamships to the colony. But time would work a reformation, and Southland yet exert its proper influence in the councils of the State.

Vignette

Henry and John Feldwick, General Mechine Printers, Dee Street, Invercargill.

By WALTER L. BULLER, C.M.G., Sc.D., F.R.S.

[*Read before the Wellington Philosophical Society*, 3*rd September*, 1881.]

THE capture of a specimen of the rare *Notornis mantelli* in the South Island, is an event of sufficient importance to warrant a special memoir in our "Transactions," and I have therefore much pleasure, at the request of our president, in bringing before you this evening all the information I have been able to collect on the subject.

I may here mention—and do so with regret—that the specimen which I am about to describe is no longer in the colony, having been despatched by the Waitangi about three weeks ago for sale in England.

Every effort was made by Dr. Hector and others to retain possession of it for one of our local Museums, and immediately before its departure from our shores I wrote myself to the owner offering him fifty pounds for the skin, but to no purpose.

It will be interesting to watch its ultimate fate; but as there are already two fine examples in the National Collection, it will most probably find its way into one of the Continental or American Museums. Although we have failed to detain the prize, there is every reason to believe that the species still survives in the land, and that it will yet be added to the type collection in the Colonial Museum. It is a curious fact, illustrating the wide range of a bird supposed to be nearly extinct, that the three known examples have been obtained at localities nearly a hundred miles apart from each other, and over an interval of thirty-five years. As the species belongs to a gregarious family, and as the general character of its habitat is rough and inaccessible in the extreme, I think it may be fairly inferred that many yet survive to reward the future search of the Southern naturalist.

The two fine specimens now in the British Museum (supposed to be male and female) were obtained through the exertions of our former president, the Hon. Walter Mantell, after whom the bird was named. The first of these was captured alive in 1849 by a party of sealers at Duck Cove, on Resolution Island, Dusky Sound. "Perceiving the trail of a large and unknown bird on the snow, with which the ground was covered, they followed the footprints till they obtained a sight of the *Notornis*, which their dogs instantly pursued, and after a

long chase caught alive. It ran with great speed, and upon being captured uttered loud screams, and fought and struggled violently. It was kept alive three or four days on board the schooner and then killed, and the body roasted and eaten by the crew, each partaking of the dainty, which was declared to be delicious." The second of Mr. Mantell's specimens was caught by the Maoris on Secretary Island, opposite to Deas Cove, Thompson Sound. This also was eaten, but fortunately the skin was preserved and sent to England to join the other, and (as already mentioned in my "Birds of New Zealand") these members of an expiring race, "having been carefully mounted by Mr. Bartlett, now stand side by side in the National Collection of Great Britain, and, like the remains of the Dodo in the adjoining case, daily attract the attention of thousands of eager visitors."

The third specimen to which I have specially to refer this evening, was obtained last year, on what are called the "Bare-patch Plains," on the eastern side of To Anau Lake. The circumstances of the capture were thus narrated to me by Captain Hankinson, on whose property it occurred. A man who was engaged "rabbiting" on the run, had camped on the Maruroa Flat, not far from the homestead. One day his dogs ran down a large bird, and on coming up he found it alive and unharmed. Taking the bird from the dogs he deliberately killed it, took it to his tent and hung it up to the ridge pole. On the following day the station manager (Mr. J. Connor), in making his customary round, visited the camp. The rabbiter had just struck his tent, and calling the manager's attention to the dead bird, still suspended to the ridge pole, told him he might have it. Mr. Connor, who was intelligent enough to suspect that he had found a *Notornis*, at once accepted the offer and took the bird home to the station, where he carefully and very successfully skinned it, preserving also all the bones of the body.

The weather had been exceptionally severe, and it is supposed that this was how the *Notornis* came to be found on the flats, having been driven down from the high country. The man who caught it said that it seemed quite tame, whereas Mantell's bird (as already mentioned) made a vigorous resistance on being taken.

Professor Parker having undertaken to describe the skeleton for our "Transactions," Dr. Hector invited me to undertake the same duty in regard to the skin, in order that, in default of the specimen itself, we might have on record in the colony as complete a monograph as possible of this interesting bird. I cheerfully undertook the task, and made a visit to Dunedin specially for this purpose.

On being introduced to this *rara avis* I experienced again the old charm that always came over me when gazing upon the two examples in the British Museum—the lingering representatives of a race co-existent in this land with the colossal Moa! Then, retiring to the Museum Library, I shut myself in with *Notornis*, handled my specimen with the loving tenderness of a true naturalist, sketched and measured its various parts, and made a minute description of its plumage.

Like many other New Zealand forms of an earlier period, the *Notornis* is the gigantic prototype of a well known genus of Swamp Hens. It is, in fact, to all appearance a huge Pukeko *(Porphyrio)*, with feeble or aborted wings, and abbreviated toes, the feet resembling those of *Tribonyx*—a bird incapable of flight, but admirably adapted for running. Similar, no doubt, was the relation borne by the powerful *Aptornis* to our present Woodhen *(Ocydromus)*; but in that case the prototype has disappeared, leaving only its fossil bones for the study of the scientist, and its place in nature to be filled by its existing diminutive representatives.

The interest attaching to *Notornis* has been greatly enhanced by the discovery that the white Swamp Hen, of Norfolk Island, belongs to the same genus, as this has an important bearing on the study of geographic distribution.

The characters of the genus *Notornis* were first determined by Professor Owen, in 1848, from certain fossil remains collected by Mr. Mantell in the North Island of New Zealand, and consisting of the skull, beaks, humerus, sternum, and other parts of the skeleton of a large brevipennate Bail. The sagacity with which the learned professor had interpreted these bones, and the absolute correctness of his prevision, were exemplified in the discovery which enabled Mr. Gould, in 1850, to communicate to the Zoological Society the complete generic characters of the bird, already known to science as *Notornis mantelli*, Owen. In illustration of these, Mr. Gould furnished to the society a coloured sketch of the head of *Notornis*, in his usual artistic style; and at a later period he published, in the supplement to his "Birds of Australia," a full-sized drawing of the bird. These plates are very beautiful, but on a close comparison with the specimen to which these notes more especially refer, I find that some of the minor features have been overlooked by the artist, or sacrificed to pictorial effect. In the following descriptive notes, I have, therefore, deemed it best to record the characters (generic as well as specific) with some minuteness of detail.

The bill is somewhat shorter than the head, greatly compressed on the sides, and much arched above, the culmen having a convex or rounded aspect, with a uniform width of ? of an inch from above the nostrils to within half an inch of the tip, when it rapidly diminishes, terminating in a rounded point. Where it merges into the frontal shield, the culmen is ? of an inch in width. Gould has somewhat exaggerated in his drawings the angle of declination towards the corners of the mouth, also the serrated edge of the upper mandible. In this specimen there is only the slightest indication of pectination. The cutting edges of both mandibles are sharp to the touch. The horny covering of the bill rises on the forehead to a line with the posterior angle of the eye,

forming a depressed frontal shield (not arched as in the drawing). Nostrils oval, placed in a depression near the base of the bill, and forming an oblique opening, nearly twice as large as shown in Gould's sketch of the head (Proc. Zool. Soc.). Wings short, rounded, and slightly concave; ample in appearance, but useless for purposes of flight; first quill shortest, second half an inch shorter than third; third fourth and fifth longest and about equal; sixth scarcely shorter than fifth. On examining the wing-feathers they are found to be feeble and pliant, the outer webs being almost as broad as the inner. The tail-feathers are likewise soft and pliant, with disunited filaments, much worn at the tips. The tarsi are long, strong, and well proportioned to the bird; longer than the toes (exclusive of claws), rounded in form, and armed in front with fourteen more or less broad, regular, transverse scutellæ, forming an effective shield; on the middle toe there are twenty-three transverse scales, all very regular, but narrowed at the joints; on the inner toe fifteen, and on the outer toe twenty-one. On the hind too there are five scales. The claws are strong, thick, not much arched, rather sharp on the edges, but with blunted points, especially on the hind toe. The palate is deeply grooved.

Head and upper part of neck very dark blue, changing according to the light into brownish-black on the crown and nape, brighter on the cheeks and sides, and passing into dark purplish blue on the lower part of the neck; the whole of the back, rump, and upper tail-coverts rich olive-green, varied more or less, and particularly on the shoulders, with dull verditer green, the feathers shading off into that colour at the tips, the general olive hue, however, predominating towards the sides of the body; foreneck, breast, sides of the body, and inner portion of flanks beautiful purplish-blue; the lengthened pectoral plumes which overlap the sides and the outer portion of flanks vivid purplish-blue, mixed and varied, especially on the former, with verditer green; abdomen, thighs, and vent dull indigo or bluish-black, more or less mixed with brown; under tail-coverts pure white. The general upper surface of the wings is a rich mixture of blue and verditer green, very difficult to express exactly in words, the combination having something of the effect, in certain lights, of *lapis lazuli*.

On a close examination of the larger coverts it is found that they are marked transversely with numerous delicate rays of a darker purplish blue, adding much to the beauty of the plumage. On the lesser coverts this rayed character although present is less conspicuous, and the olive hue is more pronounced, while on the scapulars it becomes predominant, resembling the plumage of the back. The outer edges of the wings and the tertial plumes very rich purplish-blue or obscurely rayed with green. The outer primaries are blue on their outer webs, but this rapidly changes to dull sea-green, which colour prevails on both webs of the secondaries, only washed with a brighter tint on the outer vane. This colour deepens again into olive on the inner secondaries and their coverts, thus harmonizing with the plumage of the back. The under surface of the quills is uniform blackish-brown, and the shafts are white towards the base; the axillary plumes and the larger inner coverts are of the same colour tipped on their outer aspect with blue, and the smaller coverts, which are of very soft texture, are entirely blue. The tail-feathers are dark olive mixed with verditer green on the upper surface and changing to dull olive-brown, with lighter shafts, on their under surface.

The bill has lost its original colour through being dried. On the frontal plate and along the basal edges of both mandibles it appears to have been dark red, fading outwards. The culmen still has traces of its original pinky colour; but the sides of both mandibles, in the present condition of the specimen, are reddish horn colour, fading to whitish horn along the cutting edges. The tarsi and toes appear to have been originally light-red, having now faded to a transparent reddish-brown, paler on the toes. Claws dull brown, lighter towards the tips.

The texture and general appearance of the plumage on the head, neck, and under parts generally, is very similar to that of the Pukeko *(Porphyria melanotics)*, although the latter bird lacks the produced bright-coloured pectoral plumes which overlap the sides of the body, under the wings, in *Notornis*. The plumage of the back is very long and thick, but at the same time soft and somewhat silky to the touch, being evidently adapted to haunts where the bird is constantly subject to drippings from wet herbage. On moving this plumage with the hand it is found that the basal portion, comprising more than two-thirds of the feathers, is of a uniform blackish-brown, whereas the basal plumage on the other parts of the body is dark grey. The plumage of the head and neck is short and close, as in *Porphyrio*, the feathers having a soft texture. The whole of the upper surface has a slight sheen upon it (amounting almost to a glint on the tips of the shoulder-plumage), and the bright hues of colour on the back and wings change slightly under different lights. The plumage covering the flanks and overlapping the thighs is dense and long, while its brilliant blue and green colours contrast strongly with the olive plumage of the back and rump. When looked at in front, with the wings closed in against the body, the purplish vivid blue already described is very conspicuous. The carpal spur is shaped like the claw of the hind toe, but is less arched. It is nearly one-eighth of an inch thick at the base, and is dark brown, fading into horn-colour at the tip.

Measurements.—Approximate length (measuring from tip of bill, following its curvature, and from the forehead to the end of the tail) 24.5 inches wing, from flexure, 10; from humerus to flexure 3.75; carpal spur .4; tail (to extreme tips) 4.75; bare part of tibia 1; tarsus 3.5; middle toe 3, its claw 1.1; inner toe 2.2, its claw 1; outer toe 2.4, its claw .8; hind toe .75, its claw .75. Bill, from posterior edge of frontal plate to tip of upper

mandible, 3.4; from gape along edge of upper mandible 2.5; along edge of lower mandible 2.25; greatest width of bill, measuring across from the summit of the arch, or culmen, to the junction of the rami, 2.

Observations.—Taken altogether, the specimen is a very fine one—probably an adult female. The plumage is somewhat worn, the primaries and tail-feathers having their webs more or less abraded on their outer edges and tips. The edges and sides of the mandibles are considerably worn, indicating a fully adult state. The claws of the toes, and particularly that of the hind toe, appear to be much blunted by use. The colours of the plumage generally are brighter than in the supposed female specimen in the British Museum, but they are, I think, less brilliant on the whole than in the British Museum male: notably there is an entire absence of the well defined terminal margins of verditer green on the wing-coverts which form crescentic bands in the type specimen. There are, however, as mentioned above, different blending shades of green and blue on the plumage of the wings, which impart to it a very beautiful appearance. My recollection of the # specimen in the British Museum collection is that it has these crescentic markings far less conspicuous than in the male.

Note.—There appears to have been originally very little colour in the beak except on and below the frontal shield and along the basal edges of both mandibles. The legs are in much the same condition as that presented by the legs in a dried Pukeko skin, the colours having faded out. But there is enough colour left in the tarsi to show that the legs and feet were originally, as described above, a light (probably pinkish) red. The skin is much stretched by unskilful treatment after being removed from the body; but I have allowed for the stretching in taking the measurements given above.

I remarked to Professor Parker, on first taking up the specimen, that the legs appeared to be more attenuated than in the British Museum examples, and the measurements which I afterwards made, as given above, prove that the toes are somewhat longer proportionately to the size of the bird, which is altogether slightly larger than the type specimen described in my "Birds of New Zealand." The frontal shield is, however, somewhat smaller, being just one inch across in its widest part, and ascending barely half an inch from the base of the culmen. It has a corrugated, shrivelled appearance in the dried specimen, and from the sides of the bill, at its base, the cuticle is inclined to peel off. The skin (in the dried state) is very tough, having the appearance and consistency of fine leather.

Hab.—South-west portion of South Island. As already mentioned the first recorded specimen (in 1849) was obtained on Resolution Island, the second, nearly three years later, on Secretary Island, in Thompson Sound, and the third, which has formed the subject of this paper (in December, 1879), on the eastern side of Te Anau Lake. Taking these three localities as marking the points of a triangle describing the ascertained limits of its occurrence, we have before us the present range of *Notornis* over a considerable area of very broken and rugged country. As its fossil remains testify, its ancient range was far more extensive, including the North Island, and in prehistoric times probably reaching much further.

II.—Zoology.

ART. XIX.—*Notes on the Ornithology of New Zealand*. By WALTER L. BULLER, C.M.G., Sc.D., F.L.S.

[*Read before the Wellington Philosophical Society*, 1*st December*, 1877.]

FOLLOWING a plan which I have pursued for some years, I beg to lay before the Society a budget of notes on various species of New Zealand birds, without any attempt at systematic arrangement. As natural history is made up chiefly of facts and observations, every recorded note is an additional contribution, however small, to the general fund. Facts, in themselves trivial, are often found to assume an importance in relation to other facts; and a random note sometimes supplies a missing link in the carefully elaborated chain of the systematic philosopher.

It will be seen that in the following notes I have embodied, sometimes in my own language and sometimes in his, the observations of Captain Gilbert Mair, F.L.S., who, during a long residence on the East Coast, has paid special attention to the native birds inhabiting that part of the country. In addition to habits of careful observation, he possesses a good knowledge of the birds themselves, and this adds very much to the value of his statements.

Before proceeding to my own notes, I desire to call attention to the following passage in a very interesting

paper by Mr. W. Colenso, F.L.S., published in the "The Tasmanian Journal of Natural Science," as far back as April, 1845, which I have only lately had an opportunity of reading:— "A little below Ngaruawahie (in the Waikato district) we met a man in a canoe with a live and elegant specimen of the genus *Fulica*. I hailed the man and purchased the bird, which he had recently snared, for a little tobacco. It was a most graceful creature, and, as far as I am aware, an entirely new and undescribed species. Its general colour was dark, almost black; head grey and without a frontal shield; fore-neck and breast ferruginous red; wings barred with white; bill produced and sharp; feet and legs glossy olive; toes beautifully and largely festooned at the edges; eye light-coloured and very animated. It was very fierce and never ceased attempting to bite at everything within its reach. I kept it until we landed, intending to preserve it, but as it was late, and neither material at hand nor time to spare, and the animal too, looking so very lovely that I could not make up my mind to put it to death, I let it go; it swam, dived, and disappeared. From its not possessing a frontal shield on the forehead (which is one of the principal generic marks of the Linn, genus *Fulica*) it may possibly hereafter be considered as a type of a new genus, serving to connect the genera *Fulica* and *Rallus*. Not a doubt, however, in my opinion can exist, as to its being naturally allied in habit and affinity to the *Fulicæ*; I have therefore named it *Fulica novæ-zcalandiv*. In size it was somewhat less than our European species, *F. arua."*

The bird so well described by Mr. Colenso is evidently quite distinct from *Fulica australis*, the only species of coot known to inhabit Australia, and as it has never, so far as I am aware, been heard of since this capture, more than thirty years ago, we may fairly conclude that it is one of the ornithic forms that have become extinct within the memory of man.

NESTOR MERIDIONALIS, *Gray*.—Kaka Parrot.

This bird is very abundant in the Urewera country, and during the short season the rata is in bloom the whole Maori population, old and young, are out kaka-hunting. An expert bird-catcher will sometimes bag as many as 300 in the course of a day; and at Ruatahuna and Mangapohatu alone it is said that from 10,000 to 12,000 of these birds are killed during a good rata season, which occurs about every three years.

There are several modes adopted for catching the kaka, but the commonest and most successful is by means of a trained *mokai* or tame decoy, the wild birds being attracted to artificial perches, skilfully arranged around the concealed trapper, who has simply to pull a string and the screaming kaka is secured by the leg, as many as three or four being often taken at the same moment. At the close of each day the dead birds are buried, and when a sufficient number have been collected they are unearthed, stripped of their feathers, fried in their own fat, and potted in calabashes for winter use, or for presents to neighbouring tribes. The perches used for kaka-trapping are often elaborately carved and illuminated with *paua* shell.

EUDYNAMYS TAITENSIS, *Gray*.—Long-tailed Cuckoo.

During its sojourn with us this species is generally met with singly or in pairs, but Captain Mair gives the following interesting particulars of a summer flight:—"Passing down the Hurukareao river, in the Urewera country, during the intensely hot weather of February, 1872, I was astonished at the number of koheperoa that coursed about overhead. During the three days that we were making the passage, I saw some hundreds of them, swarming about in the air like large dragon-flies, as many as twenty or thirty of them being sometimes associated together. The loud clamour of their notes became at length quite oppressive. There was much dead timber on the banks of the river, and it appeared to me that the birds were feasting on the large brown cicada. This is the only occasion on which I have observed this species consorting as it were in parties."

CHRYSOCOCCYX LUCIDUS, *Gould*.—Shining Cuckoo.

Respecting our little migratory cuckoo, Captain Mair furnishes the following notes:—"Speaking from ten years' observation of this bird in the Tauranga district, I may state that it never sings after the middle of February and seldom after the beginning of that month. As late as the end of March or beginning of April, during several successive years, I have met with these birds in the Mangorewa forest between Tauranga and Rotorua, but never heard them utter a note at this season. I have seen numbers of them perched in silence on the branches of the poporo *(Solatium nigrum)*, always in full feather, but absolutely songless. This I regard as a very curious fact. On the subject of their parasitic habit of breeding, I may add that on two occasions I have seen the young cuckoo fed by the grey warbler—a bird considerably its inferior in size; and I can further attest, from personal observation, that the same little bird performs the like parental office for the young of the koheperoa, or long-tailed cuckoo, as sketched in Dr. Buller's 'Birds of New Zealand.' "

POGONORNIS CINCTA, *Gray*.—Stitch-bird.

Captain Mair informs me that this handsome bird is still plentiful on the West Coast between Raglan and Waikato Heads, also in the ranges behind the Wangape Lake in the Lower Waikato.

It was formerly comparatively abundant in the wooded hills around Wellington and flanking the Hutt valley, but for some years past not a specimen has been obtained.

ANTHUS NOVÆ-ZEALANDIÆ, *Gray*.—New Zealand Pipit.

In former papers I have mentioned the frequent occurrence of albino ground-larks, and commented on the

remarkable tendency generally to albinism in many other species of bird in New Zealand—a fact not easily accounted for in a temperate and equable climate like ours. This abnormal feature appears to be extending itself to the introduced birds, and the following newspaper clipping furnishes an instance;—

"As an ornithological curiosity an up-country paper mentions that a gentleman residing near the Wairarapa Lake has noticed on his run two English larks, the one being puro white and the other as yellow as a canary."

RHITIDURA FULIGINOSA, *Buller*.—Black Fantail.

Since my last notice of this species, three more instances of its occurrence in the North Island have come to my knowledge.

Major Mair reports another example from the Pirongia ranges in the Waikato;

Vide "Trans. N.Z. lust.," IX, p. 330,

a second has been met with in the bush near Major Marshall's (Upper Rangitikei); and a third is reported from Auckland. Of the last-mentioned Mr. T. F. Cheeseman, the Curator of the Auckland Museum, writes me:—"You will be interested to hear that a solitary individual of the black fantail has been repeatedly seen near Auckland this winter. It was first noticed by Mr. James Baker in his garden at Remuera; afterwards it visited Mr. Hay's nursery garden where it remained for some weeks; and it has since been noticed about several of the residences at Remuera. I was fortunate enough to see it one evening when walking home, and can consequently vouch for its being the South Island species. Its occurrence so far to the north is certainly very remarkable."

CARPOPHAGA NOVÆ-ZEALANDLÆ, *Gray*.—Wood-pigeon.

At the Rev. Mr. Chapman's old mission station at Te Ngae (Rotorua), formed in 1835, and now much out of repair and overgrown, there are several hundred acres of sweet-briars, run wild and presenting quite an impenetrable thicket. During the autumn months, when the red berries of the briars are fully ripe, large numbers of our wood-pigeons resort to these grounds to feed on this fruit, and at this season become exceedingly fat.

In the Rev. Mr. Spencer's fine old garden at Tarawera, where well-grown specimens of English oak, elm, and walnut mingle in rich profusion with almost every kind of native tree and shrub, a pair of these birds some time ago took up their abode and bred for two successive years, at a spot not fifty feet from the reverend pastor's study windows. And they would doubtless have continued to breed in this quiet retreat had not one of the Maori school-boys, anxious to try his fowling-piece and wholly unmindful of the occasion, shot both birds during the breeding season, leaving a pair of callow young to perish miserably in their nest.

TRINGA CANUTUS, *Linn*.—The Knot.

Mr. Cheeseman, of Auckland, sends me the following note, under date August 14:—"Has the knot *(Tringa canutus)* been previously recorded from the North Island? My brother shot a specimen (in winter plumage) in Hobson Bay a few months ago, and the skin is now in the Museum. I believe that I have frequently seen it on the extensive mud flats near the mouth of the Thames river."

This is the first authentic record of this species in the North Island; but Captain Mair has described to me a bird found associating, in considerable numbers, with the kuaka and dottrel on the East Coast, which I have no doubt is the same. It has not, however, been met with yet on the Wellington coasts; and the only specimen in the Colonial Museum is one which I received from Dr. von Haast some years ago, as a novelty from the south.

LIMOSA NOVÆ-ZEALANDLÆ, *Gray*.—Godwit.

Captain Mair has contributed something more to the history of this migratory wanderer. In my account of the species

"Birds of New Zealand," pp. 199, 200.

I have stated that our godwit spends a portion of the year in Siberia, and visits in the course of its annual migration the islands of the Indian Archipelago, Polynesia, Australia, and New Zealand. Von Middendorff, who met with these birds in great numbers in Northern Siberia (74–75° N. lat.), states that they appeared there on the 3rd June, and left again in the beginning of August. In the months of September and April, Swinhoe observed migratory flocks on the coast of Formosa; and during the winter months he met with the species again still further south. Von Middendorff found it also in summer on the south coast of the Sea of Ochotsk, although it did not appear to breed there; and it has likewise been observed in China, Japan, Java, Celebes, Timor, Norfolk Island, and the New Hebrides. I have already described the manner in which they take their departure from this country, at the North Cape, towards the end of March or beginning of April. Rising from the beach in a long line and with much clamour, they form into a broad semi-circle, deployed forwards, and, mounting high in the air, generally take a course due north. Sometimes they rise in a confused manner, and, after circling about at a considerable height in the air, return to the beach to reform, as it were, their ranks, and then make a fresh start on their distant pilgrimage. The departure from any fixed locality usually begins on almost the exact date year after year; and for a week or ten days after the migration has commenced fresh parties are constantly on the wing, the flight generally taking place just after sunset. The main body fly in silence, but the straggling birds cry out at intervals, while endeavouring to overtake the flock in advance. Near the North Cape, Captain Mair has observed them flying northward in tens of thousands, and always in considerable flocks, numbering from

700 to 1,200 birds in each, and the wonder is where they all come from. During the period mentioned, this excitement of departure is unabated—flocks forming and following each other in perpetual succession. Though the greater number of the birds migrate, some remain with us during the winter, and it is not unusual, even in mid-winter, to see a flock of several hundred consorting together on the sand-banks. It has been remarked that at this season they are much tamer and more approachable than at other times. On their return to this country they do not make a sudden appearance, but gradually become more plentiful after the first week in November, and about Christmas they are in full force again all along our sea shore. Capt. Mair has sometimes observed a party of stragglers in Sulphur Bay, in the Rotorua Lake (about forty miles from the sea coast), no doubt brought inland by the easterly gales, which sometimes prevail for a considerable time without intermission. On the Tauranga coast he has obtained large "bags" during the shooting season; and on one occasion, at Cemetery Point, killed ninety-seven at a single shot with a heavy charge of No. 5 from an ordinary fowling-piece. This will give some idea of their numbers, and of the close manner in which they were packed together. Thousands were crowding upon each other on an insular sand-bank, and numbers more were hovering overhead in the vain attempt to find a footing among their fellows. As he was "shooting for the pot," he concealed himself with floating kelp, and crawled up under water till the birds were within easy range.

The natives catch large numbers of them by spreading flax snares horizontally on manuka sticks twelve or fifteen feet high, and arranged in the following manner:—A number of stakes are driven into the ground at equal distances so as to cover the area of the customary resting-place. A perfect network of flax-loops or running nooses, about twelve or fifteen inches in diameter, are then spread or hung in such a way as to form a canopy or roof supported by the stakes. The birds on assembling in the evening fly low and take up their position on the resting-ground to wait for the ebb of the tide. At this conjuncture the natives spring out from their concealment with lighted torches. The birds at once rise vertically, in confusion and alarm, and large numbers become entangled and caught in the running loops, sometimes as many as 200 being captured at one time in snares covering a space of twenty by forty yards. These snares are only set on calm and dark nights, for the obvious reasons that, if there was any wind, the loops would become disarranged, and that on moonlight nights the birds would see the nets and avoid them. Sometimes during wet easterly weather in summer the feathers of these birds become so saturated that they are unable to fly. The natives take advantage of this and capture large numbers of them by running them down.

From what has been said, it may be inferred that they are esteemed good eating by both settlers and Maoris. The latter always cook the bird unopened, and devour the contents of the stomach with a relish. When very fat they are potted in the orthodox fashion and "calabashed" for future use.

I have never met with a native who could tell me anything about the breeding habits of the godwit, and it has become a proverb amongst them: "Who has seen the nest of the Kuaka?" Nor has the egg of this species yet been met with in any of the other countries which it is known to visit.

LIMNOCINCLUS ACUMINATUS, *Horsf.*—Sandpiper.

Dr. von Haast having allowed me to examine a specimen of this bird killed at Lake Ellesmere in the month of December, I have been able to add the following description to my former notes on this interesting addition to our avifauna:—

Crown of the head and lores dull rufous; each feather centred with brown; nape, hindneck, and the whole of the mantle brownish-grey, slightly tinged with rufous, each feather largely centred with dark brown, which gradually fades into grey; lower part of back, rump, and upper tail-coverts blackish-brown, slightly margined with rufous; wing feathers dark brown with white shafts, the superior coverts largely tipped, and the secondaries narrowly margined with white; small wing-coverts dull brown with greyish margins; tail feathers blackish-brown, with a narrow margin of fulvous white; hue over the eye, chin and throat white; sides of the head dark grey, speckled with brown; the whole of the foreneck fulvous grey speckled with brown, and more distinctly on the outer sides; breast, abdomen, and under tail-coverts fulvous white, the latter with a streak of brown down the shafts; sides of the body, axillary plumes, and inner lining of wings pure white; towards the outer edges of the wing mottled with brown. The outermost upper tail-coverts also are white, with a lanceolate streak of brown down the centre. Bill brown; legs and feet yellowish-olive. Length, 7 inches; wing from flexure, 5.15; tail, 2.15; bill along the ridge, .95, along the edge of lower mandible, 1.05; bare tibia, .5; tarsus, 1.1; middle too and claw, 1.2; hallux and claw, .3.

ARDETTA MACULATA, *Buller*.—Little Bittern.

All the hitherto recorded examples of the little bittern are from the South Island. But Mr. Colenso assures me that a live specimen was captured by the natives at Tauranga in the year 1836. It was in his possession alive for some time, and he afterwards sent the skin to the Linnean Society. The bird was quite new to the natives in that part of the country.

NYCTICORAX CALEDONICUS, *Steph*.—Night Heron.

The same informant, in the published article already quoted, supplies evidence of the occurrence of another

South Island visitant in this island also. The record (1845) is as follows:—"In crossing a very deep swamp, a beautiful bird, apparently of the crane kind, rose gracefully from the mud among the reeds and flew slowly past us; its under plumage was of a light yellow or ochre colour, with a dark brown upper plumage. None of my natives knew the bird, declaring they had never seen such an one before." It is evident that the bird here referred to is the Nankeen night-heron of Australia, already included among our occasional stragglers.

ANAS SUPERCILIOSA, *Gmel.*—Grey Duck.

In the Bay of Plenty district there are duck preserves which are a source of great profit to the natives and are jealously guarded by them. Rotomahana—a warm lake of little more than half a mile in length—is one of these. From October to February no canoes are permitted on this lake, and no fires are allowed to be lighted in the vicinity. Various kinds of duck breed here in great numbers. From feeding on the small green beetle and on the nahonaho, a stingless gnat which swarms in countless myriads over all the waters in the lake district, the birds become extremely fat; and during the moulting season, which extends over part of February and March, they are incapable of flight owing to the loss of their quills. The strict "tapu" which is enforced during the close season is now removed with great ceremony, and all the population, men, women, and children, start together on a duck-hunting expedition. The men with dogs in short leashes keep within the belt of manuka scrub along the margin of the lake; the women and children proceed [to the middle of the lake in canoes, then take to the water, and with great noise and splashing drive the frightened birds up into the bays or inlets, where they seek refuge in the scrub and sedges and are immediately pounced upon by the trained dogs which are still held in leash. The duck-hunter snatches the bird away from the dog, kills it noiselessly by biting it in the head, and then throws it behind him to be collected by a party of women who follow on foot for that purpose. In the season of 1867, seven thousand, it is said, were caught in this manner, in three days, on this lake alone. These were not all grey duck, but included also the black teal (or pochard), the shoveller, and the white-winged duck.

At the Bitter Lake (Rotokawa), in the Taupo district, they are caught in a similar manner. Those that escape the dogs are caught by snares set at night. The snares are placed along the margins of the lake and on the warm stones where the ducks are accustomed to congregate after dark.

At Rotoiti, Rotoehu, and Rotoma, as well as on other lakes in the Bay of Plenty district, Captain Mair has observed that the ducks at one season leave the waters and travel into the surrounding woods. This happens about March and therefore not during the breeding months. Probably they retire for more security during the seasonal moult; for although at other times these lakes fairly swarm with ducks, at this period they are quite deserted. In the woods, however, the dogs turn them up in all directions, He further says:—"It is interesting to watch the ducks feeding on the gnats and green beetles which float on the surface of the warm water, forming a thick scum. On this diet they are always in good condition. The beetles, I may mention, get shaken into the water from the overhanging scrub by the action of the winds, and the gnats appear to be killed by the sulphurous vapour that rises from the water, and are seen floating on the surface in countless millions."

As a rule the grey duck forms a nest of dry grass or flags, lined with feathers and down plucked from her own body, and selects a convenient situation on the ground—always well-concealed from view—sometimes at a considerable distance from the water. Occasionally, however, a more elevated site is fixed upon. On the famous Island of Motutaiko, in the Taupo Lake, there are some gigantic pohutukawa trees *(Metrosideros tomentosa)*. In the forked branches of these trees, some twenty or thirty feet above the surface of the water, the grey duck often builds her nest and hatches her young. The natives state that when the ducklings are ready to take to the water the old birds bring them down to the lake on their backs.

Hymenolæmus malacorhynchus, *Gray*.—Blue Duck.

Captain Mair informs me that the wio is plentiful in all the mountain streams in the Urewera country. "When marching with the native contingent in pursuit of Te Kooti, as many as forty or fifty were sometimes caught in the course of a day, some being taken by hand, and others knocked over with sticks or stones, so very tame and stupid were they. A pair which he obtained as very young birds at Maunga-pohatu lived in the Kaiteriria camp for two years, associating freely with the domestic ducks, and fairly establishing themselves in the cooking-hut. They were particularly fond of potato and rice, and would readily take food from the hand. Ultimately they took to the lake and disappeared.

LARUS SCOPULINUS, *Forst.*—Mackerel-Gull.

The following communication from Captain Mair (under date May 13) presents this well-known species in the new character of a fruit-eating bird:—"I was greatly surprised on the 1st instant at seeing swarms of the small white gull—tarapunga or akiaki of the natives—crowding on the angiangi trees *(Coprosma)* at the mouth of the Maketu River, eating the berries. They were so tame that I could have knocked them down with my walking-stick. I also saw them in great numbers in the corn-fields at Maketu, and again near Tauranga yesterday. I saw a, man ploughing up a grass-field; a flock of three or four hundred of these beautiful little creatures followed his furrow, the horses almost treading on them. They followed in the steps of the ploughman so closely that they seemed almost to settle between his feet. It was a scramble to see who could be first in the

furrow after the plough had passed on. A solitary stilt-plover or torea *(Himantopus)* stalked along among them, but at a more respectful distance from the ploughman."

The same correspondent, in connection with this species, has furnished me with another instance of the law of assimilative colouring in eggs for protective purposes. In December, 1875, he visited the Rurima Rocks, in the Bay of Plenty, and found large numbers of *Larus scopulinus* breeding there. In some localities the nests—roughly formed and lined with feathers—were placed in the thick masses of wild spinach or in the midst of "sand-fire." In all such cases he observed that the eggs which these nests contained were splashed over their entire surface with large green blotches, thus assimilating their colour to the surrounding vegetation; whilst other eggs (belonging to the same species), deposited on the white sand in the immediate vicinity, had a totally different appearance, being of a light stone-colour, and so marked as to harmonize exactly with the sandy surroundings.

STERCORARIUS PARASITICUS, *Linn.*—Buffon's Skua.

I have to exhibit to the Society another specimen of the skua, or plundering gull (in immature plumage), killed in Wellington harbour in the early part of the present year, and purchased by me from Mr. Liardet. This is the third recorded instance of the occurrence of this species in New Zealand.

See "Birds of N.Z.," p. 268; and "Trans. N.Z. Inst.," VII., p. 225,

PODICEPS CRISTATUS, *Lath.*—Crested Grebe.

I have never met with this species in the North Island, but Captain Mair informs me that he has on two occasions seen it in Waikaremoana Lake in the Urewera country, and once on the Waikareiti, another lake in the same vicinity.

PODICEPS RUFIPECTUS, *Gray.*—Dabchick.

The following is an interesting fact in connection with the local range of this little grebe which is almost incapable of flight:—

Mount Edgecumbe is a high volcatnic cone on the banks of the Rangitaiki River some fifteen miles from the sea. At the bottom of the now extinct crater there is a small pool of water about thirty yards across. In this pool Captain Mair, in 1868, observed three of these dabchicks disporting themselves in the water. Some months after the same number was seen again in the same place by Dr. Nesbitt and Dr. Manley, and again by another party of visitors a considerable time afterwards. There are lagoons at the foot of the mountain frequented by these birds; but the singular fact is that those inhabiting the basin must have climbed up the cone, which is thickly covered on the outside with dense scrubby vegetation, and then down the crater, which contains a heavy forest-growth right down to the edge of the pool.

Captain Mair states that the dabchick is very plentiful in the Hot Springs district, and that he has observed as many as a hundred together in Kaiteriria and Rotorua lakes. On their habits, he has furnished me with the following notes:—"In 1869 I was riding along the shores of Tikitapu Lake with H.R.H. the Duke of Edinburgh, when our attention was arrested by a pair of these birds with their young. We drew up and watched them for some time. Taking alarm at our approach, the female took her five young ones on her back and made several dives with them, coming up after each submersion at distances of ten yards or more. The young birds appeared to nestle under the feathers of the parent's back, and to hold on with their bills. In this manner they continued to dive till they were entirely out of sight, and H.R.H. appeared to be much interested in this singular performance."

ART. XX.—*Further Notes on the Ornithology of New Zealand*. By WALTER L. BULLER, C.M.G., Sc.D., F.L.S.

[*Read before the Wellington Philosophical Society*, 12*th January*, 1878.]

CIRCUS GOULDI, *Bonap.*—Harrier.

IN the "Birds of New Zealand," page 15, I have described a very beautiful albino specimen obtained by Mr. Goodall at Riwaka, and preserved in the Nelson Museum. During a visit to the Lake district last year I saw another, apparently very like it, hovering over the fern ridges that close in the intensely blue waters of Tikitapu. As he swooped down upon a rat or lizard in the fern, his under-parts appeared to be perfectly white, and the upper surface of the body and wings ashy.

HIERACIDEA FEROX, *Peale*.—Sparrow-hawk.

A pair of these birds bred for two successive seasons on a rocky crag at Niho-o-te-kiore. They guarded their nest with great vigilance, fiercely attacking all intruders.

I may mention that this species, unlike the generality of hawks (so far as I am aware), may be attracted by an imitation of its cry. Riding along alone one fine autumn evening through the country at the northern end of Lake Taupo on my way to Ohinemutu, I saw what appeared to be a sparrow-hawk come out of the bush at some distance and descend into an old or deserted Maori garden. By way of experiment I imitated the clamorous cry of this bird when on the wing; and in a few minutes the hawk (a fine young male) came sailing up to me and performed several circuits in the air immediately overhead, and then took up his station on the dry limb of a tree close by the road, where he remained till I was out of sight.

PLATYCERCUS NOVÆ-ZEALANDIÆ, *Sparrm.*—Reel-fronted Parrakeet.

The Hon. W. Fox, who has just returned from a trip through the Canterbury district, informs me that the farmers have suffered this season a visitation, tens of thousands of these birds having descended on their ripening crops of corn and proved almost as destructive as an army of locusts. It is difficult to account for these occasional irruptions in such numbers, in the case of a bird not otherwise plentiful.

STRINGOPS HABROPTILUS, *Gray*.—Owl Parrot.

Until within the last few years the kakapo abounded in the Urewera country, and the natives were accustomed to hunt them at night with dogs and torches. The Maori proverb, "Ka puru a putaihinu" relates to the former abundance of this bird. The natives say that the Kakapo is gregarious, and that when numbers of them congregated at night their noise could be heard to a considerable distance. Hence the application of the above proverb, which is used to denote the rumbling of distant thunder.

It is said that the kakapo is still abundant on the wooded ranges of the Kaimanawa, in the Taupo district.

HALCYON VAGANS, *Less.*—New Zealand Kingfisher.

Reverting to an old controversy between Captain Hutton and myself,

"The Ibis," Jan., 1874, "Trans. N.Z. Inst.," VI., p. 129

in which I maintained the piscivorous habits of our kingfisher, under certain conditions, I may add to the argument the following note lately received from Captain Mair:—"The kingfisher is found in all the mountain streams of the Urewera and Bay of Plenty districts. It subsists largely on small fresh-water fish (mohiwai of the natives), also on flies, moths, and beetles. Referring to your interesting account of its nesting habits in the 'Birds of New Zealand,' I may mention that I have found three or four pairs building in close association in a clay bank, and that on one occasion I counted ten pairs boring in the standing trunk of a dead and decaying rimu. I have never found more than five eggs in a nest."

ZOSTEROPS LATERALIS, *Reich.*—Silver-eye.

I have lately had an opportunity of examining a beautiful series of the nests of this species, and through all the variety of individual form and structure they preserve two essential features—namely, the large cuplike cavity with thin walls, and the admixture of long hairs in the lining material. I have already mentioned

"Trans. N.Z. Inst.," VIII., p. 183.

the circumstance of pigs' bristles being pressed into the service in a part of the country not much frequented by horses or cattle; and in one of the nests forming the above series, the proximity to civilization was proclaimed by a lining consisting of the flaxen hair from a child's doll!

The history of the first arrival of this pretty little bird in the North Island in 1856 is too familiar to need repeating. It was several years before it became acclimatized, but once fairly established amongst us, it has continued to increase and multiply, and now it disputes possession of our gardens and hedgerows with the introduced sparrows and finches, and swarms all over the country. In the Bay of Plenty district it is said to be particularly plentiful, so much so as to form an article of food to the natives. They are in season in the months of March and April, and are then collected in large numbers, singed on a bush fire to take the feathers off, and forthwith converted into *huahua* and potted in calabashes. The catching is effected in a very primitive way. The birds have their favourite trees upon which they are accustomed to congregate. Selecting one of these, the bird-catcher clears an open space in the boughs and puts up several straight horizontal perches, under which he sits with a long supple wand in his hand. He emits a low twittering note in imitation of the birds' and, responding to the call, they cluster on the perches, filling them from end to end. The wand is switched along the perch, bringing dozens down together, and a boy on the ground below picks up the stunned birds as they fall. Captain Mair, when visiting Kuatahuna on one occasion, had brought to him, by two Urewera lads, a basket containing some five or sis hundred of these little birds which had been killed in the manner described.

In front of the Rev. Mr. Spencer's house at Tarawera, in a hedge of *Laurustinus*, scarcely six yards from the door, upwards of twenty nests of *Zoster* ops were found at one time, each containing from three to five eggs (generally the former) of a lovely blue colour. Usually, however, these birds do not breed in communities but scatter themselves in the nesting-season.

Myiomoira toitoi, *Reich.*—Pied Tit.

This familiar little bird, the "Tomtit" of the colonists, is far less plentiful than it formerly was in our fields and gardens. There seems no reason to fear, however, that the species is dying out, for in the *Fayus* forests of

the interior I have found it extremely plentiful. In the woods at the foot of Ruapehu and neighbouring high lands, where, save the occasional twitter of small birds in the branches, all is silent as the grave, this pretty little creature is always to be met with. It flits noiselessly from one tree to another, then descends to the ground, and in a few instants reappears on its perch, flirting its tail upwards, and emitting at intervals a soft, trilling note of exquisite sweetness. Destitute of animal life as these sub-alpine woods undoubtedly are, they are not without their attractions. Owing to their high elevation vapour-clouds are continually hanging over them, causing a perpetual moisture. In consequence of this the trees on their outer facies are more or less covered with kohukohu, a feathery fungus of a pale green colour, hanging like drapery from the brandies, while their trunks and limbs are clad to their very tops with the richest profusion of lichens and mosses. The underwood is one mass of cryptogams, and the very ground is carpetted with beautiful mosses. No idea can be formed of the quasi-tropical richness of these woods in this respect by any one who has not actually visited them. On the outskirts small flocks of *Zosterops* consort together in the underwood, and a few flycatchers and whiteheads share the solitude with the sober tomtit; but as we enter the woods the stillness becomes oppressive, unbroken even by the chirp of a cricket or the drumming of a locust, and the only sign of animation is an occasional night-moth lazily flapping its wings in the gloomy shade of the forest.

SPHENŒACUS PUNCTATUS, *Gray*.—Common Utick.

During my recent visit to the Lake district, I found this little bird plentiful in all suitable localities. In the marshy tracts occurring at intervals along the road from Taupo to Ohinemutu its familiar note was the only animate sound in those quiet solitudes; and it was always pleasant to hear a pair of them singing a duct, their plaintive notes being always in harmony and responsive.

CREADION CARUNCULATUS, *Gmel*.—Saddle-back.

This species is very irregular in its distribution. I have endeavoured to describe its range in my "Birds of New Zealand." I omitted, however, to mention that in one locality north of Auckland—a small wood at Kaitaia called Mauteringi, some three or four miles in extent—this bird is comparatively plentiful, although rarely ever met with in other parts of that district. Although never seen in the Bay of Plenty woods, it is numerous enough in the Ngatiporou country, where the natives regard it as a bird of omen. A war party hearing the cry of the tieke to the right of their path will count it an omen of victory, but to the left a signal of evil. It is also the mythical bird that is supposed to guard the ancient treasures of the Maoris. The relics of the Whanauapanui tribe—*mere pounamus* and other heir-looms of great antiquity and value—are hidden away in the hollow of a tree at Cape Runaway, and it is popularly believed that the tieke keeps guard over these lost treasures. According to Maori tradition, among these hidden things is a stone *atua*, which possessed at one time the faculty of moving from place to place of its own accord, but has since become inactive.

The natives state that this species usually places its nest in the hollow of a tree, and they point to holes in well-known trees where the tieke has reared its young for many years in succession. A pair is said to be still breeding in the hollow of the famous tree at Omaruteangi, known all over the country as "Putatieke."

Putatieke: A renowned hinau tree in the Urewera country. It is supposed to possess miraculous attributes. Sterile women visit it for the purpose of inducing conception. They clasp the tree in transport, and repeat certain incantations by way of invoking the *atua*.

The bird is accordingly regarded with some degree of superstitious reverence by the Arawa, who will not allow it to be wilfully destroyed. Those who have read Maori history will be familiar with the story of Ngatoroirangi and his sacred tiekes of Cuvier Island. Hence the proverb, "Manu mohio kei Reponga," commonly applied to a man wise in council, and used in the sense of our own proverbial saying "Old birds are not to be caught with chaff."

As the question of the specific value of *Creadion cinereus* is still unsettled, it may be mentioned here that Captain Mair, who has been familiar with the bird for years, has never seen one in the plumage of the so-called *cinereus*, supposed at present to be the immature state of *C. carunculatus*. If this form is in reality the young of the ordinary species, it is astonishing that it has never yet been met with in the North Island, although common enough in the South.

GLAUCOPIS WILSONI, *Bonap*.—Blue-wattled Crow.

During the autumn months this bird is comparatively plentiful in the Mangorewa forest between Tauranga and Rotorua. The traveller at this season frequently meets with it hopping about along the road or among the bushy branches of *Solatium* on either side.

There is a fine albino specimen in the Colonial Museum, obtained in the Rimutaka ranges and presented by Sir. G. Elliotte, who had it alive for several months.

PORPHYRIO MELANOTUS, *Temm*.—Swamp-hen.

I have before mentioned that the swamp-hen is one of those native species that increase with the progress of settlement. This is very noticeable in many of our farming districts. Captain Mair informs me that at Whangarei (north of Auckland), during a period of fifteen years—from 1850 to 1865—he never saw one in that district.

After that date they began to make their appearance, and now they are comparatively plentiful, being met with in flocks of twenty or thirty together. In the Lake district they are everywhere abundant. At the warm lake of Rotomahana several hundreds may be seen in a single flock. They build their nests on the silica terraces, not in groups or colonies, but singly and without much attempt at concealment. Captain Mair has found as many as fourteen eggs in one nest, and eleven in another. At Tokano (at the southern extremity of Lake Taupo) the natives snare thousands of them in June and July, at which time they are very fat. They are caught by a very simple artifice. The natives, having marked their principal haunts, drive rows of stakes into the swampy soil at distances of a few feet. These are connected by means of flax-strings, from which are suspended hair-like nooses (made of the fibrous leaf of *Cordyline)* arranged in close succession, with the edges overlapping, and placed just high enough from the ground to catch the bird's head as it moves along the surface in search of food. As the swamp-hen is semi-nocturnal in its habits, being most active after dusk, it has less opportunity of avoiding the treacherous loops. It frequents the Maori plantations in considerable numbers and proves very destructive to the young crops, and later in the season it plunders the potato fields and kumera beds. The snaring of these birds, therefore, on this large scale, answers a double purpose, inasmuch as they are excellent eating when roasted in their own fat. Their- eggs also are much sought after in the nesting season, being esteemed as great a delicacy as "plover's eggs."

HIMANTOPUS NOVÆ-ZEALANDIÆ, *Gould*.—Black Stilt.

This species, as well as the pied stilt, is very plentiful in the Lake district. They appear to subsist chiefly on the dead gnats that float on the surface of the water in the sulphur springs. The plovers are continually to be seen wading about in the warm yellow water of these springs, feeding on the floating scum and on the small salamander worms which abound in these places.

ANABHYNCHUS FRONTALIS, *Quay et Gaim.*—Wry-billed Plover.

This very peculiar bird with an asymmetrical bill is tolerably common in the Bay of Plenty. They associate freely with the flocks of godwit on their feeding-grounds and resting-places during the alternation of the tides.

ARDEA SYRMATOPHORA, *Gould*.—White Heron.

This stately bird appears so rarely in the North Island that the natives distinguish it as "the bird seen once in a life-time." In the summer of 1865 a pair visited the Mangrove Swamp at Whangarei, and remained there several weeks. The year before a pair was seen in Whangape Lake in the Lower Waikato; in 1867 another pair frequented, for some time, the marshy ground at the mouth of the Maketu River, and again in 1867 a pair visited the banks of the Waihi in the same district. The natives made every possible effort to obtain these birds for the sake of the white plumes. In both of the last-mentioned cases they succeeded in killing one of them, the survivor remaining in the locality for several months, leaving only on the approach of winter.

ARDEA SACRA, *Gmelin*.—Blue Heron.

A pair was seen by Captain Mair on the Taupo Lake in October, 1875. It is tolerably common along the shores of the Bay of Plenty.

CASARCA VABIEGATA, *Gray*.—Paradise Duck.

This fine duck is seldom met with north of Petane. A flock of five visited Rotomahana Lake in March, 1866, and a pair was seen in Lake Taupo in October, 1873. I have already recorded

"Birds of New Zealand," p. 242.

the appearance of five some years ago in the Kaipara district, at the far north. These are the only instances that have come withiu my knowledge of the occurrence of this species beyond its ordinary range.

STERCORARIUS ANTARCTICUS, *Gray*.—Southern Skua.

In my "Birds of New Zealand," page 267, I mentioned the only local specimen then known—a female bird obtained by Dr. Hector in Woodhen Cove, on the south side of Breaksea Sound, and deposited in the Otago Museum. Other specimens have since been collected in the South Island, and I have now in my possession a living example taken some months ago at Waikanae, some forty miles from Wellington.

LARUS DOMINICANUS, *Licht*.—Black-backed Gull.

Simpkins, a publican at Whakataue, obtained a female of this species, when quite young, from White Island, a distance of some thirty-five miles. It became perfectly tame, answering to the name of "Hinemoa," and coming into the house at meal-times to be fed. When about two years old it suddenly disappeared, and after a lapse of six months it returned with two young ones, which have since become quite domesticated. By last advices both old bird and young were still inhabitants of the yard, and evinced no desire to leave it.

PROCELLARIA PABKINSONI, *Gray*.—Black Petrel.

This petrel is said to breed in largo numbers on the Island of Karewa, in the Bay of Plenty. In March the Maoris visit the island and collect the young of this and other species. The most plentiful, however, is the oii or mutton-bird *(Puffinius tristis)*.

PHALACROCORAX BREVIROSTRIS, *Gould*.—White-throated Shag.

In the Lake district there are "shaggeries" of considerable magnitude which are much valued by the natives,

each colony of nests having its own proprietor, who exercises all the rights of ownership, visiting the ground at the breeding season for the purpose of collecting the young birds, which are potted in the usual manner and are considered a great dainty. Captain Mair accompanied one of the shag parties to the Tauranga River, at Lake Taupo, and saw 400 young birds collected in the course of a single day. Both the white-throated and the small black shag breed together in these localities, although apparently never pairing. Captain Mair still adheres to the opinion that they are distinct species, and has promised to send me nestlings of both for comparison.

It will be remembered that at one of our meetings in 1875,

"Trans. N.Z. Iust.," VII., page 225.

I exhibited an adult bird, supposed to be of this species, in which there were indications of a seasonal change of plumage from a rusty or brownish to a glossy black, without any appearance of white on the throat or fore-neck.

PHALACROCORAX VARIUS, *Gmel.*—Pied Shag.

Captain Mair informs me that at a place called Whakarewha, near Matata on the East Coast, there is a colony of the white-bellied shag where thousands of them breed together. The nests are crowded together on the branches of a clump of pohutukawa trees growing on the cliff; and the old birds may often be seen fighting fiercely for the possession of a dry stick or piece of sea-weed, required for building purposes, or endeavouring to dispossess each other of nests already made. In these fights the young birds are not unfrequently knocked out of the nests, and numbers of dead ones are found lying on the beach at the base of the cliff. The nests are rude structures formed of dry twigs and sticks, bound together by means of a peculiar kind of kelp for which the shags may be observed diving in the sea, sometimes in four fathoms of water. The harrier (*Circus gouldi*) hovers about this breeding-place and makes an occasional attempt to carry off a young bird from the nest by boldly attacking it; whereupon numbers of the old birds sally forth with loud guttural cries and chase the intruder to a considerable distance.

Captain Mair, who has often visited this "shaggery," says:—"It is very amusing to watch the old birds feeding the young ones. With a slow flapping of its ample wings the parent bird comes in from her fishing excursion, her capacious throat distended with food. There is much excitement in the nest on her approach. The young birds open wide their mandibles, and thrusting her beak down the throat of her offspring, the careful mother empties the contents of her pouch right into the little one's crop. All this time the delighted recipient is swaying its body to and fro, vibrating its flippers and uttering a perpetual scream of joy."

At the Rurima Rocks in the Bay of Plenty, six miles from the shore, where some three or four hundred shags congregate every year to refit their nests in the tall pohutukawa trees, the birds are almost exclusively of this species.

PHALACROCORAX NOVÆ-HOLLANDIÆ, *Steph.*—Black Shag.

Captain Mair states that this species is rarely seen in the Bay of Plenty. But he distinguishes from this what he terms the "Large Brown River Shag," the mapo or matapo of the Maoris. He describes this bird as "brown all over with a yellow tinge on the throat," and says that it frequents lakes and the upper courses of rivers and is never met with on the sea coast. A colony of them, numbering about a dozen individuals (exclusively of this kind) breed every year in a kahikatea forest near the shores of Lake Rotorua.

APTERYX AUSTRALIS, *Shaw*.—South Island Kiwi.

Comparatively few specimens of this bird are now brought in by collectors in the South Island, whereas the supply of *Apteryx oweni* is undiminished.

APTERYX MANTELLI, *Bartl.*—North Island Kiwi.

The natives whom I found camping at the foot of the Kaimanawa range in March last assured me that the kiwi was still very plentiful there. About a fortnight before the date of my visit (or end of February) they captured a female with a well-grown young one in a hollow log. It may be inferred therefrom that this species commences nesting about the beginning of January. As the natives agree that there is never more than one young bird in the nest, it seems probable that the kiwi breeds twice during the season.

Art. XXL—*On the Disappearance of the Korimako* (Anthornis melanura) *from the North Island*. By WALTER L. BULLER, C.M.G., Sc.D.

[*Read before the Wellington Philosophical Society*, 22*nd September*, 1877.]

IN my "History of the Birds of New Zealand," in treating of this bird I made the following statement, which was afterwards challenged by Captain Hutton, in a communication to "The Ibis:"—

"This species, formerly very plentiful in every part of the country, appears to be rapidly dying out. From some districts, where a few years ago it was the commonest bird, it has now entirely vanished. In the Waikato it is comparatively scarce; on the East Coast it is only rarely met with; and from the woods north of Auckland it has disappeared altogether. In my journeys through the Kaipara district eighteen years ago, I found this bird excessively abundant everywhere; and on the banks of the Wairoa the bush fairly swarmed with them. Dr. Hector, who passed over the same ground in 1866, assures me that he scarcely ever met with it; and a valued correspondent, writing from Whangarei (about eighty miles north of Auckland), says:—'In 1859 this bird was very abundant, in 1860 it was less numerous, in 1862 it was extremely rare, and from 1863 to 1866 I never saw but one individual. It now seems to be entirely extinct in this district.'"

Captain Hutton, in the communication referred to,

See "Ibis," January, 1874.

suggested that the districts in which the bird was all but exterminated were only those thickly inhabited by Maoris, to which the obvious reply was that the extensive wooded district lying between Whangarei and the North Cape is not inhabited by Maoris at all. Dr. Hector, who made a geological survey of that district in 1868, did not meet with a single korimako, whereas formerly these birds existed there by thousands. My remarks on the present scarcity of the species were intended to refer principally to the North Island, but even in the South, as I have already pointed out ("Trans. N.Z. Inst.," vol. IX., p. 330), it is far less plentiful than it formerly was. Doubtless it is only a question of a few years, and the sweet notes of this native songster will cease to be heard in the grove, and naturalists, when compelled to admit the fact, will be left to speculate and argue as to the causes of its extinction.

My observations as to the extreme rarity of this species in the North Island, where in former years it was the commonest of the perehers, are confirmed by Captain Mair, who informs me that during the last eight years he has never met with it at all, except on the Island of Mokoia (a place of some historic interest in the Rotorua Lake, about 600 acres in extent), and in a tract of manuka bush covering about a thousand acres of land at the foot of Mount Edgecumbe. In both of these localities it is still very plentiful.

In 1868, Captain Hutton found the korimako abundant on Great Barrier Island, although even then scarce on the main-land;

"Trans. N.Z. Inst.," I., p. 161.

and in 1871 Major Mair met with it on the Rurima Rocks and on "Whale Island, in the Bay of Plenty, places about five miles apart. He records the delight with which he again listened to its sweet note, and adds, "the Maoris think that it is the sole survivor of the race, and that it flies backwards and forwards between these islands."

"Trans. N.Z. lust." V., p. 152.

Although I have travelled a good deal through the forests of the interior since my return from Europe in 1874, I have positively never met with a single example of this bird on the main-land; but during a storm-bound visit to the island of Kapiti, in April last, I was charmed immediately on landing to hear the musical notes of the bell-bird again, and to meet with it in every direction among the stunted karaka groves that clothe the western slopes of the island. In the course of an afternoon I saw a score or more of them within a very limited area, and on a second and more extended visit on the following day I found them equally numerous. I met with another bird also, which has likewise become well-nigh extinct on the main-land *(Miro lonyipes)*, although not in such numbers as the former.

The facts I have mentioned are interesting as furnishing another illustration of the observed natural law, that expiring races of animals and plants linger longest and find their last refuge on sea-girt islands of limited extent.

ART. XXII.—*Further descriptive Notes of the Huia* (Heteralocha acutirostris.)

By WALTER L. BULLER, C.M.G., Sc.D.

Plate V.

[*Read before the Wellington Philosophical Society*, 17*th November*, 1877.]

HETERALOCHA ACUTIROSTRIS, *Buller*.—"Birds of New Zealand," pp. 63-68.

To the full account which I have already published of this rare species, I wish to add the following notes:—

Young female.—Differs from adult bird in having the entire plumage of a duller black, or slightly suffused with a brownish tinge and with very little gloss on the surface. Under tail-coverts tipped with white, and the terminal white bar on the tail washed with rufous-yellow—especially in the basal portion. Wattles small and

pale-coloured. Bill only slightly curved, as represented in fig. 1.

In another specimen in my possession, apparently a year older, the tail-coverts are without the margin, the white on the tail-feathers is purer, and the bill is perceptibly longer, with a darkened tip.

Young male.—In comparing a specimen received at the same time with the above, the same general remarks apply, except that the under tail-coverts are not tipped with white at all, while the soft feathers on the lower part of the abdomen are largely tipped with pale rufous and white. The pale rufous wash on the tail-bar is likewise more conspicuous. The bill presents the outline shown in fig. 2.

For purposes of comparison I have reproduced in the accompanying plate (fig. 3) my former drawing of the bill in the fully-developed female. Fig. 4 represents a curious deformity, if it may be so called, in a specimen which recently passed through my hands. The lower mandible having been at some time accidentally broken off, the upper mandible had considerably overgrown it, becoming somewhat thickened beyond the point of friction.

ART. XXIII.—*On the Egg of the Huia* (Heteralocha acutirostris). By WALTER L. BULLER, C.M.G., Sc.D.

[*Read before the Wellington Philosophical Society*, 12*th January*, 1878.]

IN a paper read before this Society last year,

"Trans. N.Z. Inst.," VIII., p. 192.

I described, as a great novelty, the egg of the huia, from a specimen (containing a well-developed embryo) obtained by Mikaera in the Wainuiomata bush. The same native brought in to me this season another huia's egg obtained in the same locality. It differs so much in appearance from the one in the Colonial Museum as to create a doubt at first sight of their identity. Mikaera, however, stoutly affirms that he is right; and on proceeding to blow the egg I found the shell extremely thin and fragile, agreeing in this respect with the one already described. The present specimen is more elliptical in form, measuring 1.8 inches in length by 1.1 in its widest diameter. It is of a very delicate stone-grey, inclining to greyish-white, without any markings except at the larger end, where there are, chiefly on one side, some scattered rounded spots and dots of dark purple-grey and brown. Towards the small end there are some obsolete specks, but over the greater portion of its surface the shell is quite plain.

The egg when brought to me was perfectly fresh, and the native declares that he took it from the ovary of the bird just as it was ready for extrusion. This may perhaps account, in some measure, for the extreme delicacy of the shell, which fractured under the gentlest handling in blowing, as well also for the absence of markings. I see no reason to doubt the authenticity of the specimen, for any one who has taken the trouble to examine and compare the eggs of the common house-sparrow will be aware how much the eggs of some species differ from each other in this respect, even those taken from the same nest; and we have no sufficient data at present for determining the extent of variability in the eggs of this rare form.

Mikaera brought this specimen to me on or about the 11th October. The egg previously described, which was apparently within a day or two of hatching, was obtained about the 20th October. These dates will therefore give approximately the period of incubation.

The Museum specimen (which I am permitted to exhibit this evening for comparison) measures 1.45 by 1.05 inches, and is of a pale stone-grey, irregularly stained, freckled, and speckled with purplish-grey, the markings in some places running into dark wavy lines.

ART. XXIV.—*On the Species forming the Genus* Ocydromus, *a peculiar Group of brevi-pennate Rails*.

By WALTER L. BULLER, C.M.G., Sc.D., F.L.S.

[*Read before the Wellington Philosophical Society*, 12*th January*, 1878.]

ALTHOUGH as a group the limits of the genus *Ocydromus* are sufficiently well defined, considerable difficulty has been experienced in determining the species. Every naturalist who has studied the subject appears

to have arrived at some different conclusion as to the number of constant forms; and where the variances as to size and plumage are so well maintained it is difficult to avoid drawing specific distinctions. If, however, it can be shown that all these extreme forms graduate in a series, or, in other words, run into one another, it becomes impossible to find any fixed aberrant characters. Without professing to be able yet to place the matter beyond all dispute, I venture to think that the series of specimens which I have the honour to exhibit this evening affords pretty strong evidence that several of the so-called species in the South Island must be united under the name of *Ocydromus australis*.

In my "Birds of New Zealand," I admitted only three well-ascertained species as inhabiting New Zealand—namely, *0. earli, O. australis*, and *O. fuscus*. I mentioned in the introduction to that work that, although Dr. Finsch recognized a fourth (*O. troglodytes*, Gmel.), I was unable to draw any specific line. Nevertheless, I pointed out very fully, in my account of the South Island wood-hen, the great variation both as to size and markings which that species exhibits, especially among birds from different localities.

Captain Hutton, in an article on the New Zealand Wood-hens, read before this Society

"Trans. N.Z. Inst.," VII., p. 110.

in September, 1873, agreed with Dr. Finsch in admitting *O. troglodytes*, and added two more species of his own under the names of *O. hectori* and *O. finschi*. He further described a "variety or immature" example of this last-named species, which he suggests may "possibly be identical with *Gallirallus brachypterus*, Lafr."

Dr. Finsch, in a paper

"Trans. N.Z. Inst.," VII., p. 226.

written the year following, professes to identify *Ocydromus troglodytes* with the *O. australis* of my text, page 170, but not the plate; of *O. hectori* he remarks, "I consider this a good species after having compared a typical specimen;" and of *O. finschi* he says that, having examined the type, he considers it a good species, although not without some suspicion that it may prove to be a variety of *O. fuscus*. He confuses *Ocydromus australis*, Sparrm., with the well-known *O. earli;* and with respect to the latter in Hutton's list, lie makes the following singular statement:—"Dr. Buller, in his great work, unfortunately does not mention the typical specimen of *O. earli*, Gray, and not having compared it myself, I am unable to make out whether the true *earli* is, indeed, the bright cinnamon-red bird as Captain Hutton and I believe, or whether it is the same as *O. australis*, figured under the name of *earli* by Dr. Buller."

"Trans. N.Z. Inst.," VII., p. 231.

Captain Hutton, on the other hand, writes me:—" I am sure that you are right about the identification of *O. earli*, and I don't understand how Finsch thinks otherwise."

lb., IX., p. 330.

Baron A. von Hügel, who has lately been on a scientific tour through the colonies, writes thus in "The Ibis"

"The Ibis," July, 1875, p. 393.

:—"Of New Zealand things I have got a very fair collection—some 800 specimens already. *Ocydromus* I have, of course, gone in for, and have a lot of notes about it. I don't believe in more than three good species — *O. australis* (with endless varieties), *O. fuscus*, and *O. earli*. The last two are difficult to procure, although I shall doubtless get a series of the latter in the North Island; but of *O. australis* one could get a shipload in a very short time. I have got a splendid series, showing every age from embryo to adult, and varieties to perfection."

It will be seen, therefore, that the Baron, who comes to the subject with a totally unprejudiced mind, adopts my published division of the species in a very positive manner.

If, on further investigation, it should be found necessary to add a fourth species, this must be *Ocydromus brachypterus*, Lafresnaye; for Dr. Finsch, who appears to have examined the type specimen, affirms distinctly

"Trans. N.Z. Inst.," VIII, p. 202.

that it is the same as Hutton's *O hectori*; and Captain Hutton himself admits that this is "very probable."

"Trans. N.Z. Inst.," IX., p. .330.

This is of course the bird referred to at page 171 of my "Birds of New Zealand" in the following passage:—"Dr. Hector informs me that on all the high mountains of the Otago province he met with a 'cream-coloured variety,' conspicuously marked and very readily distinguishable from the common bird. Mr. Buchanan confirms this observation, and states that on the Black Peak, at an elevation of 6,000 feet, he found this light-coloured variety very abundant, but none of the other birds; the former indeed were so numerous as to prevent his getting any sleep."

It seems unfortunate that in obedience to the law of priority in nomenclature, we must sink a name, very fittingly bestowed, in favour of *brachypterus*, which expresses no distinguishing specific character, being equally appropriate to all the forms of *Ocydromus*.

OCYDROMUS EARLI, *Gray*.

This is the North Island species, very distinct in character from the others and exhibiting only a slight degree of individual variation. It is admirably figured by Keulemans, and a full description of it, in all stages, is

given in my "Birds of New Zealand" (pp. 165, 166).

OCYDROMUS AUSTRALIS, *Sparrm*.

This species has never been met with in the North Island as an indigenous bird, although of late years it has been successfully acclimatized by Sir George Grey at Kawau.

The tendency of this bird to vary, in a very remarkable degree, has occasioned much difficulty in discriminating the form.

In my published account of *O. australis*

"Birds of N.Z.," pp. 170-173.

I made the following observations on this point:—"Examples from different localities exhibit so much variety in size and plumage as to suggest the existence of another closely allied species. Mr. Potts says that when he was 'camping in one of the gorges of the Bangitata a very striking variety used to visit his tent constantly; the individuals of either sex were above the average size; the general colour of the plumage light greyish-brown, the feathers barred or marked with shades of dark brown; the rump, and in some instances the tips of the primaries, rich chestnut; throat and cheeks grey.' * * * * My brother, Mr. John Buller, assures me that he invariably found the alpine bird considerably larger than those inhabiting the plains and of a much lighter colour. A specimen brought by Mr. Henry Travers from the interior of the Marlborough province has the general plumage of a yellowish-buff colour, very obscurely marked and spotted with brown; and among those obtained by Sir George Grey in the Otago hills for the purpose of stocking the Kawau Island, I observed that one (apparently a young bird) had similar plumage, although it was more distinctly banded on the sides and flanks. Sir George Grey informed me that these birds were taken by himself at an elevation of 6,000 feet, where they were found concealed under the tussocks or hiding among the loose rocks, the assistance of a dog being required to dislodge them." I further described a specimen in my own collection in which the whole of the upper surface is light fulvous shaded with brown, each feather having a sub-terminal spot of that colour; the primaries and secondaries are dark rufous-brown barred with black, and the soft overlapping feathers are fulvous, stained more or less with rufous and barred with black in their middle portion, margined and spotted towards the end with cream-yellow; the throat, fore-neck, and breast pale cinereous brown, mixed with fulvous on the crop; the lower parts dull cinereous brown, fasciated on the sides and flanks with narrow markings of fulvous.

After fully describing the ordinary plumage of the adult male, I stated that the female was smaller, with darker plumage and duller coloured legs; and that in immature birds the tints of the plumage generally are lighter, the transverse markings are less distinct, and the colours of the bill and legs are paler; the irides are dark brown; there is less rufous on the head and often considerably more of the cinereous grey colour on the breast and abdomen.

OCYDROMUS FUSCUS, *Dubus*.—Kelp-hen.

An apparently adult female specimen of this bird in the Canterbury Museum (obtained at Preservation Inlet) has the general plumage brownish-black; throat dark grey mixed with smoky-brown; the plumage of the fore-neck, lower hind-neck, and upper surface of wings presenting dull streaky marks of rufous, each feather being irregularly touched with this on each web; tail-feathers black; under coverts obscurely marked with rufous. On the under face of one of the primaries (an old feather which came out on being handled) there are obsolete rufous bars; and the scattered new feathers appearing on the upper surface of the body are almost entirely black; bill, bright reddish-brown at the base, horn-grey towards the tips of both mandibles; legs and feet reddish-brown.

It may be inferred from this state of plumage that the tendency of this species is to darken towards maturity. I have not yet had an opportunity of examining a first year's bird, but, judging by analogy, I think Captain Hutton is probably right in his conjecture that his "*O.fmschi* is only the young of *O. fuscus*."

"Trans. N.Z. Inst.," IX, p. 331.

Dr. Finsch himself

" Trans. N.Z. Inst.," VII, p. 232.

expressed the suspicion that one was a variety of the other.

OCYDROMUS SYLVESTRIS, *Sclaler*.

This is a very distinct species inhabiting Lord Howe Island. There were too living examples in the Gardens of the Zoological Society when I last visited them in 1873.

OCYDROMUS LAFRESNAYANUS, *Verr. et Des Murs*.

This form is peculiar to New Caledonia. The Zoological Society received a live specimen from Dr. Geo. Bennett in June, 1869, and another from the same donor in May, 1878.

ART. XXV.—*Notice of the Occurrence of the*

Shy Albatros (Diomedea eauta) *in the North Island*.

By WALTER L. BULLER, C.M.G., Sc.D., F.L.S.

[*Read before the Wellington Philosophical Society*, 22*nd September*, 1877.]

IN a paper on Now Zealand Ornithology which I had the honour of reading before this Society in September, 1876, I mentioned, on the authority of Captain Hutton, that a specimen of the shy albatros *(Diomedea cauta)* had been obtained at Blueskin Bay in Otago, thus adding a sixth species to the list of albatroses inhabiting our seas. I have now much pleasure in exhibiting another specimen of this fine bird, which was captured on the beach near the Wellington pilot station on the 12th July, and brought to me alive by Mr. James A. Capper of Molesworth Street. The fishermen by whom it was caught informed him that it had apparently been shot at sea and allowed to float ashore, the right wing being completely disabled, but that they had nevertheless considerable trouble in overtaking it before it reached the water.

This example proved on dissection to be a female, and as I have not before had an opportunity of examining this rare species in a fresh state, I think it is desirable to place on record in our "Transactions" a full description of it.

Fem. ad.—Fronte et vertice cinerascenti-albis: pileo eolloque totis pulclirè cinereo lavatis: regione ante- et super-oculari cinerascenti-nigris: dorso et interscapulio cum alâ totâ cinerascenti-nigris: uropygio, supra-caudalibus albis: remigibus brunnescenti-nigris, scapis ad basin flavieantialbidis, secundariis versùs apicem brunnesccntè tinctis: Caudâ saturatè argentescenti-cinereâ, scapis albidis: subtùs purè albus: subalaribus albis, plumis extcrioribus nigricantibus: iride læte vinascenti-brunneâ: pedibus sordidè corneo-albicantilnis, tarsis saturatioribus: rostro cyanescenticorneo, ad apicem sordidè nigro, culmine medialiter et-gonyde obscurè flavicantibus, ad basin conspicuè nigro marginatis: margine ad basin maudibulæ lætc flavâ.

Adult Female.—The whole of the head and neck delicate pearl-grey, shading off almost to white on the crown and forehead; lores and a line over each eye greyish-black, shading off below into the pearl-grey; back and upper surface of wings greyish-brown; rump, tail-coverts, and the whole of the under parts pure white, softly blending with the grey on the lower foreneck; quills brownish-black, the shafts whitish horn-colour towards the base, the longer secondaries tinged with sepia-brown; tail-feathers dark silvery-grey, with white shafts, and paler on the under-surface; lining of wings white, some of the feathers towards the edge of the wing greyish-black; irides rich vinous brown; feet dull fleshy white, the tarsi darker; bill bluish horn-colour, lighter and tinged with yellow along the culmen, and also on the under surface of the lower mandible; the sides of the unguis or hooked extremity, as well as the terminal expansion of the lower mandible, dull black; the upper mandible margined at the base with a narrow black band which broadens on the ridge and extends along the groove on each side to the nostrils; base of lower mandible fringed on each side with a membrane of a bright yellow colour, bordered behind with black, and forming a very distinguishing feature in this species.

Total length 2 feet 11 inches; extent of wings 7 feet 7 inches; from carpal flexure to the tip 22.5 inches; tail 9; bill, following the curvature of upper mandible, 5.8; length of lower mandible 5; tarsus 3.25; middle toe and claw 5.7.

The species was first described by Mr. Gould in the "Proceedings of the Zoological Society" (Part VIII., p. 177), and named by him the shy albatros, in allusion to its cautious habits when on the wing. In his "Birds of Australia" he gives the following account of it:—

"I first saw this species of albatros off the south coast of Tasmania, and had frequent opportunities of observing it during my stay in Recherche Bay, at the southern entrance of D'Entrecasteaux Channel, where I was wind-bound for nearly a fortnight. Unlike other albatroses it was most difficult to procure, for it seldom approached our ship sufficiently near for a successful shot. I succeeded, however, in shooting several examples while they were flying round the bay in which we had taken shelter. It is not usual for albatroses to approach the land or enter a secluded bay like that of Recherche, and I attribute this deviation from the ordinary-habits to the temptation presented by the vast quantities of fat and other remains of whales floating about, the locality being one of the principal whaling-stations on the coast of Tasmania. I have no doubt likewise that it was breeding on the Mewstone and other isolated rocks in the neighbourhood, as the plumage of some of the specimens I procured indicated that they had lately been engaged in the task of incubation.

"It is a large and powerful bird, the male being scarcely a third less in size than the *D. exulans;* is rapid and vigorous on the wing, and takes immense sweeps over the surface of the ocean. It will be interesting to learn the extent of the range of this species. A head in the possession of Sir William Jardine was said to have been procured at the Cape of Good Hope, but I believe this was by no means certain. When fully adult the sexes differ but little in colour; the female may, however, at all times be distinguished by her diminutive size, and the

young by the bill being clouded with dark grey. Besides being larger than the three succeeding species (namely, *D. culminata, D. chlororhyncha,* and *D. melanophrys*, to which and the present the generic appellation of *Thalassarche* has been given), the beautiful grey on the sides of the mandibles and the yellow mark at the base of the lower mandible, will at all times distinguish this bird from the other members of the genus. The stomachs of those I obtained in Recherche Bay contained blubber, the remains of large fish, barnacles, and other crustaceans."

ART. XXVI.—*On the Addition of the Bed-tailed Tropic Bird* (Phæton rubricauda) *to the Avifauna of New Zealand*. By WALTER L. BULLER, C.M.G., Sc.D., F.L.S.

[*Read before the Wellington Philosophical Soicety*, 12*th January*, 1878.]

IN the list of the Birds of New Zealand compiled by Mr. G. R. Gray and published in "The Ibis" of July 1862, the Red-tailed Tropic bird is included among the species of *Pelecanidæ*, the habitat assigned being Norfolk and Nepeau Islands. On the publication of my Essay on the Ornithology of New Zealand (1865), in the absence of any positive evidence of its occurrence in our seas, I decided to omit this bird from our list of species, and it has been rigidly excluded since.

The fine specimen of the bird, however, which I have the pleasure of exhibiting to-night, and which was shot off the "Three Kings" by Mr. Henry Man, and the further information which I have been able to collect respecting it will fairly establish the right of this species to a place in our avifauna.

The bird is well-known to the Ngapuhi tribe at the north, under the name of Amokura, and they set a high value on the long red tail-feathers which they exchange with the southern tribes for greenstone. Almost every year, after the prevalence of easterly gales, some specimens are washed ashore (generally dead) at the North Cape or in Spirits Bay. The natives of that district go out systematically to hunt for them at these periods. Owing to their rarity these plumes are more prized than those of the huia or kotuku, and in one instance a valuable slab of pounamu was given by a Hawke Bay chief in exchange for three feathers, one of which is now in the possession of the Manawatu natives.

The allusion is to this bird in the love-song of the fairies, commencing—

Kiatia taku rangi
Te kapu o te amokura, etc.

Come, deck my head
With amokura plumes.

Mr-. Gould, who has figured the species with his usual skill in "The Birds of Australia," states that it "is very generally dispersed over the temperate and warmer latitudes of the Indian Ocean and the South Seas, where it often hovers round ships and occasionally alights on their rigging. During the months of August and September it retires to various islands for the purpose of breeding; among other places selected for the performance of this duty are Norfolk Island off the east coast of Australia, and Raine Islets in Torres Straits, from both of which localities I possess specimens of the bird and its eggs." He states further that the young birds for the first year are very different from the adults, being of a silky-white without the beautiful roseate blush (so conspicuous in the specimen now exhibited), with the whole of the upper surface broadly barred with black, and with the black of the shafts of the primaries expanded into a spatulate form at the tips of the feathers.

Mr. Macgillivray, who obtained several on Raine Islet in the month of June, gives the following

account:—"Upon one occasion three were observed performing sweeping flights over and about the island, and soon afterwards one of them alighted. Keeping my eye upon the spot, I ran up and found a male bird in a hole under the low shelving margin of the island bordering the beach, and succeeded in capturing it after a short scuffle, during which it snapped at me with its beak, and uttered a loud, harsh, and oft-repeated croak. It makes no nest but deposits its two eggs on the bare floor of the hole, and both sexes assist in the task of incubation. It usually returns from sea about noon, soaring high in the air and wheeling round in circles before alighting. The eggs are blotched and speckled with brownish-red on a pale reddish-grey ground, and are two inches three-eighths long by one inch four-eighths-and-a-half broad. The contents of the stomach consisted of beaks of cuttle-fish. The only outward sexual difference that I could detect consists in the more decided roseate blush upon the plumage of the male, especially on the back; but this varies slightly in intensity in different individuals of the same sex, and fades considerably in a preserved skin."

ART. XXVII.—*Notice of a new Variety of Tuatara Lizard* (Sphcnodon) *from East Cape Island*.

By WALTER L. BULLER, C.M.G., Sc.D., F.L.S.
[*Read before the Wellington Philosophical Society*, 17*th November*, 1877.]

DURING a recent visit to Napier I saw in the possession of Mr. John White a live tuatara, which he had obtained from the natives more than a year ago as a chiefs gift, and which one of his sons had succeeded in completely domesticating.

At the first glance at this lizard I observed that it was very different from ordinary examples, and on a closer examination it appeared to me, if not a distinct species, a sufficiently well-marked variety to deserve special notice in our "Transactions."

It is comparatively short and thick-set in form, and presents a remarkable depression in the occipital region. The dorsal spines (twenty in number) are very minute; those along the neck are larger, and number fourteen. The caudal spines are much thicker and dark coloured, all the former being pure white. The tail, which has been broken off at some period, is reproduced in the usual thickened form and in darker colours.

The measurements are:—

The general colour is olivaceous-brown; sides of the body ruddy yellow with a flesh-coloured or pinkish hue, varied, spotted, and marked with olive-green and greyish-brown; on each side of the nape, large irregular ashy-white spots washed with yellow. The olive-green is brightest on the back and toes; and on the lower part of the former, on each side of the spine, there are irregular markings of ashy white. Throat bright ashy grey, with longitudinal series of minute white spots. On each side of the neck there is a broad crescent-shaped mark of olive-brown which encircles the pale-coloured throat. Under parts generally uniform pale grey; under surface of feet greenish-white. Colours darker on the (reproduced) tail. Claws horn-colour. Irides as in the ordinary form.

As will be seen from the above description, this remarkable example approaches more nearly, in the general character of its markings, to *Sphenodon guntlieri* than to *S. punctatum*, although it is sufficiently distinct in appearance from both. It may turn out of course to be a merely accidental variety; but Mr. White states from recollection that another specimen obtained by the natives at the same time and from the same locality was exactly similar to this one.

This lizard has become perfectly tame, and appears to recognize its young keeper's voice. It greedily devours blue-bottle flies, caterpillars and insects of all sorts, and also feeds on fresh meat minced up. In the early part of December last it commenced to cast its skin, and it then became restless, making every endeavour to get underground. About the 1st January the old skin was completely thrown off, the colours of the new one being perceptibly brighter and more defined.

Mr. White states that this lizard was obtained on East Cape Island, and he has promised to furnish some further information respecting it after he has had an opportunity of comparing notes with the natives.

ART. XXIV.—*On* Hieracidea novæ-zealandiæ, *and* H. brunnea.

See Trans. N.Z. Inst., xv., art. xiv.

By W. W. SMITH. Communicated by Dr. Buller, C.M.G., F.R.S.

[*Read before the Wellington Philosophical Society*, 31*st October*, 1883.]

IN the summer and autumn of 1876 I shot several specimens of "Sparrow Hawk," varying so much in size that I was often surprised at the extraordinary difference in the specimens I obtained. Taking as I did at the time a great delight in the study of birds, but only a beginner, and knowing practically nothing of the birds of New Zealand—I had heard of Dr. Buller's work, but had not seen it—and being particularly anxious to see the article on the "Sparrow Hawk" (as I called it then in common with others), I went the following June to Christchurch where I spent two days with this work in the Public Library. After studying the articles well, I was of course a little surprised to find that two species of Falcon nearly alike in plumage, but differing considerably in size, existed in New Zealand. I also at this time read the critical notes by Professor Hutton, published in the Ibis, and those by Mr. Potts in the Trans. N.Z. Inst. My mind being thus set at rest, or partly so, I determined when I returned home to procure as many specimens as possible and work out the subject for myself; and my experience since that time is decidedly in favour of the existence of two species.

HIERACIDEA NOVÆ-ZEALANDIÆ.

The first specimen I will mention (a female) was one I shot in September 1876 on the Rangitata River. Being then in the employment of the Hon. J. B. A. Acland, and it being a busy season of the year with me, I was unable to stuff and mount the specimen. I sent it to a friend in Christchurch, who was well acquainted with the late Mr. Fuller, taxidermist at the Canterbury Museum, who stuffed the bird. When Mr. Fuller had finished it he remarked that it was one of the finest he had seen. When I visited the Canterbury Museum I examined all the specimens, but none, as near as I could judge on looking into the case, are equal in size or so distinctly or beautifully marked. On the 28th October, 1874, Dr. Buller read a paper on the two species before the Philosophical Institute of Canterbury. The measurements he then gave are as near as I can make out a few lines short of mine. I copied the whole of the article in pencil, and am therefore able to compare his measurements with mine. I am not an expert at describing the different parts of a bird's plumage, but this bird has what I have never seen in any other individual, namely, nine distinct bars on the tail.

One of the shepherds at Mount Peel brought me in from the back country a very handsome pair of eggs of this species. They also are larger and much darker in colour than those in the Canterbury Museum.

On the 23rd October, 1879, I found a nest of this species in the rocks at the Rangitata Gorge. The nest contained three young ones, one female and two males. They were covered with a light bluish wool. They must have been about three weeks old, but were very quiet. I brought them home and prepared a large box for them. I fed them on birds, rats, mice, mutton, &c., which they devoured in large quantities. On the 16th November following they had cast off all their woolly covering, and were of a uniform dark brown colour. In two months they assumed a lighter shade, but by this time they were so noisy and fought so savagely that I was obliged to kill them, not having a proper place to keep them in. I have the skins still in my possession, and intend the first opportunity I have to present them, with several others, to the Colonial Museum at Wellington. I have found several other nests, but all containing eggs, some of which are really beautiful specimens. I was careful every season in searching for nests to carry a gun, and was always certain when I found one to procure both parents. The rocks around the Rangitata Gorge are a favourite nesting place of the quail-hawk, and a locality I can confidently recommend to any one who wishes to procure the eggs, young, or adult specimens of this bird. I found the nests every year in October and November.

A farmer living near Peel Forest shot three specimens, and sent them to me. They proved on dissection to be two females and one male: one of the females was a young bird, but very large, and heavily made; it had the thickest tarsus and talons I have seen in any bird of its kind. I afterwards gave the three birds to C. G. Tripp, Esq., Orari Gorge Station, who sent them to his son at the University of Cambridge.

Besides the nest mentioned above I have kept other young ones of this species; one in particular (a male) I had very tame, but one day he accidentally got away from me, much to my sorrow.

I may here remark that I have had several other specimens but all in my opinion easily distinguishable from *Hieracidea brunnea*.

HIERACIDEA BRUNNEA.

This "spirited little hunter" has been an object of great interest to me for several years, not only because I have studied the bird closely for the purpose of determining the two species, but likewise on account of its bold and intrepid habits, particularly during the breeding season.

On November 9, 1876, I found a nest of this species in a bush of "Wild Irishman" (*Discaria toumatou*). The nest was nearly on the ground among the dead leaves in a wooded gully four miles from the Rangitata Gorge. When I approached the nest the parent birds were extremely fierce and assailed me all the time. When looking for the nest it was rather difficult to find, being almost out of sight under the bush; but I succeeded. The nest contained two young birds and one egg. The young were only hatched the previous day, and were exceedingly small. When I lifted the egg the young bird chirped within the shell. Being the first nest of the species I had found, I was reluctant to leave it, thinking some of the shepherds might come along and destroy the nest. I shot

the two parent birds and brought home the two young ones in the hope of rearing them by hand, but they died next day, notwithstanding all the care I bestowed on them in keeping them warm, giving them good food, etc. The female was very plain in plumage. Her measurements agree nearly with those given in Dr. Buller's paper already alluded to. Since I first read Dr. Buller's fine work in June, 1876, I have always adopted his mode of measuring a bird; and am also very exact in doing so with this bird, as the measurements and "sexing" alone must determine the species. I should have stated that the male of the above-mentioned nest was a very small bird. It had the smallest head of any specimen I have seen, very little larger than the *Falco æsalon* of Europe and North America.

I will speak of one more nest and I have done, as I do not desire to trespass too far. On 3rd November, 1878, I found a nest in Chapman's Gully, a mile from the homestead, Mount Peel. The nest was situated under a large plant of-snow-grass (*Danthonia*), and contained three beautiful young birds. I arrived at the nest as the male came with a native pipit in his talons. When he saw me lying on the ground near the nest, he dropped the bird and dashed at me, knocking off my hat. I rose and approached the nest, when the female likewise assailed me; but it would have been almost impossible for me to remove the young, as the parent birds were so violent. I then secured the two birds and brought the three young ones home, reared them, and kept them six months; but I need not here give their history for that time, the rearing of the young of this species being ably described in the work already referred to.

The measurements of the parent birds are as near as possible the same as those of the first-mentioned pair, except that the male was a little larger.

I have possessed, from time to time, nearly thirty specimens of this bird, some varying a little in their markings and measurements.

I have one beautiful female, the smallest that I have seen, and the most distinctly marked.

Such is a little of my experience with the two species. I could relate many other facts proving or tending to prove that the species are distinct. The habits and general colouring of the plumage are almost indistinguishable; but in all the specimens of *H. novæ-zealandiæ* I have seen the plumage was much brighter, more glossy, and certainly more beautifully marked than in *H. brunnea*.

Comparing the nestlings of *H. novæ-zealandiæ* with nestlings of *H. brunnea*, the latter never attained near the size of the former, although I kept them four months longer. They were more lively, fiercer, and appeared to me more untameable than *H. novæ-zealandiæ*. I, however, never tried much to tame them.

With regard to the food of the species, in all my experience I have found *H. novæ-zealandiæ* to subsist on larger game than *H. brunnea*. When the three young birds of *H. novæ-zealandiæ* were two months old, I put a living weka into the cage. They were kept without food for one day to try their courage. The weka walked around the cage twice, when the female sprang upon it and seized it by the neck. I noticed that the hawk tried to bear down the weka by keeping on its back, but the weka succeeded in getting clear. This was repeated several times, and being then evening I left the four birds together in the cage. In the morning I found the weka killed, and the female and one male feeding on its remains.

I tried the same experiment with the smaller species but they never made any attempt to kill the weka.

I should have liked to add a few more experiments I made with the two species. I should also have liked to make a few remarks on the eggs, etc.; but I may have an opportunity of doing so on some other occasion.

ART. XXIII.—*On some rare Species of New Zealand Birds*.

By WALTER L. BULLER, C.M.G., Sc.D., F.R.S.

[*Read before the Wellington Philosophical Society*, 31*st October*, 1883.]

SCELOGLAUX ALBIFACIES.

Mr. W. W. Smith, formerly residing on the Albury estate near Timaru, and now settled at the Ashburton, has sent me from time to time very interesting notes on this rare owl. He has not only been exceptionally fortunate in getting specimens, but he has likewise been successful in his endeavours to make them breed in captivity. The following extract from one of his earliest communications on the subject will show what a good observer Mr. Smith is, and how keen his love of natural history. I have received many letters from him since, all replete with interesting facts, chiefly relating to this species; and I am also indebted to him for several fine specimens of the bird, together with eggs and a newly-hatched chick:—

"February 8, 1882. In compliance with your request I have much pleasure in writing a short account of my experience in trying to breed the Laughing Owl. The drawing of the bird made a great impression on me when I saw it for the first time in the "Birds of New Zealand," and since then I had been searching for over five years,

trying to procure a specimen; but I was never successful until April of last year I succeeded in finding a very handsome one; in June I found another pair, and again in September I found two more. They have been a great source of pleasure and instruction to me. I found the birds in fissures of the limestone rock on this place (Albury), but they are certainly very difficult to find. I first discovered that they were about the rocks by finding several fresh pellets, and being anxious to secure a specimen, I procured long wires and felt in the crevices, but with no good results. I, however, discovered a plan which proved successful. I collected a quantity of dry tussock grass and burned it in the crevices, filling them with smoke. After trying a few places, I found the hiding-place of one, and, after starting the grass, I soon heard him sniffling. I withdrew the burning grass, and when the smoke had partly cleared away, he walked quietly out, and I secured him. I obtained four birds by this means. I explained in a former letter how very tame they became in a short while after being captured. I also mentioned their call which varies considerably during the year. When I captured the second pair (male and female) their call for a long time, in waking up in the evening, was, as formerly stated, precisely the same as two men cooeying to each other from a distance. The voice of the male is much harsher and stronger than the female, and he is also a much larger and stronger bird. During the period of hatching he is very attentive in supplying her with food, as no sooner had the food been put into the large apartment of their house, than he would regularly cany every morsel into the dark recess; when feeding her she would utter a low peevish twitter and rise off her eggs. I may here correct a mistake which I made in writing to you on a former occasion. I stated that 'The male sits by day, the female by night.' I only saw the male twice on the eggs, and it was at this time I wrote the letter, but I certainly was mistaken, as the female performs most of the duty of hatching. I also ascertained the difference of the sexes by separating them at night until the second egg was laid. The females are much shyer and more timid than the males, as they bide themselves on hearing the least noise. After sitting nine days on her first eggs, the female forsook them, and all efforts to induce her to sit again were unavailing. She laid two more eggs a month afterwards, and had sat seven days, when, I regret to say, I had to leave home for medical treatment at Timaru. When I returned, eight days afterwards, she was still sitting and continued to sit until the 17th November, when she left the eggs without bringing out the young. The eggs must have been allowed to get cold, when eight or nine days sat-on, as when I tried to blow them I found they contained embryo chicks. I am glad, however, that I succeeded in getting the eggs; another season I may succeed in getting young birds. I supplied them with many different articles of food, such as beetles, lizards, mice, rats, rabbits, and mutton, of all of which they partook freely; but they have the greatest preference for young or half-grown rats. They are a little slow and clumsy in capturing living prey, but their want of proper exercise and freedom may account for this; it may be otherwise in their wild state. After what I have pointed out, there can be no doubt that the *Sceloglaux* inhabits the dry warm crevices of rocks. All the birds I captured I found in such places, generally five or six yards from the entrance, perfectly dry, and where no wet could possibly enter. One thing surprised me much— the very narrowness of the entrance to their cranny. In some instances the birds must have forced themselves in. I noticed, however, that the crevices widened as they extended into the rock. The bottoms are covered with soft sand crumbled down from the sides, and affording comfortable resting places.

"Regarding the nidification of this bird, I am no longer surprised that so little is known, and likewise of its natural habits. Considering that it conceals itself in such inaccessible places, and where few would think of searching to find it, as a rule they could lay their eggs and hatch their young unseen and unmolested.

"The breeding season may be said to take place in September and October. I found the bird mentioned in last letter sitting on an egg on the 25th September; but it must have been laid about the beginning of the month, as it contained the chick I sent you. I discovered the bird by reaching a long stick with a lighted taper into the crevice. My captives laid on 23rd, 27th, and 29th September, and again on the 20th and 22nd October. The birds were very restless and noisy for a fortnight before nesting. They begin to moult in December, and are not yet (Feb. 8) in full plumage. When casting their feathers they have a very curious appearance, as they become almost naked. At this stage two of my birds were stung to death a month ago by a swarm of bees passing through the fine wire netting and taking up their quarters on the roof of their dark recess. I was very sorry to lose them, as I cannot now send a living pair. I have one very fine male I will send you in April. I am going to Lyttelton at that time, and I will forward it by the first steamer bound for Wellington. I will likewise send you another owl's egg, but hardly such a fine specimen as any of the two I sent. I intend to search the rocks carefully for more birds, and, if I succeed in finding more, I will not fail in sending you a pair. You may, however, rely on getting a second specimen from me. I should mention that I have collected a quantity of pellets at different times, composed of the hair of rats and mice and the elytra of beetles. Three large species of the latter swarm among the debris beneath the main rock, and certainly constitute part of the bird's food."

HYLOCHELIDON NIGRICANS.

IN a communication which I made to this Society in August, 1878, I quoted a letter I had received from Mr. J. R. W. Cook, of Blenheim, reporting the appearance, on the 9th June, of a swallow hawking in the air on the

banks of the Opawa River. From the account which Mr. Cook gave of the bird, I felt no hesitation in identifying it with the Australian Tree Swallow, two occurrences of which in New Zealand had been previously recorded by me. I wrote accordingly to Mr. Cook and begged him to keep a sharp look-out for this rare visitant, and, if possible, to obtain a specimen.

In April last I had the pleasure of receiving from him the specimen which I now exhibit, accompanied by the following letter:—

"Since writing to you in June, 1878, reporting the occurrence here of the Australian swallow, I have not again noticed the bird until the 16th of February last, when I saw another hawking over one of my stubble paddocks. I watched it for some time, and had good opportunities of remarking plumage. The bird appeared to me either immature or weary, the flight being weak and uncertain. I found, too, that the white on the rump was dingy, and the chestnut on the breast faded-looking. There was a stiffish nor'-west breeze blowing at the time, and the bird tried in vain to get past a belt of willow and poplar so long as I was watching.

"On the 20th of last month (March) when duck shooting, I mentioned the occurrence to a party of sportsmen, when one remarked, 'Oh! there have been some buds answering to your description flying about Grove-town for some time back.' Grovetown, I may remark, is situated about four miles from this, and nearly in the centre of the Wairau Valley. After a little talk on the subject it struck me that possibly the birds had been bred there. I said—' The next time you see them, shoot one and send to me.' Yesterday morning one was handed in, but unfortunately I did not see the man who brought it. Fearing that the weather might not allow me to send it to you in the flesh, I have skinned the bird and now send it to you."

Mr. Cook having considerately sent me also the carcase in spirits, I was able to dissect it and to make a preparation of the sternum for Professor Newton's collection at the Cambridge University. It proved to be an adult female, and the stomach contained four large blue-bottle flies almost uninjured and the remains of others in black comminuted matter.

On this point Mr. Cook further remarks in his letter: "Certainly the condition of the specimen is not that of one which has lately made a long aerial trip. In skinning it, although I freely used cotton wool and kept the pepper castor going, I could not help getting the plumage saturated with oil, owing to the excessive fatness of the body."

My correspondent promises to obtain from Mr. Cheeseman, who procured the specimen, full particulars as to when the swallows were first seen, as to whether there seemed to be a family party, and as to when and where this one was shot. In the meantime, he offers the following pertinent remarks: "Do you think that the recent warm weather and the early and frequent nor'-westers have had anything to do with the appearance of the swallows once more? Again, what do you think becomes of the stray birds which find their way to New Zealand? I should say it is very unlikely, judging from the prevalent winds, that they could ever return to Australia or Tasmania, whence, I presume, they come. Are they known in Fiji or South Sea Islands? For, if so, we could imagine them migrating northward to escape our winter. If not, is our New Zealand winter too rigorous for this family of birds? I scarcely fancy so. Even here, there are few winter days when an occasional blink of sunshine does not fetch out dancing myriads of *Ephcmeridæ* on the river banks. In olden days, I fancy this was not so much the case. The rapid growth of willows now overhanging the water must afford protection to delicate newborn insects such as mosquito and other gnats which the old fringe of flax and toe never could have given. The temperature of the water in which the larvæ reach their fullest development is scarcely affected by the season. Indeed, in many snow-fed rivers the temperature, far from the source, when the water is at its lowest, must often be higher in winter than in summer when the melting snows are in full swing and the river body too great to be affected materially by sun-heat. I hope you will agree with me that the natural acclimatization of the Australian swallow is not impossible. One certainly does miss the easy graceful little bird out here."

I received another letter from Mr. Cook, under date June 11th, in which he says:—

"Since I wrote I have seen no further specimens, but note a local in the 'Kaikoura Star,' stating that two swallows had been seen at Kaikoura about the same time as the birds appeared here. I shall try to find out the authority for the statement in the Kaikoura paper, and get, if possible, fuller information than the newspaper paragraph gives.

"I have since seen Mr. Cheeseman who shot the specimen I sent. He tells me there were some six or seven birds in all; that they had been hanging about Grovetown for some weeks before he shot the one; and that he fancied they were young birds, or, at least, that some of them were. He could not, however, say that the party consisted of a pair of old birds with their brood.

"I fear that my idea that they may have been a New Zealand tribe is untenable. The occurrence of birds at Kaikoura and of the one I saw in my paddocks simultaneously with those at Grovetown looks rather like a 'drift' from Australia or Tasmania, I fancy.

"The one interesting question possibly may be why the first notice of occurrence of the swallow is on our

East Coast. If the 'drift' is to and through Cook Straits, I can understand it. Otherwise we should expect notice of arrivals on the west coasts of both islands."

ANTHOCHARA CARUNCULATA.

In my "Essay on the Ornithology of New Zealand, 1865," I included the above species among our birds, on the authority of a specimen in the Auckland Museum, preserved by Mr. St. John, and said to have been obtained at Matakana, to the north of Auckland. The bird was retained on our lists for many years, but no fresh examples having been heard of, and St. John's specimen being of doubtful authenticity, its name was ultimately expunged.

After a lapse of nearly twenty years, I have once more the pleasure of recording it as a New Zealand bird.

During a visit to Marton last year, I was invited by Mr. Avery, the local bird-stuffer, to examine his novelties. Among these was a bird which he had himself collected when serving with the volunteers in Mr. Bryce's expedition against Parihaka. He met with it in some high scrub at the rear of the camp at Rahotu, when on fatigue duty, and was fortunate enough to shoot it. The bird was new to him and he skinned it, performing the operation very successfully. The skin was in a fresh condition when it came into my hands, and proved on examination to be a well-plumaged specimen of *Anthochæra carunculata*, the well-known wattle-bird of Australia.

Mr. Avery was generous enough to give me this fine bird, which has now an undoubted right to a place in our Avifauna, and I have much pleasure in submitting it to your inspection this evening.

CREADION CINEREUS, Buller.

In the "Essay," to which I have already referred, I characterized and named what appeared to me then a new species of *Creadion* in the following terms:—" This species is of the size and general form of *C. carunculatus* to which it bears a close affinity, but the colouring of the plumage is altogether different. The common species (the 'Saddleback') is of a deep uniform black, relieved by a band of rufous brown which occupies the whole of the back, and, forming a sharp outline across the shoulders, sweeps over the wing coverts in a broad curve. In the present bird, however, the plumage is of a dark cinereous brown, paler on the under parts and tinted with umber on the wings and scapularies; the upper and lower tail coverts, and a few spots on the smaller wing coverts, bright rufous. The wattles are of the same colour and shape as in *Creadion carunculatus* but somewhat smaller."

My new species was at once fiercely attacked by Dr. Otto Finsch and Captain Hutton, both of whom declared it to be the young of *Creadion carunculatus*. In his paper which appeared in volume v. of our Transactions (p. 208), Dr. Finsch expressed his satisfaction that Captain Hutton's "examination of the types" had "shown *C. cinereus* to be undoubtedly the young of the above-named species."

In my reply, which appeared in vol. vi., p. 116, I explained that an examination of a fine series of specimens in the Canterbury Museum, showing what appeared to be transitional changes of plumage, had forced me to this conclusion, and that I had communicated the result to Captain Hutton long before the appearance of his catalogue. The descriptive notes which I made at the time of this examination will be found at page 149 of my "Birds of New Zealand." I was careful, nevertheless, to add the following qualifying passages:—

"I confess, however, that the subject is still beset with some difficulty in my own mind. Supposing the plumage of *C. cinereus* to be the first year's dress of *C. caruncidatus*, it seems to me quite inexplicable that the bird has never been met with in that state in the North Island. Captain Hutton suggests that this is due to the comparative scarcity of the species at the North. But during several years' residence in the Province of Wellington I obtained probably upwards of fifty specimens, at various times, without ever detecting any sign of this immature condition of plumage.

"Admitting the comparative scarcity of the species, one would naturally suppose that the younger birds would be more likely to fall into the collector's hands than the fully adult ones. It may be suggested whether the condition of the Canterbury Museum specimens has not possibly resulted from intercrossing; for we have not heard of any further examples (of the kind) being obtained. At any rate, till a specimen in the supposed immature dress has actually been taken in the North Island, the point cannot, I think, be considered finally set at rest."

Here again, strange to say, after a lapse of nearly twenty years, the required evidence is forthcoming, and my *Creadion cinereus* recovers the specific rank so long denied to it.

In 1881, Mr. A. Beischek, a very ardent collector, wrote to me as follows:—"About *Creadion cinereus*, I have this to state: In December, 1878, when I was on the west coast of the South Island, I shot about twenty of both kinds, and of both sexes. What were supposed to be the young of *C. caruncidatus* (your *Creadion cinereus)* I found, on dissection, to be fully adult birds, both male and female. My observations on this point were perfectly reliable. In December, 1880,1 stayed on the Hen (an island in the Hauraki Gulf) three weeks, and shot about thirty specimens of *Creadion carunculatus*, all of them being in the common saddle-back plumage. I

could only determine the sex in each case by dissection, and what appeared to be the young birds differed only from the adult in having the wattles smaller and lighter in colour. I roamed over the whole island during my stay there, and never saw a bird in the plumage of your *Creadion cinereus*" (which is confined to the South Island, where both species commingle).

In 1882, and again in the early part of the present year, Mr. Beischek revisited the Hen, and on both occasions remained there a considerable time exploring every part of the island, and collecting its productions. On his last visit he saw probably forty examples of this bird, all in the plumage of *C. carunculatus*, and collected many specimens of both sexes and all ages. On the Little Barrier he found the species scarce, and obtained only two specimens; while on the Chickens and Island of Kawau he did not meet with this bird at all. In some which he dissected the testes were almost microscopic, the only external differences between these and the old birds being that the plumage was not so glossy, and the wattles not so large or bright. In the adult male these ornamental appendages, of the size of cucumber seeds, are of a beautiful orange colour, and in the adult female a little lighter. In the young birds they are still lighter and extremely minute in size.

To place the matter, however, beyond all doubt, he found, on one occasion, two adult birds feeding a young one, and was successful enough to secure all three birds, which he carefully preserved and marked. He was loath to part with these specimens, but to enable me to demonstrate the specific value of *Creadion cinereus* he handed all three birds over to me, and I have now the pleasure of submitting them to you, marked respectively male, female, and young.

NESTOR NOTABILIS.

For many years the Kea ranked amongst our rarest species, and it is not very long ago that a specimen fetched £25 in the London market. But all this is changed, and, although still of very rare occurrence in the northern parts of the South Island, and quite unknown in this island, it has become a pest in the middle and southern districts; and, owing to its extraordinary penchant for live mutton, it is now so destructive on the sheep-runs, that the aid of Parliament has lately been invoked to abate the nuisance.

Under these circumstances it is scarcely admissible into a paper treating of rare species, but I am unwilling to lose the opportunity of laying before you a very interesting letter' I have received from Mr. John George Shrimpton, of Southbrook, Canterbury:—

"While residing at the Wanaka Lake, I received a letter from my brother Walter (of Matapiro) to the effect that you would like a specimen of the Kea or mountain parrot, and any notes of their habits which I might be able to afford you. My time there was so short after receipt of his letter that, although many Keas were killed, I only succeeded in getting one fair skin, which I forwarded to you by mail a few days ago, and trust has reached you safely. By this mail I forward a water-colour sketch of some young ones drawn from nature by Mr. Huddleston. In the rocky cavern, high up on the mountain, whence these were obtained, were several broods of young ones of various ages and sizes.

"I believe the Kea does not come farther north than the Rakaia River, Canterbury, and is strictly confined to the central range and its spurs as a rule, but may occasionally and will probably be more seen on those hills adjacent to the main range, which attain an elevation of five thousand feet and upwards. There is no doubt that, in spite of the war waged against them, they are increasing very rapidly, probably owing to the plentiful supply of food in the shape of mutton, which they can get, and to which they help themselves most liberally. Fifteen years ago, when I first knew the Lake country, it was a rare thing to see these birds on the hills even in their chosen home among the snow; but now you meet them in flocks of fifty even, and so bold have they become that they will attack sheep under the shepherd's immediate care. Not that they were ever very wild; on the contrary, I think they are the tamest birds in New Zealand; and it is their insatiable curiosity that has probably led them to find out the taste of mutton. At first, they contented themselves with tearing up tents, blankets, and sheepskins, the usual impedimenta of a musterer's camp. They have now so improved upon that, that nothing less than the primest mutton will suit their fastidious tastes. Though so tame that you can often knock them down with a stick, and apparently so inoffensive, a single Kea will swoop down on the strongest fat wether or hoggett, fix himself firmly on its back, generally facing the sheep's tail, and commence digging his daily meal. Sometimes the sheep runs till exhausted, sometimes contents itself by trying to dislodge its adversary by a series of contortions only, but the Kea troubles himself very little about either: he hangs on till the sheep gives in. He then digs away, carefully avoiding the backbone, till he reaches the kidney fat. This is his choicest relish. His cries soon attract others, and between them the poor sheep is soon fitted for a museum. Sometimes a sheep gets away from a timid or perhaps less experienced workman; but he carries with him an indelible scar. On some stations about 5 per cent, of the whole flock are mustered in at shearing-time more or less marked in this manner, and the death-rate is almost incredible. I have no hesitation in saying that, on the runs bordering the Wanaka and Hawea Lakes, the loss from Keas alone is nothing short of from fifteen to twenty thousand sheep annually, and these the primest of the flocks. Although Keas are seen openly enough in the day-time, there is no doubt they work their mischief mostly at night, a bright moonlight one preferred. A severe winter, with sheep

snowed in, is their great opportunity; and this they avail themselves of to the uttermost. Although like other parrots, they are given to anything in the shape of fun or mischief (and, on one occasion they killed a young kaka, tethered), I have never known them to seriously attack any animal other than a sheep. But as a moiety of them have advanced so far in the course of the last eight or ten years, it is impossible to say to what lengths they may aspire in the future.

"I cannot state for certainty that there are no Keas north of the limits I have here assigned as their habitat: I can only say that I have travelled over a considerable portion of that country without either seeing or hearing of them. But as to their habits and destructiveness in the neighbourhood of the great lakes south, I can speak from a long and painful experience."

As some of those present may not have had an opportunity of examining this carnivorous parrot, I beg to exhibit this evening the bird sent by Mr. Shrimpton, and, at the same time, for purposes of comparison, its well-known congener, the *Nestor meridionalis* or common kaka. Both species are by nature vegetable-feeders; and it is a most remarkable fact in natural history that, with the changed condition of its surroundings, this mountain parrot has so rapidly developed a taste for flesh that the instinct has become one of the first habits of life, and almost necessary to the existence of the species.

PLATYCERCUS ALPINUS, Buller.

Mr. Reischek met with this little parakeet in the scrub on the summit of Mount Alexander (above Lake Brunner on the West Coast); and he met with the species again on the Hen, where he shot two, and on the Little Barrier, where he observed another pair, and killed the male.

While on this subject I may be permitted to refer to a passage in the paper read by Mr. Travers last year, "On the Distribution of New Zealand Birds."* He explains that, in making his analysis of genera and species, he has "assumed that Dr. Buller has seen good reasons for reaffirming *Platycercus alpinus* as a species in the Manual, notwithstanding the remarks on the subject in his larger work."

It is true that I yielded to the arguments of Dr. Finsch and agreed to sink my *Platycercus alpinus*, as a species, and treated it in the text of my work as the young of *Platycercus auriceps*. In the Introduction, however, to the book, I gave my reasons for reinstating this form. I there explained that more than twenty living examples of this bird had recently been brought to England; that it was to be seen alive in the Gardens of the Zoological Society of London; and that the validity of the species had thus been established beyond all doubt.

CHARADRIUS FULVUS.

In April, 1881, Mr. T. F. Cheeseman, the Curator of the Auckland Museum, wrote informing me that he had obtained two specimens (male and female) of the Golden Plover, both shot on the Manukau Harbour; and he afterwards made an interesting communication on the subject to the Auckland Institute (Trans. N.Z. Inst., vol. xiv., p. 264).

Of this rare visitant, Mr. C. H. Robson, with his usual activity in the cause of science, has obtained and forwarded to me a fine pair from Portland Island. I take this opportunity of exhibiting them, and also of communicating to the society some notes on this bird by my correspondent who was fortunate enough to discover its breeding place and to obtain its eggs.