The Linnean

Communicating nature since 1788

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The Quagga

Extinct 140 years—but what of other species, like Grevy's zebra?

Unlocking the paintbox of FERDINAND BAUER

Walking in WALLACE'S FOOTSTEPS

The LINNEAN SOCIETY of London

About us

The Linnean Society of London is the world's oldest active society devoted to natural history. Founded in 1788 by botanist Sir James Edward Smith (1759–1828), the Society takes its name from the Swedish naturalist Carl Linnaeus (1707–1778), whose botanical, zoological and library collections have been in our keeping since 1829. These collections, awarded Designated status by Arts Council England, are of fundamental importance as a primary reference for the naming of plants and animals. They are enhanced by the Society's own rich library which provides key resources for scientific and cultural research.

Our vision is a world where nature is understood, valued and protected. To do this we aim to inform, involve and inspire people about nature and its significance through our collections, events and publications. Thanks to the wide-ranging expertise of our membership and our unique collections, we are a hub for science communication through interdisciplinary learning and engagement.

Cover image: Shutterstock.com/slowmotiongli; This page: Leonie Berwick

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Dear Fellows,

Welcome to this very full issue, where we'll look at the history—and extinction 140 years ago—of the quagga. What can we learn from its extinction in order to protect other at risk zebra species?

Famed botanical artist Ferdinand Bauer's intricate colour system and 'paintbox' has been recreated by artist Jane Jelley, with fascinating results. Similarly, Xinyi Wen has traced the original woodblock illustrations utilised by early 18th-century physician Frank Nicholls in his botanical manuscript.

And speaking of colour, our own Janet Ashdown outlines the 'natural history' of the colour red, drawing from specimens in Society founder James Edward Smith's carpological collection.

Karl Png writes of Alfred Russel Wallace's impact on his home of Singapore, and describes how Wallace has inspired his career in biology. Our bicentenary exhibition about Wallace is also on view until December—please do come and visit!

As always there are details for some exciting upcoming events, both online and in person, including our first standalone President's Lecture, nature walks and a natural history-related tour of the Victoria and Albert Museum. Book your place now.

Leonie

Leonie Berwick
Editor, *The Linnean* & Publications Manager (leonie@linnean.org)

You can also find the online interactive version of this issue in the Members' Area.

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Publish

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Features

News & Updates

What's on

Lightning Strikes in Tropical Forests: Expected Losses and Unexpected Gains

Speaker: Evan Gora

13 Sept | 12.30 BST

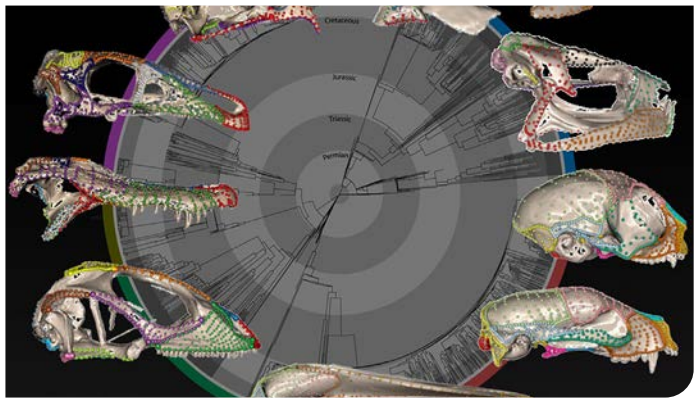
Tropical forests accumulate and store more carbon than any other terrestrial ecosystem, and the capacity of tropical forests to store carbon is fundamentally limited by tree death. Yet little is known about one of the major drivers of tree death—lightning—which has been shown to be increasing in frequency. Evan will reveal recent research, ranging from interactions between individual trees and lightning to ecosystem processes and intercontinental patterns, that will provide compelling evidence that lightning shapes patterns of plant interactions and carbon storage in tropical forests. **(Online only.)**

A Fruity Walk Around the Secret Orchards of Bermondsey and Southwark Park

Guide: Divya Hariramani Herrero

19 Sept| 17.00–19.00 BST

Join us on a Fruity Walk around Bermondsey. Starting at St James's Churchyard, discover two very special young community orchards as well as the secret orchard in Southwark Park. You'll learn about how the orchards were created, the stories behind these trees, as well as tree identification, history and folklore. Guide Divya Hariramani Herrero is a modern day urban fruit tree forager and London National Park City Ranger, and runs the Fruity Walks Instagram page, where she maps London's fruit trees, exploring the stories behind them and the people that planted them. **(Offsite event.)**



President's Lecture 2023 | The Speed of Life: A Deep-Time Perspective

Speaker: Professor Anjali Goswami PLS

21 Sept| 18.00 BST (Members-only Event)

Why is evolution seemingly a story of fits and starts, with long periods of relative stability interrupted by rapid transitions?

In this lecture, Anjali will explore how evolutionary paths are as diverse as life itself, but commonalities abound in how species respond to changes in their world, with characteristics such as social behaviour, herbivory, and metamorphosis seeming to speed up the pace of evolution. **(Onsite event.)**

To book for these and other events not shown, visit www.linnean.org/events

Images: Evan Gora; Divya Hariramani Herrero; Anjali Goswami/Natural History Museum, London

Is Natural Selection a Team Sport? Cooperation and the History of Life

Speaker: Jonathan Silvertown

5 Oct | 18.00 BST (With the University of Edinburgh)

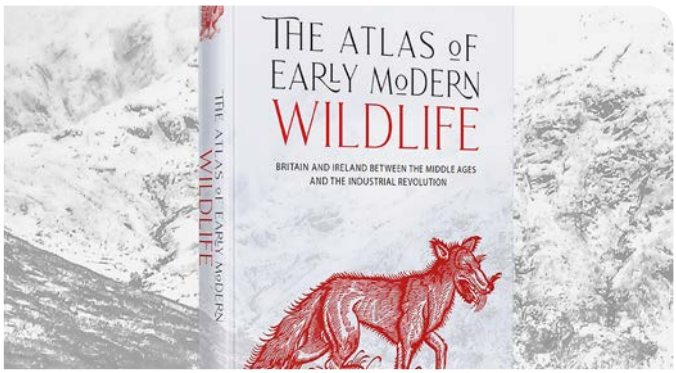
Cooperation is in our nature, but there is still a nagging doubt that something biological in us compels us to be selfish—our genes. This is the paradox—genes are inexorably driven by self-replication, and yet cooperation continually rears its head. The rules of cooperation that we encounter daily are fundamentally the same as those that apply to how our cells cooperate within the body. These rules play out in complicated ways that illuminate everything from the profound to the trivial. **(Onsite at the University of Edinburgh.)**

The Atlas of Early Modern Wildlife

Speaker: Lee Raye

29 Nov | 18.00 BST (Nature Reader)

The 16th to 18th century was an important time for recording wildlife in Britain and Ireland, with more people collecting records and inviting contributions from across the commonwealth. Species now extinct, like the great auk and wolf, were still well known, while others like the rabbit and red-legged partridge were much less widespread than they are today. In this lecture, Lee will outline the research behind the *Atlas of Early Modern Wildlife*. **(Online only.)**



Images: Wellcome Collection; Glenn Benson; Lee Raye; The Linnean Society of London

Victoria and Albert Museum: Indoor Nature Walk

Guide: Glenn Benson FLS

21 Oct | 11.00–13.00 BST

Do you 'need some nature' during the darker winter months? Join our indoor winter walk around the galleries of London's Victoria and Albert Museum (V&A) in South Kensington.

Glenn, our Honorary Curator of Artefacts, has worked for the V&A since 1984 and will lead this personal, rather alternative, tour of the V&A's vast collection exploring representations of nature, with links to the Linnean Society, amid the many items displayed throughout the galleries. The V&A is a museum of decorative arts, covering some 5,000 years of creativity from across the world. (Note: Involves a lot of walking but there will be places to sit in the galleries. **(Onsite at the V&A.)**

Treasures Tours

Guide: Members of the Collections Team

21 Sept, 5 Oct, 2 Nov, 7 Dec | 14.00–15.30 BST

Join our expert staff on an in-depth, behind-the-scenes tour of our unique home at Burlington House in central London. See some of Carl Linnaeus's own personal collections and learn the story of the Linnean Society.

Book your place!

News

INTRODUCING THE NEW EDITORS-IN-CHIEF (EIC) OF THE SOCIETY'S SCIENTIFIC JOURNALS

In the last issue of *The Linnean* we said a heartfelt thank you to our long-serving Editors-in-Chief, Professor Michael Fay, Dr Maarten Christenhusz and Professor John Allen. Here we'd like you to join us in welcoming:

Dr Steven Dodsworth

EiC, *Botanical Journal of the Linnean Society*
e: botjlinnsoc@linnean.org

Steven is a botanist with wide-ranging interests that centre on the evolution of plant diversity based at the University of Portsmouth. His research uses high-throughput DNA sequencing data to study the evolution of plant genomes and traits, and to transform systematic thinking. Steven was an Associate Editor for the *Botanical Journal*, and EiC of the *Evolutionary Journal of the Linnean Society*, before taking on this new role earlier this year.

He says: 'Taking on the role of EiC for the *Botanical Journal* has been a real pleasure. This journal has been at the heart of our botanical community for over 150 years, and recently celebrated its 200th volume. It is an exciting time for botanical research, where novel methods and big data are revolutionising our understanding of plant systematics and evolution. I hope that the *Botanical Journal* will be a significant home for some of these inspiring papers.'

Dr Karen Sears

EiC, *Biological Journal of the Linnean Society*
e: bioljlinnsoc@linnean.org

Karen brings a range of research, editorial and learned society experience to the role of Editor-in-Chief. Her research team at UCLA harnesses the diversity that exists in mammals to study how evolution works. Their primary research goal is to understand how developmental variation interacts with environmental factors to foster new adaptations in diverse mammals, with implications for human health. She is currently shadowing John Allen and will officially take over in September.

Karen says of the role: 'Taking up the reins of the *Biological Journal of the Linnean Society* is a huge honour. It's a publication that is so important to the history of science in general, and personally to my work, and I can't wait to get started. I'm looking forward to working with Professor Allen over the coming weeks, and with all of our authors, Editorial Board and of course the Linnean Society team, to continue to share high quality research with the community.'

Professor Julia Day

EiC, *Evolutionary Journal of the Linnean Society*
e: evoljlinnsoc@linnean.org

Julia has been Editor of the *Evolutionary Journal*, the Society's fully open-access journal, since January 2023. An evolutionary biologist, Julia is actively engaged in environmental DNA research for biodiversity monitoring, with a particular focus on the impacts of land-use change on the species-rich fauna of the African rift lakes, and other freshwater systems from around the world.

Images: The Linnean Society of London; Karen Sears

Julia says: 'It's very exciting to be the Editor for the newly-launched *Evolutionary Journal of the Linnean Society*. Our vision of diversity, excellence and accessibility centres around a broad journal scope, covering all perspectives on evolution and encompassing a diversity of different approaches, to welcoming our stellar and diverse international editorial board. By being solely online and open access, we also aim to deliver a stimulating journal tailored to the global evolutionary biology community.'

Dr Jeff Streicher

EiC, *Zoological Journal of the Linnean Society*
e: zoojlinnsoc@linnean.org

Jeff is an evolutionary biologist and herpetologist, based at London's Natural History Museum as a Principal Curator and Senior Curator in Charge of Amphibians and Reptiles. Having taken over in April, Jeff brings much experience to his role as EiC, serving as an Associate Editor (Vertebrates) of the *Journal of Natural History* from 2016–2019, as well as sitting on the Editorial Boards of *Current Herpetology* and the *Journal of Natural History*.

He says: 'Starting as EiC of *Zoological Journal of the Linnean Society* earlier this year was a great privilege. I have enjoyed my interactions with authors, the Editorial Board, Linnean Society and Oxford University Press. Moving forward I am excited to build on the Journal's broad appeal amongst zoologists and natural historians. I am keen to expand our impact by supporting diverse perspectives, celebrating taxonomy, and sharing our science with wider audiences.'

Images: The Linnean Society of London

Welcome to New Staff...

Rowena Howie

Rowena joined the Society in August as Office and Facilities Manager. After a decade working in adventure travel, as well as travelling across many continents herself, Rowena's enterprising mind led to the establishment of her own business in 2009, opening a multi-award-winning boutique in the West End, and launching a locally designed and manufactured range in 2017.

'I am looking forward to supporting the staff, members and visitors to Burlington House, alongside overseeing the day-to-day operations. In an historic building such as this, there is much to keep on top of, including working towards our sustainability goals.

I'll be spreading the word about the room hire that we offer, looking at what items people might want to buy and ensuring the chance to donate is available to anyone who wants to support the Society's future.' Welcome, Rowena!

...and a Farewell

In July we said a sad goodbye to our Multimedia Content Producer, Ross Ziegelmeier. Ross joined the Society in May 2015 to lead the BioMedia Meltdown SciArt project, devising and running it for schools.

Ross went on to become our content producer, developing videos, podcasts and animations about our collections. This included videos promoting papers from our journals, one being a series of animated shorts about the courtship displays of peacock spiders, in the style of a competitive drag queen pageant. One YouTube user commented: 'I like how you folks are always coming up with unique ideas.' Ross has been a part of the Linnean Society family for eight years, and many of you will have known or worked with him. We hope you will join us in wishing him nothing but the very best for the future.

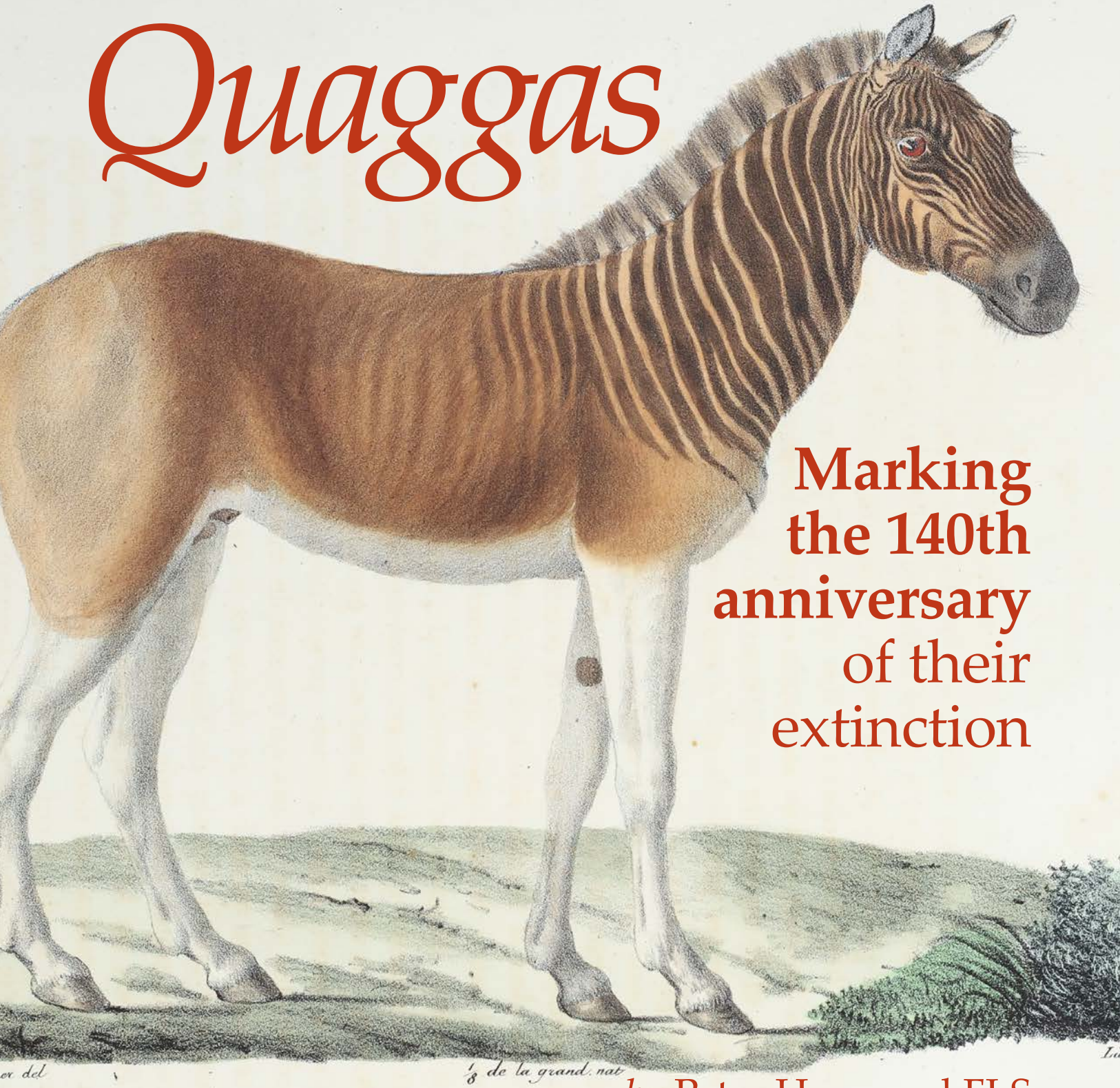
The Linnean Society of London Medals and Awards 2024

Each year, through our medals and awards, the Linnean Society recognises the outstanding achievements of individuals and groups working to further the knowledge, understanding and conservation of our natural world. Do you know of someone who has had a significant impact on our understanding of science and nature? Nominations for 2024 are now open!

The Linnean Medal | The Bicentenary Medal | The Darwin-Wallace Medal | The Irene Manton Prize | The John C. Marsden Medal | The John Spedan Lewis Emerging Leader Award | The Trail-Crisp Award | The H. H. Bloomer Award | The Jill Smythies Award

To find out more, visit www.linnean.org/medals Deadline 30 Sept 2023

Quaggas



Marking the 140th anniversary of their extinction

by Peter Heywood FLS

Quaggas (*Equus quagga quagga*) were a subspecies of the plains zebra that differed from other zebras in having unstriped legs, and bodies with reduced striping and brown coloration.[1] The 140th anniversary of the death of the last known quagga, on 12 August 1883 in the Amsterdam Zoo, is an opportunity to consider the reasons for their extinction and to draw parallels with organisms that are currently endangered.

Quaggas lived in the Karoo (an arid plateau) and adjacent biomes, especially the high veld of the Orange Free State (OFS); these habitats occur within present-day South Africa. The lives of quaggas resembled those of other plains zebras: a stallion, one or more mares and their foals lived together as a breeding group and ate a variety of plants—with grasses being the usual food. Quaggas generally grazed with wildebeests (gnus), ostriches and antelopes, all of which served as prey for cheetahs, hyenas, leopards, lions, wild dogs and humans (Heywood 2022).

Anthropogenic impact

For thousands of years, the only humans who knew quaggas were the indigenous Khoe-San people who hunted these and other animals for hides, meat and bones using bows, arrows, poisons, spears and hunting traps. Quaggas survived indigenous hunters and other predators, as well as changes in their habitats brought about by Ice Ages and interglacial periods, but they succumbed to white hunters and their firearms.

Beginning in the 17th century, European settlers expanded eastwards from Cape Town and their livestock competed with quaggas for grazing and water. Settlers shot quaggas from horseback and used their hides to make inexpensive items such as grain bags, shoes, whips and ropes; quagga meat was disdained by most white people and was given to enslaved peoples or African servants. Thomas Pringle, a Scotsman living in southern Africa, deplored their killing:

> The *quagga*, whose flesh is carrion, and even whose hide is almost useless, might be permitted, one would suppose, to range unmolested on his native mountains; but man, when he has no other motive, delights to *destroy* for the mere sake of pastime. Thus the poor quagga, in the absence of better game, is often pursued for sport alone (Pringle 1835).

Settlers were not the only white hunters: in the 19th century the remarkable variety of large animals in southern Africa attracted big-game hunters who shot not only trophy animals such as elephants and lions but also quaggas as food for their servants. Cornwallis Harris, who was one of these nimrods, reported killing 'many' quaggas on his expedition in 1836 and 1837 (Harris 1838).

As with many organisms that are endangered, quaggas did not have to be valuable to face extinction, but the final chapter of their story involved a reassessment of their worth. In the 1850s, their skins (curiously termed 'porpoise hides')

Left: Plate of the quagga ('Couagga') from Etienne Geoffroy Saint-Hilaire and Frédéric Cuvier's *Histoire Naturelle Des Mammifères, Avec Des Figures Originales Coloriées, Dessinées D'après Des Animaux Vivans* (1824–1833).

Below: This image of a quagga showing its unstriped rump and legs was photographed in southern Africa in April 1864 by Gustav Fritsch and was reproduced by photoxylography. The figure is a detail from Fig. 25 in Fritsch (1868).

Images: The Linnean Society of London; Peter Heywood

1 The name 'quagga' ('kwagga' in Afrikaans and 'iqwarha' in Xhosa) is onomatopoeic and reflects the animal's barking cry of 'kwā-hā'.

Above: A mare faces the camera, and a stallion stands to the right of the foal in this display of quaggas at the Mainz Natural History Museum, Germany. Tissues from these specimens provided the first DNA sequenced from extinct organisms. (The striped animal at the lower left is a thylacine, an Australian mammal that was also hunted into extinction). Photograph by the author.

Image: Peter Heywood

became valued as high-quality leather for expensive boots (*The Spectator* 1898). Viewed as being superior to horsehide, quagga skins were exported to Britain and the United States, and the killing of quaggas intensified.

Like quaggas, pangolins are now endangered because people living far distant from them pay handsomely for their bodies: the demand for pangolin scales used in traditional medicine has led to excessive hunting and several species are listed as 'endangered'. Similarly, large numbers of succulent plants are being stolen from South African deserts to supply collectors worldwide. Some of these plants are rare and occur only in a few localities and so species could easily be poached into extinction (Trenchard 2021).

As a result of hunting, the Karoo, which had been an important habitat for quaggas, was devoid of these animals by about 1860 (Bryden 1899), but they remained in the adjacent grasslands of the OFS, not far from the city of Kimberley where diamonds were discovered in 1871—leading to thousands of miners flocking into the area. Mining had a major environmental impact as people scoured widely for firewood and 'game' (Shillington 1985). Discussions of quagga extinction often overlook the effects of diamond mining but undoubtedly it had an impact: quaggas, whose last known habitat was the OFS, are believed to have become extinct there by 1878 (Greig 1983).

Could the quagga have evaded extinction?

Clearly, quaggas were extirpated because they were hunted on an unsustainable scale, but there was no shortage of alternative explanations that lessened the role of humans. Reinhold Rau, who wrote about quaggas and who remounted the Mainz Natural History Museum specimens shown here, noted that the names 'quagga' and 'kwagga' had been applied not only to true quaggas but also to another subspecies of plains zebra, *Equus quagga burchellii*, and even to *Equus zebra zebra*, the Cape mountain zebra. Had this inexact usage, he wondered, resulted in the failure to appreciate the declining numbers of quaggas, and so prevented the implementation of measures that would have protected them (Rau 1974)?

Taxonomy does have an important role in conservation: the recent demonstration that giraffes are four species, not one (Fennessy et al. 2016), argues that protection of the two species that number just a few thousand individuals is especially important. But in the case of quaggas, confusion in nomenclature was not a factor and Rau later changed his mind to conclude that human 'ignorance and greed' (Harris 1998) were the causes of extinction.

The issue of whether quaggas could have been protected demands consideration—especially as the dire effects of overhunting wild animals in southern Africa were recognised as early as 1822 in a proclamation by the Governor of the Cape Colony that sought to preserve 'game' by limiting

hunting. Quaggas, bonteboks (*Damaliscus pygargus pygargus*) and Cape mountain zebras were included in the proclamation, but the latter two animals were hunted into the 20th century until less than one hundred individuals of each were left. They survived, however, on farms and later in national parks and today they number in the thousands. A farming family attempted to rear a motherless quagga foal in the 1850s (Rau 1974); if they had been successful and had saved additional quaggas, this animal, too, could have evaded extinction.

Captive breeding of the 30 or more quaggas taken to Europe could also have been effective, but they were often kept singly or bred with other equines and the occurrence of two foals in the Antwerp Zoo is the only record of births in captivity (Gens 1861). The failure to breed quaggas in zoos or to protect them in other ways also has 21st-century parallels while the preservation of bonteboks and Cape mountain zebras illustrates the efficacy of conserving endangered animals in situ. The advantage of this approach is that a wider range of biota is conserved along with the endangered animals. Conversely, the large-scale hunting in the 19th century that extirpated quaggas and drastically reduced the size of other herbivore populations affected those native plants whose habitats depend on grazing; as a result, nonnative plants have invaded some of these habitats (Milewski 2000).

Above: Grevy's zebra (*Equus grevyi*) has only about 2,000 mature individuals left in the wild, according to the IUCN. The Grevy's Zebra Trust is focussed on conservation of the species and employs 90% of its team from communities that live alongside Grevy's zebra. The team also works with the local pastoral communities on regenerative grazing practices that allow plants time to recover.

Image: Shutterstock.com/slowmotiongli

What of other zebra species?

As this account was prompted by the anniversary of the extinction of quaggas, it is relevant to conclude with the challenges facing other zebras. Grevy's zebras, *Equus grevyi*, is the most endangered of the three zebra species: an estimated 15,200 animals in the late 1970s (Williams 2013) has been reduced to approximately 1,956 mature individuals (https://www.iucnredlist.org/species/7950/89624491) which occur in scattered locations in Ethiopia and Kenya. They face challenges of predation by carnivores and people, disease, loss of habitats, lack of water and climate change. Their conservation is championed by the Grevy's Zebra Trust (https://www.grevyszebratrust.org/).

In Mozambique, a morphologically distinct population of plains zebras, the Selous' zebra, had shrunk from more than 20,000 in 1970 to less than 50 in 2000 (Dutton and Dutton 2000) due to the Mozambican civil war which ended in 1992 and to hunting by safari operators which continued until 1999 (https://www.wild-about-you.com/GameSelousZebra.htm). The numbers of Selous' zebras in Mozambique remain dangerously low.

Plains zebras whose abundance in the wild was estimated at about 663,000 in 2002 (Hack, East and Rubenstein 2002) have been diminished by climate change, habitat loss and hunting to an estimated 150,000 to 250,000 mature individuals (https://www.iucnredlist.org/species/41013/45172424). Despite sometimes being called the 'common zebra', plains zebras are now listed as 'Near Threatened' on the International Union for Conservation of Nature's Red List.

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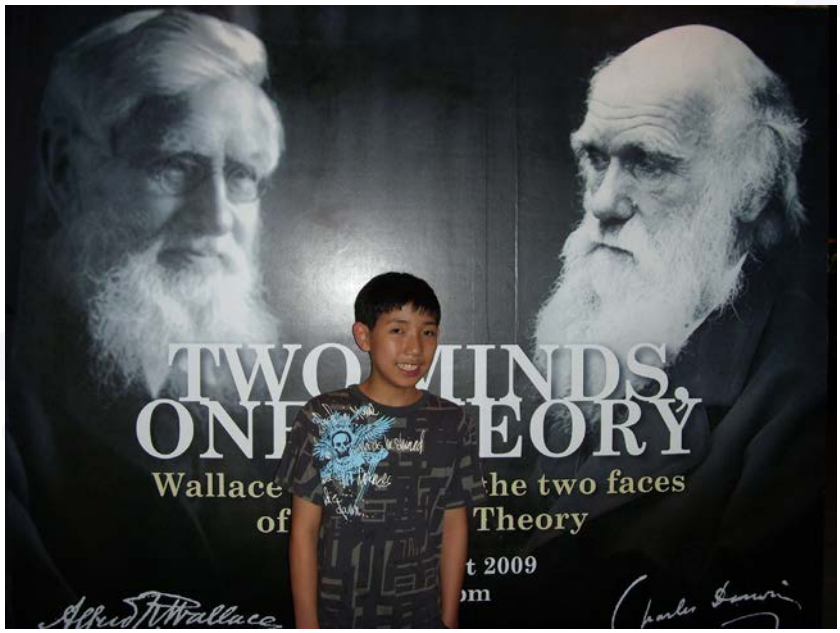
Walking in the Footsteps of Wallace

by Karl Png

Two hours before my graduation ceremony, my friends and I were taking photos with a bronze statue outside the Lee Kong Chian Natural History Museum in Singapore. The statue was of none other than Alfred Russel Wallace (1823–1913) and his Malay assistant, Ali (fl. 1840–1907). Wallace had a huge impact not only on Singapore's natural heritage, but also on my life. I had first picked up *The Malay Archipelago* (1869) at only 12 years old, when I visited an exhibit at the Singapore Botanic Gardens celebrating the 150th anniversary of the Charles Darwin's seminal work, *On the Origin of Species* (1859). Although the language in *The Malay Archipelago* was difficult for a young boy, I enjoyed the vivid descriptions of Wallace's adventures, and it motivated me to have adventures of my own around Southeast Asia, inspiring me to closely observe the wonders of the natural world. Thirteen years later, at my graduation ceremony from the National University of Singapore, I was awarded the Wallace Prize for 'Best Student in Life Sciences with a Concentration in Biology' in my undergraduate cohort. It was a great honour.

Building on Wallace's legacy

I grew up in Singapore, the 'City in Nature', where our streets are well-known for their lush greenery. At its centre lies Singapore's remaining primary forest, Bukit Timah Nature Reserve. When Wallace visited the forest he collected numerous animals, and today the forest still plays host to wildlife no longer found elsewhere on the island. I often visited the forest in search of animals, plants and



Above: The author, aged 12, finding inspiration at an exhibition about Charles Darwin and Alfred Russel Wallace in 2009; **Below:** Hiking in the Danum Valley Conservation Area as part of his Masters with the Royal Botanic Gardens, Kew.

fungi like those that Wallace and many other naturalists later described. When I started my undergraduate degree, I volunteered to survey trees in plots under the Forest Global Earth Observatory network, previously known as the Centre of Tropical Forest Science, where we identified tree species and monitored their growth. And it was tough work, scaling hills and bashing through the thick understorey. However, the experience satisfied my childhood curiosity, especially when I heard the calls of the changeable hawk-eagle (*Nisaetus cirrhatus*) nesting on the tallest dipterocarps, the dominant taxonomic tree family in Southeast Asia. Now, research from the tree census informs important studies on tropical forests globally and their resilience against climate change. So much has changed since Wallace's visit but his legacy lives on. Nearby, the Wallace Education Centre was built in his honour.

All images in article: Karl Png

My frequent trips to the forest led to my Final Year Project on fungi at the end of my degree. Amongst the dipterocarp trees, it was easy to miss the mysterious fungi. When I saw my first mushroom, I realised it was not alone; they grouped around the same tree, and it occurred around several other dipterocarp hosts. I was intrigued. Fortunately, my university lecturer offered projects to study these mushrooms in the urban landscape. There is little work done on tropical fungi, especially cities, and I took up the project immediately. I was tasked with identifying these symbiotic fungi of dipterocarps (also known as ectomycorrhizae) using DNA metabarcoding and morphology. In the Singapore Botanic Gardens nursery, I collected the roots of dipterocarp seedlings as the ectomycorrhizae wrapped around the roots like a fine mesh net. The same collection was completed on adult trees in urban parks around Singapore. There were many roots to observe under the microscope and sample for DNA metabarcoding and at the end of the project, our results showed that some fungal species dominate particular dipterocarp species in urban tropical environments.

Forest restoration

My interest in plants and fungi did not stop there. After my project, I applied for the Masters Degree course in Biodiversity and Conservation at the Royal Botanic Gardens, Kew (RBGK) and Queen Mary University of London (QMUL); the MSc was launched last year with a focus on restoration. We learnt techniques used to restore ecosystems, from seed banking to tree planting. We had the privilege of learning from experts working in Kew, and students also went on a field course this year to explore the Bornean rainforest, like Wallace before us. Our first trip was to the field centre at Danum Valley Conservation Area, one of the tallest tropical

forests in the world, established by the Royal Society under the Southeast Asia Rainforest Research Partnership (SEARRP). Just like Ali assisted Wallace, experienced local research assistants and our module coordinators from Kew organised our daily activities in an unlogged dipterocarp forest. Every day, as a part of our restoration project, we hiked under the giant trees to understand the forest's structure, encountering amazing wildlife like orangutans and tarsiers. After Danum Valley, we headed over to the living collections nursery at the Tropical Rainforest Conservation and Research Centre in Merisuli, east of Sabah. Here, we learned how to assess and plan areas for reforestation, which helped us to understand why restoration is so important in aiding fragmented forests to recover. When Wallace was in Singapore, he also recognised the negative impact of human activity on wildlife and the need to conserve biodiversity.

During my final week in Borneo, I travelled to Sarawak. Driving out of Kuching city, I was amazed by the beautiful hill forests blanketing the landscape. My friend, Mark Liao, kindly hosted me in his recently built plant nursery. He is the Global Youth Biodiversity Network (GYBN) coordinator for the Malaysia Chapter—the official youth constituency for the Convention of Biological Diversity (CBD). His nursery was constructed to also host biodiversity conservation and sustainability workshops for young environmental leaders in Sarawak, and I was his first overnight guest. We searched for the parasitic plant *Rafflesia*, but only found a dead

Above: Karl and his friend Mark exploring Gunung Gading National Park in Sarawak to find the *Rafflesia* flower (famous for its large flowers and putrid smell), the park's emblem.

flower (it is best known for producing the largest individual flower of any species, giving off the smell of rotting meat). Mark drove us around the peat swamps and mangroves that were designated as Ramsar Sites (wetlands of international biological importance, as designated under the Ramsar Convention on Wetlands). They stretched for kilometres, and I could imagine Wallace finding inspiration in these ecosystems when he wrote his 'Sarawak Law' paper.

In the present

Back to the present, in London, I have been establishing baseline data on the ecosystem services of two habitats under traditional garden and ecological land management, at Wakehurst Place in Sussex, managed by Kew. In the study, I have been investigating indicators, both aboveground (pollination visitation and plant diversity) and belowground (carbon fluxes and soil chemistry). Like Wallace, I am spurred on by seeing patterns in nature.

I saw many of these patterns on a recent trip to Svalbard in the Arctic Circle. I stood under the enormous glaciers and realised how they have shaped, and still shape, the landscape and all life in the harsh tundra. Some of these glaciers have receded significantly. Wildflowers carpeted the hills, and their adaptations to the cold weather—their trichomes, for example—were clear to the naked eye. I also had the opportunity to visit the Svalbard Global Seed Vault, where genetic lines of important global crop species are held, essentially duplicating those held at other genebanks around the world. This is an added insurance against the loss of any important food crops due to future effects of climate change and potential issues at other genebanks (such as natural disasters, funding, etc.). It was a chilling experience being near the vault, knowing how connected we all are to this building in the Arctic.

Above: A recent trip to the Svalbard Global Seed Vault in the Arctic Circle; added insurance against loss of food crops.

Occasionally I visit London's Natural History Museum, and each time I walk past Wallace's portrait there, I look back at my own adventures and thank him for inspiration. In the last couple of years, I am proud to have been able to utilise my experience and training. I was the Singapore Chapter coordinator for GYBN, and in December 2022, I also attended the Convention on Biological Diversity Conference of Parties meeting (COP15) in Montreal. It is more than evident that we need good biodiversity science, policy and engagement if we want to solve the urgent extinction crisis. Now, more than ever, nature needs our help. If Wallace was still around, I like to think he would agree.

Karl Png, Student Associate of the Linnean Society (karlpng1997@gmail.com)

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Opinion Piece:

UPON DENYING A ROSE ITS NAME*

This piece was stimulated by the debate around a paper published in the *Zoological Journal of the Linnean Society* in December 2022. The Linnean Society itself doesn't have an official view on this topic, but wishes to facilitate nuanced, productive discussion on this key issue. In order to stimulate discussion, our President, Professor Anjali Goswami, has shared her own personal opinion as a scientist. **You can read other perspectives in the September issue of the *Zoological Journal*.**

It has been suggested that every time you learn a new species name, you forget the name of someone you went to school with, a hypothesis that I can confirm through my own experience. And with good reason, as few people (or their names) are as interesting or evocative as *Balbaroo fangaroo* or *Craseonycteris thonglongyai,* as seen above, to name some of my favourites. Or even *Tyrannosaurus rex*, one that I loathe (or at least have a deep ambivalence for). I don't have to tell the membership of the Linnean Society of London that taxonomic nomenclature is not only poetic, but forms the international language and, consequently, the backbone of natural history. And so, it is with full awareness of the irony of addressing this topic as President of the Society that I say we need to talk about names.

Amongst all of Carl Linnaeus's achievements, his novel system of naming and classifying species is by far the most famous, and he himself named thousands of new species. Many of us also know first-hand the excitement of discovering a new species and deciding on the name by which it will forever (maybe) be known. Yet, we also know the ordeal of wading through synonyms to match up a name on a label in a museum collection with the current understanding of its taxonomic identity. In my most recent paper, dozens of the taxa in my dataset had genus and species names that had been amended from those on their museum labels (which already incorporate extensive name changes) and which I spent days checking (even having to update one species name in the proofs). This was for mammals—an extremely well-studied group—and those numbers would likely be far higher in more enigmatic groups.

Taxon names may change for many reasons. We may identify that a purported new species is the same as an existing one, rendering the new name invalid. We may realise that an existing named taxon actually represents multiple distinct taxa, and specimens assigned to the original taxon need to be reassessed. Similarly, new data can impact our understanding of relationships and require us to change or create not just species names, but those of genera or higher-level taxa. As our knowledge of the natural world grows in scale, quality and accuracy, we continuously revise taxonomic nomenclature. One of the critical innovations of the Linnaean system is that it reflects the hierarchy of taxa, and thus the Linnaean system has been tested repeatedly by advancements in science and proven to be both dynamic and flexible to our ever-changing knowledge. We, the creators and users of taxonomic nomenclature, should be similarly flexible, not just to our improved understanding of the natural world, but also to improvements within our own human society.

It is not controversial to acknowledge that opportunities, resources and credit are unevenly distributed around the world

Image: Wikimedia/Puechmaille, Soisook et al.

and across different communities. While there have been many improvements in recent years, equality is still very much a work in progress. The legacy of colonialism is particularly pervasive in science and natural history, and many recent studies have quantified how biases in gender, race and national origin have affected, and continue to affect, access to data, citations and recognition, including the naming of taxa. This last effect is the source of much current debate in the scientific literature and the public sphere, and I feel it is a debate that we, the Linnean Society, should not shy away from.

There are extensive arguments and nuances in this debate, as well as complex practical issues, but at its simplest, my personal view is that it comes down to whether one prioritises nomenclatural stability over the continued impact of long-standing bias on the global community of natural historians. Those arguing for stability should consider how they would feel if their study species bore the name of a person who committed violence or promoted bigotry against their community. The most extreme examples are species names that incorporate racial slurs, named in an era where certain communities were refused their right to dignity. Those examples are abhorrent, and I hope we all agree that it would be reasonable to refuse such applications if they were submitted now. However, we should also recognise that, by refusing to modify existing offensive species names, we continue to deny dignity to communities that have long been marginalised. A common argument is that we cannot change history, and that by changing names we are effectively erasing the past. However, this ignores the fact that eponymous species names are an honorific, and thus a celebration of a person. Taxon names involving a slur similarly celebrate shameful periods in our history; in both cases, there is no reason to continue the celebration.

Stability is important, especially in a period of unprecedented biotic change. But names change all the time, for a variety of good scientific reasons, including those listed above. The forementioned *Tyrannosaurus rex*, for example, is associated with over 20 genus and species level synonyms, yet we still manage to recognise, study and discuss it (far too much, in this palaeomammalogist's highly-biased opinion). We have systems to allow for taxonomic revision based on new scientific understanding, and we could employ those same systems to accommodate new societal understanding. There will be practical issues to resolve. Who should arbitrate those changes? Are all offences equal? What about the thousands of species named after people who have made huge contributions to natural history, but exhibited behaviours that were personally or professionally repugnant? Should we give up eponymous species names entirely, given we rarely know the full personal and professional story of a person being honoured in such a permanent way? These are all questions that need and deserve attention and discussion. There are international bodies that currently arbitrate biological nomenclature, but they are overwhelmingly composed of Western scientists, with little representation of any marginalised communities. While this of course does not necessarily mean they cannot accurately identify or judge degree of offense, it is reflective of a fundamental issue challenging natural history to this day: that this inherently global field is overwhelmingly dominated by Western scientists that arbitrate decisions that impact much broader and more diverse communities.

Another argument is that the scale of the challenge is too great and would distract from critical work during a biodiversity crisis. Natural historians, however, are extremely well versed at tackling immense challenges. Indeed, we would never view the fact that we have only identified a small, perhaps even infinitesimal, proportion of past and present biodiversity as an argument for giving up on the discovery and study of new species. There are also scales of offence, and my own view is that workers will be entirely capable of prioritising name changes without overwhelming the adjudicating bodies. In doing so, we would also establish better precedents for the future, perhaps doing away with the troublesome tradition of eponymous species names altogether. Of course, doing so would do away with one of my favourites—*C. thonglongyai*, a species of bat named for the eminent Thai zoologist who discovered it during his tragically short life. However, it is hard to argue with data showing that my favourite bat is an outlier, and the vast majority of eponymous species names honour Western scientists, even when they had no history of working in the region from which the species hails. Wouldn't it be better for taxon names to shake off this baggage, convey something useful about morphology, ecology or biogeography, and leave precious (and in my case, rather limited) memory for retaining the names of school friends?

These are awkward conversations, not least for a society named after an eminent naturalist who himself has also attracted accusations of racism. But being uncomfortable or awkward is far better than turning a blind eye to the continuing effect of historical bigotry on our present and future colleagues. Linnaeus's *Systema Naturae* challenged long-standing systems and transformed our understanding of the natural world, and we should be similarly bold in improving it as we work to build a better, ever more inclusive and more impactful society that continues to lead a global community of natural historians.

*The title of this piece was inspired by a poem written by one of my school friends, Dan Lewis, whose name my memory has not yet traded for that of a species.

Professor Anjali Goswami, President

Short responses (under 500 words) are welcome, and we hope to publish selected extracts in a future issue (leonie@linnean.org).

AN INTERACTIVE EVENT ON THIS SUBJECT WILL TAKE PLACE IN 2024.

Unlocking the Paintbox

THE HIDDEN MEANING OF FERDINAND BAUER'S COLOUR CODES FOR THE *FLORA GRAECA*

by Jane Jelley ALS

Previous: *Cyclamen latifolium* from John Sibthorp's *Flora Graeca*. Ferdinand Bauer's field study and watercolour of this published plate are held in the Sherardian Library, Bodleian Libraries, University of Oxford.

Many botanists and lovers of botanical art will know of the beauty and accuracy of Ferdinand Bauer's (1760–1826) illustrations for the *Flora Graeca* (1786–1794). Produced in colour, this book was the result of an expedition to Greece made in 1786–1787, planned and executed by John Sibthorp (1758–1796). Much research has been published about this ground-breaking journey and the significance of its finds, but Ferdinand Bauer, possibly one of the best natural history artists that ever lived, left an intriguing secret hidden in his original illustrations. When working up his watercolours, he could reference his drawings; herbarium specimens; plants grown from seed; and also pictures in previous floras. But he had an extra string to his bow: a colour code of his own devising. The meanings of numbers he had written on his field studies, added before his specimens wilted or faded, enabled him to make complete, coloured, folio paintings in his studio, up to six years after his travels had ended.

Bauer's puzzle has remained intact for the last 236 years. But finally, a feasible answer to explain the hundreds of numbers in this unique code has emerged, not from a study of botany, nor as a result of a knowledge of cyphers—but by way of an investigation of technique, pigments, and practicality. This painter's secret has been revealed by an understanding of artistic process.

Preparing the printed *Flora Graeca*

The *Flora Graeca* was one of the greatest illustrated botanical books of the 18th century, but could never have been made known to a wider public without a huge contribution by the Linnean Society's own founder, James Edward Smith (1759–1828). After Sibthorp's early death, all the documentation and specimen collections from this expedition were eventually sent to Smith, who was asked to prepare them for printed publication.

Smith's task was onerous. The papers came to him in a muddled state, and Sibthorp's notes were difficult to understand. The herbarium specimens, and Bauer's drawings and watercolour paintings were often unlabelled, and only Smith's vast knowledge, and his dedication to the necessary sorting and re-naming, made it possible to get the collection into order, ready for the printer's workshop. Two hundred and fifty copies of the printed flora were eventually produced at huge expense, using up the entirety of Sibthorp's substantial bequest for the purpose. One of these rare volumes can be found in the Linnean Society's library along with correspondence to Smith from Sibthorp, John Hawkins (another member of the expedition and Sibthorp's future brother-in-law), and from the printer, James Sowerby.

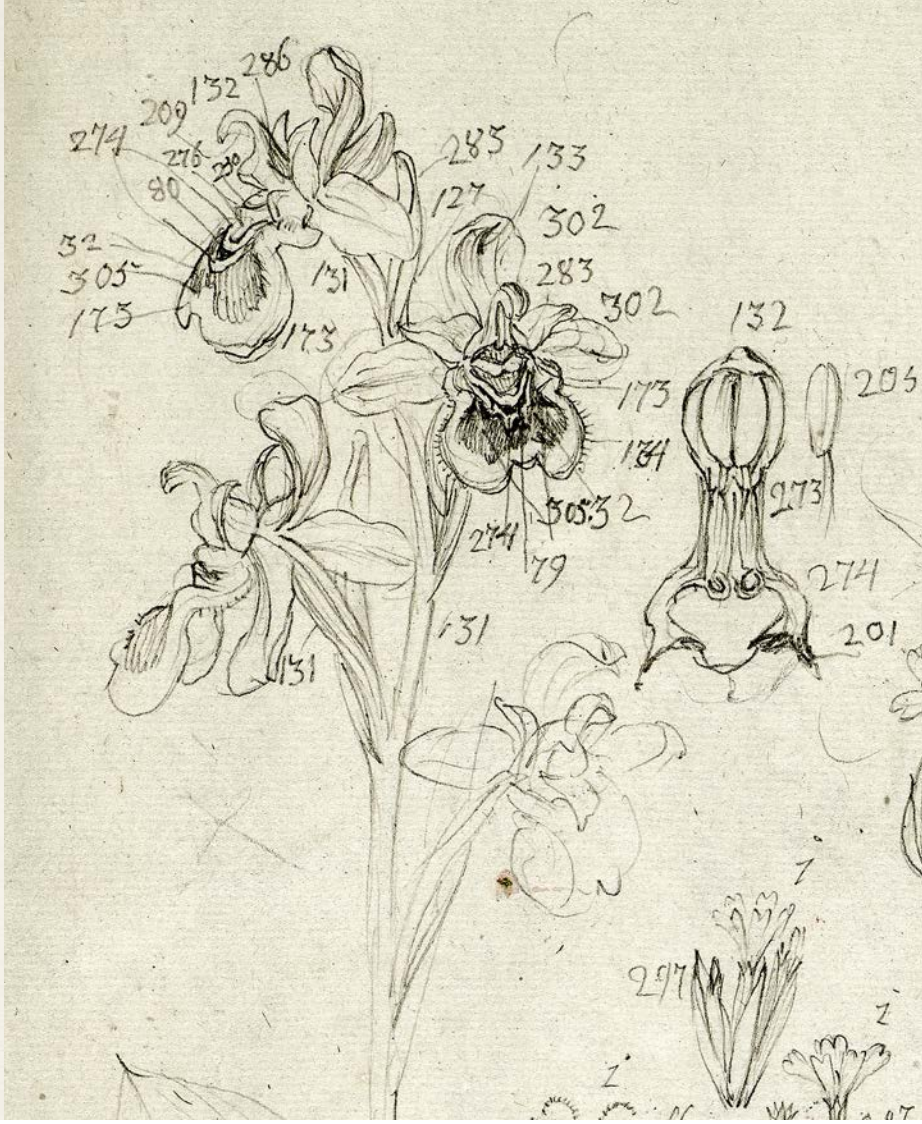
The engraved plates for the printed *Flora Graeca* were hand-coloured with remarkable fidelity, using Bauer's original watercolour paintings for reference. Neither Smith, nor the printer, had the key to Bauer's code. Nor did anyone else, because Bauer left hardly any documentation behind him, and never explained his techniques.

The code itself, with numbers from one to just over 300, can appear to be illogical and inconsistent. Some numbers are unused, and seemingly identical colours can be indicated by different numbers. It is difficult to discern a system behind them (Fig. 1).

Deciphering Bauer's code

Up until now, the botanists and conservators who have encountered the *Flora Graeca* code have focussed on the idea that Bauer's numbers must relate to a pre-prepared chart, which they think he must have used to compare painted swatches with colours he saw in the field.

However, no such chart has ever been found, and no-one has provided a viable explanation to show how Bauer's code worked. Quite apart from the unlikely idea that someone would go on an expedition to discover new species, and confidently pre-suppose what colours they would find in the flora of an unfamiliar land, a 'paint-by-numbers' approach seems unrealistic to many painters, as it would be unable to take into account the subtlety of Bauer's extraordinary watercolours. We can see that his illustrations are not made with a patchwork of hues with a uniform consistency of



paint, each applied in a single application, but are constructed extraordinarily sensitively, with variations of opacity, transitions, and successive washes.

So what kind of aid would Bauer's colour code need to be? One which was easily transportable, easily notated, and easily read back. One that would help him to remember not just the hue, but other qualities of the colours he saw. These might include their opacity and transparency, their brightness or dullness, their lightness or darkness, and their gloss and texture.

As an artist myself, conversant with the painting materials and methods of his time, I knew that he would have had a limited choice of around 30 pigments, each with particular visual and handling properties, and that he would have known each of these well. He would know how or whether they might be diluted; how they looked in successive washes; how they fared in mixtures; and how they might be used under or over another colour.

I thought an answer to Bauer's code was likely to lie in the practicalities of painting, and that its key would be based on his constant companions, the tools of his trade, and the source of his income: the colours in his own portable paintbox.

But it is one thing to form a hypothesis, quite another to try and prove it. Progress was intermittent and very slow. I had to find drawings and paintings by Bauer of the same subject to compare, then look at as many individual codes as I could. I needed to record these sequentially, making guesses about the constituents of each colour I observed, and see if I could discern any kind of logic to the numbers. At the same time

Above: Ferdinand Bauer, *Ophrys tenthredinifera*. (Left) Fig. 1a: Watercolour on paper, c. 1793. MS. Sherard 245: fol. 60r; (Right) Fig. 1b: Field study, c. 1787. MS. Sherard 247: vol. I, fasc. 6, fol. 27r (detail).

Images: Sherardian Library, Bodleian Libraries, University of Oxford

Above: Fig. 2. (Top) Seven kinds of white pigment: Lead, Eggshell, Bone, Double-Washed Chalk, Natural Chalk, Ceruse, and Vicenza white. (Bottom left) Pigment boxes c. 1800. (Bottom right) Grinding Brazil Wood lake paint.

I needed to check in contemporary treatises to see which pigments were likely contenders to be in Bauer's paintbox (Fig. 2). Some listed in these handbooks could be sourced from specialist suppliers, others could be found in antique paintboxes, but I had to make some myself from authentic materials, following old recipes. Then I ground each pigment by hand, into glue and honey, to make up cakes of paint, so I could 'mock-up' a paintbox that would have been familiar to Bauer, and make painted swatches to compare with colours in his paintings.

All this went hand in hand with constant attention to the biggest problem of all. What kind of coding system did Bauer use, and how could his numbers relate to rows of colours in a paintbox? After very many attempts to find a connection, a breakthrough came as a result of noticing the relationship between the 30-odd pigments painters were advised to use at the time, and Bauer's 300-odd codes. On a hunch, I removed the end numbers of the codes Bauer had numbered as 20–300, and wrote them down as numbers 2–30, putting them into a paper ladder with three columns. Immediately the logic became clear, as a consecutive order was revealed. This turned out to be a colour sequence almost identical to one identified in the historical literature as a 'traditional layout of colours in manuscripts' (Fig. 3a shown here, Fig. 3b *OVERLEAF*).

BELOW: Fig. 3a: Colour ladder key for codes 21–309, with pigments identified by eye. These are arranged according to the sequence of the first one or two digits of Bauer's codes.

All images: Jane Jelley

RIGHT: Fig. 3b: Elias Brenner (1647–1717), Nomenclature of colours (1680). F1700, fol. 150.

NOMENCLATURA
TRILINGUIS, ET GENUINA SPECIMINA COLORUM
simplicium, quibus potiſſimum picturæ miniatæ artifices uti ſolent, in gratiam hujus artis cultorum edita per El. Brenner Stockholmiæ A: 1680.

ALBI.	*LES BLANCHES.*	HWITA.
Ceruſsa.	*Le Blanc d' Eſpagne, ou de Ceruſe.*	Blyhwit.
Fiſſile candidum.	*Le Blanc d' Ardoiſe.*	Schiferhwit.
RUBEI.	*LES ROUGES.*	RÖDA.
Carmeſinus color.	*Le Carmin.*	Carmin.
Lacca florentina.	*la Lacque de Florence.*	Florentijn Lack.
Cinnabaris.	*le Vermillon.*	Zinober.
Minium.	*la Mine de plomb*	Menia.
Sangvis Draconis	*le Sang de dragon.*	Drakeblodh.
Hœmatites.	*la ſangvine.*	Blodſteen.
Ochra uſta vel calcinata.	*l' Occre calcinée.*	Brent Ocker.
Rubrica.	*la Terre Rouge.*	Brun Roth.
CÆRULEI.	*LES BLEUES.*	BLÅ
Ultramarinum, aut Cyprium.	*l' Outremer.*	Ultramarijn blåt.
Montanum.	*la Cendre d' azur*	Bergblåt.
Indicum.	*l' Inde.*	Jndie blåt.
VIRIDES.	*LES VERTES.*	GRÖNA.
Chryſocolla.	*le verd de Montagne ou de terre.*	Bergh grönt.
Ærugo.	*le verd de gris.*	Spanſt grönt.
Cryſtallus viridis æris.	*le verd de gris criſtalicée.*	Diſtilerat ſpanſt grönt.
Succus foliorum gladioli.	*le verd d' Iris.*	Iris grönt.
Succus viridis. ſ. Rhamni.	*le verd de Veſſie.*	Safft grönt.
FLAVI.	*LES JAUNES.*	GULA.
Ochra plumbana.	*le Maſſicot.*	Bly gult.
Gutta Gambæ, ſ. Camboya.	*la Gomme Gutte.*	Gummi gutta.
Auripigmentum.	*l' Orpin.*	Auripigment.
Color ex ſucco foliorum betulæ.	*le ſtil de grain.*	Schut gult.
Ochra vulgaris, ſ. fil.	*l' Ocre de ruë.*	Ocker.
Sandaracha.	*la ſandaraque.*	Ruſch gult.
Calculus fellis bubuli.	*la Pierre de fiel.*	Gallſteen.
Umbra.	*la Terre d' Ombre.*	Umbra.
Terra Colonienſis.	*la Terre de Cologne.*	Kölniſk Jordh.
NIGRI.	*LES NOIRES.*	SWARTA.
Elephantinum.	*le Noir d' Jvoire.*	Benſwart
Atramentum Indicum	*l' Encre de Chine.*	Jndianiſkt Bleck.
Atrum fuliginoſum.	*le Noir de Fumée.*	Kinſwart.

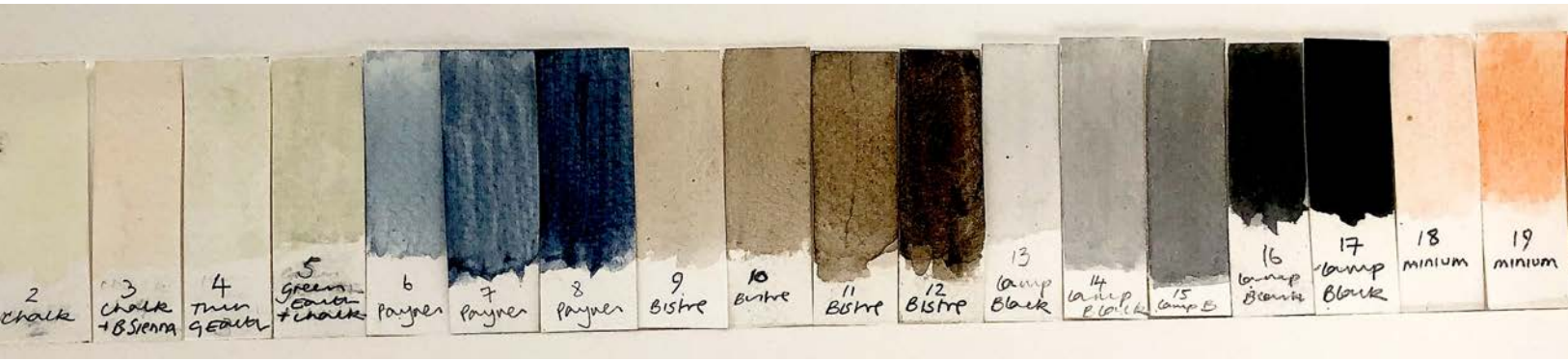
Image: Kungliga biblioteket, Sweden

Further questions

However, the work had not ended, because I had two more problems to solve. If the first part of two and three figure codes related to particular pigments, then what did the end numbers mean? Furthermore, what might single digit codes denote?

After much experimentation, and comparison of studio-made painted swatches with Bauer's paintings, I concluded that there had to be two separate systems within Bauer's colour code. The first was numbered 1–20 and appeared to comprise of eight pigments at different dilutions (Fig. 4). These pigments were amongst those commonly used in underlayers at the time, and Bauer may have listed them separately because they were useful in the first stages of work, and maybe also because low numbers would have been easy to spot when starting a new painting.

Below: Fig. 4: Proposed sequence of pigments for Bauer's codes 1–20: Eggshell White, Double-Washed Chalk, Natural Chalk, Green Earth, Payne's Grey, Bistre, Lamp Black, and Minium (Red Lead).



Then, starting at colour code number 21, and extending until 309, was a range of 29 colours with end numbers that I imagined Bauer could have used to direct himself further, maybe by recording the way he thought he should use his chosen pigments, when making a painted representation of specimens.

Nonetheless, finding what these endings might mean was a much longer task. I compared many codes which had the same starting number, but different endings. The problem was that there were so many techniques Bauer could have used to apply his paint that, even after many trials and comparisons, the meanings of some of these could only be tentative.

My reconstructed paintbox (Fig. 5, *OVERLEAF*) was made to demonstrate how Bauer might have conceived and used his mnemonic code. Except for two early 19th-century blocks of Prussian Green and Payne's Grey, paint cakes were made from authentic materials in the studio.

Pigments for codes 1–20 (Underlayer code), run left to right at the top of the paintbox, and those for codes 21–309 (Main code), follow vertically, in three columns. The fourth column gives possible meanings for the last digit of two or three-digit codes, and indicates how pigments should be used.

As an example, a two-figure code such as 72 means 7 + 2 where 7 is a pigment colour (Indigo) and 2 is a medium wash. Similarly, a three-figure code such as 214 means 21 + 4, where 21 is a pigment colour (Burnt Sienna), and 4 is a direction to use it as a line, an edge, or as spots.

Conclusion

My proposed solution to Bauer's code for the *Flora Graeca* was arrived at by visual judgment and practical experimentation, with reference to contemporary painting practice, and a personal knowledge of the behaviour and qualities of authentic materials and techniques. As a result it can only be subjective, tentative, and incomplete. However, its consistency in predicting what any

Image: Jane Jelley

RIGHT: Fig. 5: Reconstruction of Bauer's paintbox (detail), with handmade cakes of paint, numbered pigments, and meanings of code endings.

Image: Jane Jelley

particular notation means, suggests strongly that Bauer made a mnemonic for colour based on the characteristics of his pigments, and the order in which he placed them in his paintbox.

Finally, we can read Bauer's codes, and see how he could have conceived, remembered, and intended to use colour in his extraordinary paintings.

Jane Jelley ALS (printedlight@hotmail.co.uk)

Further Information

Complete results of my investigation, with full references, worked examples of coded drawings, an exploration of Bauer's painting process, and a free FigShare link to Supplementary Material, can be accessed as below:

Jelley, J. (2022). A Puzzle in a Paintbox: A Painter's Solution to Ferdinand Bauer's Colour Code for the Flora and Fauna Graeca 1786–1794. *Art and Perception* 10(4): 299–333.

https://doi.org/10.1163/22134913-bja10042

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Letters, Lists & the LOCH NESS MONSTER

THE SECRET LIFE OF A DOMESTIC ARCHIVE

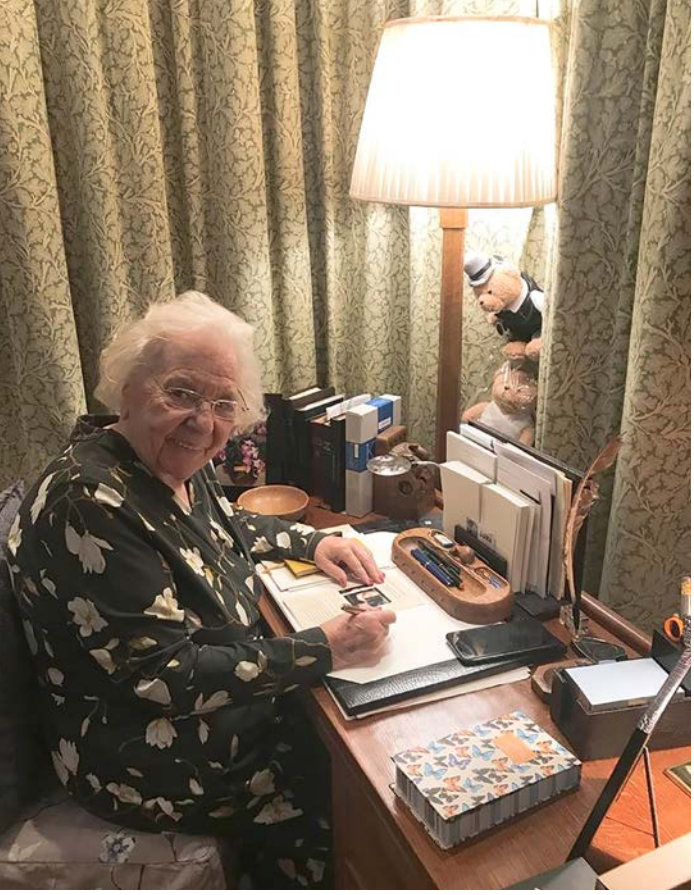
by Alex Milne, Project Archivist

During the first meetings of the Linnean Society of London, the founding Fellows signed their names in a ledger. Over 200 years later, that ledger sits in storage inside the Society's rooms in Burlington House and a whole collection has grown, branching out from those very first documents. Minute books, correspondence, receipts and building plans all created in the founding and day to day running of the Society. In fact, the Domestic Archive continues to expand as we hold events, publish research, or care for and study our collections. It is a rich source of first-hand information on the history of the Society, giving understanding to key decisions, the lives of staff and the tremendous amount of work that goes on behind the scenes.

Preserving papers

Contrary to popular archival folklore, these papers have not been languishing in a 'dusty basement'. The core of the Domestic Archive material had been collated by previous Librarian, and current Honorary Archivist, Gina Douglas, with the help of Library staff and several diligent volunteers, including the admirable listing and boxing work done by Alan Brafield FLS. Gina made sure documents from the early years of the Society were saved for future generations and gave important context to many of the files. This work has been invaluable in giving access to the Domestic Archive for staff and researchers, but it was still a physical task to find the right box and the correct folder, with the hope that a listing was present to quickly check the contents. So, when a generous legacy was left to the Society by a Fellow, Gertrude Marsh-Looi, the Collections Team were able to fund an Archivist to finally create a formal catalogue and make the information we have available and searchable. We are extremely grateful for this kind legacy. The ongoing project works in tandem with the cataloguing of the Collected Archive, which includes amazing items such as the Darwin-Wallace papers, and correspondence of Fellows like ornithologist William Swainson (1789–1855) and entomologist Alexander MacLeay (1767–1848), in the Manuscript Collection. As the Society moves towards making

Image: Shutterstock.com/Alizada Studios



the majority of our collections available, we hope that providing access to our wealth of material will give an unrivalled insight into the work of the Society and the lives of the people who have helped it to thrive and in-so-doing to support further research into the natural sciences.

If we build it, they will come

Creating an archival collection from scratch is a time-consuming and complicated process. The lack of documentation or personal insight explaining the significance or provenance of files, naming important figures, or linking artwork to their publications can leave a catalogue confusingly vague. This is why the detailed groundwork by Gina Douglas and her team has been invaluable to the Domestic Archive project. The team had worked to a general structure, grouping papers relating to Society Meetings or items in the collections together and creating files within these sections to generally describe the pages inside. This not only gave me a good understanding of recordkeeping in the Society, but the bones of a structure around which to build the catalogue.

Simultaneously, the Society has undergone a review of its modern records management practices, a project led by Digital Assets Manager Andrea Deneau. By taking Andrea's new file structure into account for current and future records, we should be able to seamlessly shift records into our archive in a manner that retains their provenance and place in our work.

Above: Gertrude Marsh-Looi FLS. A Fellow for nearly 22 years, her generous legacy helped to make this necessary archival work possible.

Opposite top: Just the tip of the iceberg; files ready for sorting and cataloguing.

Opposite bottom: Starting to see the wood for the trees; the project in progress, with Alex holding up an old image of the herbarium cabinet that used to store Linnaeus's botanical specimens, but now holds archival material.

Image: The Gertrude Marsh-Looi Estate; Alex Milne

The Domestic Archive Catalogue consists of four main sections:

Governance: Papers relating to the creation and overarching governing of the Linnean Society. This contains material such as Bye-Laws and Charters, regalia, council minutes, and information about our patrons.

Operations: Papers covering the day-to-day running of the Society, everything from the homes we have lived in, to staffing and financial papers.

Engagement: Papers relating to how the Society communicates with the Fellowship, other institutions and the general public; for example, papers relating to meetings, correspondence with our Fellows, and information relating to our variety of publications.

Collections: Papers relating to the Society's extensive holdings, including the Library, Archives, Artefacts, Artworks and the founding collections of Carl Linnaeus and James Edward Smith. This section covers details from donations and disposals to loans, and the conservation of our incredible collections.

Once this initial structure was finalised I was able to go through each box, file by file and sort them into sections that reflected their place in the history of the Society's actions. This included an 'all out siege' on Burlington House, scouring cupboards and ransacking desks for letters, plans and paperwork that helped to complete the picture.

Every file had to be read and weeded for out-of-scope items, such as magazines left in the Librarian's purchasing files, Christmas cards packed away with details of an upcoming Council Meeting, or an envelope buried in the Collections papers marked 'Sounds Intriguing!'…that turned out to be

disappointingly empty. Every file kept was then numbered and checked for conservation and security issues before being added to the catalogue. The total number of files created currently sits at 1,785 and the many series and subseries that organise the catalogue bring this up to 1,974 entries into our catalogue software. The physical files and volumes were then stored, in true Linnean Society fashion, wherever we could find a safe space! With most taking up room in our old 'Herbarium' and 'Insecta' cabinets, our Archive store, the Library and Office, several of the most precious items have been given space amongst Linnaeus's founding collections.

Piccadilly, parades and monsters

Rummaging through the correspondence of those who came before, you start to build a picture of the Society that was, previously, strangely disconnected. Items for different sections of the catalogue start to link together, showing just how intertwined every job within the Society really is, and running parallel to all of this is the relationship with the Fellowship. Many of our meeting papers reflect the fact that so many of them were hosted by the Society but they were created, and part-organised by Fellows who were invested in the ideas or projects they touched on. Our Bound and Loose Letters collections contain the bulk of our correspondence with the Fellowship, but their influence and input can be found throughout. Whether they're attempting to book a seat at one of the windows to watch a celebratory parade down Piccadilly, generously donating money or books, or even writing plays about Linnaeus, Fellowship correspondence makes up a huge proportion of our collections.

One thing I found particularly endearing about this archive is its occasional lack of continuity. The gaps of information can be confounding and send you on a quest to a file that may seem totally irrelevant on the surface but actually gives you more leads to follow. While this sadly means that some information is still hidden, or even lost to a shredder of days past, it also leaves us with some wonderful surprises. In one case a letter was missing from a file but had been replaced by a photocopy (complete with the imprint of the hands of whoever was photocopying). In another, there is the slightly bewildering addition of a letter concerning a sighting of the infamous Loch Ness monster stored in a file of insurance correspondence.

Above all, what stays with you about this archive are the voices of the people found within it. Whether you're reading early records with letters from esteemed Fellows or more modern correspondence of Fellows and staff who are still in living memory, the voices of these people shine through, their jokes, their frustrations, their schemes and, above all, their investment in the Society and its work.

Above: Archivist Alex Milne with a newly sorted, ordered and catalogued set of Domestic Archives.

Image: The Linnean Society of London

It has been an enormous privilege to work with the collection and the stories I have learnt along the way from Fellows, previous and current staff and from the papers themselves have been a wonderful way to connect with the Society's long history. There are far too many to fit into any one article but I'm sure there will be many more 'Treasure of the Month' blogs like June's 'Home from Home'. I am excited for others to be able to immerse themselves in these records and get to know them in all their eccentricities.

Alex Milne, Project Archivist (alexandra@linnean.org)

To explore the archives for yourself, visit
https://www2.calmview.co.uk/Linnean/Record.aspx?src=CalmView.Catalog&id=MS

SEEING RED: *A Natural History*

by Janet Ashdown

Previous: Cochineal beetles being harvested to produce red pigment, from Johann Jakob Scheuchzer's *Kupfer-Bibel* (1731–1735).

Below: In the 18th and 19th centuries it was still common to see Western brides and grooms wearing red, as seen here in Carl Linnaeus's 'wedding portrait'.

Images: Janet Ashdown; The Linnean Society of London (Linnaeus and packets/specimens)

It is thought that red was perhaps the first colour to be used by man; pre-historic humans learned to extract red pigments from minerals such as red ochre (iron oxide) and realgar (natural arsenic sulphide). These pigments have been found in 300,000-year-old paintings in the Blombas Caves, east of Cape Town in South Africa. Red was believed to have magical properties, and throughout human history it has been used to paint on bones and rocks, to colour bricks, statues, ceramics and textiles, and to decorate the human body. It was the first colour to be divided into tones and shades; red signified power, beauty, health and fortune, as well as danger.

The specimen collections of the Linnean Society, both those of Carl Linnaeus (1707–1778) and James Edward Smith (1759–1828), contain botanical and zoological items which have traditionally been used as dyes, a number of which have been significant sources of the colour red.

Natural sources

Red dyes were obtained from both plants and animals, with the first dyes purported to originate in China some time before 3,000BCE. Mordents, substances which could set a dye and improve its stability and fastness or alter its shade, were known to the ancient civilisations of Egypt and the Indus Valley. The Swiss Lake Dwellers of 3,000BCE were the first Europeans known to use dyes, dying textiles a shade of red by soaking them in iron-rich water streams.

Red remained the most important colour throughout the Middle-Ages, despite the rise in status of other colours, such as blue, and the international trade in red dye was important and lucrative. Even as late as the 18th and 19th centuries, brides and grooms still often wore red on their wedding day.

In 1856, Henry Perkin, while trying to synthesise quinine from aniline in coal tar, accidentally produced a lavender dye. This marked a revolution in the fabrication of dyes that were easy to produce, reliable in quality and easy to supply. The first synthetic red dye, alizarin (the same compound found in the madder plant, *Rubia tinctorum*) was made by Carl Graebe and Carl Liebermann in 1869. The late 19th century marked the end of the large-scale trade in natural dyes, although today many craftspeople and artisans employ them, and they are still used in the food industry.

ANIMAL

Kermes

Kermes dye has been used since antiquity, and has been found in Neolithic burial sites in France and was used by the ancient Mesopotamians, Egyptians and Persians. The female of the scale insect *Kermes* (usually *Kermes vermilio*) lives on the sap of Kermes oaks (*Quercus coccifera*), native to the Mediterranean, and are harvested just before laying their eggs, dried and then ground to a powder, before being added to hot water to make a dye. This red, crimson, was historically renowned for its richness and depth of colour. *Kermes* was known as 'grana' as the dried insects resembled fine grains and were widely thought to be vegetable in origin. The importance of *Kermes* declined after the Spanish conquest of Mexico in 1518 and the discovery of cochineal, the source of a superior and more stable red dye.

Cochineal

Mexican cochineal, like *Kermes*, is made from the female bodies of a parasitic insect, *Dactylopius coccus*. The Spanish observed the natives of Mexico brushing the females, feeding on the cactus before laying their eggs, off of nopal, or prickly pear cactus (*Opuntia* spp.), before placing them in hot water to kill them, drying them in the sun, and grinding them into a grainy powder. Drying could be hastened by the use of ovens, but the resulting cochineal, known as 'sylvestre' due to its silvery appearance, was inferior to the sun-dried product.

The production process was time consuming, and it took 150,000 dried insects to produce 1 kg of dye, making it a very expensive commodity. By 1525, the Aztecs were trading cochineal with the Spanish who exported it to Europe. This new red dye was superior in every way to *Kermes* and more traditional plant-based dyes and became highly sought after 'on the Continent'. The Spanish expanded the growing of the nopal cactus in Mexico in an effort to domesticate production, and the resulting insects were fatter and yielded more dye. By 1750, Spain was exporting large quantities to Europe and ships carrying these valuable cargoes were prime targets for pirates.

Above: Packets of cochineal beetles that survive in James Edward Smith's carpological collection; **Below:** Once the packet is opened, you can still see the remnants of deep red in these 18th-century specimens.

The lucrative cochineal trade was protected by Spain, and they perpetuated the myth that the 'grana', as with *Kermes*, was vegetable in origin. The secret was discovered in the 1780s, although as long ago as 1692 the French botanist Charles Plumier (1646–1704) declared it to be of animal origin, but this information was suppressed to protect Spanish trade.

Samples of the beetle were sent to Carl Linnaeus by his pupil Daniel Rolander (c. 1725–1793). The naturalist John Ellis (c. 1710–1776) was also sent a packet from Charles Town, Jamaica. At the Linnean Society, James Edward Smith's carpological collection contains six small paper packets of cochineal with descriptions ranging from 'insect cases and dirt' to 'pure cochineal'. The origin and date of these packets are unclear, but a slim printed volume of letters to Sir Joseph Banks (1743–1820), published in 1788 and donated by him to the Society's Library in 1789, may be connected with the contents of the packets.

Sent by Scottish botanist James Anderson (1738–1809) between 1786 and 1788, these letters relate

to his experiments to grow plants in support of the farming of cochineal beetles. An employee of the East India Company, Anderson set up a botanic garden in Madras, India, and had an interest in horticulture, as well as experimenting with various commercial crops.

One reason for these experiments was the rising demand for suitable dyes for the red military uniform worn by the British Army, known as 'red coats'. The plant-based dye madder and the resin-based stick lac (more on those to follow) were used but were not as strong or colourfast as cochineal. Lower-ranking members of the military often wore uniforms dyed with a combination of madder, stick lac and cochineal, but higher-ranking officers wore coats dyed with cochineal only. The British government was spending an inordinate amount on imports of cochineal from Mexico, and an alternative and more financially advantageous source was sought.

Anderson discovered insects similar to cochineal beetles on salt grass growing along the coast of Madras. Comparisons to the Mexican insects were unfavourable and, on learning that true cochineal (*Dactylopius coccus*) lived solely on *Opuntia*, specimens of *Opuntia*, together with cochineal beetles, were smuggled from Brazil into India in 1789. However, these beetles were probably a different species from *D. coccus* and ultimately proved useless as a dye source.

Anderson's letters to Banks detail his attempts to compare the Indian and Brazilian insects to that of Mexico, and his trials for planting *Opuntia*, proposing the export of *Opuntia* plants to other parts of British-controlled territories to produce cochineal, using the enslaved labour in these areas.

Above: A soldier from the British Army having his shoes shined in 1805, wearing his 'red coat'. These uniforms created a rising demand for reliable but economical red dye.

Anderson sent insect samples to Banks for comparison with the Mexican species, accompanied by detailed drawings of the beetle. Anderson also sent Banks cloth dyed with the Indian insects and a bottle of cochineal dye. It may be possible that some of the beetles sent to Banks were part of the cochineal samples found in Smith's carpological collection.

Right: Stick lac, showing the insect-produced resin (attached to the stick) used to produce the dye, and an accompanying piece of dyed materia, from the Society's carpological collection.

Images: Wellcome Images; The Linnean Society of London

Stick lac (gum lac)

Stick lac, or gum lac, is derived from the secretions of several species of lac insect, mainly *Laccifer lacca* and *Kerria lacca*. They live on trees of the *Ficus* genus in the East Indies, and the sticky gum that they secrete on the smaller twigs is broken off and then sundried to kill the remaining insects. Their use as a red dye was known for centuries in India, and these insects were exported to England in 1796 at half the cost of cochineal.

However, it was a time consuming to process. From 1810 it was sold in a cake form, but the quality was less reliable. Though cheaper than cochineal, it produced a far less brilliant red, and stick lac was often mixed with cochineal to make the latter go further. It remained a popular source of more affordable red dye during the 19th century.

PLANT

Madder

Rose or common madder (*Rubia tinctorum*) was perhaps the first plant-based source of red dye. Also aptly known as dyer's madder, it grows wild in a variety of soils and is a perennial plant native to parts of Europe and Western Asia, and was grown in Italy, France and Holland, with roots producing a strong dull red dye, often referred to as 'madder rose' or 'Turkey red'. Prior to the 1850s it was an essential source of red for producers of wool, silk and cotton; England's dyers imported large amounts of madder from Holland.

Red dye was extracted from the madder roots by drying them in the sun or in an oven, then reducing them to a powder before being aged in casks for two years to strengthen the colour. Cheaper and more readily available than cochineal or *Kermes*, madder was used to dye cheaper, coarser cloth.

Above: Rose or common madder was one of the earliest sources of plant-based red dye, taken from the roots of the species. From *Köhler's Medizinal-Pflanzen* (1887–1898).

Image: Wikimedia Commons

Brazilwood

After cochineal and madder, the next most important commercial source of red dye was from Brazil in the form of brazilwood (mainly *Paubrasilia echinata*). A legume, its generic name derives from the Brazilian common name *pau-brasil*, with its country of origin also named for it. It was a major export from Brazil to Portugal, and as with cochineal, a valuable cargo that would prove irresistible to pirates.

The name 'brazilwood' was actually used to describe several species of trees and shrubs including sappanwood (*Biancaea sappan*) which was traded from India, Ceylon and Malaysia ('sappan' was its Malaysian name, used to distinguish it from the Brazilian species). Mexican logwood (*Haematoxylon brasiletto*) a Central America small tree or shrub was another viable source of red dye. These species were of a commercial quality and were a profitable source of trade for red dyes until the early 19th century.

All 'brazilwoods' contain the dye brasilin, with each type being processed in the same way. The red heartwood was chipped, placed in sacks and immersed in water until the dye was released. Different mordents produced a variety of red hues, but none were as lightfast and wash-proof as cochineal and madder.

Safflower

Safflower (*Carthamus tinctorius*), also known as bastard saffron, is a native of Egypt and India that was cultivated in Europe for its red and yellow dye, as the petals contain the natural orange-red dye

Above: (Left) Annatto or achiote (*Bixa orellana*) from a package in the Society's carpological collection; (Right) A naturally-derived colour source, dye from the coating of the bright seeds has been used in colouring textiles and foods.

Below: Also in the carpological collection are some dried examples of the fruit of one of many so-called 'Dragon's blood' trees, in this case most likely *Calamus draco*.

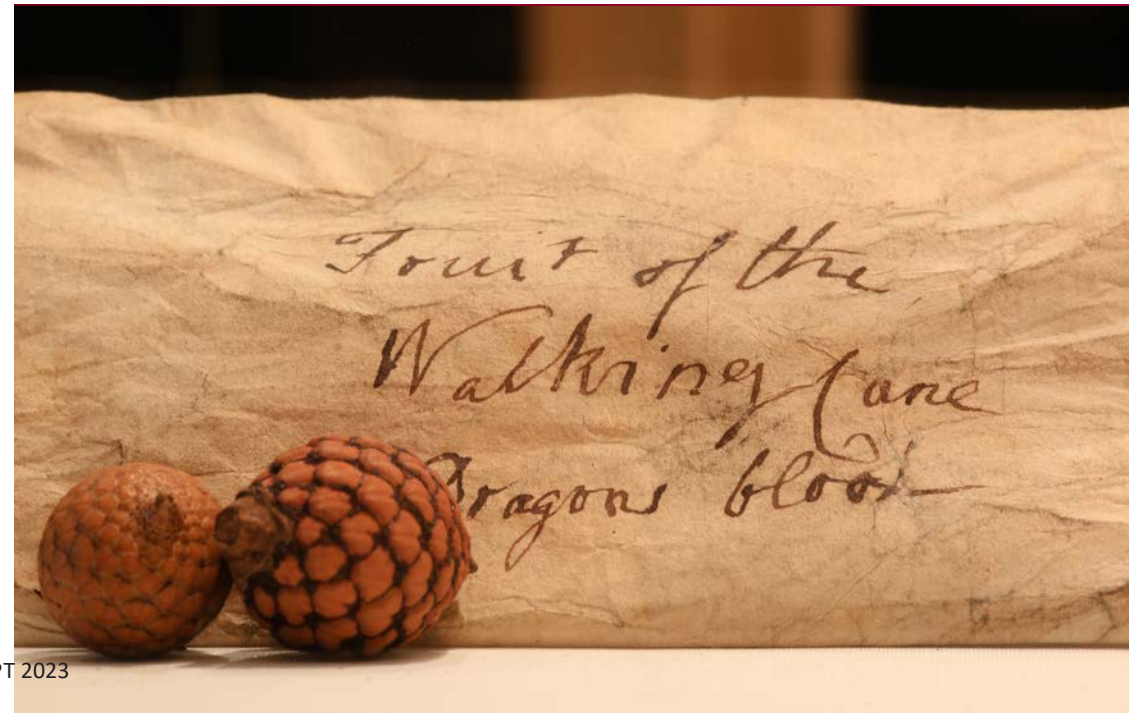
carthamine. Safflower is one of humanity's oldest cultivated crops, grown in Mesopotamia in 2,500BCE. However, the dye fades easily, so was often used for items other than textiles for clothing. It was used to dye the tape that was used to tie up bundles of legal documents, hence the expression 'red tape'.

Achiote tree/annatto

The achiote tree (*Bixa orellana*) produces the dye annatto, the colour of which is made of carotenoid pigments found in the outer coating of the bright crimson seeds. This shrub grows in tropical climates throughout the world. While it has had medicinal and ritualistic uses, it was commonly used in the 18th and 19th centuries to produce a pink/orange dye for textiles and foods, such as butter and cheese. The seed covering of this tropical shrub is soaked, fermented and then macerated.

Dragon's blood

This resinous dye gets its name from a description given by Pliny the Elder. In his *Naturalis Historia*, written c. AD 77, produced in print in 1469, he recounts the myth that dragons and elephants were traditionally enemies. As elephants sought cool waters in hot weather, dragons would lie in wait in the river, ready to strike when the elephants bent to take a drink. The legend says that a dragon would bite and exsanguinate an elephant, who in turn would collapse onto the dragon (by now too intoxicated with blood to move), crushing it to death. The resin is a mix of the elephant's and dragon's bloods, and this curious combination of blood was thought to have magical properties.



Images: The Linnean Society of London; Shutterstock.com/Horus 2017

Above: Dragon's blood trees (*Dracaena draco*), found in the Canary Islands, are now rare.

The term dragon's blood, or *sanguis draconis*, was used for a wide range of plants and trees that produce a vivid red dye from latex that drips from cuts in the bark or other parts of the species, though it is now known that the red colour is a result of bacterial activity on the resin. *Dracaena* species produce a clear resin which dries solid, turning a deep red upon exposure to air. There are examples to be found around the world; *Dracaena draco* is a tree that grows in the Canary Islands, where it is now very rare, but examples can be found in many botanic and private gardens where there is a Mediterranean climate. It is also related to *D. cinnabari* from the island of Socotra in the Arabian Sea. The mystery and folklore surrounding *Dracaena* made it popular for use in medieval paintings.

In Central and South America the species *Croton urucurana* produces a reddish latex, as does *Pterocarpus officinalis* (this Jacquin name has priority over the Linnaean name *Pterocarpus draco* that was published shortly after), a leguminous plant. Both are widespread. The moniker 'dragon's blood' was given to these species by the Spanish who exported the dye in the 16th century.

Elsewhere, from the islands of Sumatra and Borneo, the rattan palm *Calamus draco* also dispenses a red resin, obtained from the husks of the ripe fruits which naturally dry to a fine dust that can then be used as a dye. This tree became associated with 'dragon's blood' after the Middle Ages when it may have been exported to Europe by Arabic traders, and later in the 17th century by the Dutch East India Company. By the 19th century *Calamus* was the only substance produced commercially under the name 'dragon's blood'.

Image: Shutterstock.com/w1d

Above: The 1576 illustration of a *Dracaena* tree by Clusius was reproduced in many herbals that followed.

Some *Dracaena* species, like *D. draco* and *D. cinnabari* are large trees and thought to be very old. An example growing in Orotava, Tenerife, even drew the attention of Alexander von Humboldt and Charles Darwin. Much early knowledge of the dragon tree came from Charles de l'Écluse (1526–1609, known as Clusius) and his illustration of 1576 from a specimen he saw in Portugal in 1565, which was then reproduced in many later herbals.

Red-letter days

Having been rehousing and indexing the Society's carpological collection for many years, I was initially drawn to the worn, 18th-century packets of cochineal beetles, but soon realised it was just a starting point for so many natural sources that produce 'red', a colour which has had such a huge impact sociologically, ecologically and economically. I went on a journey of discovery, looking deeper into this natural world of colour, which still continues. Images of microscope slides of the Linnaean collection (c. 1960s) show cochineal specimens—could these have been those sent by Rolander to Linnaeus? And could it be the origin of one of the packets now found in our carpological collection? There is still research to do, and the story of the colour red continues to intrigue us.

Janet Ashdown, Conservator (janet@linnean.org)

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An Ongoing Journey

Recognising why diversity in natural history matters

by Sandra Knapp PPLS

Diversity and inclusion in the study of natural history has not only depended upon passion and interest, but on privilege and opportunity. When the Linnean Society of London was established in the late 18th century, natural history was the province of wealthy men who had the time to devote to its study. The Society itself did not elect women as Fellows until 1904 and the fight to gain admittance was no trivial affair. In 2018 we celebrated the Society's 230th anniversary through an event giving due recognition to its first women Fellows. It was also the beginning of a long undertaking to increase diversity within our own ranks, and to improve inclusion in the study of natural history, whether academic or 'amateur', for all those who love the natural world. The global pandemic also brought issues of diversity and inclusion into sharp relief. Inclusion of more diverse voices, and of anyone passionate about the natural world, will help us as a Society to achieve our vision of a world where nature is understood, valued and protected.

Above: Alice Eastwood.

Early trailblazers

As members you may remember that during my tenure as President I gave a pre-recorded talk at the Society's 2019 Anniversary Meeting, looking at the changing landscape of fieldwork for woman in natural history. Calling the talk 'Fieldwork in Fancy Dress: A natural history of women in the field', I wanted to celebrate the contribution of women naturalists who braved the rigours of field work, and to highlight how the world has changed since the days of those early trailblazers, but also how we still have significant challenges to overcome. (The video is available on the Society's YouTube channel: bit.ly/3Lm8ptD.) Of 51 Presidents, I was only the third female President in the history of the Society, followed by now-President Professor Anjali

Images: (Alice Eastwood) Wikipedia/California Academy of Sciences; (Marianne North/Mary Kingsley) Natoinal Portrait Gallery

Above: Marianne North.

Goswami, and my talk paid tribute to my predecessors, Professor Irene Manton (PLS 1973–1976) and Professor Dianne Edwards (PLS 2012–2015). My lecture was a highly personal romp through the challenges female natural historians have faced in the field, featuring some of my heroes—among them Mary Anning (1799–1847), Maria Sibylla Merian (1647–1717), Jeanne Baret (1740–1807), Mary Treat (1830–1923), Marianne North (1830–90), Mary Kingsley (1862–1900), Alice Eastwood (1859–1953) and Evelyn Cheesman (1881–1969). These pioneers braved discrimination and disregard in the pursuit of knowledge about our world—Jeanne Baret, for example, had to disguise herself as a cabin boy to go aboard the ship captained by Louis Antoine de Bougainville, and Mary Treat was referred to not by name, but as the anonymous 'a lady' in the publications of others. But these determined women did some truly wonderful things—Maria Sibylla Merian was the first person to document insect metamorphosis, Mary Treat's opinions were prized by Charles Darwin, Alice Eastwood single-handedly rescued the botanical type specimens of the California Academy of Sciences from the fires after the San Francisco earthquake of 1906, and Mary Kingsley and Evelyn Cheesman both collected in places no naturalist had been before. The latter two also had quite unique perspectives on attire for the field!

New challenges

So is natural history fieldwork today easy? Have women now become 'mainstream' since these pioneers faced the challenges of the past? We certainly see more women in the field today, but the challenges have not gone away—they are just different. That Mary Kingsley could go alone up rivers in West Africa may have depended upon her status as a European, Victorian woman. Times have changed. I highlighted a paper that came out in 2014 (Clancy *et al.* 2014) that documented the incidence of inappropriate behaviour in field situations—ranging from denigrating and demeaning comments and

put-downs, to sexual harassment or assault. At all levels, women overwhelmingly experience more harassment than men, and often find that there is no action taken even if it is reported. The hierarchical nature of inappropriate behaviours is also different between genders—men experience more inappropriate behaviour from their peers, while for women it comes from their superiors, those in charge. It can be hard to stand up to those who are higher in the pecking order, meaning that behaviour perceived as threatening to young female natural historians can turn them off to fieldwork forever, depriving the field of valuable contributors whose perspectives enrich our understanding of nature. So, challenges have not gone away, they just have been replaced by new trials that are no less important to overcome than those of the past. It is up to us ALL to make the experience of being in the field a joy.

From crinolines to careers in conservation

The story of women natural historians in the field highlights something I think is important about the journey towards diversity and inclusion. This is that the job is never done, new challenges arise, and new changes can and must be made. Whether it is the desire and determination to explore that took Mary Kingsley to Africa in her crinoline, or today's women to sea to discover new phenomena that help us conserve the planet, opportunity and access are critical for achieving an inclusive natural history. If you have never had the opportunity to take a walk in the woods or to look at a flower close-up, how can you find a passion for the natural world, and more importantly, the need to preserve it?

Dr Sandra Knapp (President 2018–2022)
Department of Life Sciences, Natural History Museum, London

ABOVE: Mary Kingsley, c. 1900

REFERENCE

Clancy, K. B. H., Nelson, R. G., Rutherford, J. N. and Hinde, K. (2014). Survey of Academic Field Experiences (SAFE): trainees report harassment and assault. PLoS ONE 9(7): e102172, doi:10.1371/journal.pone.0102172

The Linnean special issue no. 10: 'The Door Was Opened': Pioneering women at the Linnean Society of London and their continuing legacy'

The latest special issue dives into the fascinating stories of some of the first women to be elected as members of the Society in 1904, as well as women's impact on taxonomy and what life can be like as a woman in the field. Don't miss it!

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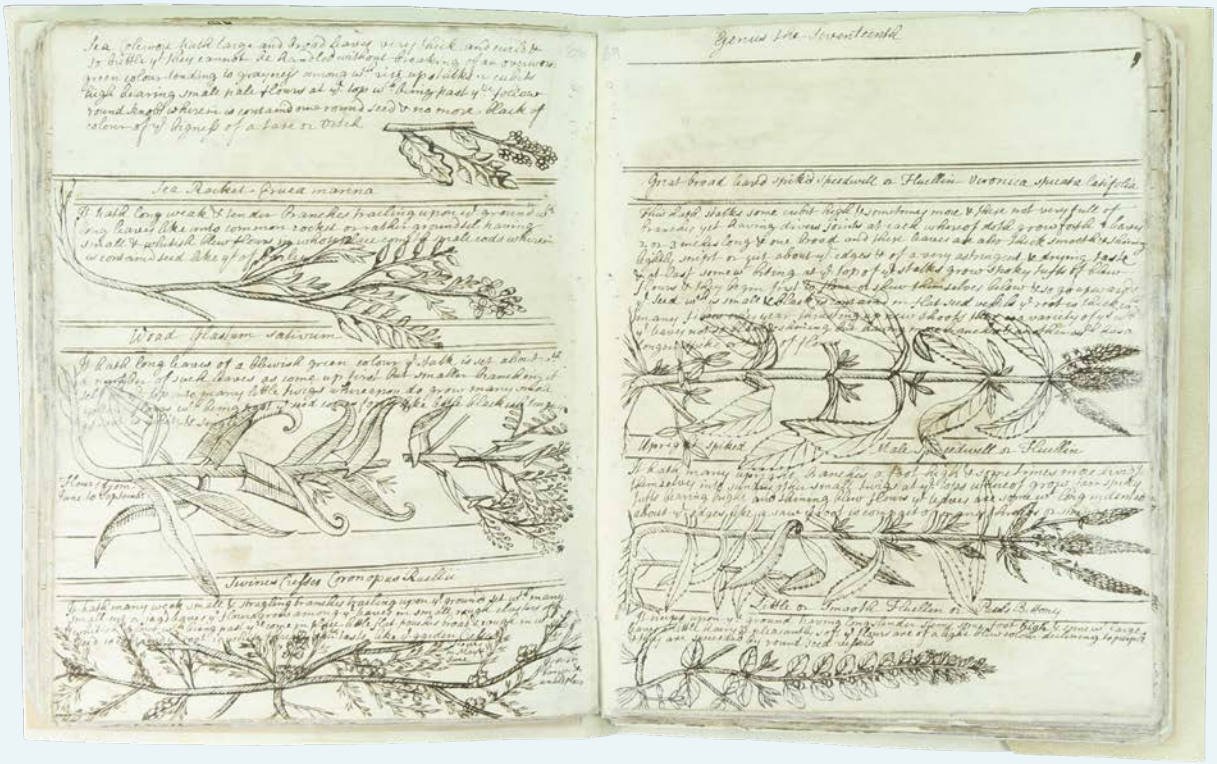
The Line of Transmission

Tracing botanical images in Frank Nicholls's manuscript (MS/24) at the Linnean Society



by Xinyi Wen FLS

Many illustrated herbals were published in Europe during the 16th and 17th centuries, but the number of new botanical images did not increase proportionately. This is because early modern herbals reproduced an awful lot of each other's illustrations: woodblocks were recycled, and images were traced and copied. An image of a dandelion found in the 1633 edition of English botanist John Gerard's (1545–1612) London-published *The Herball, or, Generall Historie of Plantes* does not necessarily depict what dandelions looked like in 17th-century England. More possibly, it could depict a dandelion grown in Antwerp 50 years ago, as the woodblocks of the Flemish botanist Rembert Dodoens (1517–1585) were loaned to England to print Gerard's herbal and never returned. But this is not the end of the story: many woodcut images from Dodoens's works were also identical to those of the 16th-century English botanist William Turner (c. 1508–1568), since both Dodoens and Turner reproduced many images from German herbalist Leonhart Fuchs's (1501–1566) *De Historia Stirpium* (1542).[1]

1 Jessie Wei-Hsuan Chen, 'A Woodblock's Career: Transferring Visual Botanical Knowledge in the Early Modern Low Countries', Nuncius: Annali Di Storia Della Scienza 35 (2020): 20–63; *Agnes Robertson Arber, Herbals, Their Origin and Evolution, a Chapter in the History of Botany*, 1470-1670 (Cambridge, University press, 1912), 62.

Above: Fig. 1. (Left): Gerard (1633), 992. Biodiversity Library, Public Domain. (Right): MS/24, Linnean Society, f.1.

When we take manuscripts into account, the line of transmission extends further. Housewives, artists, physicians and university-trained botanists—people from various backgrounds—copied these herbal images onto their drawing papers and memo books as drawing practice or botanical notes. MS/24 of the Library of the Linnean Society is one example.[2] It is a botanical notebook filled with drawings: two volumes and more than 180 used pages in total, each page is filled with two to four drawings of plants, accompanied by their names and descriptions in an 18th-century hand. The images and texts were mostly copied from the revised edition of John Gerard's herbal, or from John Parkinson's (1567–1650) *Theatrum Botanicum* (1640).[3]

Interestingly, there are loose, scattered pieces originally inserted into the notebook that could easily fall out if one opens up the archival box too abruptly. Among these loose slips are copied plant drawings and descriptions that were cut out from other pages of the same notebook; some were bills and memos with their verso filled with commonplace botanical information. It was inferred from an inserted bill that this notebook probably belonged to the anatomist and physician Frank Nicholls (1699–1778), who had been the physician of King George II.

Images in the manuscript may have been copied to create hand-drawn 'type specimens' that best represent the characteristics of each species. Every drawing was copied from somewhere, but with many selective omissions and alterations. In an image depicting tormentil, traditionally used to treat wounds and inflammation, only the middle branch of the flower was copied down from the original illustration. It was moved to the left side (Fig. 1), showing only the main stem's leaves. While Gerard's

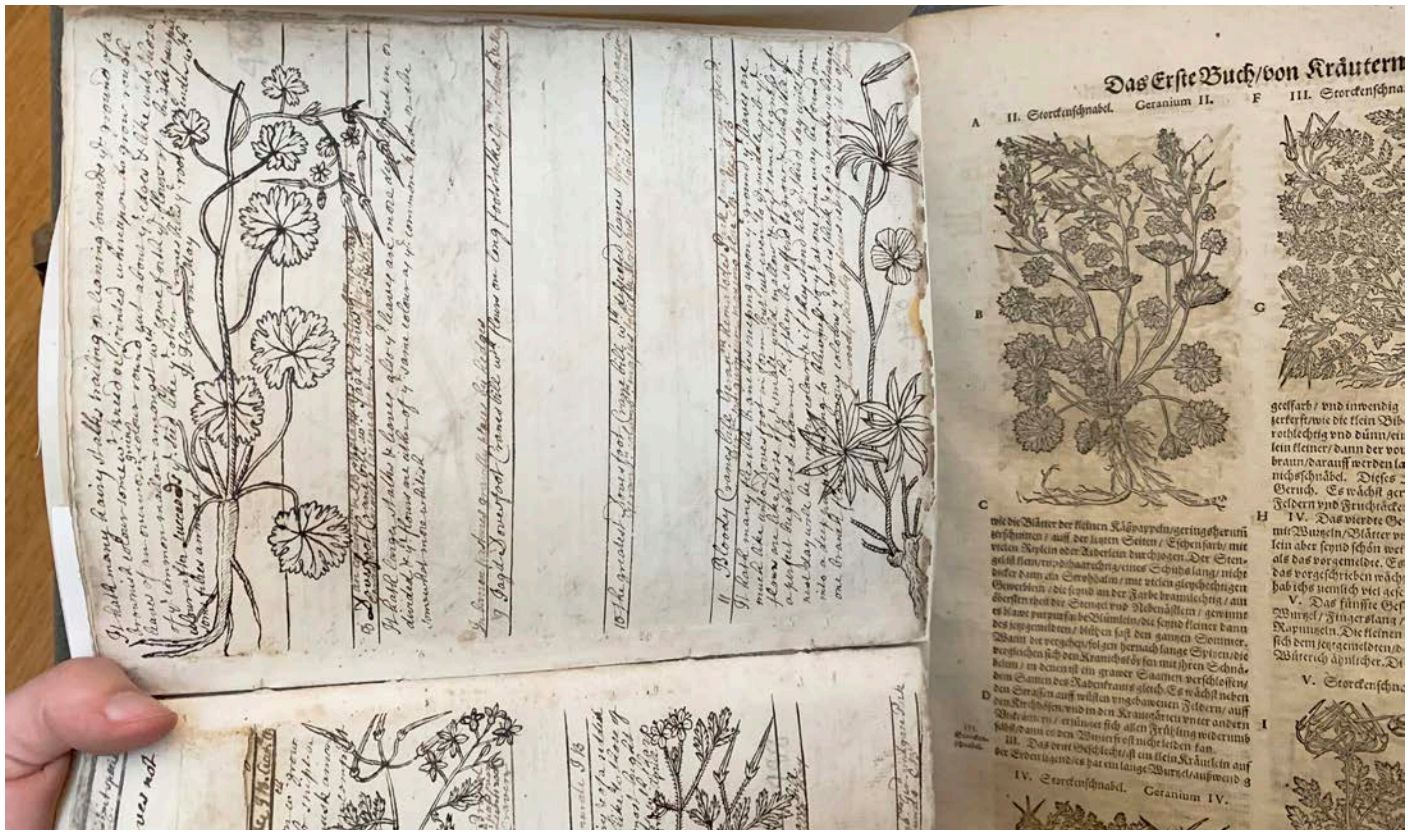
2 MS/24, Library of the Linnean Society. For more information on this notebook see 'Botanical Notebooks of Frank Nicholls | Liz McGow and Janet Ashdown', 2022, https://www.youtube.com/watch?v=Ys0LAsp9PyA. Accessed 10 Feb 2023.

3 John Gerard and Thomas Johnson, *The Herball or Generall Historie of Plantes*. (London: Adam Islip, Joice Norton and Richard Whitakers, 1633); John Parkinson, *Theatrum Botanicum: The Theater of Plants* (London: Tho. Cotes, 1640).

Images: Supplied by the author

original illustrations depicted plants in their natural ways, MS/24 only featured the most representative part of them. A branch has seemingly been chosen as the 'prototype' if it represents as many plant characteristics as possible, including leaves, flower buds and fruits. Occasionally the leaves, flowers or fruits of a plant could be copied down separately, as shown in Fig. 2. Sometimes things grown on other branches were reassembled onto the chosen one to make it more representative. As shown in Fig. 2, from Gerard's original image, the second right leaf and the stems that grew on another piece of root were assembled together to create a 'typical' leaf of golden lungwort that could fully represent how it grew and how it was connected. This image was cut out from the notebook afterwards, which made it more like a specimen.

One of the unusual features of this manuscript is the direction of these drawings. Plant drawings in MS/24 were vertical to the notebook spine, while texts were horizontally written as normal. Why would someone use a notebook like that? Possibly it's for saving space, as a horizontally-placed plant occupies fewer lines than a vertically-extending one. Drawing vertically might also enable the user to place the notebook closer to or on top of the herbals. As shown in Fig. 3, this notebook could have been spread out on top of, or next to, an opened folio herbal when those drawings were made, as entries on the facing pages of this notebook often matched entries on the same page or neighbouring pages in Gerard's herbal. Were the notebook used horizontally, it would have been more cumbersome for one to copy those images.



Opposite top: Fig. 2. (Left): A leaf inserted in MS/24, Linnean Society, f.28. (Right): Gerard (1633), 304. Biodiversity Library, Public Domain.

Opposite bottom: Fig. 3. MS/24 placed on top of an open herbal.

Left: Fig. 4. A slip inserted into MS/24, vol. 1, f. 28.

Or perhaps it is easier to copy plant images onto loose pieces of paper. The bills, letters and ballads, scattered slips inserted in the original manuscript, suggest that it was possible to copy herbal images on any handy materials. A complete piece of a bill addressed to Dr Nicholls in 1733 had at least six different descriptions of water plants on its verso side, separated with dividing lines and cut into pieces. From those pieces, one peeks into the daily life of the manuscript author: a fragment of a book page with an excerpt from the 1779 issue of *The London Magazine*, for example, was also inserted into the notebook.[4] Making those copied images into small pieces gave them infinite possibilities of being rearranged and categorised. Like the leaf shown in Fig. 2, many images and text blocks were cut out, perhaps from other lost volumes of this notebook, and inserted into this one. Sometimes the author was willing to sacrifice the illustration of one side for another, as shown in Fig. 4, which suggested that this manuscript was undergoing an unfinished rearrangement.

From printed herbals to notebooks to cut-up pieces, botanical images in MS/24 were extracted, anatomised and mobilised. The manuscript is a precious example of how botanical images from old herbals were transformed in order to feature representativeness and morphological organisation in the 18th century, during this transformative period of botanical study. I am currently looking to reconstruct the sources and transmission routes of the hundreds of images in this manuscript, along with the texts, and believe this manuscript deserves more scholarly attention.

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Department of History and Philosophy of Science, University of Cambridge

Acknowledgements

I thank Sophie Wilcox for leading me to this material and Liz Mcgow, Isabelle Charmantier, and all the Library and Archive staff at the Linnean Society, for the research assistance and inspiring conversations. This research is funded by Wellcome Trust Grant No. 221115.

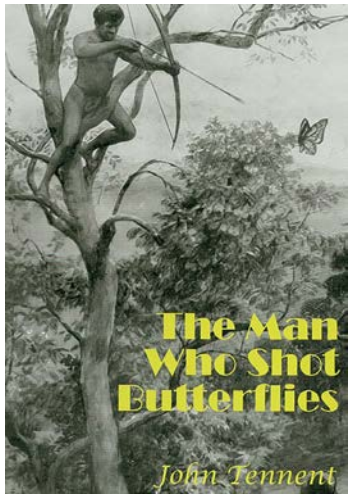
4 *London Magazine Enlarged and Improved*. C. Ackers, 1779. MS/24 contained a fragment with texts from page 522, the monthly chronologer, Friday 29 October, London.

Images: Supplied by the author

Reviews

The Man Who Shot Butterflies: Albert Stewart Meek (1871–1943), Naturalist and Explorer

John Tennent



608pp, Storm Entomological Publications, Oxford
2021 (Hardback)
ISBN 9780954204525
Col. illust. £89

This oversize and heavyweight publication reviews not only the life of the naturalist and collector A. S. Meek, but several of his contemporaries, as it includes brief biographies of Walter Rothschild and his curators, as well as collectors who worked with Meek in the Southwest Pacific. It also benefits from the author's own experiences as a natural history collector in the region, experiencing much the same conditions. The flyleaf and a 12-page 'timeline' of significant events in Meek's life (Appendix C) put him in the context of 'missionaries, traders and would-be adventurers' working in the Southwest Pacific at the turn of the 19th century, with Meek certainly falling within the 'adventurer' category, Having left England at 17 for Australia, he began work as a jackaroo in Queensland in 1890, with his first full-time natural history specimen collecting expedition there in 1893, followed by periods of extensive travel in British New Guinea, the Trobriands, d'Entrecasteaux and other island groups in the Solomons and New Hebrides.

Maps at the beginning and elsewhere show locations referred to in the 20 chapters that use his letters, and the letters of others, to document in detail Meek's work and travels as a natural history collector. These have particular taxonomic significance, specifically because they include the huge bird-wing butterflies only obtained by shooting them!

Tennent explains how his interest in Meek was piqued when examining some of Meek's specimens held in the Natural History Museum in London, labelled with names he recognised as being from remote places in New Guinea. He also discovered how little there was on record about Meek's life and work and decided to rectify that.

Printed on good quality glossy paper, the title includes 260 illustrations scattered through the text, many in full colour, with even this oversize book unable to show the full scale of the Queen Alexandra's birdwing butterfly (*Ornithoptera alexandrae*) with a wingspan of 29 cm (11.5 inches). The images also include black and white reproductions from Meek's published book and his photo album, showing images of indigenous people, expedition camps, landscape views and some of Meek's team of collectors. The acknowledgements of those that helped Tennent complete this work include Sir David Attenborough, the current owner of Meek's photo album, among many others.

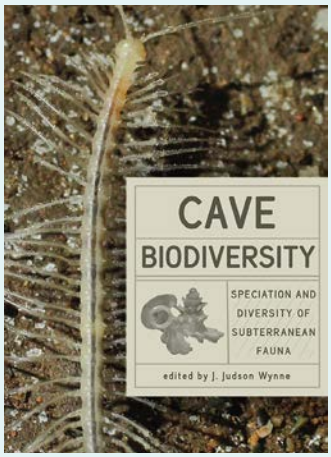
*The title includes 260 illustrations scattered through the text, many in full colour, with even this oversize book unable to show the full scale of the Queen Alexandra's birdwing butterfly (*Ornithoptera alexandrae*) with a wingspan of 29 cm.*

This may not be a 'bedside read' but is a mine of information on the vagaries of life as a natural history collector, and Meek's complex network of relationships with family and colleagues. The 27 pages of endnotes, 21 pages of reference sources, and six pages listing zoological taxa named for Meek or his partner Eichorn, together with the timeline and family trees, will help direct anyone to the information they may need.

Gina Douglas HonFLS

Cave Biodiversity: Speciation and Diversity of Subterranean Fauna

J. Judson Wynne (editor)



336pp, Johns Hopkins University Press
2023 (Hardback)
ISBN 9781421444574
Col./bw illust. £79

As the name suggests, *Cave Biodiversity* is a collection of seven chapters covering aspects of the fauna located in caves and subterranean habitats.

Included are such topics as: 'Influence of the Physical Environment on Terrestrial Cave Diversity'; 'Evolutionary Models Influencing Subterranean Speciation'; 'Biology and Ecology of Subterranean Moullusca'; 'The Subterranean Cholevinae of Italy'; 'Cave Trechine (Coleoptera: Carabidae) Radiation and Biogeography in Eastern North America'; 'Subterranean Colonization and Diversification of Cave-Dwelling Salamanders'; 'Diversity, Distribution, and Conservation of Cavefishes in China'.

As can be seen from the chapter titles, the coverage is very specific, making this publication one that is aimed at professional biologists and postgraduate students. This is further underscored by the amount of specialist terminology used throughout.

Each chapter concludes with an extensive bibliography and most are supplemented with clearly presented black and white drawings and photographs, tables of data and maps. In the central part of the book are some very fine coloured photographs of organisms alluded to throughout the text. Subject matter aside, the text is of a good size that makes reading very easy, including the legends of the figures. There has been a tremendous amount of carefully choreographed material put into each chapter and the authors and editor are to be congratulated.

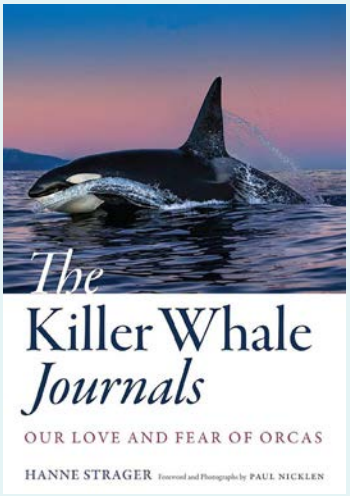
Having a particular interest in Molluscs I was naturally attracted to the Biology and Ecology of Subterranean Mollusca and I was not disappointed, though it would be remiss to say that the text was easygoing—there was a great deal of technical language that needed explanation before progress could be made and I found myself reading the chapter twice to get a better understanding. However, the effort was worthwhile.

The arrangement of the chapters permits the reader the opportunity to either read the book from beginning to end or dip in and out. The price tag may be offputting to the non-specialist reader, but to the specialist the information is of great value and, in my opinion, is worth every penny.

Stephen Hoskins FLS

The Killer Whale Journals: Our Love and Fear of Orcas

Hanne Strager



280pp, Johns Hopkins University Press
2023 (Hardback)
ISBN 9781421446226
Col./bw illust. £22

Although described as a 'journal', this volume is not a year-by-year account of research on killer whales (Strager uses her preferred common name for *Orcinus orca* throughout). But it is personal. She includes chapters on her early experiences while a student volunteer field assistant, and a family visit to the 9,000-year-old Norwegian open-air rock art at Leiknes above Tysfjord. There are interviews with Greenlanders, and observation of a 'whale jail' she saw off the Kamchatka peninsula holding captured animals until they could be sold off to aquaria in the Far East, which still use individuals to provide spectacle. She has tracked down participants or their descendants when discussing historical events, such as a 1981 mass stranding in the Lofoten Islands. Or the remarkable 70-year multi-generational partnership between a killer whale pod and the whalers of Twofold Bay, New South Wales, where the orcas would announce baleen whales with loud tail slaps, and then prevent their escape as the whalers responded and harpooned their prey.

The personal tone fits well with the overarching theme—interactions between human and killer whale populations, interactions that change with time. As Strager points out, attitudes toward other top predators have been much the same. Just as wolves and raptors have been accused of preying on species such as sheep or grouse that humans have raised for profit, so the killer whales have been accused of depleting fisheries and, until nylon replaced cotton, of wrecking nets. Just as with other top predators almost

universal antagonistic attitudes are changing, leading to more tolerance, even esteem, for orcas. They are becoming a resource, providing tourist 'whale watching' income for communities as fish-stocks have declined, and loathing is being replaced by pride, so well exemplified in Pacific Northwest coastal communities.

In telling these stories much behavioural biology is included. I had known a little from documentaries about hunting teamwork but had not realised that some pods were fish eaters while others almost exclusively hunted mammals. I did not know that different pods had their own dialects, and that they were organised as strong matriarchies. There is much food for thought here, for example the changing ranges of specific orca populations following the northward move of prey species associated with climate change and ocean warming.

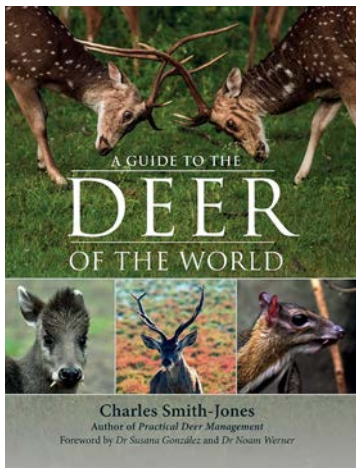
The volume is an excellent example of popular science writing, engaging, feeding appropriate biological concepts and examples into personal narrative. There are minimal notes but a carefully constructed bibliography for further reading. The uncorrected proof copy provided for review did not have the photographs by Paul Nicklen, but the narrative does not depend on their presence. The index indicated in the table of contents was not included either, and it was not possible to check how well it would facilitate mining the book for related examples or concepts.

A. M. Lucas FLS (Orcid 0000-0002-7934-5006)

A Guide to the Deer of the World

Charles Smith-Jones

320pp, Quiller
2022 (Hardback)
ISBN 9781846893629
Col./bw illust. £55



In the context of this book, 'deer' comprise three ruminant families: Cervidae (true deer), Moschidae (musk deer) and the relatively distinct Tragulidae (chevrotains). Although much of the earlier *Deer of the World* by G. Kenneth Whitehead (published 50 years ago in 1972) remains valid, there have been fundamental advances in knowledge, particularly with respect to taxonomy. The wide-ranging contents are presented in seven chapters, one being essentially a catalogue of all the IUCN's (2022) current (sometimes disputed) species and subspecies, comprising 55 true deer, seven musk deer and 10 chevrotains.

A two-page Foreword by the co-chairs of the International Union for the Conservation of Nature (IUCN) Species Specialist Group for deer provides a general background to the importance of deer in many locations and the group's functions within them. A short Introduction by author Charles Smith-Jones continues in a similar vein. Chapter one, 'Origins', has sections on Classification and Taxonomy, Fossil Deer (from 50 million to 5 million years ago), Modern Deer (current species and how these have been reclassified taxonomically in the last 50 years) and the naming of deer (binomial and trinomial names, names in vernacular languages and nomenclature of sexes and age groups). A table in the Modern Deer section illustrates taxonomic changes (possibly related to new biotechnology techniques and the now almost universal use of DNA). The taxonomists have had a wonderful time, not so much through 'shuffling the pack', as introducing a completely new deck. As a result, the 36 species of true and three species of musk deer, with a combined total of 215 subspecies of Whitehead (1972), have become 55 true and seven musk deer with a minimum of 156 subspecies accepted (or provisionally accepted) by IUCN in 2022.

Sections on Antlers, Rumination, Teeth, Senses, Scent glands, Pelage, Sexual dimorphism, Hybridisation, and Health and disease are the disparate contributions to Chapter Two, 'Aspects of Deer Biology'. 'Lifestyles' is the title of Chapter Three, with sections on Habitats and Movement, Running and Swimming, Food and Drink, Relationships, Communication and Competition, Breeding Strategies, Birthing Strategies and Natality and Mortality. 'Deer and Man' is the main title of Chapter Four, containing sections on Impacts, Poaching and Hunting, Management, Transplantation, Domesticated deer, Deer as Pets, Feeding Deer, Zoonoses and Aggression Towards Humans. In a short two-page Chapter Five, the IUCN describes categories in the Red List and provides a graphical and tabular listing of that organisation's deemed status of the world's deer. It has 10 species (18 per cent) of true deer as Data Deficient and three (30 per cent) of 10 species of the Tragulidae in the same category. Sixteen (29 per cent) of true deer are of Least Concern, 4 (7 per cent) are Near Threatened, 16 (29 per cent) are Vulnerable, 6 (11 per cent) are Endangered, 2 (4 per cent) are Critically Endangered and 1 (2 per cent) are Extinct in the Wild or Extinct.

The bulk of the book (216 of 316 pages) comprises Chapter Six, 'List of Species'. The first two pages tabulate all species of deer, musk deer and chevrotains. A full account of each species is then provided. Depending on available information, this includes a general description of the animal (with 'portrait' and other photographs), its biology, habits and habitat, distribution (including a map) and knowledge about subspecies. A 'Fact Box' for each species provides details of: world distribution; IUCN Red List status 2022; names of sexes (e.g. bull, cow, calf); alternative and/or local names; recognition features; height at shoulder; weight; food; habit; voice; annual behaviour; rut; gestation and birthing; antlers; antler cycle; lifespan; and threats.

Chapter Seven, 'Conclusion', is given the title of 'A Future for Deer'. The author believes that not enough attention is given to deer, coming a long way behind in films and television wildlife programmes about 'big game' and threatened predators such as big cats. It is considered that deer will remain under-valued in general. Emphasis is given, as is now the norm, to perceived threats such as predation by humans, habitat loss through the spread of agriculture, deforestation, urbanisation and climate change. A useful Glossary is provided and there is a short section on 'Further Resources' which lists seven books, very few online resources and a short note about the British Deer Society. There is a comprehensive Index.

Author Smith-Jones is at pains to emphasise he is not an academic. He describes himself as a lifelong naturalist and countryman with a special 40-year interest in deer. Acting also as a freelance writer and consultant, he is Technical Advisor to the British Deer Society. The publisher's claims that this is an authoritative reference book are not substantiated in the text which has no citations to scientific literature and there is no list of references. The author is more pragmatic, stating that the book can provide only brief insights to various aspects of deer biology and ecology and 'anyone who would like to discover more will find the material suggested under Further Resources useful'.

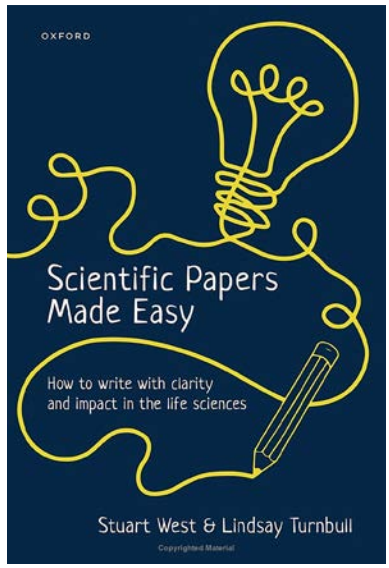
This being said, the text of this large format (270 x 210 mm) book is casual in style and easy to read in a straightforward font. The large number of clear colour photographs add considerable value to the text although many are of animals in captivity as no images exist of them in the wild. There is much here to appeal to the 'coffee table' set and to the general nature reader and deer enthusiast. In either of these roles, at a retail price of £55, it is good value for money.

Trevor Wilson FLS

Scientific Papers Made Easy: How to Write with Clarity and Impact in the Life Sciences

Stuart West and Lindsay Turnbull

198pp, Oxford University Press
2023 (Hardback/ Paperback)
ISBN 9780192862792
Boxed illustrations incl. QR codes
Hardback £70.00, paperback £22.50



West and Turnbull seek to inform, advise and guide would-be authors of scientific papers using their maxim 'the reader must come first'. Whilst their readership might be expected to include graduates engaged in doctoral studies or post-

Image: Pixabay/Diana Parkhouse

doctoral researchers aiming to publish the contents of their theses, there is much here too that more experienced writers of papers, and indeed of books, could heed.

There are 11 chapters: 'Writing as an Essential Research Skill' deals with linking a problem to doing research on it, then communicating the results in a peer-reviewed publication. These two professors explain they have taught much of the content of this book to D.Phil. students in the Biology Department at the University of Oxford. 'Core Skills' emphasises simplicity, brevity, assuming nothing and telling one's story; the accompanying 'Top 10 tips' are a helpful appendix here. 'Methods' includes planning a paper's structure, writing a synopsis, how to convey details effectively, putting *why* before *how*, and considerations of voice and tense. 'Results' again calls for planning so that data follow on from 'Methods' with priority given to more important outcomes (as a side note, examples relating to grassland fertilisers here muddle phosphorus with phosphorous eight times). 'Figures' recommends complicated results be illustrated with maximised content of information, calling for simple, effective figures with reduced reliance on legends. Perhaps surprisingly, the sixth chapter concerns 'Introductions'; it suggests no more than six paragraphs and wittily guides one away from acronyms with 'DNA: Do Not Acronym'. 'Discussions' warns against presenting new results and hyperbole under this heading. Again, it might seem odd that 'Abstracts' and 'Titles' are the eighth and ninth chapters respectively, but guidelines against jargon and for the colon here are apposite. 'Cover Letters' advises on writing persuasively to editors, e.g. to propose referees. 'Writing and Editing' concludes by suggesting 'Active Writing' as one does the science; on a human level, it recommends learning to love one's critics.

West and Turnbull acknowledge feedback from their colleagues and students, but I find the small number of footnoted references to other mentors on publication disappointing; a bibliography in a later edition perhaps? They state this book is aimed at both native and non-native English speakers, but I feel more guidance is needed here on non-British forms of English. Moreover, a wider readership might appreciate inclusion of references to non-English literature and comments on publications dating back more than 40 years. The use of summaries in most chapters and of humorous cartoons are strengths of this book. Lastly, as a Linnean, I note the preponderance of vernacular names over biological binomials in this work.

Notwithstanding these remarks, the positive tone of this book succeeds in encouraging clear and objective communication without aiming to eradicate the human idiosyncrasies that make reading scientific papers enjoyable as well as practical. So I recommend it to potential authors, and must try to adopt more of its advice for myself.

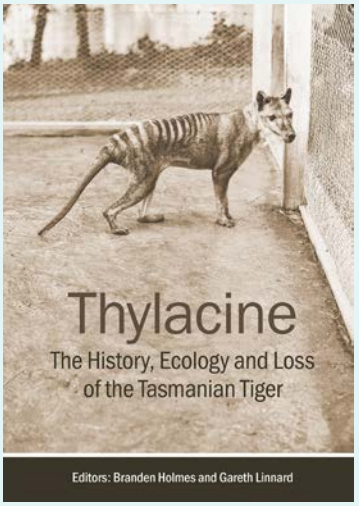
H. L. Pearson FLS

Image: Pixabay

Thylacine: The History, Ecology and Loss of the Tasmanian Tiger

Edited by Branden Holmes and Gareth Linnard

240pp. CSIRO Publishing 2023, paperback
Col./bw illust. Au $59.99
ISBN 9781486315536



The thylacine (*Thylacinus cynocephalus*), also known as the Tasmanian tiger and the Tasmanian wolf, was—and some super-optimists believe still is—the largest marsupial carnivore. The common opinion, based on a lack of sightings or other material evidence, is that the species, unique in its genus, became extinct about 90 years ago, when the last known living animal died in Hobart Zoo in 1936.

The publisher's advance publicity says the book was written to be of interest to those engaged, or personally immersed in, the thylacine, as well as offering an entry synthesis for those less familiar with the species. The latter group will assuredly vastly outnumber the former. The publisher again states that the book presents an evidence-based profile of the thylacine, examining its ecology, evolution, encounters with humans, persecution, assumed extinction and its appearance in fiction. Much of the content is, however, anecdotal, opinionated and speculative and much is derived (due to the lack of material and of museum specimens) from attempted comparisons with other species.

The book comprises 80 unnumbered chapters, mostly one to three pages in length, grouped into nine parts. These follow several introductory essays: a foreword, dedication, preface, prologue and introduction and are succeeded by a lengthy

bibliography and an index. The 80 contributing authors, none of whom is an Indigenous Australian, have varying backgrounds and not all are from Australia (and most of these not from Tasmania). The Editors list seven people contributing more than one chapter in the range of two to seven, but an eighth unacknowledged author contributed 13 chapters. The most prolific author resides in Swansea in South Wales (NOT New South Wales), the second most lives in Bristol in England; both give private addresses with no indication of institutional attachment. Other authors are from elsewhere in the United Kingdom, Germany, Singapore, Spain and the USA. Holmes, the first editor, has a private address in Western Australia, with the second, Linnard, also being the second most prolific author in the book. The very brief biography of Holmes indicates he is a researcher who studies the earliest European-thylacine interactions but has no entry in the almost 500 titles in the 'Reference List'; Linnard primarily specialises in the historical trade in thylacines during the 1920s and 1930s and has one reference entry.

The thylacine was never numerous, either on the mainland or Tasmania. A major cause of extinction on the mainland was the arrival of the dingo (*Canis familiaris dingo*). Several reasons for its putative extinction on Tasmania are advanced: climate change (of course); the definitive arrival of settlers in 1803; land use changes; limited availability of prey, hunting and shooting for skins, private and government bounty schemes from 1830 to 1914 supposedly to protect the sheep industry; and, disease.

Part Seven of the book, comprising 13 chapters mostly supporting a hypothesis of an extant thylacine, is entitled 'Into the Shadows (1937–Present)'. In part this is because large tracts of Tasmania are densely vegetated in remote areas where thylacines had a known presence in the past, and are rarely visited in modern times. Other reasons for a belief in continued survival are sets of footprints, purported sightings by individuals or groups who have varying expertise from total naïvity through to indigenous peoples' testimony to highly-experienced hunters and game wardens. A very recent publication (Brook et al 2023), published only four weeks before this review was written, does not draw a firm conclusion on the thylacine's current status but believes that if it is extinct it did not become so than much later than 1936, and on the basis of computer models is of the opinion that thylacines could be extant in some former areas of distribution.

Part Eight, 'Beyond the Present', has six chapters centred on the possibility of de-extinction. For the none-thylacineophile this is possibly the most interesting part of the book as it discusses the use of advanced technology to recreate a species from its genome and DNA. It admits that there is still a long way to go before a new animal could be created but that it is very likely to happen at some future time. The short final Part Nine, 'Beyond Reality', has chapters on the thylacine in fiction, its representation in video games and what seems to this reviewer a totally unnecessary chapter of a single day's temporal activities of a thylacine keeper in 2036.

This fascinating book is by authors from a wide range of disciplines and literary merit. It would be good to believe that the experiences of history and of conservation efforts would lead to avoidance of mistakes being made for other rare and vulnerable species, and result in lessons having been learnt (but regrettably they rarely are). In spite of these lessons, the book is unlikely to appeal to a large readership outside the coterie of enthusiasts of the thylacine but it would be a useful addition to museum and science department libraries.

Trevor Wilson FLS

Reference

Brook, B. W., Sleightholme S. R., Campbell, C. R., Jarić, I. and Buettel, J. C. (2023). Resolving when (and where) the Thylacine went extinct. *Science of The Total Environment* 877(June).

https://doi.org/10.1016/j.scitotenv.2023.162878.

Books for Review

Please contact the Editor before sending books for review (leonie@linnean.org).

Books for review should be sent to the attention of the Editor at:
Burlington House, Piccadilly, London W1J 0BF

Please note: While the Society aims to review as many books as possible, a review is not guaranteed, and is dependent on finding a reviewer and the decisions of the Editor and Linnean Steering Group.

Members

Please join us in welcoming the following new members to the Society (elected May–July 2023):

Fellows

Miss Sophie Bagshaw

Dr William Bell

Dr Mauricio Bonifacino

Mr Timothy Bush

Mr Zhuo Chen

Rev. Lars Christiansen

Mr Trevor Clarke

Dr James Connorton

Mr Dan Crowley

Dr Jennifer Cruse-Sanders

Dr Wolfgang Denzer

Mr Phillip Charles Douglas

Mrs Angela Evans

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Dr Jacopo Scudieri

Mr Vincent Smith

Miss Allison Stephens

Ms Elizabeth Volkmann

Student Associates

Mr Arjan Arenas

Dr Tong Cao

Ms Linda Cassalger

Mr Daniel Fung Jr

Ms Mackenzie Hobbs

Ms Mandy Lall

Mr Seamus Lynch

Mr Tobias Mainda

Mr Dorin Moisa

Ms Aurora Prehn

Mr Caleb Scutt

Lives remembered

Esmé Frances Franklin Hennessy (30 August 1933–20 May 2023)

Dr Esmé Frances Franklin Hennessy, Professor of Botany and acclaimed botanical illustrator, died 20 May 2023, in Portland, Oregon in the US. She was 89.

Born 30 August 1933, Dr Hennessy grew up in the coastal village of Umzinto, Natal, South Africa, where her father was the district surgeon. Childhood exploration of her rural environs fuelled her curiosity of plants. She completed her Bachelor's, Honours, and Master's degrees in Botany, and her Ph.D. in Taxonomic Botany, at the University of Natal, Pietermaritzburg. In 1956, she married Royal Navy Commander Brian John Hennessy.

In 1961, Dr Hennessy was invited to serve as a lecturer in Botany at University College, Durban, the first woman to hold that post. Between 1972 and 1993, she was a member of the science faculty at University of Durban-Westville, culminating as Associate Professor of Botany. In 1994, she accepted an honorary post as Associate Professor of Botany, University of Natal, Pietermaritzburg, where she served until 2006. She remained External Examiner in Plant Taxonomy (Ph. D theses) at the University of Natal until 2010.

Dr Hennessy is the author and illustrator of many publications, including the books *South African Erythrinas* (1972); *Orchids of Africa: A Select Review* (1981), which she wrote and illustrated with Joyce Stewart; and *The Slipper Orchids* (1989), which she illustrated and co-authored with Tessa Hedge.

Dr Hennessy's botanical illustrations were exhibited widely, including a 1977 exhibition at the Hunt Institute for Botanical Art and Illustration at Carnegie-Mellon University, Pittsburgh; 1989 and 1992 exhibitions at the Royal Horticultural Society in London; and a 2000 exhibition at the Smithsonian Institution.

Honours Dr Hennessy received for her botanical illustrations included two Grenfell silver-gilt medals from the Royal Horticultural Society, and the Cythna Letty Medal from the Botanical Society of South Africa. She was elected as a Fellow of the Linnean Society of London in 1985; she was a founding member of the Society of Botanical Artists, UK (1988) and the South African Association of Botanists (1968). Dr Hennessy is survived by her son, Timothy.

by Timothy Hennessy

Image: Reproduced with the permission of Timothy Hennessy

Gail Bromley (19 November 1950–7 May 2023)

Gail Bromley was a taxonomist at the Royal Botanic Gardens, Kew from 1975–1986, where she specialised in South American plants, working primarily in Verbenaceae and Asteraceae. From there, Gail moved into outreach, becoming Kew's Head

of Education, where she developed and managed the schools, adult and higher education profiles and established the volunteer programme. In 2003, Gail was awarded an MBE for services to education, followed by the Kew Medal in 2012.

She moved on from Kew in 2013 to become a freelance consultant in Heritage education, but joined the Botanic Gardens Conservation International (BGCI) part time in 2016 to support their education programmes, particularly EU projects. Gail co-founded and worked with the Botanic Gardens Education Network (Bgen), and would also act as a consultant, evaluating learning support for the Big Local Trust.

Gail was known as a kind and generous person, and an excited champion of knowledge sharing. Her lifetime of dedicated work clearly shows that she wanted to inspire learning in others through the botanical world. She was a Fellow of the Linnean Society for over 30 years, having been elected in January of 1993, and will be missed by all who knew her.

Deaths Reported to Council

Fellows

Mrs Gail Bromley

Mr Angus Cameron Carmichael

Mr David Elliott

Prof. Peter Gahan

Mrs Carol Graves

Dr Esmé Hennessy

Mr Trevor Jennings

Dr John McCormack

Mr Nigel Mussett

Miss Pamela Paradine

Mr Patrick Vyvyan

Prof. Philip John White

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