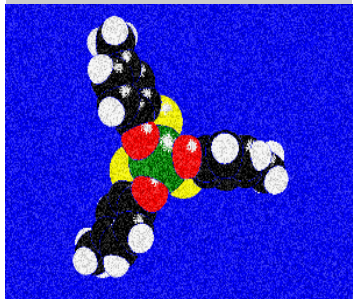


# Chemistry

2010-2011



John Carroll  
UNIVERSITY

## Are You Interested in Chemistry or Biochemistry?

### General Description of the Chemistry Department

The Chemistry Department currently has nine full-time faculty and a full-time staff of three. In addition, emeritus faculty and experts from local industry frequently serve as part-time instructors. The department is approved by the Committee on Professional Training of the American Chemical Society (ACS). All full-time faculty hold Ph.D. degrees, with some having previously held positions in industrial and biomedical laboratories. All are experienced, professional teachers. The research interests and backgrounds of the faculty are quite diverse, and cover the major areas of chemistry (analytical, biochemistry, inorganic, organic, physical, and theoretical) as well as some interdisciplinary areas (biochemistry/molecular biology, bioinorganic, environmental, surface and interfacial, polymer and materials chemistries).

While the primary focus of the de-

partment is teaching, a vigorous research program has been established at the undergraduate level. Undergraduate research is available for upper division credit, and chemistry majors are encouraged to participate in one or more research projects at some time during their career either at JCU, The Cleveland Clinic Foundation, or local universities or chemical industries.

The Chemistry faculty are well known for their excellent teaching and availability to students. Students will often find that they learn as much in one-on-one sessions in faculty offices, and in the teaching and research laboratories as they do in the more traditional classroom setting.

In addition to excellent laboratory facilities, the department has been able to obtain state-of-the art instrumentation. These instruments are used extensively in undergraduate courses, as well as in research.



The JCU Department of Chemistry is housed on the third floor of the Dolan Center for Science and Technology. The Chemistry Department has 7 teaching, 8 research, 1 major instrumentation and 1 computer laboratories.

#### Inside this issue:

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#### Questions? Call or Write:

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## B.S. Degree Programs and Concentrations

The department offers three programs which lead to a Bachelor of Science (B.S.) degree in Chemistry. The student's choice among them should be based upon their long-range career goals. The programs offered include:

- The Comprehensive Major in Chemistry.
  - The Pre-Medical / Life Science Major in Chemistry.
  - The General Major in Chemistry.
- In addition, the department also offers the following additional programs and concentrations:
- Pre-Chemical Engineering Program
  - Biochemistry/Molecular Biology Concentration
  - Cooperative Program in Chemistry
  - Neuroscience Concentration
  - Environmental Studies Concentration
  - Optional Minor / Concentration
  - Certificate Program in Chemistry

The 3 B.S. programs require the following chemistry courses as a foundation:

CH141 – 142	General Chemistry I and II	8 cr hr
CH143-144	General Chemistry Lab I and II	2 cr hr
CH151H*	Chemical Principles	4 cr hr
CH153*	Chemical Principles Lab	1 cr hr
CH221-222	Organic Chemistry I and II	6 cr hr
CH223-224	Organic Chemistry Lab I and II	2 cr hr
CH261	Analytical Chemistry	3 cr hr
CH263	Analytical Chemistry Lab	1 cr hr

\* Students entering with a rigorous background in chemistry may elect to take the CH151H, CH153 courses as substitutes for the CH141-144 sequence.

## Comprehensive Major in Chemistry

This program is designed for the student who intends to become a professional chemist. Students who successfully complete this program generally obtain industrial, governmental, or academic chemical positions either at the B.S. level or after obtaining higher (M.S. or Ph.D.) degrees. Upon completion of this major, students are certified to the American Chemical Society. In addition to the requirements listed above, the minimum requirements listed to the right apply.



### Chemistry

CH 365 – 366	Physical Chemistry I and II	6 cr hr
CH 367 – 368	Physical Chemistry Lab I and II	2 cr hr
CH 441	Instrumental Analysis	3 cr hr
CH 443	Instrumental Analysis Lab	1 cr hr
CH 478A/B	Chemistry Seminar	0 cr hr
CH 481	Inorganic Chemistry	3 cr hr
CH 482	Inorganic Chemistry Lab	1 cr hr
CH431	General Biochemistry	4 cr hr
CH 399*	Chemistry Research	1 – 3 cr hr

Plus two upper division electives and one credit hour of laboratory elective.

### Supporting Courses

MT135, 136, 233	Calculus and Analyt. Geom. I – III	12 cr hr
PH 135L – 136L	Physics Workshop I and II	2 cr hr
PH 135—136	Physics I and II	8 cr hr
PH 246**	Modern Physics	3 cr hr
PH 325**	Thermodynamics	3 cr hr
CS 202*	Intro. Computer Science w/C	3 cr hr
EP 217	Math. Methods of Physics	3 cr hr

\* These courses are strongly recommended.

\*\* Either PH 246 or PH 325 will satisfy these requirements.

## Biochemistry Major in Chemistry

This program is intended for students who wish to use the undergraduate major in chemistry as preparation for further study and/or employment in medicine, dentistry, or any of the other life sciences: veterinary medicine, biochemistry, clinical chemistry, biotechnology, pharmacology, toxicology, and other health-related fields. To serve such a variety of career goals, the program offers multiple tracks, which may differ in some requirements and options.

In addition to the general chemistry requirements listed earlier, the following minimum requirements apply for the Life Science Major in Chemistry:

### Chemistry

CH 361*	Introductory Physical Chemistry	3 cr hr
CH 365 – 366*	Physical Chemistry I and II	6 cr hr
CH 367	Physical Chemistry Lab I	1 cr hr
CH 435 – 436	Biochemistry I and II	7 cr hr
CH 437	Biochemistry Laboratory	1 cr hr
CH 478	Chemistry Seminar	0 cr hr

Plus one upper division elective\*\*

### Biology

BL 155 – 156	Principles of Biology I – II	6 cr hr
BL157 – 158	Principles of Biology Lab I – II	2 cr hr

Plus two upper division electives\*\*

### Mathematics Physics

MT 135 – 136	Calculus and Analyt. Geom. I – II	8 cr hr
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\* Either CH 361 or the CH 365-366 sequence will satisfy this requirement.

PH 125 – 126	General Physics I – II	6 cr hr
PH 125L – 126L	General Physics Lab I – II	2 cr hr

\*\* These courses are required for the Pre-Medical, Pre-Dental and Life Science Tracks. For the Biochemistry Track, they are replaced by CH441-443 (Instrumental Analysis and Lab) and two upper division electives in either biology or chemistry.

While not required, CH399 (Undergraduate Research) and CS202 (Introduction to Computer Science) are strongly recommended.

## The General Major in Chemistry

This program is available to students who desire a systematic training in chemistry as a background for a career in other fields, such as business, education, information science, journalism, or law. It will also be useful to students who wish to earn the equivalent of a second major in another discipline.

In addition to the requirements listed earlier, the following minimum requirements apply:

### Chemistry

CH 361*	Introductory Physical Chemistry	3 cr hr
CH 365 – 366*	Physical Chemistry I and II	6 cr hr
CH 367	Physical Chemistry Lab I	1 cr hr
CH 441	Instrumental Analysis	3 cr hr
CH 443	Instrumental Analysis Lab	1 cr hr
CH 478	Chemistry Seminar	0 cr hr
	Upper Division Electives	6-8 cr hr

\* Either Physical Chemistry sequence may be taken.

### Supporting Courses

PH 125 – 126**	General Physics I and II	6 cr hr
PH 125L – 126L	General Physics Lab I and II	2 cr hr
MT 135 – 136	Calculus and Analyt. Geom. I – II	8 cr hr

\*\* PH 215-216 (with PH 209-210) may be substituted for PH 125-126 by permission.



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## Pre-Chemical Engineering Programs

Students whose ultimate objective is a degree in Chemical Engineering may pursue one of the three following options:

- Complete the B.S. degree in chemistry (ordinarily as a comprehensive major) and then enter an engineering school for a further (MS/Ph.D.) degree.
- Complete two years of pre-engineering at John Carroll and then transfer to an engineering school to pursue a bachelor's degree in engineering.
- Pursue a joint 3:2 program, which consists of the first three years at John Carroll as a science major followed by two years at a participating engineering school. Successful completion of the 3:2 program leads to two bachelor's degrees: a B.S. degree from John Carroll and a bachelor's degree in engineering from the second school.

Students planning to participate in this program are strongly urged to consult with the Chemistry Department Pre-engineering Advisor Dr. Nick Baumgartner before beginning their freshman year.



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## Biochemistry / Molecular Biology Concentration

This concentration is intended for students majoring in either Biology or the Chemistry Life Sciences program who seek a rigorous training in the molecular basis of biological processes. The primary goal is to prepare students for graduate work in biochemistry, molecular biology, biophysics, structural biology and molecular genetics. In addition, this concentration may be of interest to students considering careers in biotechnology and pre-medical students interested in the molecular basis of disease. Because admission to the concentration is subject to space limitations in BL/CH470 (Molecular Methods Lab), students must apply to the coordinators (Dr. James Lissemore in Biology and Dr. David Mascotti in Chemistry) for admission to the concentration by the end of the sophomore year. Chemistry majors must have completed BL 155-158 (Principles of Biology lecture and lab I-II), BL 213 (Genetics), CH141-144 (General Chemistry lecture and lab I-II) or CH151, 153 (Chemical Principles and Lab), CH221-224 (Organic Chemistry lecture and lab I-II), CH261, 263 (Analytical Chemistry and lab).

A life science chemistry major accepted into the Biochemistry / Molecular Biology Concentration must also fulfill the following requirements:

### Chemistry

CH 361*	Introductory Physical Chemistry	3 cr hr
CH 365 – 366*	Physical Chemistry I and II	6 cr hr
CH 367	Physical Chemistry Lab I	1 cr hr
CH 435 – 436	Biochemistry I and II	7 cr hr
CH 437	Biochemistry Lab	1 cr hr
CH 439	Biochemistry III	3 cr hr
CH 470	Molecular Methods Lab	3 cr hr

\* Either Physical Chemistry sequence may be taken.

### Support Courses

MT 135 – 136	Calculus and Analyt. Geom. I – II	8 cr hr
PH 125 – 126	General Physics I – II	6 cr hr
PH 125L – 126L	General Physics Lab I – II	2 cr hr
BL 465	Molecular Genetics	3 cr hr
	One Approved BL Elective	

## Cooperative Education in Chemistry

A cooperative education (co-op) program in chemistry provides interested and capable students with a combination of formal and applied educational experiences. This is accomplished by alternating periods of University study with periods of full-time employment in an industrial, governmental or clinical setting.

The co-op program is not for everyone. Normally it will take five years for the co-op student to complete the degree. To be eligible for admission to this program, a student must be an accepted chemistry major (comprehensive, pre-medical and life sciences, or general), with a minimum grade average of 2.5 both overall and in chemistry. Students should demonstrate dexterity and understanding in laboratory work as well as the ability to communicate effectively both orally and in writing. Prerequisites for admission to the program include successful completion of Organic Chemistry (CH221-224) and Career Planning and Development (CE101). Application for admission should be made when one applies to be accepted as a chemistry major (usually in the middle of the sophomore year).

## Concentration in Chemistry

A **Concentration** is available for students from other departments. This requires the same chemistry courses as the Minor except that the Physical Chemistry course or sequence (CH361 or CH365-366) is excluded. No support courses are required.

## Environmental Studies Concentration

The Chemistry Department takes part in the Environmental Studies Concentration, which is designed to acquaint students with the operations of the physical, biological and chemical systems of the planet, the impact of people on these systems, and the sociological and political processes which impinge upon our environment. Any tract of chemistry major may take part in the concentration.

In addition to fulfilling the requirements of the particular chemistry tract, students must also take 12 hours of coursework from the following choices, where at least two departments and two courses are represented: CO455; EC211, EC212, 315; HS340; PL314, 398 (Env. Ethics or Ecofeminism); PO325, 361, 363, 364, 365, 437 (Am. Env. Pol. Thought); RL101, 333, 365; SC101, 251, 380, 381, 383. A senior capstone course is also taken where an environmental issue or problem is studied. More information can be obtained from Dr. Michael Nichols.

## Neuroscience Concentration

The Chemistry Department collaborates in an Interdisciplinary Concentration in Neuroscience. A Chemistry major should follow the Pre-Medical / Life Science Program, but replaces the upper division biology and chemistry electives with the following required courses:

BL 360 – 361	Mammalian Physiology	4 cr hr
PS 326	Psychobiology	3 cr hr
PS 426	Psychopharmacology	3 cr hr
PS 497N	Individual Research Project in Neuroscience	3 cr hr

## Optional Minor in Chemistry

An **Optional Minor** in chemistry is available to students majoring in any other department. The following courses are required:

### Chemistry

CH 141 – 142*	General Chemistry I and II	8 cr hr
CH 143 – 144*	General Chemistry Lab I and II	2 cr hr
CH 151*	Chemical Principles	4 cr hr
CH 153*	Chemical Principles Lab	1 cr hr
CH 221 – 222	Organic Chemistry I and II	6 cr hr
CH 223 – 224	Organic Chemistry Lab I and II	2 cr hr
CH 261	Analytical Chemistry	2 cr hr
CH 263	Analytical Chemistry Lab	1 cr hr
CH 361**	Introductory Physical Chemistry	3 cr hr
CH 365 – 366**	Physical Chemistry I and II	6 cr hr
CH 367	Physical Chemistry Lab I	1 cr hr

### Supporting Courses

*	Either the General Chemistry sequence or the Chemical Principles sequence may be taken.	
**	Either Physical Chemistry sequence may be taken.	
***	PH 215-216 (with PH 215L-216L) may be substituted for PH 125-126 by permission.	
PH 125-126***	General Physics I and II	6 cr hr
PH 125L-126L	General Physics Lab I and II	2 cr hr
MT 135-136	Calc. And Analyst. Geo. I and II	8 cr hr

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## Certificate Program in Chemistry

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The Chemistry Department also offers a non-degree program leading to a certificate in chemistry, requiring the completion of 63-64 credit hours. This program is intended primarily for the part-time student who needs a systematic education in Chemistry, but lacks the opportunity to complete a full degree program. In addition to the requirements for an Optional Minor listed on Page 5, the courses listed at right must also be completed.

With the approval of the Dean of Arts and Sciences, all the above can be applied toward a degree.

### Chemistry Supporting Courses

CH 441	Instrumental Analysis	3 cr hr
CH 443	Instrumental Analysis Lab	1 cr hr
PH 125 – 126	General Physics I and II	6 cr hr
PH 125L – 126L	General Physics Lab I and II	2 cr hr
MT 135 – 136	Calculus and Analyt. Geom. I – II	8 cr hr
EN 111 – 112	Composition and Rhetoric I – II	6 cr hr
CO 100	Speech Communication	2 cr hr
	2 General Electives	6 cr hr



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## 2008-2009 CHEMISTRY DEPARTMENT AWARDS LUNCHEON

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## Faculty



Dr. Baumgartner joined the faculty in 1969 to teach General and Physical Chemistry, as well as, Biochemistry. His research interests are in Vision Chemistry, Photosynthesis/Photo respiration and

**Nick R. Baumgartner**

*B.S. Upper Iowa College  
Ph. D. University of Wyoming*

*Professor  
Physical and Biochemistry*

Enzyme Kinetics. Dr. Baumgartner spent the Summers of 1979 and 1980 working at SOHIO (now BP-Amoco) Research Laboratories studying renewable energy sources. He received a Grauel Faculty Fellowship from John Carroll University for the 1985-86 academic year and spent that time doing research in the Biochemistry and Pharmacology Departments at Case Western Reserve University. He is an active member of the Cleveland Section of the American Chemical Society, having served as its Chairman (1977) and currently serving as Director since 1982. He serves on the Board of Trustees of the North-east Ohio Science and Engineering Fair. Dr. Baumgartner served as Chairman of the Chemistry Department from 1989 to 1994. He received the Distinguished Faculty Award in 1990. He served as Dean of the College of Arts and Sciences from 1994-2004.



Dr. Kwan joined the faculty in August 2001. He was born and raised in Hong Kong and came to the U.S. in 1988 to receive his B.S. and Ph.D. in chemistry. Under the direction of Dr. Norris W.

**Man Lung  
Desmond Kwan**

*B.S. Univ. of S. Alabama  
Ph.D. Univ. of Florida*

*Assistant Professor  
Organic/Organometallic  
Chemistry*

Hoffman at the University of South Alabama, his undergraduate research work involved organo-transition-metal synthesis and pseudo-first order kinetics on ligand exchange reactions. In 1993, he went to the University of Florida to study Organic Chemistry under the direction of Dr. Merle A. Battiste. His research work focused on main group organometallic synthesis, synthetic methodology with special focus on allyl- and vinyl-silane synthesis. After his Ph.D work, he moved the Eugene, Oregon to join the Dr. Kenneth Doxsee's group for his post-doctoral study on organotitanium synthesis and Tebbe's reagent mediated vinylsilane synthesis. He worked at Molecular Probes for a few months as a synthetic chemist synthesizing "Fluorescent Dye" before coming to JCU. His research interests focus on " Organometallic Reagent Mediated Allyl- and Vinyl-silane Synthesis".

He is currently collaborating with the National High Magnetic Field Lab in Florida State University on catalysis research. Dr. Kwan is also interested in incorporating "Green Chemistry" laboratory experiments into the organic chemistry curriculum. Dr. Kwan teaches Organic Chemistry lecture/lab and General Chemistry courses.

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### PUBLICATIONS

Schroder, P. M.; Spilker, T. F.; Luu, W.; Updegraff, J. B.; Kwan, M. L.; Challen, P. R.; Protasiewicz, J. D. "Improved synthesis of pincer ligand precursor, and synthesis and structural characterization of terphenyl scaffolded S-C-S palladium pincer complex" *Inorg. Chem. Comm.* 2009.

Kwan, M.L.; Battiste, M.A.; Macala, M.K.; Aybar, S.C.; James, N.C.; Hauoi, J.J. *Synthetic Communications*, **2004**, 34 (11) 1943-1950.

Kwan, M.L.; Battiste, M.A. *Tetrahedron Lett.* **2002**, 43, 8765-8768.

Kwan, M.L.; Yeung, C.W.; Breno, K.L.; Doxsee, K.M. *Tetrahedron Lett.* **2001**, 42 1411-1413.

Hoffman, N.W.; Kwan, M.L; etal. *Organometallics* **2001**, 20, 2270-2279.

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## PRESENTATIONS

Man Lung (Desmond) Kwan, Paul M. Schroder, Katherine L. Conry, Bradley M. Williams, Norris W. Hoffman, Rachel Traylor, Benjamin Wicker, Alan G. Marshall and Gregory A. Khitrov, (1)John Carroll University, University Heights, OH, (2)University of South Alabama, Mobile, AL, (3)Ion Cyclotron Resonance Program, Tallahassee, FL. Preparations of PCP and NCN F Reporter Pincer Complexes. Green Enough?

39th Mid-Atlantic Regional ACS Meeting. Man Lung (Desmond) Kwan, Katherine L. Conry, Jennifer E. Marshall, Paul M. Schroder, Norris W. Hoffman, Rachel Traylor, Benjamin Wicker, Camden N. Henderson, Richard Sykora, James H. Davis Jr., Oleg V. Ozerov, and Fan Lei. (1) John Carroll University, University Heights, OH, (2) University of South Alabama, Mobile, AL, (3) Brandeis University, Waltham, MA, "Preparation, Characterization, and Equilibrium Studies on Pd(II) complexes of an F NMR-Reporter Pincer Ligand."

November 4, 2005, "Preparation and Characterization of Pd (II) Complexes of an  $^{19}\text{F}$  NMR", (ABRCMS), Atlanta, GA. **Heldi M. Fondeur, Charles S. Carfagna, Jennifer E. Marshall**, Man Lung Kwan, et al.

July 14, 2005, "Preparation and Characterization of Pd(II) Complexes of a  $^{19}\text{F}$  NMR" (NERM 2005), Sacred Heart University—Presented by: **Jennifer E. Marshall, Charles S. Carfagna**, and Man Lung Kwan.

July 14, 2005, "Preparation and Characterization of Pd(II) Complexes of a  $^{19}\text{F}$  NMR", (NERM 2005), Sacred Heart University. **Man Lung Kwan**

October 31, 2004, "Preparation and Characterization of Pd (II) Complexes of a  $^{19}\text{F}$  NMR", The ACS 32<sup>nd</sup> Northeast Regional Meeting, Rochester, NY. Presented by: Man Lung Kwan, **Sara Conry**, and **Charles Carfagna**.

March 17, 2004, "Diethylaluminum Chloride Mediated Vinylsilane Synthesis", ACS Meeting in Miniature, JCU, Presented by **Kristen Hudach** and Man Lung Kwan.

July 2004, "Organoaluminum Reagents in Vinyl Silane Synthesis". Bridges to Success Program, Cuyahoga Community College, **Sylvia Aybar** and Man Lung Kwan.

"November, 2003, Application of Organoaluminum Reagents in a One-pot Synthesis Of Vinylsilanes", The 14<sup>th</sup> Annual Argonne Symposium for Undergraduate Research, Argonne National Laboratory, IL, **Sylvia Aybar** and Man Lung Kwan.

2003, "Organoaluminum and Organotitanium Reagents Mediated Vinylsilane Synthesis From Ketones or Aldehydes", The 35<sup>th</sup> ACS Central Regional Meeting, PA **Man Lung Kwan**.

2003, "Diethylaluminum Chloride Mediated Vinylsilane Synthesis: Comparison of Different Solvent Systems", The 35<sup>th</sup> ACS Central Regional Meeting, PA, **Kristen Hudach, Nicholas James**, and Man Lung Kwan.

2003, "Stereoselective One-Pot Synthesis of Vinylsilane from Aromatic Aldehydes", The 38<sup>th</sup> Organic Symposium, Indiana University. **Kristen Hudach** and Man Lung Kwan.

2003, "Application of Organoaluminum Reagents in a One-Pot Synthesis of Vinylsilanes", The 38<sup>th</sup> Organic Symposium, Indiana University. **Joseph Haoui, Megan Macala**, and Man Lung Kwan.

2003, "Organotitanium and Organo aluminum Reagents in Vinyl silane Synthesis", Research Presentation, University of South Alabama. **Man Lung Kwan**.

2003, "Application of Organoaluminum Reagents in a One-Pot Synthesis of Vinylsilanes", Meeting in Miniature, Oberlin College **Megan Macala** and Man Lung Kwan.

2002, "Application of Organoaluminum Reagents in a One-Pot Synthesis of Vinylsilanes", **Megan Macala** and Desmond Kwan; Kent.

2002 "The Importance and Preparation of Vinylsilanes Via Organo aluminum Intermediates", **Nicholas C. James** and Desmond Kwan; Kent.





### **Yuh-Cherng Chai**

*B.S. Iowa State University  
Ph. D. Iowa State University*

*Associate Professor  
Biochemistry*

Dr. Chai joined the faculty in the fall of 2002 as a Visiting Assistant Professor and is now a tenure-track Assistant Professor. Prior to this position, he was trained and carried out independent research in the Lerner Research Institute of The Cleveland Clinic Foundation (CCF). During this time, he was awarded the Tarazi Prize for significant achievement in cardiovascular research and he was funded by the American Heart Association Northeast Ohio Chapter for the years 1995-97. At CCF, he had mentored three JCU undergraduate students in research projects. In addition to pursuing investigations into the cellular and biochemical mechanisms underlying human disease by oxidant stress, he is eager to pursue a teaching career. During the training at CCF, he was a selected member of the Cleveland Clinic teaching faculty at Cleveland State University, where he lectured in the biochemistry course in the graduate program from 1994 to 1998. At CCF, he was also participating in the radiobiology lecture course

for Radiation Oncology residents. He currently teaches General Chemistry, Biochemistry and Biochemistry and Molecular Methods Labs.

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#### *Publication*

*"The Effect of Oxidant and the Non-Oxidant Alteration of Cellular Thiol concentration on the Formation of Protein mixed-Disulfides in HEK 293 Cells"*, Jasen Lee Gilge, Michael Fisher, and **Yuh-Cherng Chai**, PLoS One 2008; 3(12): e4015 Published online **2008** December 24

Amanda Leonberg & **Yuh-Cherng Chai**, "The Functional Role of Cysteine residues for c Abl kinase activity," *Molecular and Cellular Biochemistry*, April **2007**.

#### *Presentations*

*"The Paradox of Protein Cysteines: The mystery of cellular caspase-3 and c-Abl activation under oxidative stress"* Yuh-Cherng Chai, Case Western Reserve University, Department of Pharmacology. Date: October 12, 2004.

*"Regulation of c-Abl kinase activity is inhibited by the modification of cysteine residues"* Amanda Leonberg and Yuh-Cherng Chai, a joint local ACS societies meeting in Akron January 19, 2005. (Talk)

*"Regulation of c-Abl kinase activity by S-glutathiolation"* Presented by: Amanda Lenoberg and Yuh-Cherng Chai Place: Baldwin-Wallace College (MEETING-IN-MINIATURE) Date: March 23, 2005. (Talk)

"Oxidant induced S-glutathiolation of c-Abl in HEK 293 cells" John F. Sullivan, Amanda K. Leonberg and Yuh-Cherng Chai, 17<sup>th</sup> Annual Argonne Symposium for Undergraduates in Sciences, Engineering and Mathematics, Argonne, Illinois, November, 2006 (Talk)

"Oxidant induced S-glutathiolation of c-Abl in HEK 293 cells" John F. Sullivan, Amanda K. Leonberg and Yuh-Cherng Chai, Meeting-in Miniature, Notre Dame College, OH, March, 2007 (Talk)

"S-glutathionylation of c-Abl in vivo and in vitro" Yuh-Cherng Chai, Amanda Leonberg, and John Sullivan, American Chemical Society National Meeting, Boston, Massachusetts, August 2007.

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### Paul R. Challen

B.A. Oxford Univ., England  
Ph.D. Univ. of Michigan

Professor  
Inorganic Chemistry

Dr. Challen joined the faculty in 1990. He taught high school chemistry in Europe for several years before coming to the United States to study for the Ph.D. At JCU he regularly teaches Inorganic Chemistry, General Chemistry, Non-majors Chemistry and First Year Seminar. Dr. Challen's research is in the area of synthesis of new compounds with potential applications in catalysis or as materials with novel electronic or magnetic properties. He has published papers in, among others, Inorganic Chemistry, and Polyhedron and his research at JCU has been funded by Research Corporation and the Petroleum Research Fund. In recent years he and his students have been involved in a collaborative project with a faculty member from the University of Michigan on C/N materials. From 1990-2001 Dr. Challen served as the University Chemical Hygiene Officer. Also, from 2001-2005 he served as the Chair of the JCU Chemistry Department

### PUBLICATIONS

"Vanadium (IV) Complexes with Mixed O,S Donor Ligand. Syntheses, Structures and Properties of the Anions Tris(2-mercapto-4-methylphenolato) vanadate (IV) and Bis(2-mercapto-4-methylphenolato) oxovanadate (IV)" Klich, P.R.; **Daniher, A.T.**; Challen, P.R.; McConville, D. B.; Youngs, W.J. *Inorganic Chemistry* **1996**, 35, 347.

"One-Dimensional Chains in Sodium Tetraphenylphosphonium Bis(2-mercapto-4-methylphenolato-O,S)oxovanadate(IV), Challen, P.R., et. al, *Acta Crystallographica Section C*, **2000**, 56(3), 310-311.

"Improved Synthesis of Pincer Ligand Precursor, and Synthesis and Structural Characterization of Terphenyl Scaffolding S-C-S Palladium Pincer Complex", Paul M. Schroder, Thomas F. Spilker, Wilson Luau, James Updegraff, Man Lung Kwan, Paul R. Challen, and John D. Protaseiwicz, *Inorganic Chemistry Communications*, online September 15, **2009**

*The Spectroelectrochemical, Magnetic, and Structural Characterization of Reduced Hexaazatriphenylhexacarbonitrile, HAT(CN)<sub>6</sub>*, Joseph R. Gallegos, Anthony H. Francis, Nathan W. Ockwig, Paul G. Rasmussen, Raphael G. Raptis, Paul R. Challen, Issouf Ouedraogo, *Synthetic Metals* 159 (**2009**), 1667-1671.

### PRESENTATIONS

"Synthesis of Metal Complexes of HAT-(CN)<sub>6</sub>", **John J. Morris**, Paul R. Challen and David W. Ewing.

"Transition Metal Complexes of HAT-(CN)<sub>6</sub>", **Issouf Ouedraogo** (Cuyahoga Community College) and Paul Challen.

"Transition Metal Complexes of HAT-(CN)<sub>6</sub>", **Issouf Ouedraogo**, Paul R. Challen; Ohio-Michigan NSF-REU Undergraduate Research Poster Session, Kent State University, July 2002.

"Synthesis and Studies of HAT-(CN)<sub>6</sub> and Metal Complexes", **John J. Morris**, Paul R. Challen; David W. Ewing; Cleveland ACS Meeting-in-Miniature, Oberlin College, March 2003. (JJM won one of four undergraduate research prizes at this meeting.)



### David P. Mascotti

B.S. Hope College  
Ph.D. Texas A&M Univ.

Associate Professor  
Biochemistry

Dr. Mascotti joined the faculty in the summer of 1998. He completed his Ph.D. in 1992 studying nucleic acid chemistry and the interactions of synthetic peptides (that served as simpler models of proteins) with DNA and RNA. After completing his Ph.D., Dr. Mascotti accepted a National Institutes of Health Postdoctoral Fellowship to work at Washington University in St. Louis. While there, he studied iron metabolism and the control mechanisms of ferritin synthesis. After his postdoctoral work, he was an assistant professor at

the Richard Stockton College of New Jersey for two years. In addition to being departmental Chair, he now teaches general chemistry and biochemistry. His current research interests include continuation of his earlier efforts to understand the chemical forces governing protein-nucleic acid interactions, as well as how those interactions influence gene expression.

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### PUBLICATIONS

\*Waner, M.J. & Mascotti, D.P. accepted by *J. Biochem. Biophys. Meth.* "A Simple Spectrophotometric Streptavidin-Biotin Binding Assay Utilizing Biotin-4-Fluorescein."

"Use of Biotin-labeled Nucleic Acids for Protein Purification and Agarose-based Chemiluminescent Electromobility Shift Assays." **Rodgers, J.T., Patel, P., Hennes, J.L.,** Bolognia, S.L. and Mascotti, D.P. *Analytical Biochemistry* **2000**, 277, 254.

"Green Fluorescent Protein as a Quantitative Reporter of Relative Promoter Activity in *E. coli*" Lissemore, J.L., **Jankowski, J.T., Thomas, C.B.,** Mascotti, D.P., and deHaseth, P.L. *Biotechniques*, **2000**, 28, 82.

"Thermal and Sodium Dodecylsulfate Induced Transitions of Streptavidin". Waner, M.J., Navrotskaya, I., **Bain, A., Oldham, E.D.,** & Mascotti, D.P. *Biophys. J.* **2004**, 87, 2701.

"Quantitative Non-Isotopic Nitrocellulose Filter Binding Assays: Bacterial MnSOD-DNA Interactions". **Czerwinski, J.D. Hovan, S.C. & Mascotti, D.P.** *Anal Biochem.* **2005**, 336, 300.

"Complementary Spectroscopic Assays for Investigating Protein-Ligand Binding: a Project for the Advanced Chemistry Laboratory", Waner, M.J., Mascotti, D.P., accepted for publication in *J. Chem. Educ.* **2009**

### PRESENTATIONS

October 21, 2006, Rustbelt RNA Meeting, Deer Creek, Ohio, Lana Bengez,\* Angela C. Smolik, & David P. Mascotti, "Preferential Binding of Manganese Superoxide Dismutase to Single-stranded Nucleic Acids." (poster)

March 22, 2006, A Celebration of Scholarship, John Carroll University, **Megan Mamolen\*** and David P. Mascotti, "siRNA"

March 22, 2006, A Celebration of Scholarship, John Carroll University, Mark J. Waner, **Anthony Mustovich,\*** Seema Patel\* & David P. Mascotti Intrinsic Tryptophan Fluorescence as a Structural Probe of the Streptavidin-Biotin System"

October 28, 2005, Rustbelt RNA Meeting, Deer Creek, Ohio, **Angela C. Smolik,\*** Stephanie C. Hovan\* & David P. Mascotti, "Interactions of MnSOD with Single Stranded RNA using Fluorescence Spectroscopy."

October 28, 2005, Rustbelt RNA Meeting, Deer Creek, Ohio, **David P. Mascotti,** Robert J. Kall\* & Michael P. Iannetti,\* "Effect of Ethanol as a Cosolvent on Charged Peptide Interactions with RNA."

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March 16, 2005, University of Akron, Department of Chemistry, **David P. Mascotti**, "Reversibility of Thermal Denaturation of Streptavidin in the Presence of SDS"

March 17, 2004, ACS Meeting in Miniature, Cleveland Section, **Joshua D. Czerwinski\*** and David P. Mascotti, "Chemiluminescent Nitrocellulose Filter Binding Assays: SOD/DNA Interaction as an Example." "Quantitation of the Thermodynamic Equilibrium Constant for the Interaction of IRP1 and IRE."

February 18, 2004, 48th Annual Biophysical Society Meeting in Baltimore, MD. **Joshua D. Czerwinski\*** and David P. Mascotti presented a poster entitled "Chemiluminescent Nitrocellulose Filter Binding Assays: SOD/DNA Interaction as an Example."

March 24, 2003, The 225th ACS National Meeting, New Orleans, LA, **Rachel T. Finley** (Saint Mary's College)\* and David P. Mascotti presented "Determination of the equilibrium affinity for IRP1 binding IRE".

March 24, 2003, The 225th ACS National Meeting, New Orleans, LA, David P. Mascotti and **Michael P. Iannetti** (Youngstown State University)\* presented "Effect of Alcohol-containing Cosolvents on Charged Peptide Interactions".

July 24, 2002, REU Undergraduate Research Poster Session, Kent State University, OH. **Rachel Finley** (St. Mary's College, IN)\* and David P. Mascotti, "Determination of the Equilibrium Affinity for IRP1 binding to IRE."

July 24, 2002, REU Undergraduate Research Poster Session, Kent State University, OH. **Michael Iannetti** (Youngstown State University, OH)\* and David P. Mascotti, "Effect of Alcohol-containing Cosolvents on Charged Peptide Interactions with RNA."

April 18, 2002, Council on Undergraduate Research Posters on The Hill, Washington, D.C., **Laureen M. Lenchak\*** and David P. Mascotti,



### Catherine Miller

B.A. Knox College  
Ph.D. Purdue University

Clare Boothe Luce  
Assistant Professor  
Inorganic Chemistry

Dr. Miller joined the faculty in August 1996. After completing her Ph.D. studies in bioinorganic chemistry, she taught for two years at Carthage College in Kenosha, Wisconsin as a Visiting Assistant Professor. Dr. Miller's research interest is mainly in the chemistry of copper and specifically in the spectroscopy of metalloproteins. Her research uses metal replacement techniques to form isotopically pure derivatives to further characterize the active site of the protein. She studies the extent of copper exchange in a variety of protein derivatives by using UV-visible spectroscopy, (low-temperature) electron spin resonance spectroscopy (ESR), and inductively coupled plasma-mass spectrometry (ICP-MS). She also studies ion-exchange materials that have a high specificity toward copper and the toxicity of titanium salts in mammalian systems. In Summer 2000, Dr. Miller spent a Grael Sabbatical at the National Institutes of Health Sciences in North Carolina, using in vivo techniques to monitor free-radical metabolites. Dr. Miller has taught General Chemistry, Inorganic Chemistry, Analytical Chemistry, Environmental, Physical Chemistry lab and in the University's First-Year Seminar Program.

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### PUBLICATIONS

**Vanadium-vitamin B<sub>12</sub> bioconjugates as potential therapeutics for treating diabetes**, Riya Mukherjee, Edward G. Donnay, Michal A. Radomski, Catherine Miller, Duane A. Redfern, Arne Gericke, Derek S. Damron and Nicola E. Brasch, *Chem. Commun.*, 2008, 3783

*"Revisiting the Interaction of the Radical Anion Metabolite of Nitrofurantoin with Glutathione"*, Miller, C.; Folkes, L.K.; Mottley, C.; Wardman, P.; Mason, R.P. *Arch. Biochem. Biophys.* **2002**, 397(1), 113-118.

### PRESENTATIONS

*"Determination of Isotopic Exchange in the Copper of Laccase Using ICP-MS and IDMS"*, **Elena Caraman** and Catherine Miller, Kent 2002.

*"Thermal Energy Studies of the Freeze/Thaw Cycle of Laccase"*, **Lindsey Westerfield** and Catherine Miller, Kent 2002.

*"New Methods of Extraction and Purification of the Blue Copper Oxidase, Laccase"*, **Shaneyfelt, K.**, Miller, C., Baldwin-Wallace College, March 2000.

*"New Methods of Extraction and Purification of the Blue Copper Oxidase Laccase"*, **Lewis, M., Shaneyfelt, K.**, Miller, C.M., Bridges to Success in the Sciences Poster Session, Cuyahoga Community College, Metro Campus, Cleveland, OH, April 2000.

*"New Methods of Extraction and Purification of the Blue Copper Oxidase, Laccase"*, **Shaneyfelt, K.**, Miller, C.M. Council on Undergraduate Research (CUR) Poster Session on Capital Hill, Washington, D.C., April 2000.



### Michael A. Nichols

B.S. Clarion Univ. of PA  
Ph.D. Duke University

Associate Professor  
Organic/Environmental  
Chemistry

Dr. Nichols joined the Chemistry Department in 1994 after serving as a Visiting Assistant Professor at Kansas State and Ohio Universities. He received his Ph.D. in physical-organic chemistry from Duke University, studying the structural and thermodynamic properties of organolithium compounds. Dr. Nichols then spent two years as a postdoctoral associate at Brown University, where he determined the solid-state and solution structures of organic and organometallic compounds using x-ray crystallography and heteronuclear NMR. At JCU, his research interests lie in the diverse areas of physical organic studies of organoalkali compounds and reactions and environmental water quality analysis. The physical organic projects involve studying the solution and solid-state structures of

organoalkali compounds by x-ray diffraction and heteronuclear nuclear magnetic spectroscopy (NMR), synthesizing isotopically-labeled organic and organometallic compounds, and determining the thermodynamics and mechanisms of organoalkali reactions using reaction calorimetry and computational methods. In the area of environmental chemistry, he and his students have focused on

studying the water chemistry of urban Cleveland streams, lakes, and constructed wetlands. Since Summer 2004, he has been collaborating with the City of Shaker Heights and the Doan Brook Watershed Partnership in determining the effectiveness of bioaugmentation treatments to prevent excessive algal and other plant growth in two small lakes. Previous research projects have studied the effectiveness of constructed wetlands in the remediation of urban run-off (in collaboration with the Summit County Soil and Water Conservation District). Dr. Nichols is currently helping the Cuyahoga County Soil and Water District establish the Euclid Creek Watershed Volunteer Water Quality Monitoring Program, which will soon be the first volunteer monitoring program certified by Ohio EPA.

Dr. Nichols regularly teaches Organic Chemistry Lecture and Lab, and has taught General and Honors General Chemistry, Advanced Physical Organic Chemistry, and Environmental Chemistry courses. He also served as co-coordinator of the 2005 Forensic Chemistry for Kids Camp with Faith Whitworth and developed many of the hands-on forensic activities used in the camp.

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### PUBLICATIONS

Nichols, Michael A., Rachel M. Sobinsky, Allen D. Hunter, and Matthias Zeller. "Crystal Structure of a Butyllithium 1,2-Dipiperidinoethane Dimer Complex." *Journal of Chemical Crystallography* 37.6 (2007): 433-38.

"Synthesis of [ $^{15}\text{N}$ , $^{15}\text{N}'$ ]- $N,N,N',N'$ -Tetramethylethylenediamine and Its Use in Solvation Studies of [ $^6\text{Li}$ ]- $n$ -Butyllithium", Waldmuller, D.; Kotsatos, B.J.; Nichols, M.A.; Williard, P.G. *Journal of the American Chemical Society* **1997**, 119, 5479.

### Presentations & Workshops

"Isolation and Identification of the Components Found in the Spice Coriander", Michael A. Nichols and Gloria Gyimah, American Chemical Society Central Regional Meeting, Covington, KY, May 2007. (Poster)

"An Overview of the Euclid Creek Watershed Volunteer Water Quality Monitoring Program", Michael A. Nichols, A Celebration of Scholarship! Science Poster Session, John Carroll University, March 2007. (Poster)

"Kinetic and Mechanistic Studies of the Deuterium Exchange in Classical Keto-Enol Tautomerism Equilibrium Reactions", Michael A. Nichols and Mark J. Waner, American Chemical Society Central Regional Meeting, Covington, KY, May 2007. (Talk)

"Mechanistic and Synthetic Studies of Polystyrene Polymerization Using a Sterically Hindered Alkyl Lithium Initiator", Michael A. Nichols and Olga Masliantchouk, American Chemical Society Central Regional Meeting, Covington, KY, May 2007. (Talk)

"Preparation of Ultra-Low Molecular Weight Polystyrene: Mechanistic and Structural Studies", Michael A. Nichols, A Celebration of Scholarship! Grauel Fellowship Panel Session, John Carroll University, March 2007. (Talk)

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Oral and Poster Paper Presentations by Undergraduate Research Students

*"Mechanistic and Synthetic Studies of Polystyrene Polymerization Using a Sterically Hindered Alkyl Lithium Initiator"*, Olga Masliantchouk and Michael A. Nichols, A Celebration of Scholarship! Science Poster Session, March 2007. (Poster)

*"Mechanistic and Synthetic Studies of Polystyrene Polymerization Using a Sterically Hindered Alkyl Lithium Initiator"*, Olga Masliantchouk and Michael A. Nichols, American Chemical Society, Cleveland Section, Meeting-in-Minature, Notre Dame College, March 2007. (Talk)

*"Working with NSF Fastlane and How a Funded Undergraduate Research Program Can Transform a Department"*, Michael A. Nichols, given at the Grant Basics for Faculty At JCU Workshop, John Carroll University, February, 2006.

*"Fingerprint Analysis: Hands-On Activities for Middle and High School Students"*, Michael A. Nichols, given at the Second Annual Teachers' Symposium at the Cleveland Museum of Natural History, Cleveland, OH, February, 2006.

*"Chemical and Microbiological Studies of the Effectiveness of Bioaugmentation to Prevent Algal Growth in Two Urban Lakes in the Doan Brook Watershed (OH)"*, Michael A. Nichols, Adrienne Clark, and Keith Jones, American Chemical Society Central Regional Meeting, Midland, MI, May 2006. (Poster)

*"Kinetic and Mechanistic Studies of the Deprotonation of Isobutyrophenone Using a Sterically-Hindered Lithium Amide Base"*, Michael A. Nichols and Christina Leposa, American Chemical Society Central Regional Meeting, Midland, MI, May 2006. (Talk)

*"Kinetic and Mechanistic Studies of the Deprotonation of a Sterically-Hindered Ketone Using a Sterically-Hindered Lithium Amide Base"*, Christina Leposa and Michael A. Nichols, Meeting-In-Miniature of the Cleveland American Chemical Society, Cleveland State University, March 2006 and A Celebration of Scholarship! Science Poster Session, John Carroll University, March 2006. (Oral and Poster Presentations)

*Characterization of the Product(s) of the Polymerization of Styrene Initiated by a Sterically-Hindered Alkyl lithium Compound"*, Rachel Sobinsky and Michael A. Nichols, A Celebration of Scholarship! Science Poster Session, John Carroll University, March 2006. (Poster)

*"Isolation and Structure Determination of the Major Components of the Spice Coriander"*, Gloria Gyimah and Michael A. Nichols, A Celebration of Scholarship! Science Poster Session, John Carroll University, March 2006 and the STARS Research Conference, University of Akron, March 2006. (Oral and Poster Presentations)

*"Chemical & Microbiological Studies of the Effectiveness of Bioaugmentation to Prevent Algal Growth in Two Shaker Heights Lakes in the Doan Brook Watershed"*, Michael Nichols, Department of Chemistry, JCU; Keith Jones, doan brook Watershed Partnership; Martin Reese, City of Shaker Heights, OH, Celebration of Scholarship Math and Science Poster Session, John Carroll University, March 2005 and by K. Jones at the Ohio Lake Management Society 10th Annual Ohio Limnology Conference and 20th Annual OLMS Symposium, Mt. Sterling, OH, March 2005.

*"Screening for Lead in Children's Sidewalk Chalk"*, Melanie Lawrence and Michael Nichols, Bridges to Success in the Sciences Spring Poster Session, Cuyahoga Community College, Metro Campus, May 2005.

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*"Attempted Correlations Between Metals and Colors in Children's Sidewalk Chalk"*, **Melanie Lawrence** and Michael Nichols, Bridges to Success Summer Seminar Presentation, Cuyahoga Community College, Metro Campus, July, 2005.

*"What? Chemicals in the Water? An Overview of Water Testing and Applications"*, Nichols, M.A. Keynote Address: Cleveland Regional Council of Science Teachers (CRCST), Fall Conference, October 2004, John Carroll University.

*"Determination of Lead in Children's Sidewalk Chalk"*, **Roylene Coggins**, and M. Nichols, Bridges to Success in the Sciences Poster Session, Cuyahoga Community College, Metro Campus, April 2004.

*"Determination of Lead and Cadmium in Various Chalks"*, **Melanie Lawrence** and M. Nichols, Bridges to Success in the Sciences Presentation Session, Cuyahoga Community College, Metro Campus, July 2004.

*"Which De-Icer is Best? Development of an Environmental Chemistry Experiment"*, **Roylene Coggins** and M. Nichols, Bridges to Success in the Sciences Poster Session, Cuyahoga Community College, Metro Campus, April 2003.

*"Chemistry Camp for Kids at John Carroll University"*, **Roylene Coggins**, F. Whitworth, and M. Nichols, Bridges to Success in the Sciences Presentation Session, Cuyahoga Community College, Metro Campus, August 2003.

*"Determining the Effectiveness of Two Constructed Wetlands for Water Remediation"*, Nichols, M.A.; **Cannon, J.; Ritter, D.** Society for Applied Spectroscopy Annual May Meeting, John Carroll University, May 2002 and at the Woodlake Environmental Field Station 2002 Annual Conference, Cuyahoga Valley National Park, October, 2002. (Both Oral Presentations)

*"What, Chemicals in the Water?: An Overview of Environmental Chemistry/Biology Projects at John Carroll University"*, Nichols, M.A., Invited Lecture: Department of Chemistry, Clarion University of Pennsylvania, October, 2002.

*"Remediation of Water from Landfill Leachate Using a Constructed Wetland"*, **Frank Calabro** (Cuyahoga Community College) and Michael A. Nichols; Kent 2002.

*"Development of a Web-site for Calculating Generic Diatom Index; Its Use and Correlation to the Water Quality of Mill Creek and Doan Brook"*, **William Brochak** (Garfield Heights High School) and Michael Nichols, Kent 2002.

*"Structural – Energetic Studies of Organoalkali Compounds"*, **Heather Jackson** and Michael Nichols, Kent 2002.

*"Analysis of Powders Using Differential Pulse Anodic Stripping Voltammetry"*, **Evangeline Johnson** (Mount Vernon Nazarene College (OH)) and Michael P. Setter, Kent 2002.

*"Evaluation of Urban Streams for Metals Contamination using ICP-MS"*, **Melissa I. March**, Michael A. Nichols and Michael P. Setter, Kent 2002.

*"Polymerization Reactions of Styrene Using Trimethylsilylmethylithium as an Initiator"*, **Erin Shaneyfelt** and Michael A. Nichols, Kent 2002.

*"The Analysis of Pyrethroid Insecticides in Doan Brook and Green Sunfish"*, **April Stauffer**, Michael Nichols and Miles Coburn (Dept. of Biology, JCU), Kent 2002.

*"Remediation of Water from Landfill Leachate Using a Constructed Wetland"*, **William Wade** (Riverside High School) and Michael A. Nichols, Kent 2002.

*"Polymerization Reactions of Styrene Using Trimethylsilylmethylithium as an Initiator"*, **Shaneyfelt, E.**; Nichols, M.A., Case Western Reserve University, March 2002.

*"Determination of the Efficiency of Artificial Wetland Use for Remediation of Urban Run-Off Water"*, **Cannon, J.**; Nichols, M.A., Case Western Reserve University, March 2002.





### Michael P. Setter

B.S. Rose-Hulman Institute of Technology  
Ph.D. Arizona State University

Assistant Professor  
Analytical Chemistry  
Chair

Dr. Setter joined the faculty in 1999 and has served as Chair of the Chemistry Department since 2009. Prior to that, he performed developmental work on lithium ion batteries for Eveready Battery. Dr. Setter teaches General and Environmental Chemistry courses, as well as the beginning and advanced Analytical Chemistry courses. Dr. Setter's main research area is the surface chemistry of powders. The emphasis is on development of techniques to determine the surface composition of powders by examining the liquid phase in suspensions of the powders. Dr. Setter currently uses Atomic Absorption Spectroscopy (AAS), High Performance Liquid Chromatography (HPLC), Anodic Stripping Voltammetry (ASV), and Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES) for this work. He and his students have demonstrated the ability to monitor the dissolution of powders using AAS, HPLC, and ASV. This dissolution data is consistent between all three techniques. They have used AAS, HPLC, and ICP-OES to determine that the both the existence and identity of contaminants on the surface of a powder. The quantitative results obtained with AAS and ICP-OES are consistent with each other. This work has been accomplished through the efforts of fifteen students over the past six years. Dr. Setter also serves as the University's Chemical Hygiene Officer.

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### PUBLICATIONS

**Investigation of New Chelation Ion Chromatography Procedure to Determine the Surface Composition of Powdered Metal Oxide Samples in the Solid State**, Peebles, Brian C., and Michael P. Setter. *Journal of Chromatography A* 1039 (2004): 13-21.

### PRESENTATIONS

WEWS Channel 5 News, Cleveland, 6:00 PM newscast: Angie Lau reported on effectiveness of various hand sanitizers. Dr. Flechtner reported on biological testing. My research student, Genna Andrews, performed tests to verify the concentration of the active ingredient and I appeared on air discussing the results. April, 2007.

Use of Atomic Absorption Spectroscopy in the Surface Analysis of Powdered Copper(II) Oxide, Michael P. Setter, Genna Andrews, Alan Laszczynski, and Erica J. Newbould, a poster presented at Pittcon 2007, McCormick Place South in Chicago, Illinois, February, 2007

**"Recent Advances in Small Surface Analysis"**, Michael P. Setter, an oral presentation at the John Carroll Chemistry Department Seminar on September 15, 2004.

**"Dissolution of Copper(II) Oxide in Various Concentrations of Nitric Acid to Determine the Surface Composition Using Atomic Absorption Spectroscopy"**, Erica J. Newbould and Michael P. Setter, a poster presentation at the 2<sup>nd</sup> Ohio Analytical Symposium, Ohio State University, Columbus, OH October 31, 2003 and the Ohio Academy of Sciences 113<sup>th</sup> Annual Meeting in Youngstown, OH, April 17, 2004, published in Ohio Journal of Science, 104(1), A-19.

**"The Future of Surface Analysis"**, Michael P. Setter, an oral presentation at the 2<sup>nd</sup> Ohio Analytical Symposium, Ohio State University, Columbus, OH October 31, 2003.

**"New Methods for Analysis of the Surfaces of Solids using HPLC"**, Brian C. Peebles, and Michael P. Setter, an oral presentation at the International Ion Chromatography Symposium in San Diego, CA, September 17, 2003.

**"New Methods for Surfaces Analysis of Solid Powders by HPLC"**, Brian C. Peebles and Michael P. Setter, a poster presentation at the 1<sup>st</sup> Annual Meeting of the Ohio Analytical Consortium at The Ohio State University, November 8, 2002 and at the ACS Meeting -in-Miniature, March 12, 2003 at Oberlin College.

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**“Dissolution of Iron Compounds in Acidic Conditions to Determine Surface Composition”, Jennifer Grzybowski** and Dr. Michael Setter, an oral and poster presentation at the Ohio-Michigan NSF-REU Undergraduate Research Poster Session, July 24, 2002 at Kent State University and at the Ohio Academy of Sciences 112<sup>th</sup> Annual Meeting, April 5, 2003, published in Ohio Journal of Science, 103(1), A-20.

**“Analysis of Urban Streams for Metals Contamination and Accumulation using ICP-MS”, Melissa March**, Dr. Michael Nichols, and Dr. Michael Setter, a poster presentation at the Ohio-Michigan NSF-REU Undergraduate Research Poster Session, July 24, 2002 at Kent State University and at the Woodlake Environmental Field Station 2002 Annual conference, October 5, 2002 at Cuyahoga Valley National Park.

*Grants:*

**“Surface Analysis of Fine Powders using Anodic Stripping Voltammetry”** Michael P. Setter, \$3000, 2003.

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## Mark J. Waner

B.S. John Carroll University  
M.S., Ph.D. Michigan State University

Assistant  
Physical Chemistry

After completion of the Ph.D. in Physical Chemistry, Dr. Waner spent a year teaching at Spring Hill College before coming back to JCU in August 1999. His research interests range from the study of surface chemistry and thin films to protein structure. Research in his laboratory uses the atomic force microscope (AFM), the differential scanning calorimeter (DSC), Fourier transform infrared spectroscopy (FTIR), as well as other techniques such as gel electrophoresis. A primary area of study is the measurement of protein molecular structure and orientation upon adsorption to a solid surface. A related project is aimed at gaining a better understanding of the structural stability and heterogeneity of streptavidin, which is an important tool in many biochemical assays and techniques. Another of his research interests involves the synthesis and characterization of alumina thin film via sol-gel chemistry; the goal being films with tailor-made properties. Dr. Waner has taught courses in General and Physical Chemistry, as well as interdisciplinary science for education majors. Another of his interests is science education outreach and promotion of K-12 science education through various service projects

### PUBLICATIONS

Mark J. Waner, David P. Mascotti, A simple spectrophotometric streptavidin–biotin binding assay utilizing biotin-4-fluorescein, *Journal of Biochemical and Biophysical Methods* (accepted June 28, 2007).

“Thermal and Sodium Dodecylsulfate Induced Transitions of Streptavidin”. Waner, M.J., Navrotskaya, I., **Bain, A., Oldham, E.D., & Mascotti, D.P.** *Biophys. J.* **2004**, 87, 2701.

Choi, K., -S., Patschke, R., Billinge, S.J.L., Waner, M.J., Dantus, M. and Kanatzidis, M.,G., *J. Am. Chem. Soc.*, **1998** 120 (41), 10706-10714. Waner, M.J., Gilchrist, M., Schindler, M., Dantus, M.J. *Phys. Chem. B*, **1998** 102, 1649-1657.

“Complementary Spectroscopic Assays for Investigating Protein-Ligand Binding: a Project for the Advanced Chemistry Laboratory”, Waner, M.J., Mascotti, D.P., accepted for publication in *J. Chem. Educ.* **2009**

“Particulate Pictures and Kinetic Molecular Theory Concepts: Seizing an Opportunity”, Waner, M.J., accepted for publication in *J. Chem. Educ.* **2009**

### PRESENTATIONS

“Kinetic and Mechanistic Studies of the Deuterium Exchange in Classical Keto-Enol Tautomerism Equilibrium Reactions”, Michael A. Nichols and Mark J. Waner, American Chemical Society Central Regional Meeting, Covington, KY, May 2007 (Oral Presentation)

“DNA Analysis laboratory workshop” Faith A. Whitworth and Mark J. Waner, Forensic Science Teachers Symposium at the Cleveland Museum of Natural History, Feb. 18, 2006.

“Intrinsic Tryptophan Fluorescence as a Structural Probe of the Streptavidin-Biotin System” Mark J. Waner, **Anthony Mustovich\***, **Seema Patel\*** and David P. Mascotti Celebration of Scholarship, John Carroll University, March, 2006.

“Intrinsic Tryptophan Fluorescence as a Structural Probe of the Streptavidin-Biotin System” Mark J. Waner, **Anthony Mustovich\***, **Seema Patel\*** and David P. Mascotti, ACS Central Regional Meeting and 39th Silicon Symposium, Frankenmuth, Michigan, May 16-21, 2006.

“Binding of Urea to Streptavidin: Let’s Get Specific!” **Seema Patel & Tony Mustovich**, Undergraduates; Dr. Mascotti, Chemistry Faculty Sponsor: Dr. Waner, Chemistry Celebration of Scholarship, Wed. March 16, 2005.

“Binding of Urea to Streptavidin: Let’s Get Specific!.” **Seema Patel,\* Anthony Mustovich**, David P. Mascotti and Mark J. Waner, A Celebration of Scholarship, John Carroll University, March 16, 2005.

“Streptavidin Stability under Different Denaturing Conditions.” **Zachary Coleman,\*** David P. Mascotti, and Mark J. Waner, A Celebration of Scholarship, John Carroll University, March 16, 2005.

“Analysis of Valerate Modified Aluminum Isopropoxide as a Precursor for Sol-gel Formation of Alumina Films”, **Sterk, L.** and Waner, M.J. Case Western Reserve University, March 2002.

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## Staff



**Bea Stofcho**

*Department Secretary*

Bea Stofcho serves as the Secretary to the Chair of the Department of Chemistry. She is responsible for managing the office and administrative duties for nine chemistry faculty members. She loves being part of JCU and the interaction she has with the students as well as being part of the JCU community. Bea is new to the Department of Chemistry but has been a part of JCU since 1997. Bea lives in Concord Township with her husband Alan, they have two children. Brian '03 and Sara '06 they are JCU Grads.

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Mrs. Whitworth joined the department in June 1992. She began her career as an industrial chemist during the start up of North Star Steel in Youngstown. After transferring to Cleveland, she entered into the field of water analyses and treatment with the Dexter Mogul Corporation. In 1989, Mrs. Whitworth took a year to pursue her M.A. in Education, after which she taught high school chemistry and math. Once again, returning to industry, she performed research in the degradation of bleach by-products for Quantum Technologies. Using her extensive experience in industry and education, Mrs. Whitworth teaches all sections of the General Chemistry Laboratory sequence. She has improved the quality of the General Lab courses by writing and compiling a manual that is used in the course as well as incorporating the use of calculator-based lab probes (CBL) to collect and analyze data during the laboratory period. In the summer, Mrs. Whitworth organizes and directs Chemistry Camp for Kids, a summer chemistry camp where area middle school students perform experiments and learn about the excitement of chemistry



**Faith A. Whitworth**

*B.S. Youngstown State University  
M.A. Kent State University  
General Chemistry Lab Coordinator*

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### PRESENTATIONS

"*Chemistry Camp for Kids at John Carroll University*", **Roylene Coggins**, F. Whitworth, and M. Nichols, Bridges to Success in the Sciences Presentation Session, Cuyahoga Community College, Metro Campus, August 2003.

"*Chemistry Camp for Kids at John Carroll*", **Clemmons, N.** (Cuyahoga Community College), Whitworth, F. Bridges to Success in the Sciences Poster Session, Cuyahoga Community College, Metro Campus, Cleveland, OH, July 2000.



Mr. Your joined the department as Stockroom Manager in 1991. After completing his undergraduate studies at John Carroll, he worked in the clinical field for six years. In 1995, Mr. Your was appointed Hazardous Materials Officer for the university community. He has published numerous articles about the safe storage of chemicals and about Internet utilization by scientific purchasing managers. Extensive training in hazardous waste management, environmental protection law, transportation and handling of hazardous materials, and occupational health and safety has made him an important resource to the department and the campus. Mr. Your received his professional licensure as a Certified Scientific Materials Manager in 1998, a Master's degree in Business Administration in 2000, and was named Science Buyer in 2002. He was awarded the Kimble-Kontes 2001 Outstanding Scientific Materials Manager for the United States. He presently serves as the Manager of Central Scientific Stores and Laboratory Support Services, a resource for the entire Dolan Science Center.

### **Jeff Your, C.S.M.M.**

*B.A. John Carroll University  
M.B.A. John Carroll University*

*Department and Materials Manager  
University Hazardous Materials Officer  
Science Buyer*

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#### *PUBLICATIONS*

*"Peristaltic Technology – an application note," Your, J. and Your, R.E., NAOSMM Newslite, Spring 2005, v.38, no.1: 16-17.*

*"Safety and OSHA Requirement for Laboratories and Stores", Your, J., NAOSMM Newslite, Spring 1999, v.32, no.2: 11.*

*"A Compilation of Some Environmental, Safety, and Health Regulatory Interfaces for Laboratory and Academic Settings", Jeff Your and Mark D. Hoover, NAOSMM Safety Website, December 4, 2009.*

#### *PRESENTATIONS*

*"Cleveland, the New American City; a bid to host 34<sup>th</sup> NAOSMM Conference and Trade Show, July 30 – Aug 3, 2005"* NAOSMM Board of Directors meeting, Reno, NV.

*"Nanotechnology: Understanding and Addressing Potential Health Impacts," Respondent, National Association of Scientific Materials Managers – 32<sup>nd</sup> NAOSMM Conference and Trade Show, Reno NV, July 2005.*

*"Building Renovation and New Construction, part III," Presenter and panel moderator, 29<sup>th</sup> NAOSMM Conference and Trade Show, St. Louis MO, July 2002.*

*"Building Renovation and New Construction, part II," Presenter and panel moderator, 28<sup>th</sup> NAOSMM Conference and Trade Show, Grand Rapids MI, July 2001.*

*"Building Renovation and New Construction," Presenter and panel moderator, 27<sup>th</sup> NAOSMM Conference and Trade Show, Research Triangle Park NC, July 2000.*

## Facilities

The Chemistry Department occupies the third floor, and parts of the second and first floors, of the Dolan Science Center. There are ten teaching laboratories and two walk-in Environmental Rooms, which allow controlled experimentation between  $-10$  and  $+25^{\circ}\text{C}$ . In addition, there are eight research laboratories, which are not only used by the faculty, but also by undergraduate students doing independent research. The Chemistry Department also maintains a large stockroom, administered by a full-time manager, where a large share of the department's chemicals, equipment, and glassware is stored.

The Chemistry Department also maintains its own computer facility, the John A. Carrabine Computer Laboratory. This facility is used at all levels of the undergraduate program and contains 20 Pentium-IV PC computers, two high-end Sun Unix workstations and laser and color printers. These computers are used to analyze data, and view molecular structure using organic, inorganic, and bimolecular modeling software, learn and review various chemical topics using multimedia tutorial programs, and perform chemical literature searches using the Internet and World Wide Web.

The Chemistry Department is well equipped with modern instrumentation, many pieces of which are state-of-the-art. One advantage of the Chemistry Program is the ample opportunities that students have to obtain hands-on experience using this modern instrumentation. The Department has over \$1.5 million in instrumentation in the teaching and research laboratories. This equipment is used by students, from general chemistry to the advanced laboratory courses. Students also make extensive use of these instruments during the course of pursuing independent research projects.



*The C.F. O'Neill Instrument Room houses most of the Chemistry Department's over \$1.5 million in instrumentation. All Chemistry undergraduate students get hands-on experience running these instruments in various lab courses and in research.*



The John A. Carrabine Computer Laboratory was dedicated on Sunday, Nov. 9 2003 in the Dolan Center for Science & Technology. This new laboratory marks a significant upgrade to the departmental computing facilities. There are 20 new Pentium 4 PC's, a networked color inkjet and laser printer. In this new laboratory students can now log in to the campus network, as well as take advantage of chemistry specific software available in this lab. The new laboratory also has a professionally done portrait painting of Dr. Carrabine. The room can also be used for classes, with a PC, document camera, DVD projection system. The original John A. Carrabine Computer Laboratory was dedicated on Sunday, April 28, 1996 in the Bohannon Science Center. It housed 8 PC Computer systems and 2 networked printers. The laboratory is normally open Monday-Thursday 8am-10pm, Friday 8am-5pm, Saturday 1-5pm, Sunday 1-10 pm. Special events or classes are occasionally scheduled for this space. Notice of reservations are normally posted on the door.



## Instrumentation

- Perkin Elmer AAnalyst 200 Atomic Absorption Instrument with Autosampler and Hydride Generator
- 2– Sun Microsystems SunBlade2000 Computer Workstations with Gaussian Molecular Modeling Software
- PTI QuantaMaster Dual Emission Spectrafluorimeter
- Calorimetry Sciences Corporation (CSC) MC-DSC Differential Scanning Calorimeter
- CSC MC-ITC Isothermal Titration Calorimeter
- CSC Two-Drop Isothermal Titration Calorimeter
- Hewlett Packard 5972B Gas Chromatograph / Mass Spectrometer
- Varian Gemini-300 MHz Nuclear Magnetic Spectrometer Equipped with a Broadband and Variable Temperature Capabilities
- Hewlett Packard 8453 Diode Array UV / VIS Spectrometer
- Dionex DX500 Ion / High Pressure Liquid Chromatography System
- Jarrell Ash Model 975 ICP-AES Spectrometer
- Fisons Instruments VG PlasmaQuad ICP-MS Spectrometer
- Perkin Elmer Spectrum One FTIR w/ Diffuse Reflectance and Horizontal ATR Sampling Accessories
- Perkin Elmer 1700X Near Infrared Fourier Transform Raman and 1760X Fourier Transform Infrared Spectrometer
- 2-Perkin Elmer Autosystem III TCD / FID Capillary Gas Chromatographs
- 2-Gow Mac Gas Chromatographs Model 69-550
- Beckman JZ-HS Refrigerated High Speed Centrifuge
- Instrumentation Laboratory Video 22 Atomic Absorption Spectrophotometer w/graphite furnace
- Rudolph Research Autopol III Automatic Polarimeter
- Beckman LS 5000 TD Liquid Scintillation System
- Beckman L7-65 Ultracentrifuge
- Branson 450 Sonifier
- Cell Culture Facilities, Including a Class I1, Type A/B3 Bioflow Chamber, Carbon Dioxide Incubator and Olympus CK2 Inverted Microscope with Phase Contrast
- Princeton Applied Research Model 174A Polarigraphic Analyzer
- Parr Model 1455 Solution Calorimeter
- Parr Model 1672 Bomb Calorimeter
- BAS Model C V-50W Electrochemical System
- Vacuum Atmospheres Dry Box
- UVP GDS-8000 Chemi System with an 8-bit cooled CCD camera
- Bruker Electron Spin Resonance (ESR) Spectrometer w/ liquid helium capability
- Park Scientific Instruments Autoprobe CP Atomic Force /Scanning Tunneling Microscope
- Phillips PW3710 X-ray Powder Diffractometer
- A Water Analysis Laboratory including Metrohm-Peak Personal Ion Chromatograph, HACH DR/890 and DR2500 Spectrophotometers, Incubators, and Ken-a-vision Microscope w/computer.
- Several Pentium-III Computer Systems with Gaussian, Alchemy 2000, CAChe 5.0, PCSpartanPro and PCSpartanPlus Molecular Modeling Packages
- Approximately 20 sets of Texas Instruments Calculator-Based Laboratory (CBL) Interfaces and pH, Colorimeter, Temperature, Pressure, Conductance, Dissolved Oxygen, and Ion Specific Electrode Probes routinely used in General, Honors General, and Environmental Laboratory Courses.
- Various Buchi Rotary Evaporators, and Constant Temperature Baths
- Shimadzu HPLC Systems w/autosamplers
- 2—Medium Pressure Preparative LC Systems



Frank Samuel (above 2nd from left in group picture), Science & Technology Advisor to Ohio Governor Robert Taft, toured the Dolan Center for Science & Technology today (Feb 24), pausing for a briefing in David Mascotti's biochemistry lab along with Linda Eisenmann, Dean of the College of Arts & Sciences and David Ewing, former Chemistry Faculty and Director of JCCI (John Carroll Collaborative with Industry). In the background are students Brigid Long (I) and Christen Kempton.

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## Undergraduate Research

Undergraduate research has become a vital component of the modern chemistry curriculum in the past decade. Students participating in undergraduate research projects gain the experience of combining concepts learned in the different areas of chemistry and studying problems for which there are currently no reported answers. JCU faculty consider undergraduate research “the ultimate form of teaching” and strongly encourage students to participate. As a result, the Department has developed a very active undergraduate research program, which has recently received national recognition and funding. For the past three summers, the Department has served as a Research Experiences for Undergraduates (REU) site by the National Science Foundation (NSF), becoming only one of a handful of principally undergraduate universities (PUI) to host such a program. In Spring 2002, the Department received one of four Heuer Awards for Outstanding Achievement in Undergraduate Science Education from the Council of Independent Colleges, in part for making undergraduate research a capstone experience in the curriculum.

In the past fifteen years, the department has been able to attract over \$1.5 million to support acquisition of instrumentation for teaching and research, and to support faculty and student research projects. Sources of this funding have included: BP America, Ferro Corporation, NASA Lewis (now Glenn) Research Center, Petroleum Research Fund (of the American Chemical Society), Keck Foundation, Ohio Supercomputer Center, JCU Graduate School, National Science Foundation, Exxon Education Foundation, STARS Program of the Ohio Regents, Council on Undergraduate Research, Clare Boothe Luce Foundation, and the Research Corporation.

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***“It [undergraduate research] takes us out of the realm of theory and textbook ideas and gives us practical experience dealing with real world problems and situations.”***

***- Steve Halady, Summer 2001 REU Participant***

***“Undergraduate research acts as a bridge for the student between structured labs in college and independent research of the professional world.”***

***- Jacob Morris, Senior Chemistry Major***

***“[Undergraduate research] gives us an opportunity to experience what we might be doing for the rest of our lives ... [and] we gain confidence in our skills and ... a greater understanding for the techniques and procedures used.”***

***- Jamie Cannon, Senior Chemistry Major***

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Undergraduate Research (CH399) may be taken for up to three semester hours credit with the approval of the chairman and research advisor. A total of three hours credit is equivalent to an upper division elective. Students are encouraged to participate in research since it offers a desirable alternative to the formal classroom setting. Often students who have been involved in research have matured considerably with respect not only to chemistry, but also to career goals. In addition, prospective employers, as well as graduate and professional school committees, often look upon undergraduate research favorably. Students who participate in research are required to write a research report and participate in the Annual JCU Fall Undergraduate Science Research Poster Session. Students are also encouraged to present the results of their research at local, regional and national meetings. Often, undergraduate research leads to publication in chemistry journals.

While a majority of chemistry majors participate in research projects on-campus during the summer or academic year, others have been involved in research at other universities and local chemical industries, including the University of California Santa Cruz, the University of Michigan, Youngstown State University, Kent State University, NASA Glenn Research Center, BP America, Sherwin-Williams, OMGAmericas, PAVCO, Inc., and Lubrizol. JCU also has a program with The Cleveland Clinic Foundation where approximately 20-30 chemistry, biology, psychology and computer science majors are placed into research laboratories in the Lerner Research Institute each summer.

Since 1995, over 90 students have received over 200 CH399 credit hours, given over 100 student presentations, and 8 papers with undergraduate coauthors have been published. A comprehensive listing of these papers and presentations is given in the preceding pages.



*Chemistry majors Partick Bruss ('03), Joe Rodgers ('02) and James Bellar ('02) were recently profiled in a special edition of the JCU alumni magazine, highlighting on- and off-campus undergraduate research activities.*





Photo from the first ever JCU pre-pharmacy club outing at the Renaissance with Dr. Rey at the PDM Healthcare MedExpo.



For the past seven summers, the Department has hosted "Chemistry Camp for Kids", a week-long summer camp where 5th-7th grade students perform experiments and learn basic chemical concepts. The program is directed by Faith Whitworth with several faculty leading demonstrations.

### Special Chemistry Awards and Scholarships

Certain awards and scholarships for chemistry majors are presented annually and are based primarily upon academic achievement. These are described briefly below. Information on all other University scholarships, grants, federal and state grants, and loans is available from the Office of Financial Aid.



#### **The Edmund B. Thomas Memorial Scholarship Fund**

The late Dr. Thomas spent thirty-nine years in the Chemistry Department at John Carroll and was strongly instrumental in helping the department develop into one of the best available. Dr. John Carrabine, past Chairman of the Chemistry Department (1981-1989) instituted the Scholarship Fund in memory of Dr. Edmund B. Thomas. Many of Dr. Thomas' students and colleagues have contributed to this fund. Upon the sudden death of Dr. Carrabine in 1990, many of his students, colleagues and friends also contributed to this Scholarship Fund. The fund is used to provide competitive merit scholarships to assist young people majoring in Chemistry at John Carroll. One \$1,000 award is made annually to an incoming freshman. The award is renewable each year.

#### **Mastin Scholarships in Science and Mathematics**

Mastin Scholarships in the amount of \$10,000 each per academic year are renewable for four years and

are available to four John Carroll students committed to majoring in Biology, Chemistry, Physics, or Mathematics. Each student must be, or be qualified as, a National Merit Semi-Finalist, or have an ACT composite score of 27 or better.

#### **Clare Boothe Luce Scholarship**

The JCU Chemistry Department has been selected to award this scholarship to an outstanding female Chemistry major nominated by the Chemistry faculty four times in the past fifteen years. It is designated for a sophomore woman chemistry major and covers all tuition and room and board for student's remaining two years.

#### **American Institute of Chemists Award**

The American Institute of Chemists annually honors a senior Chemistry Major for scholastic achievement, leadership ability, and character. The award includes a certificate and a Student Associate Membership in the AIC. The recipient is chosen by the departmental faculty.

#### **Undergraduate Award in Physical Chemistry**

This Award is given annually by the Department faculty to the outstanding student in Physical Chemistry lecture and lab courses. The award consists of the student's choice of a Hypercube statistics software package and a certificate.



**Rev. George J. Pickel, S.J.  
Senior Chemistry Award**

The Senior Chemistry Award is named after the Rev. George J. Pickel, S.J., who founded the Chemistry Department at St. Ignatius College (which later became John Carroll University) in 1904. This annual award is given to an outstanding graduating Chemistry major by the Department faculty. A student's academic achievement, integrity, and department and university service are all considered as criteria. The award consists of a plaque and a graduation gift selected for that individual.

**Undergraduate Award In Analytical Chemistry**

This award, given under the auspices of the Analytical Division of the American Chemical Society, is given annually to the Outstanding Student in Analytical Chemistry selected by the departmental faculty. In addition to the honor, the award includes a subscription to the journal *Analytical Chemistry*, and an honorary membership in the ACS Division of Analytical Chemistry.

**Undergraduate Award In Physical Chemistry**

This Award is given annually by the Department faculty to the outstanding student in Physical Chemistry

courses and lab work. The award consists of a statistical software package and certificate.

**Undergraduate Award in Biochemistry**

This Award is given annually by the Department faculty to the outstanding student in Biochemistry course and lab work. The award consists of the student's choice of a subscription to a major scientific journal.

**General and Organic Chemistry Awards**

Each year, this award is given to one student from each section of the General and Organic Chemistry courses. Each student, chosen by their instructor, receives either a copy of the *CRC Handbook of Chemistry and Physics* (General Chemistry) or the *Merck Index* (Organic Chemistry).

**Lubrizol Awards**

The Lubrizol Corporation makes available two annual awards of \$1,100 each to Chemistry Majors based solely on scholastic ability. The recipients must be sophomore, junior or senior chemistry majors. Winners are selected by the departmental faculty.

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## Students and Extra Curricular Activities

Students majoring in Chemistry at John Carroll come from varied backgrounds and have diverse interests and goals. Well-prepared students should have had at least one year of high school chemistry and physics, and four years of mathematics including trigonometry. High school calculus is not necessary, but would provide an advantage to the college student. Students lacking the background described still can major in Chemistry, but will need careful counseling and perhaps, some remedial work.

Class sizes in Chemistry courses vary from 25-35 students in General and Organic sections to 10-25 students in upper level courses. These class sizes are compatible with the kind of personal attention that characterizes the Chemistry Department and John Carroll University. Overall, Chemistry majors enjoy a student-to-faculty ratio of 3:1. Chemistry majors are typically involved in one or more extracurricular activities, which may include participating in professional organizations such as the American Chemical Society Student Affiliates or Alpha Epsilon Delta (pre-professional medical honor society). Many majors are also involved in athletics, University musical and drama groups, *The Carroll News*, fraternities and sororities, and other extracurricular activities.

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## Jesuit Education

The mission of JCU is to "educate men and women in service of others." To that end, the Chemistry Department faculty and majors are involved in a number of service activities. The ACS Student Affiliates organize tutoring sessions every week for students taking the general and organic courses and also participate in National Chemistry Week activities, such as demonstrating chemical reactions at the Great Lakes Science Center for young children. Many majors are involved in community service activities and have taken leadership positions in groups such as F.O.C.U.S., Buddy-swim, and participate in spring break service trips.

The Chemistry faculty are involved in a number of professional service activities as well. Many community college students and high school teachers and students are involved in research projects at JCU. Grade and High School students have performed science fair projects using departmental instrumentation. When an inner city high school's science labs were destroyed by fire, a faculty member arranged to have the students come to JCU and use the biology/chemistry labs and equipment. Several faculty are involved in K-12 education, such as developing teacher training workshops. Our *Chemistry for Kids* summer camp has inspired 5th-7th grade students to become exposed to the amazing world of chemistry.