



# Chemistry News

2017 - Winter 2018

***Shelving the Lab “Cookbook”***

**Michigan Chemistry faculty aim to**

**share the excitement of research**

**through engaged learning**

**Inside:**  
**News of faculty, students and alumni**  
**Research briefs**

**Now: “Snow Chemistry”—**  
**an Authentic Research**  
**Connections lab**

**Then: Analysis Lab 1890s**

**Chemistry Through University of Michigan History**



UNIVERSITY OF MICHIGAN  
BICENTENNIAL

**1817** *Chymia* — Chemistry — is one of the topics to be taught at the nascent UM.

# M Welcome from the Chair

Alumni and Friends:

At Michigan, the Chemistry Department is more popular than ever.

We more than doubled the number of students majoring in our department over the last five years. So far this year, more than 300 students have declared our newest concentration—Biomolecular Science—as their major. It offers a grounding in the chemical principles underpinning biology but with flexibility to explore related topics through electives.

For the last several years, we have awarded Bachelor's degrees to more than 200 students each year. The Spring 2017 commencement celebration for our majors, held at the Michigan Theater, featured an address by alumnus David Walt, who with his wife, Michele May, has provided a substantial gift to help fund summer research experiences for our undergraduates. It was truly inspiring to hear David's story on that special day.

Our graduate program is also an educational success story. Compared with 20 years ago, significantly more students are completing their PhD degree, and in less time, with an average time of completion of five years. Dissertation topics listed on page 12 give a flavor of the explorations that our students are undertaking as part of our research mission. Also, we have graduated our first cohorts from our Chemistry Master's program and our 5-year accelerated degree program.

The leadership and professional development opportunities we offer through the graduate-student run Karle Symposium and our CALC|UM and CSIE|UM programs are also well regarded. Graduate students have frequently listed these activities as highly valuable.

Our faculty are providing award-winning teaching, advising, and mentoring. Beyond preparing individuals for the jobs in chemical industry and related fields, the study of chemistry it develops the ability to solve problems and to think critically. Our faculty are helping our students through writing, leadership opportunities, and research experiences to come understand how the study of chemistry provides an education for life.

The faculty news section recounts some faculty highlights, including a Distinguished University Professor honor for Charles Brooks. Melanie Sanford added the Blavatnik Award to her list of accolades; Julie Biteen,

Pavel Nagorny, and Nate Szymczak were promoted to associate professor. Our junior faculty have been recognized with early career awards, and several have earned crucial National Science Foundation funding.



Also in this newsletter, meet the newest members of our faculty: Jennifer Bridwell-Rabb, Sarah Keane, Marikos Koutmos, and Carol Ann Castaneda. It is a delight to welcome these newcomers to our department.

And of course, our students eventually become our alumni. A feature that has disappeared from many a newsletter but that has preserved through the diligence of Emeritus Professor Arthur Ashe is our Alumni News section. We rely on you to let us know news of your life since leaving the University of Michigan. Please share with us what you are doing by sending in an alumni note. We love to hear your updates!

We also welcome the involvement of our alumni. You can provide mentoring for our current students through our programs designed to support professional development of graduate students for careers in industry and academics.

The University's 200th birthday celebration, just concluded, provided an opportunity to review our origins as a profession. As we build on our history of innovation and leadership in chemistry education on the national scene, we are looking ahead to continued excellence. Your generous financial support for the Department helps make that possible.

If you find yourself in the Ann Arbor area, I hope you will take the opportunity to stop by the Department.

**Robert Kennedy**

*Chair, Chemistry Department*

*Hobart Willard Distinguished University Professor*

*Professor of Chemistry*

*Professor of Pharmacology*



## Connecting abstract chemistry concepts to the real world

**Science as a creative endeavor** was a new idea to seniors in Kristin Koutmou's "Special Topics in Nucleic Acids" class. Used to accumulating a mountain of facts and formulas and "regurgitating" them on tests, the students say, they were quite struck by the how society influences science and science influences society.

They came to this realization through writing tasks in the class. One assignment was to create a presentation on a chemistry topic for a non-specialist audience. Several students said that wrestling with the material to make it understandable to a non-specialist was some of the hardest work they had put into any class.

The students rose to the challenge and their classmates were appreciative. "You had a 'sick' amount of information," one student said of a fellow student's presentation—high praise in the lingo of the undergraduate.

The class attracted students in the department's newest major—Biomolecular Science. Across the group, their minors in computer science, Asian studies, History, and more, highlighted chemical sciences as part of a liberal arts education.

Koutmou, an assistant professor of chemistry, also had the students write "News and Views" pieces—writing for a more specialized audience on topics related to the course material. She could fairly readily incorporate writing experience into a class of 20 students by relying on the students to critique each other's work.

Consider trying to give those assignments to a class of more than 200 students. That is the challenge undertaken by Assistant Professor Ginger Shultz. She aims to add writing to the curriculum of large introductory courses. Her work is funded by the National Science Foundation

*Kristin Koutmou (l) confers with her students in the Science Learning Center during a writing/research session.*

in collaboration with the Sweetland Writing Center. Writing is a way to improve students' understanding and retention of major concepts in science, she says. It may also be key to help retain students who are currently turned off by traditional approaches to instruction.

The difficulty in retaining students from groups that are underrepresented in STEM has been an impetus to changing up the approach to instruction. Several projects aim to incorporate the excitement that scientists derive from discovery into the takeaways from lab classes. Traditionally, labs cover techniques through sets of "cookbook" instructions. Now, with a considerable investment of time among students, postdocs, and faculty, Chemistry courses are infusing research approaches and real-world challenges into the lessons.

Concerned about the drop-off in interest among first year students, Professor Anne McNeil has overseen the implementation of new modules in the organic chemistry lab taken by 2000 students each year. The coursework provides a chance for beginning chemists to think through how to solve a research question. Her team has developed several modules that include some "dry lab" planning sessions as well as "wet lab" opportunities to practice techniques.

Another example is the Authentic Research Connection which taps Professor Kerri Pratt's expertise in arctic sea ice and snow chemistry for teaching lab fundamentals. Through the weeks of the class, students did exercises that gave them the expected training in chem-

# Education Initiatives



## Discovery and problem solving

*"I'm trying to replicate the research experience—within the constraints of the system—for as many people as I can," explains Professor Anne McNeil*

## A few notable projects

- **Authentic Research Connection Labs:** Lab techniques and concepts are taught in the context of pursuing research questions. Snow Chemistry (Kerri Pratt), Solar Cell Chemistry (Stephen Maldonado), and Medicinal Chemistry/Cancer drugs (John Wolfe & Matt Soellner) Learn more at: <https://sites.lsa.umich.edu/arc/>
- **Compute to Learn:** Led by Professor Eitan Giva, undergraduate honors students develop Mathematica-based interactive modules to demonstrate concepts in physical chemistry courses. Learn more at: <http://umich.edu/~pchem/compute-to-learn.html>
- **Creating REAL (Research Experiences in Authentic Laboratories) Science:** Professor Anne McNeil has Howard Hughes Medical Institute funding for revamping the introductory organic chemistry lab for approximately 2000 first-year students per academic year. Her approach is to replace labs focused on technique and abstract concepts with explorations that teach the technique but also have connections to real research. Learn more at: <http://mcneilgroup.chem.lsa.umich.edu/educational-research/>
- **Mathematical Methods:** Professor Roseanne Sensen developed a one semester course that covers the math concepts needed for chemistry. A "flipped classroom" approach has students working through problems during class time with lecture material delivered outside of class.
- **REBUILD:** A UM campus-wide effort to rethink foundational courses that are often taught in large scale classes with more than 300 students in a lecture by incorporating research findings, learning assessment and analytics, and innovative technologies into improved teaching methods. See: [rebuild.lsa.umich.edu](http://rebuild.lsa.umich.edu)
- **Writing-to-Learn:** Assistant professor Ginger Shultz is the co-principal investigator on a project that aims to incorporate more writing across the curriculum, including large enrollment classes. The effort has funding from the National Science Foundation See: [lsa.umich.edu/lsa/news-events/all-news/search-news/the-write-stuff.html](http://lsa.umich.edu/lsa/news-events/all-news/search-news/the-write-stuff.html)

istry methods and approaches. Rather than each lab session standing alone, the series of techniques built on each other, results in a wealth of data that the students turned into manuscripts and scientific posters. (More about this class is in last year's newsletter and online.)

All these education projects stem from the Department's philosophy of continuous improvement and desire to provide a world-class education for Michigan students.

For more education innovations, see the list on this page and explore our CSIE|UM website.

## Chemical Sciences at the Interface of Education|University of Michigan



*CSIE|UM participants—postdoctoral associates, graduate and undergraduate students—work with faculty on revamping the curriculum, reworking laboratory instruction, exploring new approaches and technologies in pedagogy, and more. If you are interested in exploring more innovations, a list of projects is available at <https://sites.lsa.umich.edu/csie-um/>*

## Chemistry Instruction By the Numbers

*At Michigan, the Chemistry Department is more popular than ever. We are graduating more than 200 students with Bachelor's degrees each year.*

- 5 Different majors: Chemistry, Biochemistry, Biomolecular Science, Chemical Sciences, Interdisciplinary Chemistry
- 612 Students majoring in Chemistry in April, 2017
- 100+ Undergrads doing research for credit/semester
- 3000 Students in lab courses
- 3 Number of times that Chemistry has won the College of Literature, Science, and the Arts Award for Innovation in Undergraduate Education.

1869

The first original contribution from the chemical laboratory was a paper, "The Blow-pipe Assay," by Albert Benjamin Prescott in the Engineering and Mining Journal.



# Building Better Batteries

“The race is on for seeking new battery technologies, so-called beyond-lithium ion,” says Bart Bartlett. Is a magnesium-based battery the answer?

Delivering a good amount of energy for their weight and rechargeable through many cycles, lithium ion batteries have been the go-to power source for our watches, cameras, and phones. But there are drawbacks to this technology, especially when considering the needs of electric vehicles.

When your watch or phone battery inevitably dies, you can easily replace it, but that is untenable for an electric vehicle. The risk of fire is another drawback. Further, lithium reserves—mostly in China and Chile—will run out when we try to scale up battery production for electrical vehicles.

These limitations have set UM researchers on a quest for a better battery—one made with more abundant elements, that delivers power over many cycles, and isn't prone to going up in flames.

Bart Bartlett's lab has been working with magnesium as a replacement for lithium. Bartlett is an associate professor of chemistry and was recently named the Interim Director of the UM Energy Institute.

Magnesium is abundant and available on every continent, he explains. Costs of battery materials could come down, and it is safer for the environment. But it is not simple chemical substitution.

A battery contains two electrodes with an electrolyte between. Electrode materials, which store the metal, have channels where ions flow in and out. The ions move through an electrolyte from one electrode to the other when we are powering a device and in reverse when we recharge the battery. The electrons given up with the movement of the ions is what generates the current. Lithium gives up 1 electron. Magnesium has 2 electrons to give up.

The challenge for magnesium ion battery development: “We don't yet have materials that will insert and extract two at once without undergoing other changes,” explains Bartlett. The magnesium tends to

create other compounds in the battery that impair its usefulness.

Bartlett's cadre of undergraduate and graduate students first set about finding an electrolyte that could be made to strongly disassociate to generate the ions needed for the electron flow. Using physical organic design principles, they synthesized various magnesium salts and found a good prospect in phenolates. More recently, they improved the electrolyte by adding fluorine to their magnesium salt. “It is hard to oxidize the fluorinated salt so that provides stability to the battery,” Bartlett explains. The high solubility of the salt generates as much current as a lithium battery and is reversible over many cycles.

“Overall, our work suggests that fluorinated alkoxide-based electrolytes are promising candidates for a practical magnesium-ion battery,” they report in a recent article.

More work lies ahead to create practical electrode materials, says Bartlett.

Students who worked on this project include Emily Nelson, (PhD 2015) now at Lockheed Martin; Adam Crowe, a 4th year graduate student; Scott Brody, now a graduate student at Minnesota, and Kyle Stringham, now a graduate student at Michigan State University.

### Some Articles on Magnesium Batteries from the Bartlett Group

- Nelson, E. G.; Kampf, J. W.; Bartlett, B. M. Enhanced Oxidative Stability of Non-Grignard Magnesium Electrolytes through Ligand Modification. *Chem. Commun.* 2014, 50, 5193-5195. (Emerging Investigators themed issue)
- Crowe, A. J.; Stringham, K. K.; Bartlett, B. M. Fluorinated Alkoxide-Based Magnesium-Ion Battery Electrolytes that Demonstrate Li-Ion-Battery-Like High Anodic Stability and Solution Conductivity. *ACS Appl. Mater. Interfaces* 2016, 8, 23060-23065.
- Crowe, A. J.; DiMeglio, J. L.; Stringham, K. K.; Bartlett, B. M. Kinetics of Magnesium Deposition-Stripping from Non-Aqueous Electrolytes. *J. Phys. Chem. C.* 2017, 121, 20613-20620.

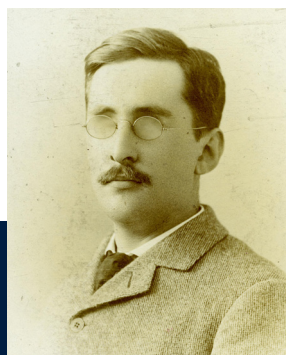


## Former D-RISE Student Wins Intel Science Fair Internship

**Rashad Prendergast**, then a senior at Cass Technical High School in Detroit, placed 4th at the Intel International Science Fair in 2017 in Los Angeles. He competed against 800 other students from around the globe. The project that won Rashad a summer internship in Israel was work he began in the Pratt Lab as part of D-RISE, the Detroit Research Internship Summer Experience program. It provides summer internships to high school students through a partnership between the University and Cass Tech. During the internships, students perform full-time research in a chemistry laboratory and live on campus as UM students would. The goal is to increase underrepresented minority participation in the sciences by motivating participating students to attend college and pursue careers in science, technology, engineering and math fields. Now in its fourth year, D-RISE is funded in part by Nicolai Lehnert's National Science Foundation grant. Rashad is now enrolled at UM in the School of Nursing. Read more about D-RISE at: <https://record.umich.edu/tags/d-rise>

## More Undergraduate News

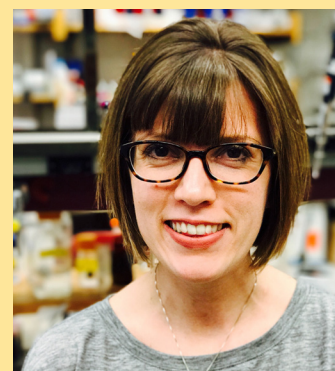
See the Chemistry website for more about award-winning undergraduates and our Commencement Ceremony.



1892

Chemistry professor Edward DeMille Campbell was blinded by a laboratory accident in 1892. Yet Campbell taught and conducted research for another 33 years. As the director of the Chemical

## M Our New Faculty



**Jennifer Bridwell-Rabb**  
*Assistant Professor*

Jennifer Bridwell-Rabb joined the Chemistry Department in the Fall, 2017. Her research focuses on photosynthetic organisms, which rely on light to make carbohydrates from carbon dioxide and water. To adapt to different light environments, including those where sunlight is shaded or filtered, these organisms chemically modify the scaffolds of their light-absorbing pigments.

The mechanisms by which these pigments are tuned and organisms interpret environmental light signals are largely unknown. If we understood how organisms sense and adapt to light we may be able to engineer photosynthetic pigments and photosynthetic organisms that have altered light-absorbing properties—with impacts on human health, agriculture, and bioengineering.

The Bridwell-Rabb Lab uses structural biology, biochemistry, enzymology, and metalloprotein expertise to explore the molecular details of how organisms harness light, extend the spectrum of light available for photosynthesis, and filter out harmful UV-radiation.

She earned her B.S. in Chemistry, Biology, and Mathematics from Central Michigan University (2007) and her Ph.D. in Chemistry from Texas A&M University (2012). She was an HHMI/NIH postdoctoral Fellow in the laboratory of Catherine Drennan at the Massachusetts Institute of Technology.



**Sarah Keane**  
**Assistant Professor**

Sarah Keane has been a UM assistant professor of Biophysics and Chemistry since January, 2017.

Research in the Keane Lab is focused on understanding the function of non-coding RNAs by examining their structure and interactions with other biomolecules. The discovery of functional non-coding RNAs has revolutionized our understanding of gene expression and regulation. Non-coding RNAs also appear to be key regulators of cellular and pathogenic processes. Structure and function are inherently intertwined, thus uncovering biomolecular structure of the molecules sheds light on their functions.

The Keane Lab uses biomolecular NMR spectroscopy complemented with a variety of biochemical and biophysical techniques to uncover the structures, mechanisms, and functional roles of these non-coding RNAs in disease progression.

She graduated from Furman University with a B.S. in Chemistry (2007). Under the direction of David Giedroc, she received a Ph.D. in Chemistry from Indiana University (2012). She was a postdoctoral fellow with Michael Summers at the Howard Hughes Medical Institute at the University of Maryland Baltimore County.



**Markos Koutmos**  
**Assistant Professor**

In Fall 2018, Markos Koutmos will become an Assistant Professor of Biophysics and Chemistry. Since arriving at UM in 2017, he has been continuing his NIH-funded research as an research assistant professor. His research focuses on understanding the relationship between the structure, dynamics and function of biological macromolecules. His lab uses a diverse combination of powerful tools, such as x-ray crystallography, electron microscopy, biochemistry and cell biology to study how mitochondrial RNAs and vitamin B12 are processed and used by organisms. This work will provide the molecular level framework necessary for understanding and ultimately treating diseases.

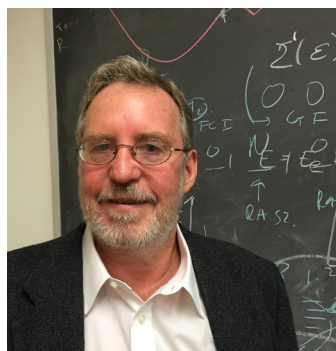
He received his undergraduate degree in Chemistry from the University of Athens, Greece (1998), and his Ph.D. in Chemistry from the UM under Dimitri Coucouvanis (2005). He did postdoctoral work at UM under Martha Ludwig, Janet L. Smith, and Rowena G. Matthews. Before returning to UM, he was an Assistant Professor of Biochemistry and Molecular Biology at the Uniformed Services University of the Health Sciences in Bethesda, Maryland.



**Carol Ann Castaneda**  
**Lecturer III**

Carol Ann (Pitcairn) Castaneda teaches introductory chemistry and is part of the Comprehensive Studies Program. She earned a Chemical Biology Ph.D. in 2015 in Carol Fierke's lab and did postdoctoral work with Anne McNeil. Her Bachelor's degrees in Chemistry and Spanish are from Youngstown State University.

## M Faculty News



Charles Brooks

**Andrew Ault** has received a NSF Career Award (Chemistry Division), “Molecular Studies of Phase Separations and Internal Structure in Individual Particles.”

**Charles L. Brooks, III** has been named the Cyrus Levinthal Distinguished University Professor of Chemistry and Biophysics. Distinguished University Professorships recognize exceptional scholarly or creative achievement. Created in 1947, University Professorships carry a salary stipend and research supplement.

**Dimitri Coucouvanis** has been honored as a 50 year member of the American Chemical Society.

**Theodore Goodson, III** has published, *Solar Fuels: Materials, Physics, and Applications*. The book is available from CRC Press.com.

**Kristina Hakansson's** work has been featured in an issue of the Journal of the American Society for Mass Spectrometry: <http://myumi.ch/JWjyj>

**Robert Kennedy** received the Ralph Adams Award in Bioanalytical Chemistry for 2017. He is also the recipient of the ACS Award in Chromatography for 2017. In November he received the EASSS Award at the 46th Symposium on HPLC held in Jeju, Korea.

**Anna Mapp** has received a Harold R. Johnson Diversity Service Award in recognition of her impressive efforts running the Program in Chemical Biology at the UM.

**Charles McCrory's** new CAREER award from the National Science Foundation focuses on new electrocatalytic materials for carbon dioxide reduction.

**Neil Marsh** and **Anne McNeil** have been honored as fellows of the American Association for the Advancement of Science. AAAS fellows are elected to membership by their peers.

**John Montgomery** was awarded a 2017 Rackham Distinguished Graduate Mentoring Award.

**Kerri Pratt** was awarded a 2017 A. P. Sloan Research Fellowship, one of 23 awards nationally for chemistry. She also received a 2017 LSA Individual Award for Undergraduate Education. She has been named the 2018 James J. Morgan Environmental Science & Technology Early Career Award winner. It is the only early career award in environmental chemistry from the American Chemical Society. In addition, she is the recipient of the 2018 Eastern Analytical Symposium Young Investigator Award. This award is given annually to an outstanding early career researcher in analytical chemistry.

**Brandon T. Ruotolo** organized the first biennial Advanced Mass Spectrometry (AMS) Meeting for Biophysics and Structural Biology held in Ann Arbor, July 28-August 1, 2017. The next meeting will be held at the University of Massachusetts, Amherst in 2019.

**Melanie S. Sanford** has won a 2017 Blavatnik National Award for Young Scientists. She is celebrated for developing simple chemical approaches to the syntheses of molecules with important applications. She will receive an unrestricted award of \$250,000.



Kristina Hakansson



Kerri Pratt



Melanie Sanford





## Promotions

Three faculty members have been promoted to Associate Professor with Tenure.



**Julie Biteen**



**Pavel Nagorny**



**Nathaniel Szymczak**

**Corinna Schindler** has been named a *C&E News* “Talented Twelve” for 2017. See: [cen.acs.org/magazine/95/09533.html](http://cen.acs.org/magazine/95/09533.html). Her research focuses on replacing precious metal catalysts with more abundant metals such as iron. Professor Schindler has also received a 2017 A. P. Sloan Fellowship and a NSF Career Award.

**Nathaniel Szymczak** has been selected by the LSA Executive Committee to receive the Class of 1923 Memorial Teaching Award.

**Nils Walter** is now the Francis S. Collins Collegiate Professor of Chemistry, Biophysics and Biological Chemistry. Collegiate Professorships are given for outstanding performance in research, teaching and service. He has also received the RNA Society Mid-career Award for 2017.

**Paul Zimmerman** will receive a 2018 Henry Russel Award. This UM award is considered the University’s highest honor for early to mid-career faculty members who have demonstrated an outstanding record of accomplishment.



*Corinna Schindler*



*Nils Walter*

## Departures and Retirements

**Mark Banazak Holl** left the University of Michigan on December 31, 2017 to head the Chemical Engineering department at Monash University in Australia.

**Carol Fierke** retired effective August 31, 2017. She is now the provost of Texas A&M University.

**Jadwiga “Dotie” Sipowska**, long-time lecturer in Chemistry, retired at the end of May 2017.

## Staff News

**Agnes Soderbeck** was a finalist in the President’s innovation competition for the online events management system she developed for the Department of Chemistry.



*Paul Zimmerman*

1900

Chemistry professor Moses Gomberg discovered an organic free radical that had been thought impossible. He is now considered the founder of this field.

## M Research Spotlight

### Building a bridge from nature's chemistry to greener, more efficient synthetic chemistry.

Chemistry professor Alison Narayan's research team is analyzing biocatalysts evolved by nature for their utility in a variety of synthetic chemical reactions. The results, published in *Nature Chemistry* in November, open the door to promising practices for chemists, pointing to not only more efficient but more powerful tools for chemists.

The researchers start with microorganisms that have, over the millennia, developed complex chemical reactions to create molecules with important biological activity for various purposes, such as defenses. The scientists then analyze the chemical pathways that give rise to these potentially useful molecules to determine how they can be repurposed to create compounds synthetically in the lab.

"Nature has evolved catalytic tools that would enable chemists to build molecules that we can't easily build just using traditional chemistry," says Narayan, the senior study author and assistant professor at the Life Sciences Institute, where her lab is located. "Our work bridges the two worlds of biosynthesis and synthetic chemistry."

To build complex, bioactive molecules—like the molecules that allow drugs to find the right biological targets in our bodies—synthetic chemists use a variety of reactions, including a process called oxidative dearomatization. This process converts flat molecules into three-dimensional structures that are more reactive. But traditional oxidative dearomatization methods have several flaws.

Because they require the use of a chemical reagent to convert the starting material into the desired end product, the reactions themselves are fairly wasteful. In addition, the reagents demonstrate poor selectivity in the transformation, resulting in a mixture of compounds that contains several unnecessary, and sometimes harmful, variants of the desired product molecule.

"It's not a very efficient process," says Narayan. "You can end up with various structures when you really want only this one specific structure—and you generate a lot of waste in the process."

In this recent study, the Narayan lab demonstrated that enzyme catalysts have the potential to solve these issues.

Enzymes are efficient catalysts, generating many product molecules from a single molecule of the catalyst, leading to less waste. And Narayan's lab found that the catalysts perform the reactions with improved selectivity—meaning that the reactions produce only the desired molecular structure.



Alison Narayan, Assistant Professor

These enzymes have not yet been widely adopted by chemists because their overall utility and robustness for chemistry have not been demonstrated, Narayan says.

"The work being done in the field of biosynthesis primarily focuses on understanding how molecules are made in nature and identifying the single reaction an enzyme does in its natural context," Narayan explains. "We have to figure out how an enzyme is useful in the field of synthetic chemistry—what can it do, what types of molecules it works with—so that chemists can just go to the literature and see how they can use this tool."

Narayan's research program begins to close the gap between these two fields by testing enzymes not just for their natural roles, but for the roles they could play in a variety of reactions. The lab also has developed methods to make these enzymes easy to handle in bulk and share with other chemists.

"We're showing that these enzymes can do more than the one specific task they evolved to do in nature," says graduate student Summer Baker Dockrey, the lead study author. "They can be surprisingly generalizable and could prove to be highly selective tools."

The lab is now working on engineering these enzymes to perform more reactions. "We are really starting to build the library of new, efficient, powerful tools for chemists," Narayan says.

The research was supported by funds from the LSI, the UM Department of Chemistry, the National Institutes of Health and the U.S. Department of Education.

Authors on the paper are Summer A. Baker Dockrey, April L. Lukowski, Mark R. Becker and Alison R.H. Narayan.

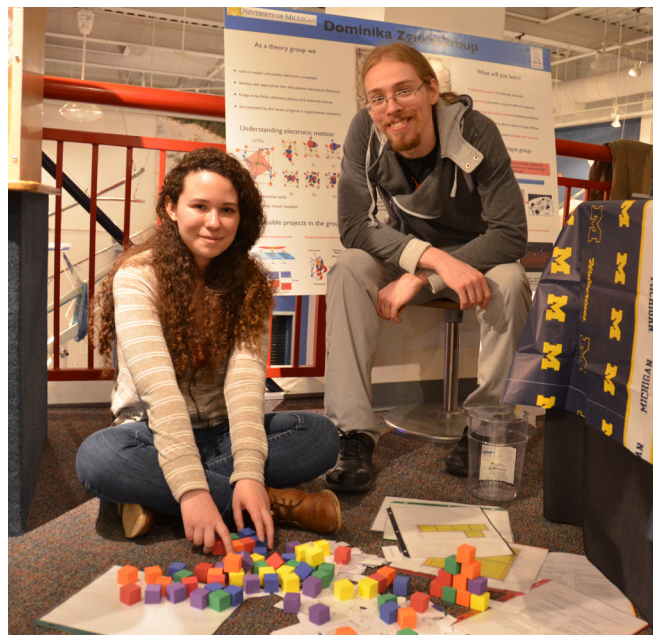
"Biocatalytic site- and enantioselective oxidative dearomatization of phenols," *Nature Chemistry* DOI: 10.1038/NCHEM.2879

Story by Emily Kagey, Science Writer  
University of Michigan Life Sciences Institute



## Michigan Chemistry Opportunities for Research and Education—M|CORE — alums are going places!

*Our November preview weekend, aimed at encouraging students from underrepresented groups to join our doctoral program, now counts eleven enrollees. From left: Monique Cook, Gloria Diaz, Nhat Le, Rosalyn Kent, Kristine Parson, Phoenix Williams, Kori McDonald, Wes Pein, and Isabel Colon-Bernal. Not pictured: Angelar Muthike and Kevin Stanford.*



*Above: UM Grad students Alicia Welden (Zgid Lab) and Alan Rask (Zimmerman) offer chemistry fun at the Ann Arbor Hands-On Museum, one of many outreach efforts by our students.*

*Left: This custom mass spectrometer from Kerri Pratt's lab is being loaded into a special truck for sampling runs during a controlled burn at the UM Biological Station in October, 2017. Designed by former graduate student Matt Gunsch, the instrument was able to sample particles in smoke during the burn. Grad student Nate May is overseeing the loading. Read the full story from UM News at: <http://myumi.ch/J7AZA>*

# PhDs Awarded

## December 2016

### Student

### Committee Chair

Peipei Hu

Chen

*Molecular Interactions between Nanoparticles and Model Cell Membranes Investigated by Sum Frequency Generation Vibrational Spectroscopy*

Alex Ketchum

Meyerhoff

*The Preparation and Study of Lipophilic S-Nitrosothiols for Use in Improving the Biocompatibility of Medical Grade Polymers*

Jessica Rabuck-Gibbons

Geva

*Studying the Structure and Stability of Protein: Ligand Complexes using Ion Mobility-Mass Spectrometry*

Anisha Shakya

Banaszak Holl/Al-Hashimi

*Intermolecular Exchange, Solvent Microenvironment, and Catalysis in Nanoparticulate Complexes of Nucleic Acids and Polycationic Polymers*

Jenny-Marie Wong

Kennedy

*LC-MS Strategies for in vivo Neurochemical Monitoring and their Applications*

## May 2017

Neranga Abeyasinghe

Goodson

*Linear and Nonlinear Microscopy of Quantum Confinement through Investigations of Gold Monolayer Protected Clusters*

Jonathan Bennion

Matzger

*Multicomponent Crystallization of Energetic Materials*

Nicole Camasso

Sanford

*Design, Synthesis, and Reactivity of High-Valent Nickel and Palladium Complexes*

Zachary Garlets

Wolfe

*New Developments in Metal-Mediated Heterocycle Synthesis*

Cassandra Joiner

Mapp

*Evaluation and Utilization of Photo-Activatable Unnatural Amino Acids for The Study of Protein-Protein Interactions*

Laura Kiefer

Kubarych

*Ultrafast Spectral Dynamics of a Rhenium Photocatalyst*

Kyle Korshavn

Lim/Rams

*Mechanistic and Structural Insights into the Chemical Modulation of Amyloid Aggregation*

Charles Lhermitte

Bartlett

*Mechanistic Investigation of Metal Oxide Semiconductors for Use as Visible Light Photocatalysts in Photoelectrochemical Water Oxidation*

Shusheng Lu

Kennedy

*Microfluidic Assays for Perfusion Culture and Chemical Monitoring of Living Cells*

Luyao Ma

Maldonado

*Low-Temperature Electrodeposition of Crystalline Semiconductors Nanostructures & Application of As-Prepared Materials in Li-Ion Batteries*

Ashley McQuarters

Lehnert

*Synthesis of Model Systems for Reactive Intermediates in Cyt. P450 Nitric Oxide Reductase (P450nor)*

Mitchell Smith

McNeil

*Expanding the Utility of Catalyst-Transfer Polycondensation*

David Todd

Montgomery

*Development of Nickel-Catalyzed Methods Towards the Deoxygenation of Small Molecules*

Yaqi Wo

Meyerhoff

*Novel Antithrombotic and Antibacterial Polymers for Biomedical Applications: Nitric Oxide (NO) to the Rescue*

Tim Zhang

Maldonado

*Electrochemical Liquid-Liquid-Solid Germanium Growth and Voltammetry at Mercury Ultramicroelectrodes*

## August 2017

Jordan Boothe

Wolfe

*Of Palladium Catalysis and Stereochemical Strategies: A Collection of Synthetic and Educational Chemistry Studies*

James Brancho

Bartlett

*Compositionally Complex Titanium Niobium Oxynitrides for Solar-Driven Photochemistry*

Pablo Cabrera-Ventura

Sanford

*Development of Metal Complexes for Use in Non-Aqueous Redox Flow Batteries & C-H Functionalization of N-Heterocycles*

Joseph Eschweiler

Ruotolo

*Methods and Informatics for Gas-phase Structural Biology and Drug Discovery*

Bing Fu

Biteen

*Interactions Between Fluorescent Molecules and Plasmonic Nanoparticles: A Super-Resolution Study*

Peter Goldberg

McNeil

*Pi-complex Behavior in Catalyst-transfer Polycondensations*

Ariana Hall

McNeil

*Catalyst and Reaction Development in  $\pi$ -conjugated Polymer Synthesis*

Sudarat Lee

Maldonado

*Nanostructured p-type Phosphides for Solar Energy Conversion*

Yaixin Li

Chen

*Structural and Functional Studies of Peptide and Protein on Engineered Surfaces/Interfaces*

Luke Peterson

Wolfe

*New Developments in Heterocycle Synthesis: Applications of an Anti-aminopalladation Mechanism*

Sydonie Schimler

Sanford

*Development of Practical Fluorination Methods and Selective C-H Borylation of Methane.*

Derick White

Wolfe

*Pd-Catalyzed Alkene Difunctionalization Reactions for the Synthesis of Polycyclic Nitrogen Heterocycles and Functionalized Carbocycles*

Theodore Wiley

Sension

*Excited State Dynamics of Photoswitches: Molecular Motors, Photoacids and Vitamin B12*

1939

Professor Werner Bachmann, DuPont Postdoctoral Fellow J. Wayne Cole, and Teaching Fellow Alfred J. Wilds synthesize equilenin. This was the first time that such a large, complicated natural product



## Graduate Students Honored

### New Master's Programs Award Degrees to First Students

In response to student and employer interest, we now offer MS degrees that are not part of the PhD track.

In 2015, we began offering a combined 5-year, research-based BS/MS option for our undergraduate majors. Three students have graduated and are now all enrolled in PhD programs: Brandon Yik (Goodson) at Georgia Tech; Wuliang Zhang (Kopelman) at Northwestern University; and Qian Hou (Walter) at Cornell. There are currently five students enrolled for 2018 graduation.

In 2016-17, we accepted and graduated our first class of four non-UM students into the one-year, stand-alone MS program. Those graduates are: Rong Duan, Maria Morales Estupinan, Rohit Ranjan, and Brennan Watch.

In 2017-18, we have 12 students enrolled, split evenly between the research-based and course-only options.

Seated (l to r): *Stephen Lee, Steven McNamara, James Bour, Nate May* Standing first row from left: *Bijay Bhattarai, Lily Hale, Kortney Kersten, Amanda Leone, Rachel Merzel, Daniel Nasrallah, Kyle McDonald* Back row: *Thitaphat Ngersutivorakul, Alonso Arguelles, Associate Professor Kevin Kubarych, graduate program chair.*

Every summer, we recognize award-winning graduate students with a ceremony and ice cream social. Among the awards are outstanding teaching, graduate student leadership, travel, and summer research support.

Eleven students received prestigious National Science Foundation fellowships. Ellen Aguilera, Tyler Doyon, Jeremy Kallick, Molly MacInnes, Christopher McAtee, Rory McAtee, Elizabeth Meucci, Colleen Riordan, Kevin J. Romero, Robert M. Vasquez, and Shannon Wetzler.

The complete list of awards and the award recipients is available on the Chemistry website. Support for some of these awards comes from gifts that are listed starting on page 22.

had ever been made in a lab. Bachmann went on to be well-known for his manufacturing process for the powerful explosive RDX, and his contributions to the chemistry of penicillin.



## M Alumni News

Above: Professor **Jean-Paul Desaulniers**, University of Ontario Institute of Technology and former UM post-doc leads a summer class in chemical biology at Shanghai Jiao Tong University (SJTU). The course was team taught by Desaulniers and UM professor Brian Coppola. Coppola has been working with Chinese universities to help find instructors for intensive summer courses taught in English. Professor **Melissa Reynolds**, Colorado State University, who is also a former UM PhD student, taught a Bio-Analytical course. The summer program in Shanghai created a two-fold opportunity for ten UM science students: to study abroad as members of classes being offered to the local students, and to fulfill upper level course credit in their UM degree program.

**Saleem Al-Ahmad** (PhD 1990, Coucouvanis, Ashe, Post-doctoral) is Global Sales Director for CPI Engineering, a Lubrizol Company, based in Midland, MI, specializing in synthetic lubricants.

**Richard E. Boice** (BS 1973) retired from the Federal Government at the end of 2011 after a 38 year career in the U. S. Environmental Protection Agency. For the last 30 years he was Remedial Project Manager in the Superfund Program in Region 5, Chicago. From fall 2012-fall 2014 he was a part-time Adjunct Chemistry Instructor at the College of DuPage, Glen Ellyn, IL. Since fall 2015 he has been a part-time Adjunct Chemistry Laboratory Instructor at Dominican University, River Forest, IL.

1944

Jerome Karle and Isabella Karle are awarded their PhDs. He receives the Nobel Prize in 1985 for direct methods. He felt she should have shared in the prize.

**Betsy Brown-Tseng** (*PhD 2016, Maldonado*) is a Research Chemist with PPG in Allison Park, PA.

**Vivian Cody** (*BS 1965*) has been honored as a 50 year member of the American Chemical Society. She writes that she is in the process of retiring from 46 years of work at the Hauptman-Woodward Medical Research Institute in Buffalo NY, which focuses on X-ray crystallographic methods to determine 3-D structures of proteins and enzymes that are drug and hormone targets. She is also a faculty member at the School of Medicine of the University of Buffalo.

**James M. Cook** (*PhD 1971, LeQuesne*) has been honored as a 50 year member of the American Chemical Society. Jim is a University Distinguished Professor in the Department of Chemistry and Biochemistry at the University of Wisconsin, Milwaukee. He has published over 450 papers and holds more than 50 patents, primarily in the areas of synthetic organic, natural products and medicinal chemistry. His wife Gloria, who also attended UM, retired several years ago as District Manager in Sales from Wyeth-Ayerst. The Cooks have two daughters and three grandchildren.

**Daniel T. Chang** (*BS 1998, MD 2002 Wayne State*), a Professor of Radiation Oncology at Stanford University, is now Associate Chair of his Department. He is an expert on SBRT (Stereotactic Body Radiotherapy) that allows for the delivery of high dose, conformational radiation causing minimal damage to surrounding tissues.

**Allison Dick** (*PhD 2007, Sanford*) has accepted a position as a Visiting Assistant Professor at her undergraduate alma mater, Wheaton College, IL. She will be teaching organic chemistry.

**Ryan C. Fields** (*BS 1998, MD Duke*) was promoted to Associate Professor of Surgical Oncology at Barnes-Jewish Hospital and the Alvin J. Siteman Cancer Center at Washington University School of Medicine in St. Louis, MO. He received an NIH/RCI-R01 award

to study the biology of cancer metastases and develop novel in vivo and in vitro models of cancer. He is also an Associate Program Director for the General Surgery Training Program and Assistant Program Director for the Hepato-Pancreatico-Biliary and Advanced Gastrointestinal Surgery Fellowship. He and his wife, Laura, have two children, Gabriel (9) and Sarah (6).

**Stephen Gaudioso** (*PhD 1972, Dunn*) has been honored as a 50 year member of the American Chemical Society. Following graduation from UM he spent one year as a postdoctoral at Argonne National Laboratories after which he was hired by the Xerox Corporation of Rochester, NY. He spent 39 years at Xerox, working in areas of research, engineering and manufacturing, eventually retiring as a RD&E Strategic Planning Manager in 2012. While at Xerox he was active in the local section of the ACS. He and his wife of 48 years have five grown children and three grandchildren.

**Tom Giordano** (*PhD 1974, Rasmussen*) has retirement activities include tutoring at the Denver School of Science and Technology and facilitating history and chemistry classes for seniors. He is also active in the local Rotary Club.

**Elliot Greenburg** (*PhD 1954, Westrum*) was recently honored as a 70 year member of the American Chemical Society. Dr. Greenburg was born in New York City and received his BS in chemistry from CCNY. After completing his PhD in physical chemistry at UM he was employed at Argonne National Laboratory, where he worked in combustion bomb calorimetry. In 1969 he became a Professor of Chemistry at Prairie State College in Chicago Heights, IL from which he retired in 1988. He was active in the ACS DIVCHED Committee. He resides in Park Forest, IL. He has three sons, eight grandchildren and a one great-grandchild. One grandson is now in the combined MD/PhD program at the UM.



1948

Chemistry has once again outgrown its building and a new addition is added to the east side of the 1908 building.

**Lawrence Hamann** (*PhD 1991, Koreeda*) is now Vice-President, Chemistry, of the Celgene Corporation, was recognized in 2017 together with other scientists from Bristol-Meyers Squibb as an ACS Hero of Chemistry for work on Daklinza<sup>™</sup> and Sunvepratm, very efficacious antiviral agents.

**Dinari Harris** (*PhD 2004, Walter*) is an Assistant Professor of Chemistry at Howard University, Washington, DC.

**Steven Kaiser** (*PhD 1975, Rasmussen*) visited the Department recently. After a postdoctoral appointment with Professor Mark Wrighton at MIT, he joined Union Carbide R&D, initially in catalyst development, then becoming a Senior Technology Manager. He then joined Borden Chemical as R&D Director of global resins. Steve has worked with many individuals and companies in business development and IP matters and currently serves on the Board of Directors for one of those companies.

**Ravi Meruva** (*PhD 1997, Meyerhoff*) is founder and Chairman of Sensa Core Medical Instrumentation Pvt. Ltd. The company and Dr. Meruva were recently featured in The CEO Magazine ([www.theceo.in](http://www.theceo.in), vol. 2, issue 6, May 2017).

**Eric Monberg** (*BS 1971, PhD 1977 Kopelman*) writes that 2017 will mark his 40th year working in Research on Semiconductor Materials and Optical Fibers for Western Electric, Bell Labs, Lucent Technologies and new OFS-Fitel.

**John D. Nguyen** (*PhD 2015, Stephenson*) was a post-doctoral associate with Professor Stephen L. Buchwald at MIT, 2014-2016. John recently joined the pharmaceutical practice group of Wolf, Greenfield & Sachs, PC, a Boston based intellectual property law firm, as a Technology Specialist.

**Van Nguyen** (*BS 1990*) has been cited as a 2017 ACS Hero of Chemistry. This award is in recognition of his work at Bristol-Meyers Squibb for pioneering the development of direct acting antiviral agents Daklinzamt and Sunvepratm that have produced hepatitis C cure rates greater than 95%. Since 2015 Van Nguyen is with Ly-cera, Ann Arbor.

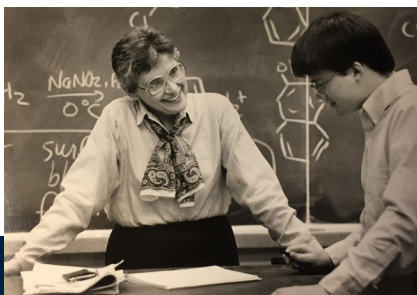
**Wayne A. Pletcher** (*PhD 1971, Wiseman*) is a 50 year member of the American Chemical Society. Wayne and his wife **Carol H. Pletcher** (*MS 1968, PhD Biochemistry, U. Minn.*) have endowed the Wayne A. and Carol H. Pletcher Fellowship to support chemistry graduate students. This gift will be augmented by the Bicentennial Matching Opportunity Initiative. The Pletchers are very excited about helping the department and future graduate students. Wayne was formerly the director of Corporate Technology and Business Planning at 3M Corp. and the president and CEO of Minnesota Technology, Inc. Carol is a former vice president at Cargill and the president of Pletcher, Inc.

**Paras Prasad** (*Postdoctoral 1971-74, Kopelman*) will receive the 2018 Peter Debye Award in Physical Chemistry from the American Chemical Society. He is a SUNY Distinguished Professor at the University of Buffalo.

**Douglas J. Raber** (*PhD 1968, Lawton*) and his wife Linda donated about 1000 lbs. of vegetables from their farm in West Virginia to a Martha's Table, a Washington, DC based food bank. They have also published a new book, *Warlord*. See: [www.raberbooks.com](http://www.raberbooks.com).

**Martha Bennett Wells Stiles** (*BS, 1954*) is at work on her thirteenth book for young readers.

**Weihong Tan** (*PhD 1993, Kopelman*) is now an Associate Editor of the Journal of the American Chemical Society. He was recently elected to the Chinese Academy of Sciences. He is a University of Florida Distinguished Professor as well as an Adjunct Professor, the Biomedical Engineering Department and the Department of Chemistry at Hunan University, China.



1965

**Seyhan Nurettin Ege** (shown in a ~1985 photo) became the first tenured woman and the first woman full



## 2017 Alumni Outreach Event



Michigan chemists—veterans and those still in training—gathered for the 3rd Annual Alumni Reception on August 3, 2017, the afternoon before the annual graduate-student-run Karle Symposium.

The event was hosted by the Department's chemistry graduate student professional development organizations: CSIE|UM (Chemical Science at the Interface of Education at UM) and CALC|UM (Chemistry Aligned with Life and Career at UM).

The day began with a panel on the broad topic of "How Michigan Prepared You for the Future." Panelists included Zachary Buchan, Research Chemist at Dow AgroScience; Betsy Brown-Tseng, Research Chemist at

PPG; Sethu Pitchiaya, Research Investigator at UM Department of Pathology; and Beth Kubitskey, Associate Dean at Eastern Michigan University. The event drew more than 60 graduate students eager to ask questions of the alumni about their experiences and expertise. Panelists discussed benefitting from the department's state-of-the-art research opportunities, help from office and support staff, the collaborative environment, and the opportunities for outreach and presentation.

A Mock Speed Interviewing Session was conducted for senior graduate students to interact with alumni in both academic and industrial jobs. The event allowed graduate students to get experience and feedback on their job interviewing skills from alumni, some of whom are the industrial recruiters they will be meeting with later in the semester. Alumni from academic positions at EMU and UM participated along with alumni from industrial positions at BMS, Merck, Dow, and PPG.

The event concluded with an Alumni Reception in the Radical Room of the Chemistry building. Light refreshments were provided to welcome the alumni to a reception to mix, mingle, and network with former lab members, advisors, and current graduate students. The alumni, graduate students, and professors involved had a wonderful time catching up and telling stories.

Watch for notices of the August 2, 2018 event.

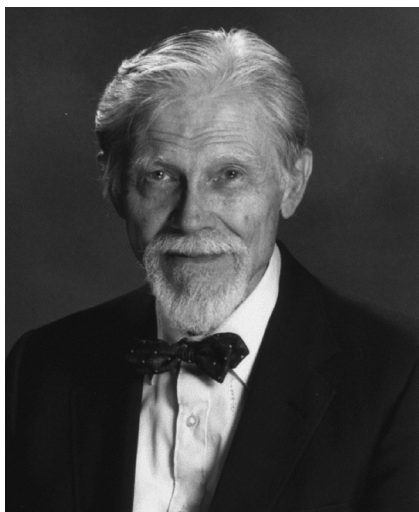
**David R. Walt** (*BS 1974*) has moved to the Department of Pathology at Brigham and Women's Hospital and the Wyss Institute for Biologically Inspired Engineering at Harvard University. This move follows more than 30 years at Tufts University. He has published more than 300 papers, holds 75 patents and received numerous national and international awards as well as founding a multibillion-dollar biotech business. He is also a Howard Hughes Medical Institute Professor. In September Professor Walt was a plenary speaker at the 2017 Saitel Life Sciences Symposium in Ann Arbor.

**Charles S. (Scott) Weinert** (*BS 1995*) has recently been promoted to Professor of Chemistry at Oklahoma State University, Stillwater. For the past two years he has been

involved with an outreach program at University of Detroit Jesuit, his high school alma mater. He recently had a paper accepted with some of the students as co-authors. This past year he spoke in Europe on some of his research, specifically at U. Pardubice (Czech Republic), T. U. Graz (Austria) and University of Freiberg (Germany). In November he gave a lecture at the UM Chemistry Department.

**Danielle Zurcher** (*PhD 2016, McNeil*) has joined the University of North Carolina, Chapel Hill, as a Teaching Assistant Professor.

professor on the faculty of the Department of Chemistry. She earned her PhD with Peter Smith in 1956, and returned to the UM in 1965. She was an Arthur F. Thurnau Professor and Professor Emerita of Chemistry.



**Lawrence S. Bartell** (BS 1944, PhD 1951, Brockway; Philip J. Elving Professor of Chemistry Emeritus, faculty member 1965-1993) died on Sept. 8, 2017 at the age of 94. After graduation in 1944, Professor Bartell began work as a research assistant under Glenn Seaborg on the separation of

plutonium from uranium for the Manhattan Project, at the University of Chicago. This work terminated when he was drafted in 1945 and joined the US Navy. After a medical discharge due to contracting rheumatic fever, he returned to Michigan to pursue a PhD and subsequently held a H. E. Rackham postdoctoral fellowship. He joined the faculty at Iowa State University in 1953 progressing through the ranks until returning to Michigan as professor of chemistry in 1965. Thus Lawrence followed his father's footprints at Michigan. Floyd E. Bartell was a professor of chemistry at Michigan from 1910-1953.

Bartell's early research period focused on improving the technique of electron diffraction as a gas phase structural tool. He and his coworkers improved the structural determination of molecules to an accuracy of 0.001 Å. One of his most quoted publications was an experimental measurement with enough resolution to resolve electron shells in atoms. In the 1970-80s he made contributions to developing molecular force fields, quantum measurement theory, electron holography, and laser pumping of molecules in supersonic jets. His interests evolved to using supersonic nozzles to study large molecular clusters, liquid clusters, nucleation rates and phase changes. Publications (over 300) continued into the new millennium with studies of proto-snowflakes in supersonic flow, confirming conjectures that snowflakes start out in a metastable form of ice, and the first study of recrystallization of metals on an atomic scale.

Bartell held several visiting professor positions: at the University of Texas (1978 and 1986); University of Paris (1973); Moscow State University (1972.) He was regularly honored as speaker at named lectures including the 3M lecturer, University of Minnesota; DuPont lecturer, University of South Carolina; Sigma Xi lecturer, University of Toledo; and a Welch lecturer. The Science Museum, Lansing Michigan named him "Michigan Scientist of the Year" in 1986. He served on editorial boards of the Journal of Chemical Physics (1963-69), the Journal of Computational Chemistry (1979-90) and Chemical Physics Letters (1981-84). He was a member of the American Chemical Society Committee on Chemical Education, Curriculum (1970-76); the Advisory Board of the Petroleum Research Board, ACS (1973-76); and fellowship committees for the National Science Foundation and the National Research Council. At Michigan he was elected to the executive committees of the Rackham Graduate School, the Institute of Science and Technology and numerous times to the Chemistry Department.

Professor Bartell was a devoted and inspirational teacher of undergrads who mentored some 37 undergraduate researcher students. He was proud of rarely missing office hours. He directed 39 graduate students, and 30 postdoctoral students and scholars. Four of his Ph.D. students received the biennial Kasimer Fajans award for best thesis. He is survived by his son, Michael of Atlanta, Georgia.

**Louis A. Errede** (BS 1947) died on February 10, 2017 in Wayzata, MN at the age of 93. Dr. Errede grew up in New Britain, CT. His education at the UM was interrupted when he was drafted in 1944 into the US Army, where he served as a Japanese interpreter. On discharge in 1946 he married Marion Kanter and finished his BS in Chemistry. He then moved to Minnesota where he completed his PhD in Organic and Physical Chemistry at the University of Minnesota in 1951.

From 1951-57, he was a Research Scientist at M. W. Kellogg Co. (NJ). When Kellogg was acquired by 3M, he moved

1988

A 270,000 gross (140,000 net) square foot new building connected to the east side of the 1948 building.



back to Minnesota. He was head of Physical Chemistry at 3M from 1963-68, Director of Exploratory Research at 3M Harlow Laboratories, UK 1968-73, 3M Corporate Scientist 1973-93 and 3M Corporate Scientist, Emeritus thereafter. In 1985 Dr. Errede became a member of 3M's prestigious Carlton Society. He had published more than 150 scientific papers and held nearly 50 patents.

Dr. Errede is survived by daughters Ellen and Dawn, sons Steven and Mark, and three grandchildren. More details: <http://www.legacy.com/obituaries.aspx?pid=184110601>.

**William Bruno Hillig** (BS 1944, PhD 1953 *Fajans*) died on September 17, 2017 at the age of 92. He was born in Melvindale, MI. After earning his BS degree, his studies were interrupted by WWII. He worked at MIT and the University of Chicago on the Manhattan Project, and he participated in the first atomic bomb tests at Bikini Atoll. After discharge from the US Army he returned to the UM. In 1949 he married fellow student and lab partner Dr. Beth Cook. He completed his PhD in 1953.

From 1953 through 1989 he was a Research Scientist at the General Electric Corporation Research and Development Laboratory in Schenectady, NY. Following retirement Dr. Hillig spent a year in Hamburg, Germany as an Alexander von Humboldt Fellow. He then joined the Rensselaer Polytechnic Institute in Troy, NY as a Research Professor of Material Science. He held 12 patents and authored more than 70 scientific publications. He received a S. B. Meyer Award from the American Ceramics Society in 1963. He was a Fellow of the American Ceramics Society and the American Association for the Advancement of Science, and a founding member the German Composites Society.

Dr. Hillig is survived by his wife of 68 years, his sister Joyce (Wayne) Baker, his children Christine McKeen, Karl Hillig, Kurt W. Hillig II (PhD 1981, *Kuczkowski*), Kurt's wife Kathy Dien Hillig (PhD 1983, *Morris*), two grandchildren and two great-grandchildren. More information at: <http://myumi.ch/J21Y3>.

**Isabella Lugoski Karle** (BS 1940, PhD 1943 Brockway) died on October 3, 2017 at the age of 95. Isabella Lugoski was born in Detroit, the daughter of immigrants from Poland. When she started in the public schools in Detroit, she spoke no English. However, she was a precocious student



and was allowed to skip several grades. She received a competitive full scholarship at the UM, graduating with a B.S. in Chemistry at the age of 19. In the Chemistry Department she met her future husband Jerome Karle (PhD 1944). They were married in 1943.

Following graduation with her PhD she worked for one year on the Manhattan Project at the University of Chicago. She successfully developed a process for preparation of the then unknown plutonium chloride from the oxide. In 1945 she returned to the UM for one year as an Instructor in the Department of Chemistry. In 1946 she and Jerome joined the US Naval Research Laboratory. From 1959 until her retirement in 2009 she was the Head of the X-Ray Analysis Section.

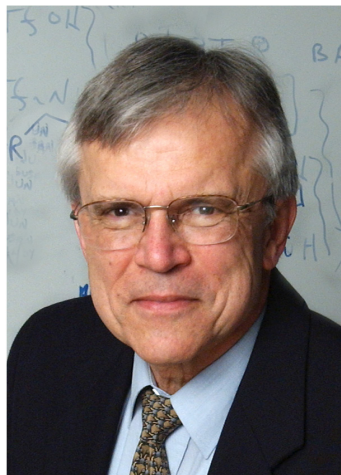
An eminent scientist of international renown, Isabella Karle worked on the application of electron and X-ray diffraction to structural problems and phase determination in crystallography. In the 1950s Jerome Karle and Herbert Hauptman developed direct methods for applying X-ray diffraction to complex structural problems. Isabella used direct methods to investigate configurations and conformations of increasingly complex natural products, particularly polypeptides and proteins. Many knowledgeable people including Jerome himself felt that her contributions allowed him to win the Nobel Prize in 1985.

Isabella Karle's scientific work was widely recognized. She received Honorary Degrees from many universities, including a D. Sc. from the UM in 1976. Other awards

include the Hillebrand Prize from the Chemical Society of Washington in 1969, the Garvan Award from the ACS in 1976, the Gregori Aminoff Prize of the Royal Swedish Academy of Science in 1988, the Bower Award from the Franklin Institute in 1993 and the National Medal of Science awarded by President Clinton in 1995. She was elected to the National Academy of Science in 1995.

Her husband died in 2013. She is survived by her three children: Louise Karle Hanson (BS, 1967, MS 1969); Jean Karle Dean (BS, 1971); and Madeleine Tawney, and their families, including four grandchildren, and a great-granddaughter. For more information see the New York Times obituary at: <http://myumi.ch/L3pgy>.

**Chava Blodek Kopelman** (wife of Professor Raoul Kopelman) died in Ann Arbor on December 31, 2017 at the age of 86. She is survived by Raoul, their children Orion Kopelman, Leeron Kopelman and Shirli Kopelman and grandchildren Talia Kopelman and Yasmin Kopelman.



**Edwin (Ed) Vedejs** (BS 1962, Emeritus Professor) died in Madison, WI on December 2, 2017 at the age of 76. He was born in Riga, Latvia on January 31, 1941. Following WWII, he lived for six years in displaced persons camps in Germany, before emigrating to the USA in 1950. His family settled in the Grand Rapids area to be near relatives.

Ed received his BS in Chemistry at the UM in 1962 and his PhD in 1966 from the University of Wisconsin, Madison, studying with Muxfeldt. He then did post-doctoral research with E. J. Corey at Harvard University, before returning to the University of Wisconsin as a chemistry faculty member in 1967. He was promoted through the professorial ranks ultimately becoming Robert M. Bock Professor of Chemistry. In 1999 he joined the University

of Michigan as the Moses Gomberg Collegiate Professor of Chemistry. In 2011 he was awarded emeritus status.

Professor Vedejs was internationally known in the field of synthetic and mechanistic organic chemistry, widely recognized as a leader in development of synthetic approaches to cytotoxic nitrogen-containing natural products. His work focused on the challenging frameworks of aziridinomitosene and diazamide families of heterocyclic compounds. He was recognized as a pioneer in the mechanistic elucidation of the Wittig reaction.

He supervised more than 80 Ph.D. theses, and directed many undergraduate research students and postdoctoral scholars. He held an A. P. Sloan Research Fellowship (1971-73). He was an Associate Editor of the Journal of the American Chemical Society (1994-99) and served as Chair of the Organic Division of the American Chemical Society (2003). In 2004, he received the H. C. Brown Award for Creative Research in Synthetic Methods from the American Chemical Society.

Professor Vedejs had a long term interest in promoting sciences in Latvia. His efforts were recognized with the Paul Walden Medal (1997), the Grand Medal of the Latvian Academy of Sciences (2005), the Order of the Three Stars (2006) and an honorary doctorate from Riga Technical University (2010).

Ed is survived by his wife Pat Anderson, son Michael, daughters Christina Mersereau, Jesikah Cordova and Julia Vander Meer and their families. For further details see: <http://www.cressfuneralservice.com/obituary/228310/Edwin-Vedejs/>

**Nancy Willard** (Lindbloom) (Daughter of Professor Hobart H. Willard) died on February 19, 2017 at the age of 80 at her home in Poughkeepsie, NY. She was a prolific author who had published 70 books of poetry and fiction and had won numerous awards. For more information see the New York Times obituary at: <http://myumi.ch/aKZ1y>

# M Gifts

Contributions received from July 1, 2016- June 30, 2017

\*Matching Gifts

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Ryan C. Fields  
Mary Ellen Sheridan  
Jessica Zhang

2016

Professor Melanie Sandford is elected to the National Academy Sciences, the first Department member to be so honored in many decades.



*Every gift is important and makes a difference in the Department's ability to provide for students and faculty.*



**Chemistry Strategic Fund**

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