



UNIVERSITY OF MICHIGAN

Chemistry

Fall 2019

News



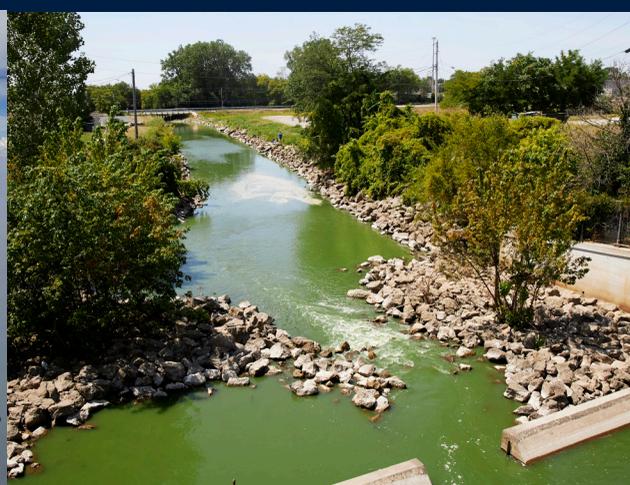
Direct Determination of Aerosol pH:
Size-Resolved Measurements of Submicron
and Supermicron Aqueous Particles

Aerosol Acidity

Colorimetric Detection

pH Scale

H_2O NH_4^+ H^+
 H_2O HSO_4^- H^+
 SO_4^{2-} H^+



Welcome from the Chair



Alumni and Friends—

I know first-hand the transformative experience that research as an undergraduate can have. I entered my college years expecting to become a veterinarian. But a research experience with an organic chemistry lab turned me into a chemist. The analytical side of the work intrigued me and that is the career path I have followed since.

Our undergraduates and our graduate students often are surprised by insights into their future selves that they gain from our courses, our labs, and our professional development programs. These experiences open our students to a variety of careers, whether as industrial chemists, teachers, physicians, patent attorneys or science communicators—all directions some of our recent graduates have pursued.

Generous donations from our friends and alumni have allowed us to provide these opportunities. If you have given to the department, we thank you! If not, we hope you will take a moment to choose an option important to you.

Your support is what helps us maintain innovative curriculum development (as you can read on page 6-7) and our forwarding-looking research (on the following pages). We depend on your generosity to help us meet the day-to-day incidentals of an enterprise of 45 labs, 600 students in our majors, the many more students taking chemistry as a requirement for other majors, our 280+ graduate students, as well as our professional and administrative staff.

Beyond your financial support we appreciate your involvement. Volunteer for our pre-Karle alumni-student networking event set for July 31 this summer.

Looking for a good overview of department research directions? There is no better compilation than the Karle Symposium the day after the alumni event.

Both events are growing and engaging more and more alumni and students.

Between newsletters, follow our accomplishments on our website. You can also follow us on Twitter, Instagram, and LinkedIn.

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

Robert Kennedy

Chair, Chemistry Department

Hobart Willard Distinguished University Professor

Professor of Chemistry

On the cover

- *Northern Lights—one perk of doing research in the Arctic in winter. (Courtesy of Pratt Lab)*
- *Soupy green lake water rich in algal growth an. Ault lab is analyzing what gets into the atmosphere from such lakes. (Courtesy of the Ault Lab)*
- *The air around us—and the particles it contains—comes in contact with surfaces, such as our kitchen counters. The Ault Lab is analyzing the result of that contact.*

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Exploring the chemistry of the environment around us

*The fiftieth anniversary of the first Earth Day is coming up in April 2020. That national event called attention to the environment and helped bring about policies and practices to control pollution. Yet all these years later fundamental questions remain about environmental chemistry—from Arctic snowpacks to the countertops in our kitchens. With their application of analytical chemistry and instrumentation to these questions, the research groups led by Assistant Professors Andrew Ault and Kerri Pratt are helping to fill in missing information. Their creative research earned them spots on *The Analytical Scientist* magazine's Power List: Top 40 under 40—two of only seven assistant professors in the US so honored. Here is bit about their work. For a deeper dive into their research, use the resources at the end of the articles.*



*Ault group graduate student **Madeline Cooke** with samples of water from a freshwater lake in Ohio. Note the green color. Cyanobacteria, often called blue-green algae, is a particular concern as it can create a toxin that endangers the health of pets and humans.*

The wind stirs the lake into a frenzy sending waves crashing over the breakwater. The awesome power of the lake is something to behold, but just what is that lake spray sending into the atmosphere?

Until recently, it was very difficult to say, says analytical and environmental chemist **Andrew Ault**.

With a combination of lab and field studies the Ault and Pratt Labs at Michigan are finding answers. Especially during harmful algal blooms, lake spray aerosols raise concerns about health. An important question for the climate is what role do the aerosols play as nuclei for cloud or ice formation.

Answering these questions using a combination of new techniques and instrumentation, the Ault lab uses in particular Raman Microscopy and Atomic Force Microscopy-IR [See page 5.] They also use a mix of electron microscopy, X-ray spectroscopies, and mass spectrometry.

“We used to believe the aerosols were all water droplets like the classic rain drop. Now we want to know more.”

The Ault Lab also focuses on poor air quality, particularly haze, by trying to understand the chemistry behind its formation. They are measuring acidity (pH) and phase state (liquid, solid, or somewhere in between). Acidity and phase are critical properties that drive extreme air pollution events like smog in Los Angeles or the recent episodes in China and India, Ault explains.

In addition to instrument-based approaches, the Ault group is experimenting with the effect of various particles on novel polymers as a way to determine acidity.



***Andrew Ault**, Dow Corning Assistant Professor of Chemistry Ault was interviewed by MichiganRadio about the lake spray aerosols. He joined the University of Michigan in 2013.*



Kerri Pratt, Seyhan N. Ege Assistant Professor of Chemistry

A 2018 Department of Energy (DOE) Early Career Award provides five-years and \$750,000 to support her research on Arctic chemistry.

“The overarching goal of my project is to improve understanding of atmospheric aerosol processes in the Arctic, particularly during the understudied and rapidly changing winter,” Pratt explains. *“For predictions of Arctic atmospheric composition and feedbacks, knowledge of aerosol sources and processes is critical. This is a major gap in our understanding of Arctic aerosols, which have significant impacts on cloud formation and atmospheric warming.”*

Her group will be analyzing atmospheric particles collected from an aerosol sampler deployed aboard the German Icebreaker Polarstern. The ship is floating frozen into the high Arctic sea ice for an entire year in an historic international field campaign called MOSAiC (Multidisciplinary drifting Observatory for the Study of Arctic Climate). Follow the expedition at: www.mosaic-expedition.org

Hot Climate, Cool Science

Analytical chemistry applied to the study of atmospheric chemistry is answering urgent questions about air quality, sea ice, and climate change

“Climate change is occurring most rapidly in the Arctic, compared to anywhere else on the planet,” says atmospheric and analytical chemist **Kerri Pratt**. “What I see with my own eyes in the Arctic is really shocking, and it scares me.”

“We are tackling things that have never been measured before,” Pratt explains, for example, the relationship between atmospheric aerosols and decrease in Arctic sea ice.

Pratt joined the Michigan faculty in 2013. Beginning with a love of environmental science, Pratt was inspired during her initial research years to focus on mass spectrometry and has found a way to combine her passions: the Arctic and instrumentation.

“I found a niche that is not a crowded research area in the U.S.,” she explains. “I have the unique capability of applying analytical chemistry to the study of atmospheric chemistry. I’m not just a user of instruments, so I can do unique things as a result. I look at where my expertise is and where the most urgent questions are.”

Those urgent questions include: What is shaping the negative environmental changes? How are these factors involved in the loss of sea ice in the Arctic? How can these things be measured?

“The Arctic is the place on the planet that is in the forefront of climate change,” says Pratt. “There used to be ice at the shore where we do our research in northern Alaska decades ago. There were waves breaking when we visited last winter.

“If it were eighty degrees here in Michigan in December for a few weeks, you would say something is wrong. If it happened, year after year, you would say we are not supposed to be living in a climate like this. That is what it is like in the Arctic—the norms of their climate are changing.”

What is even more frightening, Pratt adds, “The system is changing more rapidly than we can measure the changes.”

Other research tied to climate change—for example, renewable energy sources such as biofuels, tidal power stations, or solar cells—is moving ahead rapidly, but there is still very little known about atmospheric chemistry in the Arctic. “Right now, there are very few observations in the Arctic. What we have done to this point is just the tip of the iceberg. We know very little,” Pratt says.

—**Kristina Lenn**, Chemistry SciComm Fellow

*Right: Pratt group members **Jun Liu** & **Jamy Lee** with the Lab’s custom-built mass spectrometer behind them in Arctic lab. They spent two months during the Arctic winter at the research site on Alaska’s North Slope. This field-deployable single-particle mass spectrometer allows the researchers to measure the size and chemistry of individual particles in real-time.*

Atmospheric Research using the AFM-IR

Ault Lab is targeting aerosols—tiny particles floating around in the atmosphere

Atomic force microscopy (AFM) is a common technique to analyze the topographic surface of a sample. Infrared spectroscopy (IR) is widely used for the analysis of functional groups and identification of chemicals. With AFM being limited by a lack of chemical information, and IR being limited by its resolution, the AFM-IR combines the advantageous parts of these two analytical techniques into one instrument—combining identification and visualization to increase the capabilities of each.

One group exploiting these capabilities is the Ault Lab. Analyzing aerosols or atmospheric particles is relevant to climate and environmental science, but the challenging part is detection. These particles are extremely small.

“If I were to breathe the air in this room, the most abundant size of aerosol particles by number would be about 100 nm in size, which is smaller than what we can see with an infrared microscope,” Ault explains.

Ziying Lei, a graduate student in the Ault group and a PhD candidate in the School of Public Health,

works on developing methods for model systems that can later be used to predict future air pollution production and human health.

“My research focuses on the characterization of the chemical and physical properties of single particles in the atmosphere,” Lei explains.

Lei is interested in improving current understanding of atmospheric formation and the viscosity and morphology of atmospheric particles. “AFM can provide me with lots of useful information—what the individual particle looks like; if the particle is liquid, semi-solid or solid; and the size of the single particle.

“The IR portion of the instrument is used to study the chemical compositions of individual particles, especially for particles in nanoscale.

“Most of the particles I’ve studied have core-shell morphology. The IR spectra can help me identify most of inorganic species in the core and organic species in the shell,” Lei adds.

In 2017, the Ault group published the first application of the AFM-IR technique towards the understanding of aerosol particles in *Analytical Chemistry*. The article described



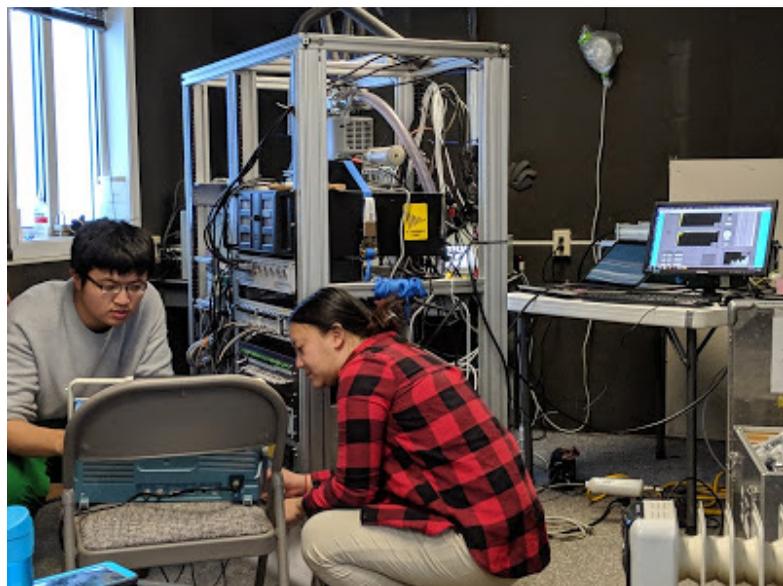
Ziying Lei

the first successful chemical identification of model aerosol particles, which moves both analytical and atmospheric chemistry fields forward.

The Department of Chemistry’s AFM-IR is about to be updated for faster spectral acquisition and higher spectral resolution.

The Scanning Probe Microscopy facility, which will be managed by Ault, will also have an optical photothermal infrared spectroscopy (OPTIR) added to the existing instrument, which will be combined with a Raman system for simultaneous IR and Raman spectral collection for particles down to one micron in size. This will be the first instrument of its kind at a US academic institution.

—Taylor Soucy, *SciComm Fellow*



Learn More

Pratt Research Group: prattlab.chem.lsa.umich.edu/
Dr. Kerri Pratt on Twitter: @ArcticKerri

Ault Research Group: sites.google.com/a/umich.edu/ault_lab/home
Dr. Andrew Ault on Twitter: @Andy_P_Ault



Faculty team up with Future Faculty Graduate Student Instructors to Improve Teaching, Expand Curriculum

CHEM 125-Snow Lab

Students hold up the beaker, showing off the color change they are excited to see as part of their experiment. In this first year lab, they are gaining lab skills and exposure to experimental protocols but through a genuine research lens.

Part of the Authentic Research Experience (ARC) program at UM, Chem 125-Snow has first year students carry out analyses on Arctic snow samples, identifying ions and concentrations, and forming ideas about why samples differ by location where they were collected. This is akin to the analytical work that **Kerri Pratt**'s research group does in its work in the Arctic.

Pratt has assembled a fairly large team over a few years to integrate the relevant analyses from her research program into a section of the first-year general chemistry laboratory. She credits help from former graduate students **Nate May** (*PhD, 2018*) and **Stephen McNamara** (*PhD, 2019*), and now Future Faculty Graduate Student Instructors (FFGSI) **Jeff Spencer** and **Madeline Cooke**, with the success of the snow chemistry section.

"It would not have been possible to have developed CHEM 125-Snow lab without them," Pratt says.

As early as 1994-98, the department started creating

opportunities for faculty members to recruit undergraduate students, graduate students, and postdoctoral associates to form "teaching groups" for instructional projects as a direct parallel to the way they form "research groups," according to Professor **Brian Coppola**. In 2014, the department institutionalized its collective activities devoted to future faculty development, under the direction of Coppola as the new Associate Chair for Educational Development and Practice.

The faculty and the students are all clear about the importance of the FFGSI option for getting interesting work done.

Better Teaching

"The FFGSI program has been an amazing resource to get help with curricular projects in the department," reports Professor **Anne McNeil**. "I use the FFGSIs to get stuff done that I know will help the course run more smoothly and will help the GSIs and students have a better experience, but that don't rise to the top of my "must-do" list before the term starts.

"Last year I collaborated with a FFGSI to help streamline a Michigan Math Science Scholars [summer pro-

gram for high school students] course, which had a lot of good parts but they were too disconnected and, in many cases, not optimized.”

The 15 high school students that participated in the revised course appreciated the new ‘flow’ and the improved experiments with clearer instructions.

“Overall, I have been able to teach better courses because of the FFGSI contributions,” McNeil says.

“The FFGSI program was invaluable as a resource when I was in the process of developing my research-based section of CHEM 216,” says Professor **John Wolfe**. “The two FFGSIs spent their time optimizing the experimental protocols, helping me assemble the course materials, and structuring the class.

“There is simply no way I could have done this without considerable help, give the amount of time, especially in the lab doing wet chemistry, that was required,” Wolfe says. “The benefits for all involved were immense. I was able to get the class put together, the FFGSIs gained valuable experience developing curriculum for a lab class, and the students got a unique lab class to take, that would not have existed without this program.”

Catalyst for Compute to Learn

Professor **Eitan Geva** has developed an honors option for CHEM 260, the second-year survey course in physical chemistry, called “compute-to-learn” (CTL). Geva says “The CTL honors studio would have never been possible without the FFGSI program. In fact, the introduction of the FFGSI program was the catalyst for developing the studio.

“And it was FFGSIs who spearheaded the development and continual improvement of self-guided tutorials, designed the schedule and ran the studio in practice. Doing so provided FFGSIs with invaluable experiences that a traditional GSI position could not, including mentoring undergraduate peer leaders, guiding research and trouble shooting in real time. It is now a visible part of my program.”

Undergraduate Funding Needs

“It’s incredible to see how well this has worked,” reports Coppola. “As always, the incremental expense is the bottleneck for how many of these positions we can offer.” There is a need for more support for undergraduates to free up GSI time.

“An attractive funding target that I hope we can promote more actively is funding for stipends to support the undergraduates who pursue ‘undergraduate teach-

ing.’ It is exactly parallel to supporting ‘undergraduate research.’”

“In fact, the typical teaching stipend we need for the undergraduates to teach during the entire term is currently about half the level of the typical summer stipend for research.”

Benefit Trifecta of Future Faculty GSI positions (FFGSI)

How it works. . .

Faculty members propose teaching project ideas that they want to develop. Graduate students review the descriptions and meet with the faculty to work out the details of a proposed project.

Graduate students who would otherwise have their regular GSI duties for 20 hours/week can devote 10 of those hours to the educational development work. This time is universally seen as an excellent pre-professional experience. The work—as it should, says Coppola—often results in publications. For those students carrying out education research, the work is integrated into their dissertations.

To compensate for the 10 hours of work that is not being performed by the GSI, the department can hire outstanding UM junior and senior students who have usually already logged many instructional hours through the Honors organic chemistry program or through being a group leader with the Science Learning Center. These students earn a combination of pay and credits for their work as undergraduate educational support for courses.

Dr. Coppola would be happy to talk with anyone interested in supporting this program.

Contact him at: **Brian P. Coppola**
bcoppola@umich.edu

734.764.7329

lsa.umich.edu/chem/people/faculty

Support this program by designating your gift to the CSIE|UM Future Faculty Fund 732330

Faculty & Staff News

Jennifer Bridwell-Rabb has been named a 2019 Searle Scholar, a program that supports independent research of exceptional younger faculty in their initial appointments at selected universities and research institutions. There are only 15 awards nationally. She receives \$100,000/year in research support for three years. She has also received a Ralph E. Powe Junior Faculty Award, which is designed to help outstanding junior faculty in their first two years of independent research. The award is sponsored by the Oak Ridge Associated Universities.

Charles L. Brooks, III will receive the 2020 ACS Award for Computers in Chemistry & Pharmaceutical Research, sponsored by the ACS Division of Computers in Chemistry.

Zhan Chen was named a fellow of the American Association for the Advancement of Science (AAAS).

Carol Ann Castaneda has been promoted to Lecturer IV.

Brian Coppola was selected for the first annual Faculty Champion Award by the Science Learning Center (SLC) of LSA at their 30th anniversary event. He played a critical role in the origin and development of the SLC.

Emerita professor **Carol Fierke** will receive the 2020 Mildred Cohn Award in Biological Chemistry to be given by the American Society for Biochemistry and Molecular Biology.

Eitan Geva has received an Individual Award for Outstanding Contributions to Undergraduate Education for 2019 from the College of Literature Science and the Arts.

Amy Gotfried was named the Michigan Volleyball Faculty/Staff Member of the Match for the game on September 13, 2019. She was nominated by Katerina Rocafort, a current senior on the UM volleyball team.

Sarah Keane has been awarded an National Science Foundation CAREER award for “Mechanisms of RNA-mediated control of gene expression in bacteria.”

Robert Kennedy received the Chromatographic Society’s 2019 Martin Medal for his “outstanding contribution to the development of innovative techniques in miniaturization of chemical separations and microfluidics for highly sensitive analysis of biological compounds.”

Anna K. Mapp has been appointed Associate Dean for Programs and Institutions in the Rackham Graduate School.

Adam J. Matzger received a 2019 Rackham Distinguished Graduate Mentor Award.

Charles C. L. McCrory was awarded a 2019 Cottrell Scholar Award by the Research Corporation for Science Advancement, one of 24 awards made nationally. The award for “Selective Electrocatalysis by Polymer-Encapsulated Catalysts: the Role of Charge and Substrate Transport on Catalytic Efficiency” provides \$100,000 of discretionary support.

Anne McNeil has been awarded a Guggenheim Fellowship for 2019. This will support her research focus on chemical approaches to reimagining the lifecycle of plastics. She was also honored with the Willie Hobbs Moore award for fostering diversity in STEM from the UM Women in Science and Engineering program.

Mark E. Meyerhoff will receive the 2020 ACS Award in Analytical Chemistry sponsored by Battelle Memorial Institute.

Alison R. H. Narayan was named a 2019 Sloan Fellow. She is one of 23 chemists nominated for this prestigious early career honor which has been awarded since 1955. She was also received a 2019 Cottrell Scholar Award from the Research Corporation for Science Advancement for a project entitled “Biocatalytic Reactions for Selective Sustainable Synthesis and Engaging Graduate Student Instructors for Improved Outcomes in Organic Chemistry.”

Alex Poniatowski has been reappointed as a Lecturer IV.

Vincent Pecoraro was recently elected as the President-elect, President and then Past-President for the Society of Biological Inorganic Chemistry (SBIC). The President-elect term began on October 1, 2019. He will become President on October 1, 2020-2022 and Past-President on October 1, 2022-2024. The SBIC is the primary international society in the field of bioinorganic and biological inorganic chemistry.

Ayyalusamy (Rams) Ramamoorthy delivered his Collegiate Professor lecture in November entitled, “Probing Membrane-Assisted Dynamic Protein-Protein Interactions by NMR.” He is the Robert W. Parry Collegiate Professor of Chemistry and Biophysics.



Banner year for Corinna Schindler

- 2020 Henry Russel Award. This is the highest University of Michigan honor awarded to faculty early in their careers and is given on the basis of an outstanding record of scholarship and teaching.
- 2020 American Chemical Society Award in Pure Chemistry sponsored by the Alpha Chi Sigma Fraternity and Alpha Chi Sigma Educational Foundation; made in recognition of outstanding accomplishments by chemists with fewer than ten years since their terminal degree. The Award in Pure Chemistry has been given since 1931 and past recipients include many giants of our field.
- Eli Lilly Grantee Award: supports emerging leaders in organic chemistry. It comes with a two-year \$100,000 unrestricted grant and a visit to a Lilly Symposium.
- 2019 Marion Milligan Mason Award for Women in the Chemical Sciences, American Association for the Advancement of Science: designed to help the research efforts of early-career women researchers in the chemical sciences.
- ChemComm Emerging Investigator Award. As a part of this award she will present lectures at three locations in the coming year.
- 2019 Lectureship Award of the Society of Synthetic Organic Chemistry of Japan (SSOCJ); she will present lectures at Japanese universities and conferences in the coming year.
- Presidential Early Career Award for Science and Engineering (PECASE). She was nominated for the PECASE by the National Science Foundation.
- Promoted to Associate Professor of Chemistry with Tenure effective September, 2019.

Brandon Ruotolo received the 2018 Protein Society Young Investigator Award. The award recognizes a scientist in the first eight years of an independent career who has made an important contribution to the study of proteins.

Melanie Sanford delivered her Distinguished University Professor lecture on February 5, 2019. She was named the Moses Gomberg Distinguished University Professor in 2016. Her talk “New Ways to Make Molecules: From Fundamental Science to Applications in Medical Imaging and Drug Development,” Sanford will focus on her team’s development of new ways to form carbon-fluorine bonds. She highlighted the interactions of her graduate students and industrial partners in shaping the work.

Ginger Shultz has received a 2019 Individual Award for Outstanding Contributions to Undergraduate Education. She also won a 2019 UM Provost’s Teaching Innovation Prize. These awards recognize several aspects of her work including the write-to-learn approach.

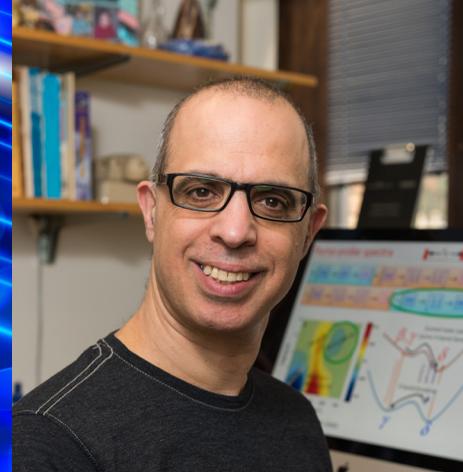
Corey Stephenson will receive an Arthur C. Cope Scholar Award for 2020. The award is sponsored by the Arthur C. Cope Fund administered by the ACS to recognize excellence in organic chemistry.

Staff News

Michigan Chemistry staff swept the annual outstanding staff awards for the LSA Natural Sciences division. Undergraduate program coordinator Angie Cox was named the Outstanding Individual Employee; Graduate program coordinator Katie Foster received the Rising Star Award. Chief administrator **Jan Malaikal** (c) was not only selected by her peers to receive the Natural Sciences Chief Administrator Award, she also was the winner of the Robin Sarris Outstanding Supervisor Award.

James Vollmers, long-time manager of the undergraduate laboratories, has retired. **Joseph Ward** is the new Laboratory/Classroom Services Manager.

UM Chemists finding new opportunities in quantum science



Eitan Geva recounts MichiganChem approach at workshop aimed at developing a complete picture of the Michigan footprint in quantum science and technology

Different from the classical physics we observe in our daily lives, the physics that govern the smallest of particles—small molecules, atoms, and electrons—are quantum interactions. Quantum science and the technology that takes advantage of these quantum behaviors are intriguing to scientists from many disciplines.

At a University of Michigan workshop aimed at bringing scientists involved in quantum science together, physical chemist **Eitan Geva** presented the Michigan Chemistry approach to tackling the leading problems in quantum science and technology research. “I think the most important problem in this quantum technology business is to find the right materials. Chemistry, in a sense, is materials science in a molecular manner,” Geva explains. “We know as chemists that by manipulating molecules, you can manipulate performance and functionality.”

The molecules that many chemists study are large, and the kinetics of their reactions with one another often obey classical mechanics. As a result, chemistry is not traditionally thought of as a quantum science field. However, the individual atoms and electrons within those same molecules adhere strongly to quantum mechanics. Many molecular properties, such as the way electronic excitation energy is created and transferred in solar cells or photosynthetic systems, are inherently quantum and can only be understood by studying the quantum physics that controls them.

Of the many scientists devoted to studying the quantum physics that underlies chemical and biological systems, Geva highlighted the work of six chemistry research labs in his presentation at the workshop: three from experimental physical chemistry and three from theoretical and computational chemistry.

Experimental researchers in the **Goodson, Kubarych, and Sension** labs are using laser spectroscopy to measure molecular properties and monitor molecular dynamics when light and matter interact. This light-matter interaction excites the electrons in molecules, causing them to move around and find different ways to transfer their newly received energy to other places. Applications such as renewable energy sources, microscopy, photochemis-

try, and catalysis can be drastically improved if chemists learn how to take advantage of these quantum properties in molecules.

Three theoretical and computational research labs—**Geva, Zgid, and Zimmerman** groups—are developing mathematical models and computer algorithms for a range of quantum chemistry calculations. Their algorithms would make calculation of electronic structure, molecular properties, and dynamics one of the most essential applications of quantum computing.

Using improved models and quantum computers with enhanced computational power, theoretical chemists will be able to study how molecules interact and evolve with their surrounding environments, even explaining phenomenon that may still be elusive to experimental chemists. The experimental and theoretical research groups often collaborate as they identify how the structure of certain molecules can enhance the quantum behavior compared to other molecules, allowing the chemists to predict and design new molecules to enhance the quantum behavior even more.

—*Ryan Burdick, SciComm Fellow*



25 Years of Peer-Led Honors Organic Chemistry

Alex Poniatowski, Nicole Tuttle, Brian Coppola, Costas Lyssiotis, and Alison Narayan

Leading a Structured Study Group (SSG) has set many a student on a teaching path. The brainchild of Professor **Brian Coppola** in 1993, a few years after introducing a revised undergraduate chemistry curriculum, the SSGs gave Chemistry a way to offer LSA Honors students a credit option: a 2-hour/week supplemental instruction program.

Today these groups routinely attract about 150 students from the 1400 who are enrolled in Organic I during the fall semester. These self-selected, science-motivated students meet with an undergraduate junior/senior SSG leader in groups of about 20. Each week, the first-year students have an original, literature-based assignment that they bring to their session for peer review, discussion, and critique.

About 130 individuals have been SSG leaders over the years, including four alumni who are back at the University of Michigan: **Alison Narayan** (BS 2006; *assistant professor in Chemistry, research professor in Life*

Sciences Institute), **Costas Lyssiotis** (BS 2005; *assistant professor in Physiology and Internal Medicine*), **Alex Poniatowski** (BS 2003; *Lecturer IV in Chemistry*), and **Nicole Tuttle** (BS 2004; *assistant director, Center for Research on Learning and Teaching and Lecturer I in Chemistry*).

Coppola, who still directs the SSG program is quick to say that the specific assignments were co-developed over the years by all of the leaders, who take their experiences and make excellent suggestions for new and improved ideas. “Particularly noteworthy among these have been **Doug Daniels** (BS 1995), **Jason Pontrello** (BS 1998), **Ian Stewart** (BS 2002), and **Justin Lomont** (BS 2008).”

“In a delightful coincidence for this 25th year anniversary,” says Coppola, “Professor Narayan and Dr. Tuttle are two of the four instructors in Organic I during the fall 2019 term, teaching in the course they took, and then taught for, when they were undergraduate students in the department.”

Mass Spectrometry 2.0

A Biological Mass Spectrometry Facility to be located in the Department of Chemistry is under development with the leadership of **Brandon Ruotolo**, professor of chemistry. “This facility will be the ‘front door’ to mass spectrometry for users from across the University and beyond,” says Ruotolo. While some labs have their own mass spectrometers with narrow applications, this facility will fill cracks between applications and regional gaps in capabilities.

The UM Biosciences Initiative is supporting four mass spectrometers, including one that is the first of its kind in the Western Hemisphere.

“Some of the instruments are well-known to researchers but are capable of being used in

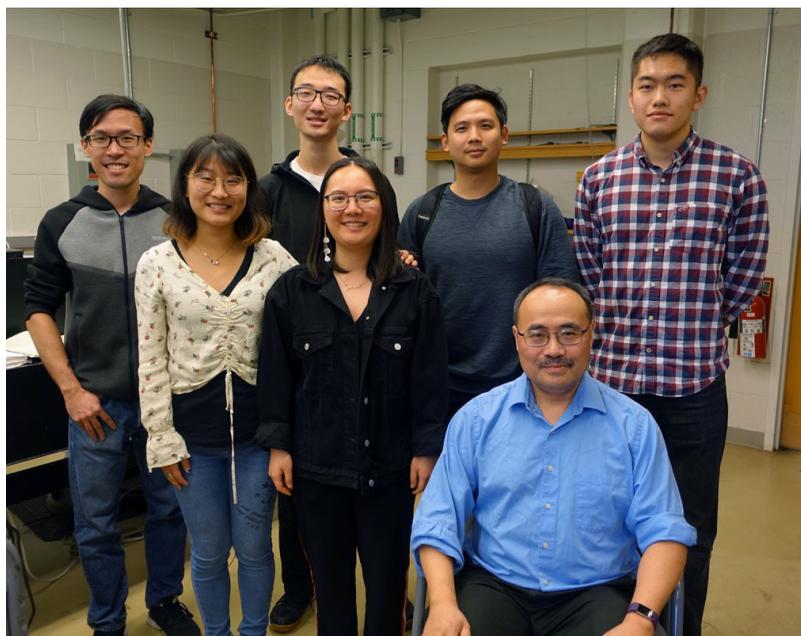
unique ways. Some are novel technologies. The instruments will be capable of connecting with others used in drug discovery, for example.”

If all goes according to plan, Ruotolo expects the facility to be “up and running” and taking samples next summer.

Agilent, Inc is also making a major investment in UM mass spectrometry through gift of instruments and funding for professional technical support.



In Brief



Major universities in China support their undergrads for extended periods of research in the US. Thus far, we have hosted 66 outstanding senior students in nearly every research group in the department. Professor **Zhan Chen** (seated) along with UM graduate students who were previously interns and three current interns. Left to right: **Tieyi Lu** (Shanghai Jiao Tong U, 2016), **Lirong Shi** (Nanjing U, 2017), **Guangyao Wu** (Nankai, 2019), **Wen Guo** (U of Science and Technology of China, 2017), **Xvhong Chen** (Nanjing U, 2019), **Yuchen Xing** (Jilin U, 2019).



This fall we welcomed “Kate the Chemist” for two semesters of science communication. **Kate Biberdorf** (*BS 2006 and alumna of the Wolfe lab*) now lecturer at University of Texas, has shot her demonstrations, such as how to breathe fire, on *Late July* with **Steven Colbert** among other TV appearances. Her goal is to have so many scientists making science friendly to non-technical audiences that she will not be unusual.



This year UM was part of the **STEM Posse** program, which brings a cohort of students—the posse—who will be entering UM in the fall for an orientation to campus and to build community among them for their years ahead.

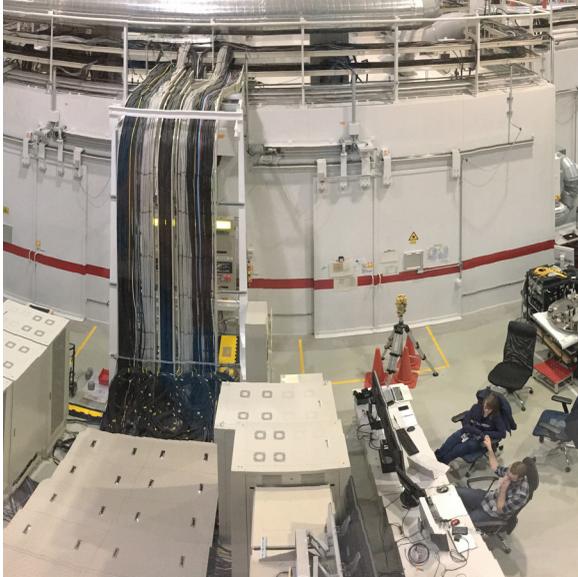
Throughout the summer our teaching labs are the site of enrichment programs for middle school and high school students, such as the D-RISE collaboration with Detroit Cass Technical High School.



Diversifychemistry.com: Because recognition is easy to recall, Professor **Anne McNeil** launched this website and created this resource because I wanted to bring visibility from underrepresented groups in the academic chemistry community.” It is being used by people putting together panels of journalists looking for chemistry experts.



Alum **Darryl Boyd** (*BS 2004, Pecoraro lab*) was the guest speaker for 2019 Chemistry Commencement. The department holds this popular event for our majors each spring at the Michigan Theater. Boyd is now a scientist at the Office of Naval Research and has a popular website: “Dr. Boyd, The Chemist” aimed at showing young people “anyone can be a scientist.”



Grad students **Lindsay Michocki** (*Kubarych Group*) and **Nick Miller** (*PhD 2019, Sension*) spent long shifts at the controls of the SACLA facility in Japan, where Professors **James Penner-Hahn** and **Roseanne Sension** and Associate Research Scientist **Aniruddha Deb** had “beam time” late last year. The Spring8 Angstrom Compact free electron Laser (SACLA) can produce light pulses as fast as 50 femtoseconds (50 quadrillionths of a second). In their experiment, the researchers shot a molecule with an array of X-rays. The fast pulse made it possible to obtain a picture of a molecule during a reaction rather than just before and after a reaction. *[Read more in the website story by SciComm Fellow Zechariah Pffafenberger.]*



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PPG scientist **Betsy Brown** (*r*) (*PhD 2016, Maldonado*) helps grad student **Shannon Wetzler** (*Bailey Group*) sharpen her interviewing skills at the 2019 Alum|NUM (Alumni Networking at UM)—our annual networking event. New this year were events for undergraduates doing research in the department this summer, including a poster session to showcase their work and tips on applying to graduate school.

The event was organized by the Chemistry professional career development organizations—CSIE|UM (Chemical Science at the Interface of Education at UM) and CALC|UM (Chemistry Aligned with Life and Career at UM), and the Chemistry Graduate Student Council, with support from CellGene.

Join us in 2020!



Alum| NUM on July 31

Karle on August 1

This year’s Karle Symposium on August 2 provided a comprehensive look at the breadth and depth of Michigan Chemistry research. An annual, one-day event, organized by Chemistry graduate students, it provides a unique venue for showcasing their research to the entire department as well as fostering new collaborations. PPG helped fund the event and travel awards for outstanding posters and student oral presentations were funded Dow Chemical.

Learn more at these websites:

sites.lsa.umich.edu/karle-symposium/
sites.lsa.umich.edu/alum-num/

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PhDs Awarded

December 2018

<i>Student</i>	<i>Committee Chair</i>
Bhattacharai, Bijay <i>Cardiotonic Steroids: Concise Syntheses and Anticancer Activity</i>	Nagorny
Daley, Kimberly <i>Solvation Dynamics of Concentrated Aqueous Polymer Mixtures: A Two-Dimensional Infrared Spectroscopy Study</i>	Kubarych
Ferguson, Stephen <i>Advancements in Electrochemical and Optical Detection, Quantification, and Characterization of Cosmetic/Industrial Polyelectrolytes</i>	Meyerhoff
Hale, Lillian Virginia Alyce <i>Interconversion and Interception of Reactive Intermediates Using H₂</i>	Szymczak
Leone, Amanda <i>Using Mechanistic Insight to Develop Living Polymerizations for Conjugated Homopolymers and Conjugated/Olefin Copolymers</i>	McNeil
Ouimet, Claire <i>Protein Cross-linking Capillary and Microchip Electrophoresis for Protein-Protein Interaction Analysis</i>	Kennedy
Williams, Kyle Luke <i>Spectroscopic Signatures of Energy and Charge Transfer in Organic Materials: An Ab Initio Approach</i>	Geva
Xu, Yi <i>Towards Automated Epigenetics: Sample Processing with Droplet Microfluidics</i>	Bailey

May 2019

Albright, Haley <i>The Development of Catalyzed Carbonyl-Olefin Metathesis and Oxygen Atom Transfer Reactions</i>	Schindler
Arguelles, Alonso <i>Mechanistic studies on phosphoric acid catalyzed acetalizations and development of acetal-containing ligands for transition metal catalysis</i>	Nagorny
Cardenosa Rubio, Maria <i>Development of the Silicon Photonic Microring Resonator Platform with Applications for the Detection of Nucleic Acids and Other Biopolymers</i>	Bailey
Cristie-David, Ajitha <i>A Generalizable, Symmetry Based Approach to De Novo Design Protein Nano Cages</i>	Walter

Crowe, Adam <i>Synthesis and Electrochemical Characterization of Electrolytes for Magnesium-Ion Batteries</i>	Bartlett
Dewyer, Amanda <i>Automated Reaction Discovery to Understand Chemical Reactivity</i>	Zimmerman
Doonan, Steven <i>Droplet Microfluidic Technologies for Bioanalytical Chemistry: Advancing Epigenetic Profiling via Chromatin Immunoprecipitation in Droplets</i>	Bailey
Ferguson, Devin <i>Development of Methods for Introducing Fluorine Groups to Small Molecules</i>	Sanford
Groso, Emilia Joelle <i>Development of New Strategies Towards Accessing Chiral Nitrogen Heterocycles</i>	Schindler
Haynes, Sarah <i>Improving Traveling Wave Ion Mobility Mass Spectrometry for Proteomics</i>	Martin
Hinds, Elsa <i>Development of Strategies for the Synthesis of Heterocycles and Carbocycles; and Investigation of Chemistry Course Placement on Undergraduate Students</i>	Wolfe
Hlynchuk, Sofiya <i>Functional Organic Monolayers on Semiconductor Surfaces</i>	Maldonado
Hunt, Andrew <i>Synthesis and Spectroscopic Characterization of Ferric Heme-thiolate Complexes and their Reactivity with Nitric Oxide as Models for Cytochrome P450 Nitric Oxide Reductase</i>	Lehnert
Kent, Rosalyn <i>Modern Approaches to the Development of Energetic Materials</i>	Matzger
Lee, Stephen <i>Enhanced, live-cell, super-resolution imaging and single-molecule emission spectrum reshaping</i>	Biteen
Leng, Katy <i>Investigating the Substrate Selectivity and Regulation of Histone Deacetylases</i>	Fierke
Li, Jieming <i>Engineering Dynamic Behavior into Nucleic Acids Guided by Single Molecule Fluorescence Microscopy</i>	Walter
Ludwig, Jacob <i>New Strategies for Carbonyl-Olefin Metathesis</i>	Schindler
Magallanes, Gabe <i>Photo- and Electrochemical Methods for Biomass Valorization</i>	Stephenson
Makaravage, Katarina J <i>Development of Copper(II)- Mediated Methods for PET Imaging Applications</i>	Sanford

Miller, Nicholas <i>Somewhat Fast Spectroscopy of B12 Vitamer</i>	Sension	Meucci, Elizabeth <i>Development of High-Valent Nickel Complexes for Carbon-Carbon and Carbon-Heteroatom Bond Formation</i>	Sanford
Polasky, Daniel <i>Methods and Informatics to Analyze Intact Protein Sequence and Structure by Ion Mobility-Mass Spectrometry</i>	Ruotolo	Proctor, Aaron <i>Metal Oxides as Catalysts for Visible Light-Driven Photo(electro)chemical Oxidations</i>	Bartlett
Roy, Ved <i>Ultrafast Hydration Dynamics Near Extended Macromolecular Interfaces</i>	Kubarych	Riehl, Paul <i>New Developments in Catalysis and their Applications in Total Synthesis</i>	Schindler
Vitek, Andrew Koji <i>Computational Investigations of Organometallic Polymerization Catalyst Reaction Mechanisms</i>	Zimmerman	Ritch, Grayson <i>Perturbations of the Primary and Secondary Coordination Sphere</i>	Szymczak
Wang, Qingyi <i>Protein-Protein Interaction Analysis: Expanded Hydrogen/Deuterium Exchange Tandem Mass Spectrometry and Host Cell Protein Characterization</i>	Hakansson	Steyer, Daniel <i>Integrating Nanoelectrospray Ionization-Mass Spectrometry with Droplet Microfluidics for Applications in Biology and Small Molecule Synthesis</i>	Kennedy
Watson, Rebecca <i>New Reactivity Modes between Carbonyls and Olefins: Catalytic Carbonyl-Olefin Metathesis and Oxygen Atom Transfer</i>	Schindler	Valenta, Alec <i>Advances in Applications of Neurochemical Monitoring using Liquid Chromatography-Mass Spectrometry</i>	Kennedy
August 2019			
Armaly, Ahlam <i>Development of New Synthetic Methods to Enable Access to Atropurpuran and the Arcutins for the Development of Novel Therapeutic Agents</i>	Schindler	Vazquez, Ricardo <i>Using Ultrafast Spectroscopy and Nonlinear Optical Techniques to Understand the Excite-State Dynamics of Rationally Designed Organic Materials for Targeted Optoelectronic Applications</i>	Goodson & Kim
Arvin, Natalie <i>Microfluidic Western Blotting with Improved Throughput and Sensitivity with Application to Multiprotein Detection in Islets</i>	Kennedy	Wang, Junqi <i>Development of Micro Gas Chromatographic Prototypes for Airborne and Aqueous Volatile Organic Compound Determinations</i>	Zellers
Cheung See Kit, Melanie <i>Functional analyses of ABHD17 enzymes</i>	Martin	Wang, Yanming <i>Advances in Coarse-grained Models for Protein Folding and Protein-Protein Interactions</i>	Brooks
Colon-Bernal, Isabel <i>Unraveling Chemical Composition Heterogeneity Changes in Trabecular Bone as a Function of Disease and Treatment</i>	Banaszak Holl	Wiscons, Ren <i>Manipulating Energetic and Electronic Performance in Multicomponent Crystals through Discrete and Continuous Compositional Variation</i>	Matzger
Dixit, Sugyan <i>Traveling wave ion mobility and computational methods in studying protein structure</i>	Ruotolo	Master's Degrees	
Golonka, Alexander <i>Iron-catalyzed Synthesis of Heterocycles, and Progress Towards the Synthesis of Pahlinine Natural Products</i>	Schindler	December 2018	May 2018
Jafari, Mina <i>Designing and Implementing Analytical Tools to Solve Chemical Problems</i>	Zimmerman	Kang, Heeho	Gazdecki, David
Kirpes, Rachel <i>Microscopic Analysis of Aerosol Chemical Mixing States in Cold Environments</i>	Pratt	Pevarnek, Jennifer	LaFave, Nicholas
McNamara, Stephen <i>Characterizing Atmospheric and Snowpack Halogen Chemistry in Urban Areas and the Arctic</i>	Pratt		Liu, Menglan
			McFarlin, Austin
			Quarin, Steven
			Slizewski, Dylan
			Yang, Mengshijie
		Accelerated Degree Program	
		Brunt, Makayla	
		Hourani, Rami	

Alumni News

Isaac Agyekum (*Postdoctoral 2017-19, Hakansson*) has joined the faculty at the University of North Georgia.

Nickolas (Nick) Borotto (*Postdoctoral 2016-19, Hakansson, Martin*) has joined the faculty at the University of Nevada, Reno.

Robert Carling (*PhD 1975, Westrum*) has been honored as a 50 year member of the ACS. He retired from Sandia National Laboratories in Livermore, CA in 2014 after nearly 38 years of service. At the time of his retirement he was director of the Combustion Research Facility, a DOE Office of Science User Facility dedicated to the fundamental understanding of the chemistry and fluid dynamics of fossil fuel combustion with the expectation that more efficient and less polluting devices could be designed and developed.

In 2016 he was elected to the Livermore City Council and now serves as vice-mayor. It isn't a full time job but does occupy about 15-20 hours a week of his time. He and his wife have seven grandchildren.

Shawn (Xiaoyun) Chen (*MS 2004; PhD 2007, Zhan Chen*) has received the 2019 Coblenz Society Craver Award. The Craver Award is presented annually to an outstanding young molecular spectroscopist whose efforts are in the area of applied analytical vibrational spectroscopy. Shawn is currently a senior research scientist working at the Core R&D Analytical Science at the Dow Chemical Company. The award was presented on October 17 in Palm Springs, CA at the 2019 SciX meeting. His thesis advisor, Prof. Zhan Chen, spoke at the award symposium.

Pui Luen Fan (*MS 1967; PhD 1970, Brockway*) has been honored as a 50 year member of the ACS. In retirement he continues to participate in the development of US and International Standards for dental products.

Howard S. Friedman (*Postdoctoral 1977, Ashe*) was recently honored as a 50 year member of the ACS. He and his wife Lori are happily retired in Philomath, OR.

James Grinias (*Postdoctoral 2014-16, Kennedy*) is an Assistant Professor of Chemistry and Biochemistry at Rowan University, Glassboro, NJ. He was cited on the Power List for 2018 as one of the top analytical scientists under age 40 by The Analytical Scientist Magazine.

Kami L. Hull (*PhD 2009, Sanford*) is a 2018 recipient of the Novartis Early Career Award in Chemistry. After receiving her PhD at the UM she was an NIH postdoctoral at Stanford U. where she worked with Professor Barry Trost. In 2012 she began her independent career in the Department of Chemistry at the University of Illinois at Urbana-Champaign. In 2018 she joined the University of Texas at Austin where she is now an Associate Professor of Chemistry.

Caroline Chick Jarrold (*BS 1989*), the chairman of the Department of Chemistry at Indiana University, will receive the Francis P. Garvan-John M. Olin Medal, sponsored by the Francis P. Garvan-M. Olin Medal Endowment, from the ACS for 2020.

Rachel Kirpes (*PhD 2019, Pratt*) was one of ten scientists nationwide to receive a 2019 National Academy of Sciences Gulf Research Program Science Policy Fellowship. She is now a science policy fellow in Lafayette, Louisiana. In 2018, she spent more than two months on a ship as part of the Arctic Ocean 2018 MOCCHA campaign.

Beth Kubitskey (*BS 1987*) reports that as an undergraduate at UM, she had a student job in the chemistry office, where she was encouraged by Leah Atwater and Carole Moody to major in chemistry. After graduation she worked for Abbott Laboratories in Illinois. On joining their Manufacturing Professional Program she discovered she really wanted to be a teacher. She then returned to Michigan and entered Eastern Michigan University's Masters in Physics Education Program, earning a teaching certificate. She taught high school chemistry, physics and math for four years in South Redford, MI before returning to EMU. as a lecturer. In 2001, she enrolled in the UM PhD program in Educational Studies. Brian Coppola was on her dissertation committee. In 2008, she returned to EMU as a faculty member in Physics and Astronomy and is now Associate Dean of Students and Curriculum in the College of Education. She also points out that her husband Mark and their three children have also graduated from UM.

Chem alum half of podcast team making the science of popular culture accessible

Anyone can be a scientist, even if they don't realize it yet! This central theme drives the new podcast—*Dope Labs*—that aims to empower listeners to discover their inner scientist and to understand experiences in daily life. It explores the science behind pop culture phenomena—everything from consumer DNA testing to why we lie. And the co-hosts will be the first to tell you: “This is *not* your typical science podcast!”

Those hosts are PhD scientists and educators **Titi Shodiya** and **Zakiya Whatley**. Shodiya was a postdoctoral researcher in the Maldonado Group at UM.

Shodiya and Whatley became friends while earning doctoral degrees at Duke University. For them, the podcast is a natural extension of their relationship. They admit, “we’ve basically been doing this podcast since 2011. We’re just now hitting ‘record.’”

While in graduate school they noticed that people outside of their scientific communities would have “a million” unanswered questions once they found out that the two were scientists.

“We realized that there was a need for scientific questions to be answered in a way that is more digestible.” *Dope Labs* provides Shodiya and Whatley with a platform to do just that, in a way that is both informative and entertaining.

They were able to make the podcast a reality when Shodiya (1 of 10 participants from 18,000 applicants) was selected to attend Spotify’s inaugural *Sound Up Bootcamp*. This week-long intensive workshop brought the diverse voices of women of color into the podcast world. Shodiya (on behalf of herself and Whatley) was one of three participants who were awarded a \$10,000 grant to fund their pilot episode. The result is a pod-



Courtesy of Titi Shodiya

Zakiya Whatley, PhD and Titi Shodiya, PhD

cast full of contagious energy that invites anyone and everyone to join in the scientific investigation of the day-to-day.

For each podcast, Shodiya and Whatley tease out the science behind a topic that is trending on Instagram, Twitter, Facebook, or the news. They structure the podcast based on their actual experience as scientists, so each episode (or Lab) is divided into three parts: the recitation, the dissection, and the conclusion.

Shodiya and Whatley hope to use *Dope Labs* to “expand people’s idea of what should be considered science, and who can be a scientist.”

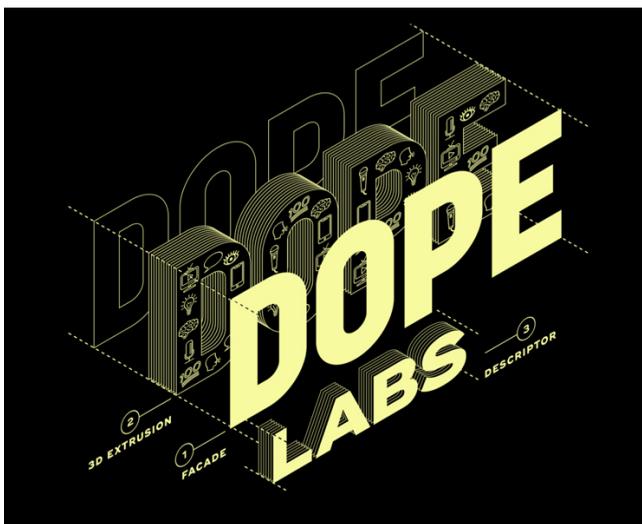
The podcast medium is perfect for them because “it’s on demand so people can listen when it’s convenient,” and because the barrier to produce it is relatively low.

Whatley and Shodiya continue to be inspired by their listeners. According to them, the most rewarding thing about the podcast is the listeners who say things like “I hate science, but I love your show” or “I don’t listen to podcasts, but I listen to your show.”

Dope Labs is now in its second season. As they would say, “welcome to the lab!”

— Emily Mueller, *SciComm Fellow*

You can listen to the old and new episodes of *Dope Labs* on the website: www.dopelabspodcast.com/listen or on Spotify, Apple, Stitcher, Radio Public, or Google. Episodes air every other week.



G. David Mendenhall (*BS 1966*) has been honored as a 50 year member of the ACS. He continues his interest in chemistry through his company Eastern Sources, Pomona, NY, where he is engaged in consulting and custom synthesis.

Andrew J. Patterson (*BS 1987*) received his MD degree from Emory University in 1991 and his PhD in Neurosciences from Stanford University in 2002. He is currently Chair of the Department of Anesthesiology at Emory, a member of the Board of Directors of the American Board of Anesthesiology and a member of the Accreditation Council for Graduate Education for Anesthesiology. A summary of his position at Emory can be found at: news.emory.edu/stories/2018/11/som_anesthesiology_chair/index.html. He writes that for more than a decade he has been involved in infrastructure development projects, clinical projects, educational projects and research projects in the rural village of Gitwe, Rwanda. During the past year the research in Gitwe has resulted in several publications. "We are always looking for intrepid collaborators and innovators interested in improving the lives of those who live in resource limited environments like Gitwe."

Rebecca (Appleman) Peebles (*PhD 2000, Kuczkowski*) is on leave from her position as Professor of Chemistry and Biochemistry at Eastern Illinois University, to join the chemistry division of the National Science Foundation in Alexandria, VA as a visiting program officer.

Edmund F. Perozzi (*Postdoctoral Ashe 1973-74*) has been honored as a 50 year member of the ACS. He recalls that he worked on arsabenzene at UM, following graduate work at the University of Illinois at Urbana-Champaign with Professor J. C. Martin. His wife, Rhoda, and he took biology and chemistry positions at Southeastern Christian College in Winchester, KY. After five years he took an industrial position with Ethyl Corporation (now Afton Chemical) where he stayed 21 years. While at Ethyl he did organic synthesis work and later worked on formulation technology for heavy duty diesel crankcase use. Following early retirement from Ethyl, Rhoda and he took teaching positions at Beijing University of Technology where they stayed four years. Currently Rhoda and he are academic editors working on papers predominantly from Chinese scientists.

Aniruddha Ray (*PhD 2013, Kopelman*) is an Assistant Professor in the Department of Physics and Astronomy and an Adjunct Faculty in the Department of Radiation and Oncology at the University of Toledo, Toledo, OH. He presented a lecture, entitled, "Unconventional techniques of imaging and microscopy for bio-medical applications," in our Department on September 19, 2019.

John Schwab (*BS 1969*) has been honored as a 50 year member of the ACS. He has been retired from his position as a Program Director for National Institute for General Medical Sciences since 2011 and has been living happily in Durham, NC for the past few years.

Thomas W. Smith (*PhD 1973, Overberger*) has been recognized as a 50 year member of the ACS. He is continuing as Professor of Chemistry and Microsystems Engineering at Rochester Institute of Technology.

Jeffery Wajda (*MS 1982*) serves as a Chief Medical Information Officer (physician IT) for the University of California, Davis.

Matt Wolf (*PhD 2018, Lehnert*) is now a postdoctoral fellow with Professor Peter Tremaine of the Department of Chemistry, University of Guelph, ONT.

We'd like to hear from you!

Send us news about yourself!

Share a memory of your time at Chemistry. Who inspired you to pursue a chemistry degree? Which faculty made a lasting impression on you? What was your favorite spot on campus? Who are you keeping in contact with from your days at University of Michigan? What have you done with your degree since leaving Ann Arbor or maybe you are still in the area?

Send a note to the Department of Chemistry
930 University Ave., Ann Arbor, MI 48109-1055

Or email the information to chem.alum@umich.edu.



Alum Sumita Mitra Inducted into National Inventors Hall of Fame

By Arti Dumbrepatil, SciComm Fellow

An inventor of a reliable, durable nanocomposite dental filling material with high cosmetic characteristics, U-M alumna Sumita Mitra was inducted into the National Inventors Hall of Fame in 2018. A Ph.D. graduate in organic/polymer chemistry from the U-M Department of Chemistry, Mitra has created many materials technologies and several products for the dental and orthodontic market, including resin-modified glass ionomers, nanocomposites, and adhesives. She has been awarded 100 US patents. Mitra was inducted into the Hall of Fame based on her research and development leading to three patents in particular. On May 14th, 2002, the U.S. Patent and Trademark Office issued U.S. Patent No. 6,387,981, titled Radiopaque Dental Materials with Nano-sized Particle, Two other patents issued to 3M: Aesthetic Dental Materials (2003,) and Clustered Dental Fillers (2004).

Recently Michigan Chemistry's Arti Dumbrepatil interviewed Dr Mitra, who explained her journey as a chemistry graduate and as a scientist. Arti hopes this will help students to prepare for their dream careers in science.

MC: Tell us a little bit about your background, before entering the PhD program at Michigan.

Dr Mitra: I was born in India and attended school and college there. I attended Presidency College in Kolkata and majored in chemistry. Thereafter, I attended University of Kolkata and obtained my Masters degree in chemistry with major in organic chemistry in 1972. I joined the PhD program at the Chemistry Department of University of Michigan in January of 1973.

MC: How was your experience during your PhD? How did the department influence your research attitude?

Dr Mitra: I value greatly my experience as a PhD student at the University of Michigan. It opened my eyes to the vast possibilities of using chemistry for creating materials and processes for the betterment of human lives. The faculty, staff and other graduate students were very supportive of me. My research advisor, Dr. Richard Lawton, provided me with the overall objectives of my PhD thesis project but gave me ample room for being creative and doing things my own way. I also had the support from him to seek out help from professors in other departments (e.g. Biochemistry) and laboratories (VA Lab). This taught me the importance of seeking collaborative help when needed and working at the interface of different disciplines to create new knowledge.

MC: What advice would you give to aspiring researchers in chemistry?

Dr Mitra: Once a person has identified a problem one has stick to it and not give up easily. Some parts of the solutions to the problem may come from people knowledgeable in other disciplines – so it is extremely important to be able to seek help outside one's immediate sphere and effectively collaborate with them. There will undoubtedly be roadblocks during the research process but one should not be afraid of taking detours – in fact this will lead to new ideas and inventions.

MC: How did the different awards especially being inducted into the hall of fame change things for you?

Dr Mitra: I am humbled and honored by the different awards and especially to have been inducted in the National Inventors Hall of Fame (NIHF). The publicity around these awards has given me the opportunity to reach out to students at school and college levels and provide encouragement to pursue STEM education and careers. Many aspiring innovators have connected with me and I hope I have helped them in their journey. Through the NIHF's Camp Invention STEM program for school students I have participated and connected with many curious students and talked to them about becoming innovative thinkers.

In Remembrance

Marion C. Francis

(wife of Prof. Emeritus Anthony Francis)

Died on May 22, 2019 in Ann Arbor at the age of 75. She is survived by Anthony and their two children.

James Jeffrey (Jeff) Friar

(MS 1967, PhD 1969, Peter Smith)

Died on October 21, 2018 at his home in the UK at the age of 81. His PhD thesis was titled, "Reactions and nature of the primary thermal decomposition product of a 5-azidotriazole." After graduation, he returned to the UK where he was employed by Her Majesty's Health and Safety Executive. He was the Head of Chemical Agents Group from 1991-95. Head of the Radiation and Power Group from 1988-91 and Head of the Specialist Asbestos and Other Dusts Section from 1984-88.

Dr. Friar is survived by his daughters Gillian Smith and Sarah Lister and grandchildren. He was predeceased by his wife Barbara.

John L. Gland (Faculty member, 1988-2009)

Died on March 2, 2019 at his home in Saline, MI at the age of 72. He was born on February 22, 1947 in Valparaiso, IN and grew up in the nearby town of Chesterton. John received a B.A. in chemistry in 1969 from Wittenberg University and his PhD (physical chemistry) from the University of California, Berkeley where he studied with Professor Gabor Somorjai.

From 1973-82, he was employed as a research chemist at the General Motors Research Laboratories. From 1982-88 he was a senior research chemist at the Exxon Research and Engineering Co. He joined the University of Michigan faculty in 1988 as professor of chemistry and professor of applied physics in LSA and professor of chemical engineering in the College of Engineering.

Professor Gland's principal research efforts were on chemical properties and reactivity of solid surfaces in reactive atmospheres. He pioneered the development of fluorescence near edge spectroscopy, a powerful method for characterizing absorbed monolayers and surface reactions in reactive atmospheres.

Professor Gland collaborated widely with both private sector and national laboratories. His research has been summarized in over 180 scientific publications. He trained more than 20 doctoral and postdoctoral students.

He chaired the Colloid and Surface Science Division of the ACS, served on the editorial advisory board of the surface science journal *Langmuir* and was awarded the Giuseppe Parravano Award in Catalysis from the Michigan Catalysis Society. He retired in 2009, becoming Professor Emeritus of Chemistry and Applied Physics.

John is survived by his wife, Dr. Christine Evans; a brother; children and grandchildren.

Beth Cook Hillig (BS 1944, PhD 1949 Fajans)

Died on December 11, 2018 at the age of 94. Growing up on a farm near Osseo, MI with no electricity or indoor plumbing, she was valedictorian at Hillsdale High School and came to UM in 1940. She received her BS in Chemistry in 1944 and continued on in research with Prof. Kasimir Fajans. In 1949 she married fellow student and lab partner William Hillig (Ph.D 1953.) After receiving her Ph.D she worked on her "Ph.T" ("Putting Hubby Through") as a rocket scientist at the Michigan Aeronautical Research Center at Willow Run. Moving with her husband to Schenectady NY, she raised three children—Christine McKeen, Kurt W. Hillig II (PhD 1981, *Kuczowski*) and Dr. Karl Hillig—and was active in the Unitarian church, on the board of Planned Parenthood, ran a small stained glass studio, grew far more vegetables than her family could eat, and always had her nose in a book when not otherwise occupied. Dr. William Hillig passed away in 2017; Dr. Beth Hillig is survived by her three children, two grandchildren, and two great-grandchildren.
—submitted by Kurt Hillig

Borek Janik (Postdoctoral, Elving 1973)

Died on June 10, 2019 at the age of 85. He had been employed by Miles Laboratories and Gelman Sciences.

Paul R. Jones (Visiting Scholar, 1995-2013)

Died in Ithaca, NY on January 3, 2019 at the age 88. Paul received his BA in chemistry from Albion College in 1952 and his PhD in organic chemistry from the University of Illinois in 1956. He then joined the department of chemistry of the University of New Hampshire.

After retirement in 1995, he and his wife Meredyth moved to Ann Arbor. The Department of Chemistry at UM offered him an office and the honorific title of Visiting Scholar. From 1995-2010, he served as editor of the *Bulletin for the History of Chemistry*. For several years Paul was the faculty advisor to the ACS student affiliate. For the occasion of the Chemistry Department sesquicentennial in 2007 he prepared a booklet of the chemistry genealogy of all of members of the faculty. Paul was a good and congenial colleague for the 17 years he spent with us.

Paul is survived by his wife, a son and two daughters, and grandchildren.

Yolonda Lucia Milagros Marino

(wife of Prof. Emeritus Joseph Marino)

Died on August 20, 2019 at the age of 76. She is survived by Joseph and their three children.

Jack Novodoff

(Director of Laboratories and Facilities of the Chemistry Department, 1985-2007)

Died on July 16, 2019 in Ann Arbor at the age of 76. Jack was born in the Bronx, NY in 1943. He received his BS in chemical engineering from Cooper Union in New York City and his PhD in 1971 from Hunter College, CUNY.

Jack worked in research at Montefiore Hospital in the Bronx, where he met his wife Dorothy (Dottie) Sibley. They were married in 1974. In 1976, Jack moved to Pomona, NJ where he became Director of Laboratories and Facilities of Chemistry at Stockton State College. In 1985 Jack moved to Ann Arbor to become Director of Laboratories and Facilities in the Department of Chemistry at the UM. He retired in 2007.

Jack's position at the UM was highly demanding since it involved planning for the new chemistry building (1988), renovation of the existing structures, and reoccupation of the increasingly complex facilities. Jack interacted with most of the graduate students and all of the faculty. Jack's good humor in the face of countless everyday problems is a local legend in the department.

Jack is survived by his wife Dorothy, daughter Debbie and son Joshua and grandchildren. He was predeceased by his daughter Jodie Ann Novodoff.

Wayne A. Pletcher *(MS 1967, PhD 1971, Wiseman)*

Died on October 20, 2018 in Solana Beach, CA at the age of 76. Wayne was born on August 24, 1942 in Crooksville, OH. He received his BS in chemistry in 1966 from Ohio University before attending UM where he worked with Professor John Wiseman designing hydrocarbons which are exceptions to Bredt's rule.

Dr. Pletcher joined the 3M Corporation in 1971 where he had a highly successful career in research, development, management and technical planning. From 1996 he was the Director of Corporate Technical Planning for the entire 3M Company.

Dr. Pletcher was a generous benefactor of the UM Chemistry Department, where he and his wife Carol (Carol, MS 1968) established the Wayne and Carol Pletcher Fellowships. They also supported scholarships at Juniata College, Ohio University, and the University of Minnesota.

Wayne is survived by his wife Carol, sons Mark and Eric, and three grandsons.



ENDOWMENTS

Endowments have been created by former students to recognize beloved professors and by alumni whose lives were transformed by their college experiences. Some aim to “pay it forward” to the next generation of scholars. Others are just grateful for their association with the department. Whatever the motivation, endowments are a legacy. They keep giving year after year as the interest earned provides current support for our missions while the principal maintains a solid foundation for the future. Here are some that received funding infusions this year.

Richard J. Cook and Teresa Lahti Undergraduate Research Fellowship

Hillig Family Graduate Student Endowed Fellowship

Masato Koreeda Research Fund

Robert Kuczkowski Endowed Faculty Research Fund

May-Walt Chemistry Summer Research Fellowship Fund

Wayne A. and Carol H. Pletcher Fellowship

Robert W. Parry Fellowship

Kathleen Haller Ryan Scholarship Fund

Peter A. S. Smith Fellowship

Robert C. Taylor Fund

*To explore giving opportunities, please contact Robert Kennedy, Chemistry Chair.
chem-chair@umich.edu
phone: 734-647-2125*

General Support

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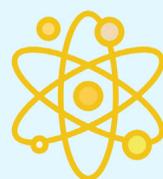
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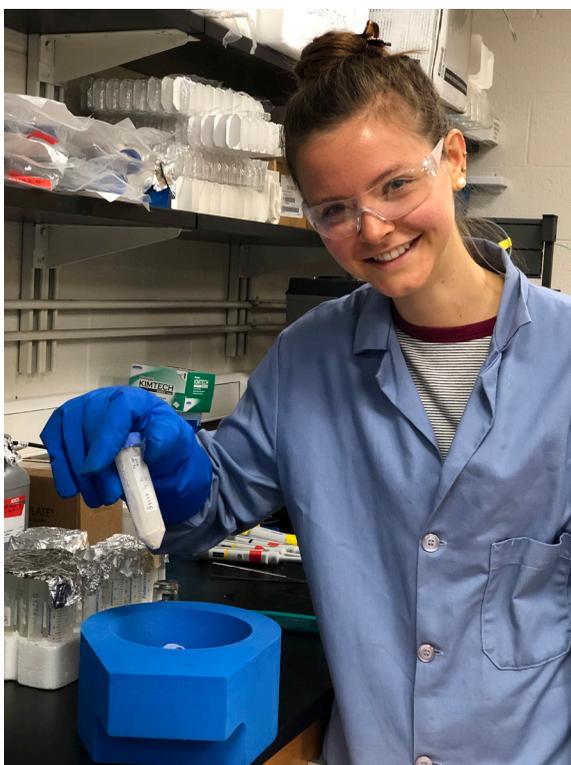
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