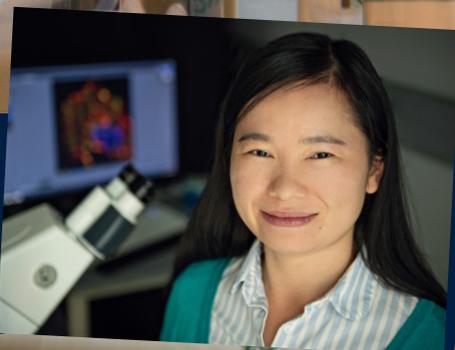




Chemistry News

Fall 2018



M Welcome from the Chair

Alumni and Friends—

Fall, and the start of a new academic year, brings renewed energy to campus that is contagious. Our teaching labs are running at capacity and some 280 graduate students and 100 undergraduates in our research labs are enriching their education with research experiences—research and education being intertwined in this department.

This year marks the 30th anniversary of our Research for Undergraduates summer program as well as the University's Undergraduate Research Opportunity Program. Hundreds of undergraduates have learned the value of research through these programs led by our faculty and graduate students.

Over the spring and summer, we had occasion to hear from some alumni who exemplify the connection between teaching and research, many having been launched in their own careers through a research experience. **Seble Wagaw** (*BS 1994*), who grew up in Ann Arbor and is now a senior scientist at AbbVie, inspired our undergraduates with her address at our Chemistry Commencement ceremony in April. **David Walt** (*BS 1974*) spoke at the Rackham Graduate Commencement and received an UM honorary degree. With his wife, Michele May, they support our summer research experiences for undergraduates among other contributions to UM. Recently, **Richard Cook** (*BS 1969*) and Terri Lahti met with some undergraduates supported by their generous endowment. As part of the Karle Symposium in August, PPG scientist **Steven Zawacky** (*BS 1973*) was surprised to find himself giving a talk in the same lecture hall where he had lessons from now Emeritus Professor Arthur Ashe (who was in the audience.)

Many more alums joined us for our annual pre-Karle Alumni event that provides an opportunity to reconnect with old lab mates and mentors and time to interact with our current students. The current students find it invaluable to connect with alumni and learn from their experiences. In this issue, **Amine Taleb-Bendiab** (*PhD 1991, Kuczkowski*) tells you just how enjoyable that was!

Tell us about your relationship with Michigan Chemistry. If you were a student here, where did you spend your time in the building? Who was your favorite or

most memorable professor? If you are the parent of a chemistry student, has your student shared special memories? If you are a friend of the department whether you have a Michigan degree or not, we value your engagement. How would you want to make an impact on our department today? We are grateful for your financial support and we welcome your involvement.

Pencil in early August for our pre-Karle alumni event and Karle Symposium. Both events are growing and engaging more and more alumni and students.

Through this newsletter, you can read about some of the innovative work and recognition our faculty and students have received, as well as catch up with other alums and friends. Some of the articles are written by our Science Communications Fellows—graduate students with an interest in science communication who receive support and editorial advice for their work. They have contributed some wonderful profiles of noteworthy faculty and alumni and new developments in the department. Look for their bylines at the end of each article. Longer versions appear on our website.

Between newsletters, follow our accomplishments on our website. Now 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

Web Address: lsa.umich.edu/chem

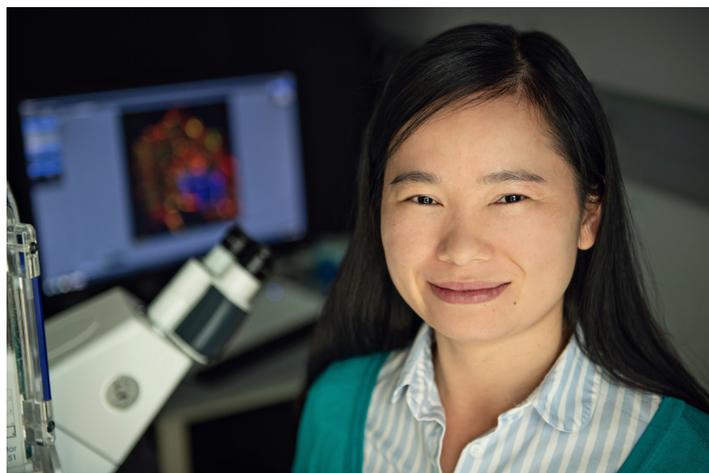
Twitter: @MichiganChem

Instagram: www.instagram.com/michiganchem/

LinkedIn: www.linkedin.com/showcase/michiganchem/

Email: chem.alum@umich.edu





Meet New Assistant Professor Wenjing Wang

To truly understand how our brains regulate our behaviors, neuroscientists need genetic and molecular access to clear snapshots not just of the entire brain, but of specific neurons firing during a behavior.

“The problem is, there really is no perfect tool that allows us to interrogate those specific neurons that are firing at a given time,” says Wenjing Wang, Ph.D., It’s a problem that Wang will tackle with her research program at the UM.

In summer 2018, she began a joint appointment at the Life Sciences Institute, where her lab is located, and in the Department of Chemistry.

Wang is using her extensive protein engineering expertise to create tools that will use different light colors to ‘tag’ neurons firing in mice during a given activity. These tools help advance neuroscience research by allowing investigators to identify neurons that are active during a defined window of time. For example, researchers could label neurons activated by fear with one color, and label neurons activated by the reduction of fear using another color.

“Then we can actually study how the neurons differ at the molecular level and determine how the neuronal projections to different regions of the brain result in different valence,” explains Wang. These new tools will also have utility beyond neuroscience, enabling researchers to investigate the detailed ways in which other cell types, such as secretory endocrine cells, regulate activities like metabolism — and how disruptions in those pathways lead to disease.

The work builds upon a tool that Wang developed as a postdoc in the lab of Stanford University’s Alice Ting. Working with mouse models, Wang engineered a protein-based tool called FLARE that was able to tag neurons firing during a defined time period. Wang is eager to further improve the technique.

In other work to improve research techniques for studying protein functions, Wang plans to develop regulatable nanobodies that can perturb specific protein molecules within cells.

Wang earned her PhD in Chemistry at Michigan State University with Babak Borhan and a BS degree from Xiamen University, China.

—Emily Kagey, *Life Sciences Institute*

Andrew Ault has received a 2018 A.P. Sloan Fellowship.

Ryan Bailey has won the 2018 Benedetti-Plicher Award of the Microchemical Society. He received the award at the Eastern Analytical Symposium in November.

Anna Mapp has received the LSA Imes and Moore Mentorship Award. This award is presented to faculty members who have made exceptional contributions towards recruiting and mentoring graduate students in the sciences from disadvantaged and nontraditional backgrounds.

Neil Marsh has been selected as a Fellow of the American Association for the Advancement of Science. He has also been elected as Chairman of the Faculty Senate at UM.

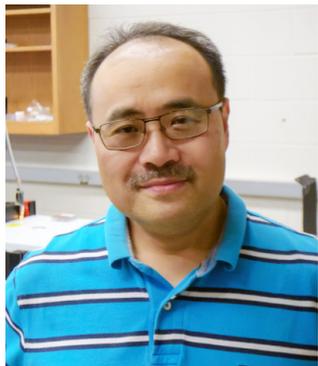
Anne McNeil has been selected as a Fellow of the American Association for the Advancement of Science.

John Montgomery has received an Individual Award for Outstanding Contributions to Undergraduate Education.

Kerri Pratt and **Ginger Shultz** received NSF funding to incorporate research on the changing climate in science courses at Ilisagvik College, in collaboration

Department of Chemistry Newsletter

Chair: Robert Kennedy
Editors: Arthur J. Ashe, III
Suzanne Tainter
Alumni News: Arthur J. Ashe, III



Zhan Chen and Ayyalusamy (Rams) Ramamoorthy

Chen and Ramamoorthy elected Fellows of the Royal Society of Chemistry

Michigan Chemistry professors **Zhan Chen** and **Ayyalusamy (Rams) Ramamoorthy** have recently been elected as Fellows of the Royal Society of Chemistry (RSC)—the top professional organization of chemical scientists in the United Kingdom with over 54,000 members and publisher of several international journals.

Chen studies molecular level, in-situ interfaces using non-linear spectroscopy to look directly at buried interfaces that cannot be studied otherwise. Examples are anti-fouling polymers for coatings for marine ships; microelectronic units; packaging; biomaterials and biosensing.

Ramamoorthy applies solid-state NMR spectroscopy to biology and materials. His group uses basic chemistry and biophysics to develop methodologies to address important biological and medical questions. Specifically, he has developed novel NMR techniques and studied membrane proteins, amyloid proteins, antimicrobial peptides, and bone at the atomic level.

Both Chen and Ramamoorthy were delighted and humbled to learn of this recognition.

On what it means to be named an RSC Fellow, Chen said, “It encourages us to do more research in chemistry and science. Structure-function relationships are important but hard to study complicated surfaces and interfaces. Students learn fundamental methods, rigorous training and how to think of real-world applications.”

Ramamoorthy added, “While our research is now focused on multidisciplinary problems, keeping the core chemist identity is important as chemistry is a fascinating discipline. It enables me to interact with more chemists to synthesize novel compounds/polymers and develop membrane mimetics for our research in the biophysical area, and also contribute more significantly to international chemistry.”

— **Isabel Colon-Bernal**



Kerri Pratt



Corinna Schindler

with the local community and Ilisaġvik’s science faculty member Professor Linda Nicholas-Figueroa. Ilisaġvik College, the only tribal college in Alaska, is located in Utqiagvik, the northernmost point in the Alaskan Arctic.

Kerri Pratt has received a DOE Early Career Award as well as the 2018 Eastern Analytical Symposium Young Investigator Award.

Corinna Schindler has received a 2018 Amgen Young Investigator Award, which recognizes her important contributions in organic and pharmaceutical chemistry. She has also received a 2018 Dreyfus Teacher-Scholar Award. The Dreyfus award is made nationally to younger faculty who have created an outstanding independent body of scholarship and are deeply committed to education.



Kristina Håkansson and Brandon Ruotolo have received the Aligent Thought Leader Award. It is the highest honor that Aligent gives to the external community and recognizes their leadership in protein analysis. The award carries with it a substantial grant of research funds and instrumentation.



Bart Bartlett



Stephen Maldonado



Brandon Ruotolo



Dominica Zgid



Paul Zimmerman

Promotions

Three faculty have been promoted to Professor: **Bart Bartlett**, **Stephen Maldonado**, and **Brandon Ruotolo**.

Stephen Maldonado also received the 2018 John Dewey Award and an Individual Award for Outstanding Contributions to Undergraduate Education.

Dominika Zgid was selected to be a Dow Corning Assistant Professor. She has also been promoted to Associate Professor with Tenure. She received the Class of 1923 Memorial Teaching Award for her outstanding teaching.

Paul Zimmerman was selected to be the William Roush Assistant Professor. He has also been promoted to Associate Professor with Tenure.

News of our Emeritus Professors

S. M. Blinder continues to work full-time as a telecommuting scientific consultant. He is the editor of a collection of essays on, "Mathematical Physics in Theoretical Chemistry," in press 2018, Elsevier.

David Curtis and his wife Audrey have moved to a retirement community in Mount Dora, FL. They have traveled extensively in the past year.

Carol Fierke has been selected to receive the Movie A. Fersht Award from Sigma Xi for notable contributions to the motivation and encouragement of research through education.

Coppola Honored with Distinguished Mentor Award



When Professor Brian Coppola was still a graduate student at the University of Wisconsin-Madison, he realized that there weren't many resources for PhD students who wanted professional development for their future careers.

"I got particularly interested in what was not going on for professional development. There was really nothing, except for 'get in the lab and get your work done,'" he said. "While I was still at Wisconsin, I happened to get involved with a student in the Education Department on a side project, and the first notion that occurred to me was that we need to spend more time doing things for people who were thinking about academic careers."

After becoming a Professor of Chemistry at the University of Michigan, Prof. Coppola had the opportunity to bring these experiences to the department in order to put ideas into practice. His commitment to preparing students to discover the workforce began within a few years of his work in the Chemistry Department, and led him to start two programs known as CSIE|UM and CALC|UM -- pronounced like the periodic elements Cesium and Calcium, respectively. These programs help students find exposure to and professional development for post-graduate school careers.

Coppola's work advising and mentoring students through these programs has earned him Rackham's Distinguished Graduate Mentor Award, which honors five professors out of 180 departments. The award winners must be "outstanding mentors of doctoral students, who support their intellectual, creative, scholarly, and professional growth and foster a culture of intellectual engagement in which they thrive."

Coppola continued on page 6

Coppola continued

When Coppola came to Michigan he started to put some early versions of things like 'CSIE|UM' in place. "We decided to make it real and a department institution."

The names of the groups were inspired by a graduate student who said "Why don't we just add a 'University of Michigan' at the end? We have lots of elements that have UM as the last two letters."

The elemental naming system stuck, and **Chemical Sciences at the Interface of Education | University of Michigan** was born, with the goal of preparing students for academic positions. Several years later, **CALC|UM** (Chemistry Aligned with Life & Career | University of Michigan) was formed, which exposes students to careers in industry, government, policy, and science writing and others outside of the academy. These two programs bring in speakers and workshop leaders. Additionally, they feature visits to academic and industry sites.

Recently, Coppola named an alumni organizing committee after another element: **Alumni Networking at the University of Michigan** or Alum|NUM. It is now the official name of an event, started several years ago in coordination with the Karle Symposium, to bring alumni to campus. Michigan Chemistry's large alumni network helps students find connections with desired career paths. [Read more on page 10.]

"I feel terrific that the department nominated me for the Excellence in Graduate Mentoring Award because it recognizes a nontraditional idea about graduate mentoring. It was all about these programs, and that the mentoring is an extended institutional way of encouragement that people can support," Coppola says.

When giving advice to others who want to work on their mentoring, he points to what he calls his management style. "It's very simple," he says. "Encourage people. Support people. Find out what they need. Then, get out of their way. Let them do their work. That means: have the dialogue, and let's engage in what decisions you want to make."

"This profession is quite a responsibility and a privilege," he adds. "All of the different parts—from graduate mentoring, to running CSIE|UM and CALC|UM, to being in the classroom—these are all teaching," he explains. Coppola says the "pay-it-forward" aspect inherent in teaching is perhaps his favorite part. "I get to be a little part of chemistry for a while and hope that it's shaped a bit better because I was around."

— **Taylor Soucy**

A longer version of this profile appears on our website.



Nicolai Lehnert with the 2016 D-RISE Group

Nicolai Lehnert Recognized for Diversity Service

Nicolai Lehnert, professor of chemistry and biophysics, is a 2018 Harold R. Johnson Diversity Service Award recipient for his efforts to recruit students from historically underrepresented and underserved populations to pursue studies in science, technology, engineering and math.

"It is nice to get recognition for all the hard work that was required to reach here," Lehnert says. "This award was possible due to concerted efforts of the departmental staff whose help has been crucial."

Lehnert created and leads the *UM Detroit Research Internship Summer Experience (D-RISE)* program which brings students from Detroit's Cass Technical High School to the university to live on campus for seven weeks over the summer for a research internship in the department. The vision of D-RISE is to inspire students about science and help them understand that STEM fields are not limited to medicine and engineering.

"The most important hallmark of this program is that the high school students do not just observe their graduate student or postdoctoral mentors in the laboratory, but they perform full-time, hands-on research for 40 hours per week on projects directly related to that research," Lehnert says.

Since the program's inception in 2014, 85 percent of participants from the first four years are now attending UM, with the others at Harvard University, Stanford and Wayne State University.

His work to increase inclusivity across the university goes beyond D-RISE. [Read more on our website.]

Lehnert is optimistic about the effects programs like these might have on society: "Success on smaller levels will bring about a big change in the future."

— **Arti Dumbrepatil**

A longer version of this profile is at: Isa.umich.edu/chem

MEET MICHIGAN'S FIRST CHEMISTRY EDUCATION ASSISTANT PROFESSOR

Ginger Shultz didn't always think that she was going to be a professor of chemistry education.

"When I finished graduate school, I didn't see myself being a PI," Shultz said. "I knew that I wanted to be somewhere where teaching was the focus, but thought I would be a lecturer or a PI at a small college."

As she was finishing her PhD in polymer chemistry at the University of Oregon, she began searching for her next step. UM's Brian Coppola suggested a teaching postdoc with him. Until then, she had never even considered chemistry education as an option.

"As I started to do education research... the research ideas would bubble up and I would get excited about stuff. Because I am really interested in teaching, there was a natural curiosity about education research and it fed into what I wanted to study."

Her research during her teaching postdoc was extremely distinct from her PhD work. "In every way, education research is different from polymer chemistry. Some people transition from one field to another when they go into their postdocs and that just means a longer postdoc, and that's what happened. I almost feel like I did a second PhD."

She researched how students interpret data and how students write to learn. Her current lab continues to focus on these questions and expands into collaborations with other groups.

Teaching is different from content knowledge.

You can be an expert in organic chemistry but maybe not an expert in teaching organic chemistry.—Ginger Shultz

A newer research question that Dr. Shultz's lab is focused on is how graduate students go from being students to teachers. "I have graduate students in my lab observing graduate student instructors (GSIs) and interviewing them, but also developing test measures for this knowledge for teaching." Teaching, she explained, "is different from content knowledge. You can be an expert in organic chemistry but maybe not an expert in teaching organic chemistry."

In addition to analyzing data from surveys and interview, Shultz and her lab use technology such as cameras that attach to a GSI's lab goggles. "We're seeing the GSI's viewpoint



Ginger Shultz. Her new class on chemistry education is being taught for the first time this fall.

because they are wearing the camera, and we can see what they are looking at, what they are paying attention to, what they notice," she explained. The research question behind collecting that data is: "what does that say about how they think about teaching?"

In addition to her research duties, Dr. Shultz has taught organic chemistry lectures and labs during her time as a faculty member. This fall, she started a new class for graduate students that focuses on chemistry education. She is excited to interact with students who love their research fields in organic or analytical chemistry but who are interested in teaching as well. She explained that starting up a new course in chemistry education is "daunting, but super fun."

The new class, titled *Chemistry Education Research and Practice*, will "prepare future secondary and post-secondary chemistry educators to translate chemistry education research into effective classroom practice," according to the official course description.

Students will evaluate literature from top chemistry and science education journals, prepare and test their own assessments, and practice student-centered classroom techniques. Also, the class will give students the opportunity to develop their own teaching style while learning about issues of diversity and equity in the classroom.

"All of these pieces of chemistry and education have come together, and I feel super lucky to be doing what I'm doing," Shultz said. "I'm excited to wake up and come in to work, and how many people get to say that?"

For graduate or undergraduate students who might be interested in going into education research, she emphasizes that anyone can enter into the world of science education at any point in their career. She advises students that "you don't have to dive into the deep end of the pool... just dip your toes into the world of science education. And don't wait."

—Taylor Soucy

UM scientists improve synthesis of PET imaging molecules

In the daily grind of scientific research, it can sometimes be hard for researchers to see the meaning of their work outside of the lab. Not so for graduate student **Katarina Makaravage** of Melanie Sanford’s group. She has been able to see her work change how medicines are made. Working with Dr. Allen Brooks, who is part of UM Radiology Professor Peter Scott’s lab, Makaravage developed a new method to produce the radiotracers needed for PET imaging. Their method is already being used to help develop potential medicines.



Allan Brooks and Katarina Makaravage with the robotic system at the PET center for making tracers
Photo courtesy of Katarina Makaravage

Positron Emission Tomography (PET) is a medical imaging technique that involves giving patients a small dose of a radioactive molecule. When this radiotracer decays, it emits a positron, which quickly collides with an electron to emit two gamma rays in opposite directions. The gamma rays are detected simultaneously, allowing the radiologist to pinpoint exactly where the radiotracer was located in the patient’s tissue.

Depending on the type of PET molecule used, doctors can determine different types of three-dimensional functional information, including whether a tumor is cancerous. PET is also used to decide whether a drug being developed in the lab will work in the intended part of the body—knowledge that is key to advancing a potential new medicine.

But it can be nearly impossible to make certain PET molecules because there is such a small amount—less than one nanomole—of the radioactive isotope to work with. In 2014, when former Sanford lab member Dr. Naoko Ichiishi approached Scott with highly efficient fluorination methods, Scott was excited to join forces and suggested Ichiishi work with Brooks.

“Fluorine-18 has essentially optimal properties compared to other PET isotopes,” Brooks explains. Image resolution of around 1 mm is possible compared with 4-5 mm for the other isotopes. “Fluorine is also usually metabolically stable.” This means the PET molecule won’t degrade in the body. Radioactive fluorine-18, usually written ^{18}F , also has highly efficient positron decay and an ideal two-hour half-life, which makes it easier to use in humans or in animal testing.

Taking advantage of the optimal properties of ^{18}F meant facing notoriously difficult fluorine chemistry though. That’s where Katarina Makaravage came in. Working between her fume hood in Chemistry and the PET Center in Radiology, Makaravage developed a new method to add the radioactive ^{18}F label onto molecular tracers of interest.

This new method uses copper to catalyze the addition of ^{18}F to an aromatic tin starting material, one commonly used to generate PET tracers. Not only does the copper-mediated synthesis allow a greater variety of tracers to be made, but it is also significantly faster than the older palladium-catalyzed method. This makes the production of a dose feasible given the two-hour half life.

Makaravage’s methods can be used on a wide range of compounds, and perhaps most importantly, they still work when the synthesis is moved to a robotic system, tucked away behind leaded glass. “While the patient gets a very small amount of radiation at the end of the day, the technician producing the PET tracers would be exposed to 10-100 times that amount without automation,” explains Makaravage. “Automation also allows for easy reproducibility.”

The radiofluorination collaboration between Melanie Sanford’s lab in Chemistry and Peter Scott’s lab in Radiology has led to several highly-cited publications and an NIH grant. The collaboration will continue to yield improved ^{18}F methods to aid drug discovery and diagnostic PET imaging.

Makaravage says one of the most exciting moments in her research was “when I found out multiple pharmaceutical companies were using my method as the go-to and using it for clinical trials. It was even FDA approved!”

—Sarah Haynes

Michigan Chemistry acquires a new instrument to profile proteins and metabolites

There's a new mass spectrometer in town, and it's being used by researchers in the Chemistry Department to study the molecular mechanisms of disease.

With a \$1.1 million grant from the National Institutes of Health, Chemistry purchased an Orbitrap Fusion Lumos mass spectrometer—the fastest, most sensitive mass spectrometer of its kind. Housed in the department's Mass Spectrometry Facility, the instrument is tailor-made for measuring chemicals to uncover the inner workings of cells.

Proteins perform many cell functions. Metabolites, the small chemical products of life-sustaining reactions, can give an up-to-the-minute picture of a cell. Changes in the abundance or activity of proteins and metabolites alter biological function so scientists need to be able to detect such variations.

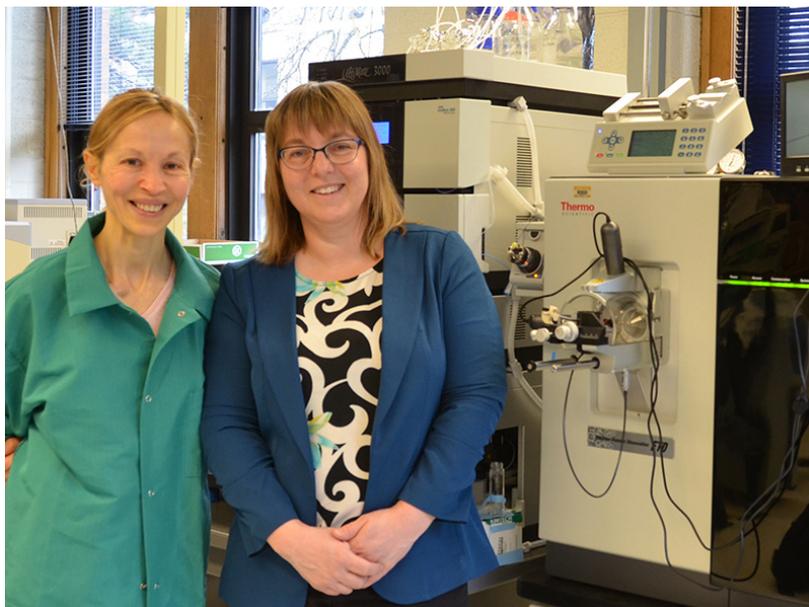
Researchers conduct proteomics experiments to obtain a snapshot of the protein landscape and help pinpoint disease-related changes. Proteins from cultured cells or tissue samples are typically cut into pieces, or digested, with an enzyme. The pieces are then sprayed into the mass spectrometer, where they are precisely weighed. By measuring the protein pieces, researchers can identify the protein and its abundance.

However, a major obstacle to getting an accurate picture of proteins or metabolites is their sheer complexity. The human body makes over 20,000 different proteins and more than 100,000 metabolites. Adding to the challenge, some of these are highly abundant while others are extremely scarce. To measure most of them in a reasonable amount of time, a mass spectrometer must be extraordinarily sensitive and tremendously fast.

Users will also benefit from the prowess of Dr. **Gabriela Grigorean**, the Senior Research Lab Specialist who manages the instrument. Dr. Grigorean was a training instructor for Orbitrap systems with Thermo Fisher Scientific. She has significant expertise in both proteomics and metabolomics and previously worked with Chemistry Professor **Kristina Håkansson**. Håkansson is the primary investigator on the grant that brought the Orbitrap to central campus.

"We are very excited to receive support from the NIH Office of Research Infrastructure Programs, along with cost sharing from various units at UM to cover service contracts and the addition of a PhD-level staff member to our mass spectrometry facility," said Professor Håkansson. "We are working to further expand our capabilities and build state-of-the-art infrastructure to serve a wide range of applications and faculty research areas, both in the department and in the broader UM community."

Major users of the Orbitrap mass spectrometer include the Andrews, Håkansson, Kennedy, Martin, Ruotolo and Sherman labs. Other users include Chemistry faculty Mapp and Marsh along with



Dr. Gabriela Grigorean (left) and Professor Kristina Håkansson (right) with the Orbitrap Fusion Lumos

researchers in the College of Pharmacy, the Life Sciences Institute, and Molecular, Cellular and Developmental Biology.

The Orbitrap Lumos system is available to help conduct proteomics experiments by University of Michigan researchers outside the Department of Chemistry as well as those unaffiliated with the University. For more information, please contact Gabriela Grigorean at elagrig@umich.edu.

—**Sarah Haynes**

Don't miss these other articles by our Communications Fellows on our website

MichiganChem boosts facility for atomic resolution—powerful NMR spectrometer installed

Building Motors to Drive Nanorobots

Energy Research And Education Fuel McCrory CAREER Award

Shedding New Light on Photosynthetic Pigments

Meet Professor Bunsen Burns

—the alter ego of UM undergraduate Tyler Lopez, the professor shares chemistry with a wide audience through wacky but memorable YouTube videos.



Alumni panelists: Prof. Joseph Furgal of Bowling Green State University, Prof. Doug Genna of Youngstown State University, Prof. Kate Plass of Franklin and Marshall College, Dr. Liz Swift of AbbVie, Dr. Ping Guo of Micromeritics, and Dr. Onas Bolton of Octet Scientific.

Alumni Connect with Students At Annual Reception



Mrs. Francoise Tamres with Joseph Meadows (Kubarych Group), who received a Milton Tamres Outstanding Teaching Award. Her late husband, Emeritus Professor Milton Tamres, established this award. She continues its support.



Now with a new identity—Alum|NUM (Alumni Networking at UM)—our annual networking event is growing every year. This year the event drew more than 20 alumni who shared their expertise with graduate students and postdoctoral fellows on August 2, 2018, the day before the Department’s Karle Symposium. More than 100 graduate students participated.

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) with the Chemistry Graduate Student Council.

The day began with two concurrent alumni panels, one detailing industrial careers and the other focussed on academic positions. A mock speed interviewing session and resume workshop provided experience and feedback on job interviewing skills for graduate students.

A reception rounded out the event and included the Graduate Student Awards Ceremony, which recognizes students for distinguished teaching and research. Find a complete list of the awards and recipients on the Chemistry website.

Alumnus Amine Taleb-Bendiab recounts his visit on page 18.

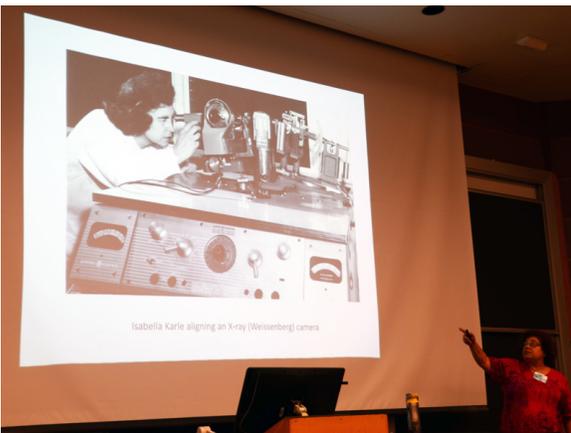
Join us for the 2019 Alum|NUM & Karle Symposium!

Learn more at these websites:
sites.lsa.umich.edu/karle-symposium/
sites.lsa.umich.edu/alum-num/

A mock speed interviewing session



At poster sessions throughout the day, 150 students, including high school and undergraduates working on projects during the summer, shared their work.



Dr. Louise Karle Hanson, who is also a UM Chemistry alum (BS 1967, MS 1969), recapped the remarkable careers of her father and mother, sharing personal stories about how Isabella and Jerome helped develop X-ray crystallography as one of the most widely-used methods to determine molecular structure.



Dr. Malika Jeffries-EL

Karle Symposium Showcases MichiganChem Research

With poster sessions, student talks, plenary talks, and a special presentation on the namesakes for the event, this year's Karle Symposium on August 3 provided a comprehensive look at the breadth and depth of Michigan Chemistry research and a nod to the impact of previous graduate students.

This annual, one-day event is organized by Chemistry graduate students and provides a unique venue for showcasing their research to the entire department as well as fostering new collaborations. Since 2016, this event has been known as the Karle Symposium in honor of alumni Drs. Isabella and Jerome Karle.

The Karle Plenary Lectures were delivered by scientists from Dow Chemical Company and PPG, the symposium's industrial sponsors. These talks focused on the chemistry of coatings. Jodi Mecca, Senior Research Scientist from Dow Chemical Company, explained how Dow developed a new high throughput technique to better understand coating properties and to improve the component materials in their coatings. Steven Zawacky, Associate Fellow at PPG, talked about factors that drive innovation, using the development of an electro-coating catalyst as an example. Dr. Zawacky (*BS 1973*) noted that Professor Emeritus Arthur Ashe once taught him organic chemistry in the same room where Zawacky was now delivering his Karle talk. "When I sat in this room and listened to the lectures, I never thought I would ever be at the front of the room," he said. "I really appreciate the chance to do it and a chance to talk to people that are just starting in their careers."

Malika Jeffries-EL, associate professor of chemistry at Boston University, delivered the keynote lecture on her work with organic semiconductors at the forefront of OLEDs and organic solar panels.

Ten graduate students were also selected to give talks. Dow Chemical Company and PPG provided travel awards for outstanding presentations.

"The 2018 Karle Symposium organizing committee did an incredible job incorporating student presentations, alumni engagement, industry talks, and interesting academic discoveries into a celebration of research and shared connections," said Robert Kennedy, chair of the Department of Chemistry. "On behalf of the Department, thank you for the hard work. Also thank you to the sponsors of this year's Karle Symposium: The Dow Chemical Company, PPG, Rackham Graduate School, Michigan Chemistry and the Chemistry Graduate Student Council."



2018 Chemistry Commencement



Professor John Wolfe, associate chair for undergraduate education, with Seble Wagaw, speaker at the Chemistry Commencement Ceremony at the Michigan Theater on April 26, 2018. Wagaw is a 1994 graduate of UM Chemistry, and is now Director of Pharmaceutical Development at AbbVie. She shared her career arc and advice she received from her mentors with the more than 200 graduating seniors and their families at this popular event.

A “maizing’ Undergrads Recognized



Just three of the students recognized at our award ceremony: Luke Higgins, Suzie Kim, Jeremy Tervo

Each April the Chemistry Department celebrates the outstanding work of our undergraduate students and their contributions to research and courses over the year. Read about these students and the awards at: <http://myumi.ch/6v5Zv>

PhDs Awarded

December 2017

Student

Alan Chien
Characterizing the Electronic Structure of Excited States, with Applications to Singlet Fission

Matthew Gunsch
Online Single Particle Chemical Characterization of Aerosol Populations in Remote Environments

Rosina Ho Wu
Synthesis and Ultrafast Optical Characterization of Solid State and Functional Metal Nanoclusters

Alexei Kananenka
Development and application of finite-temperature Green's function methods in quantum chemistry

Jean Marie Lodge
Discovery of small molecules to dissect the individual roles of activator-coactivator complexes

Phillip McClory
Optimization of Acidic Post-translational Modification Detection and Natural Product Biosynthetic Enzyme Analysis with Dual Polarity nLC/FT-ICR Mass Spectrometry

Kyle Andrew McDonald
Fundamental Studies on Metal-Organic Framework Functionalization and Reactivity

Nomaan Rezayee
Strategies Towards the Hydrogenation of Carbon Dioxide and Carboxylic Acid Derivatives

Committee Chair

Paul Zimmerman

Kerri Pratt

Theodore Goodson III

Dominika Zgid

Anna Mapp

Kicki Hakansson

Adam Matzger

Melanie Sanford

May 2018

Amy L Bondy
Single Particle Microscopic and Spectroscopic Chemical Analysis of Primary and Secondary Aerosols

James Roderick Bour
Accessibility, Reactivity, and Fluoroalkylation Reactions of High-Oxidation-State Organonickel Complexes

Kyoung Ha Cha
Advances in Glucose Sensing Techniques: Novel Non-Invasive and Continuous Electrochemical Glucose Monitoring Systems

Junjie Chen
Aggregation and Dendrimer Mediated Secondary Binding towards Folate Binding Protein & Fatigue Failure Mechanism of Anterior Cruciate Ligament Fracture

Rebecca Lynn Craig
Applications of Raman Microspectroscopy to the Study of Atmospheric Aerosol Particles

Eric Dahl
Applications of Sterically Protected Hydrogen Bond Donors in the Secondary Coordination Sphere

Andrew Ault

Melanie Sanford

Mark Meyerhoff

Mark Banaszak Holl

Andrew Ault

Nathaniel Szymczak

Joshua Thomas Damron Ayyalusamy Ramamoorthy
Insights into Crystalline and Materials Solids from Advances in Magic Angle Spinning NMR

Joshua James Demuth Stephen Maldonado
Low temperature electrodeposition of epitaxial films of covalent semiconductors

Samuel Logan Esarey Bart Bartlett
Probing the Chemical Stability & Adsorption Properties of Molecule|Metal Oxide Architectures under Conditions of Photoelectrochemical Water Oxidation

Kyle Louis Ferguson E. Neil M. Marsh
*Probing the Non-Oxidative Decarboxylation Mechanism of Ferulic Acid Decarboxylase from *Saccharomyces cerevisiae**

Jacob Geri Nathaniel Szymczak
Bond Activation by Unconventional Lewis Pairs

Michael Gilbert John Montgomery
Development of Biocatalytic Strategies for the Directed Oxidation of Small Molecule and Macrocyclic Substrates

Ye Guan Qiong Yang
A Robust and Tunable Mitotic Oscillator in Artificial Cells

Kevin M Ileka Kicki Hakansson
Structural Characterization of Ribonucleic Acids and Their Complexes by Negative-ion Mode Mass Spectrometry

Kortney M Kersten Adam Matzger
Pharmaceutical Hydrates: Prevalence and Properties

Chang Heon Lee Raoul Kopelman
Utilization of Nanoparticles for Photoacoustic Chemical Imaging

Melissa Lee Melanie Sanford
Remote C-H Functionalization of Aliphatic Amines

Jialiu Ma Adam Matzger
Rational Design and Activation of Metal-organic Frameworks Towards Targeted Structures and Porosity

Paige Ann Malec Robert Kennedy
Derivatization Methods for Improved Metabolome Analysis by LC-MS/MS

Thitaphat Ngernsutivorakul Robert Kennedy
Microfabricated analytical systems for monitoring brain chemistry at high spatiotemporal resolution

Ian Matthew Pendleton Paul Zimmerman & Melanie Sanford
Computational Chemistry Studies of Organometallic Energy Landscapes

Danielle Christine Samblanet Melanie Sanford
Homogeneous, Heterogeneous, and Heterogenized-Homogeneous Catalytic Hydrogenation for the Cascade Conversion of Carbon Dioxide to Methanol

Jessica Stachowski John Montgomery
Investigation of Cytochrome P450 Enzymes as Biocatalysts for Multifunctional C-H Oxidation; and a Case Study of a Graduate/ Undergraduate Laboratory Exchange Program

Rachel Leah Wallace Mark Banaszak Holl
Folate Binding Protein as a Therapeutic Natural Nanotechnology

Minyu Xiao Zhan Chen
Elucidating Buried Interfacial Structures of Complex Materials Using Advanced Spectroscopic and Microscopic Techniques

August 2018

Jake Boissonnault Adam Matzger
Functionality and Functionalization of Metal-Organic Frameworks

Yvonne Camille Deporre Corinna Schindler
Quaternary carbon synthesis via Lewis base reductive aldol: calculations and application towards isopalhinine A

Peter Eckert Kevin Kubarych
Ultrafast Vibrational Dynamics of Biomimetic Catalysts

Thomas Hopkins Raoul Kopelman
Advancements in Photodynamic Therapy Designs

Bryant James Melanie Sanford
Applications of Metal-Organic Frameworks in Catalysis and Separations

Hilary Kerchner John Montgomery
Advances Towards Regioselective Synthesis of Secondary Alkylboranes and 1,2-cis Glycosides

Jacob Lutter Vince Pecoraro
Refining Lanthanide Luminescence in Metallacrown Complexes by Systematic Alterations to Aromatic Hydroximate Antenna Ligands

Nathaniel May Kerri Pratt
Investigations of Aerosol Production from Wave-breaking & Integration of Environmental Chemistry Research in the Classroom

Timothy Monos Corey Stephenson
New Photochemical Methods for Arene Functionalization

Alex J. Nett John Montgomery
Development and Mechanistic Implications of Nickel Pre-Catalysts for Organic Synthesis

Tay (Jia-Hui) Rosenthal Pavel Nagorny
Chiral Bronsted Acid: Innovations and Application to Site-Selective Glycosylations

Kendra Souther Anne McNeil
Advancing Conjugated Polymer Synthesis through Catalyst Design

Yuwei Tian Brandon Ruotolo
Developing Ion Mobility-Mass Spectrometry for Biopharmaceutical Characterization

Nathan Wesley Ulrich Zhan Chen
Spectroscopic Studies on the Molecular Structural Changes of Polymer Substrates and Polymer Adhesives Relevant to the Microelectronics Industry

Alicia Welden Dominika Zgid
Finite-temperature Green's Function Methods for ab-initio Quantum Chemistry: Thermodynamics, Spectra, and Quantum Embedding

Eric Wiensch John Montgomery
Silyloxyarenes as C-O Electrophilic Coupling Partners Enabled by Nickel Catalysis

Matthew Wolf Nicolai Lehnert
Heme Protein Engineering and Mechanistic Investigations

M Alumni News

The chemistry department takes pride in the achievements of faculty, graduate students, and alumni.

Irving M. Alder (*PhD 1970, Brockway*) is working on a book dealing with the Holocaust in Vienna, Austria based on letters from his grandmother to his mother.

Nicolas Ball (*PhD 2010, Sanford*) has been named a Wig Distinguished Professor at Pomona College, Claremont, CA. He is an Assistant Professor of Chemistry.

Ryan Baxter (*PhD 2010, Montgomery*) is an Assistant Professor at the University of California, Merced. Has been received an NSF Career Award for 2018.

Darryl Boyd (*BS 2004*) has been named one of Chemical & Engineering News 2018 “Talented Twelve” (Aug.13/20, 2018 issue). He is a research chemist in the Optical Sciences Division of the Naval Research Laboratory.

Elizabeth Brisbois (*PhD 2014, Meyerhoff*), after an NIH postdoctoral at the UM Medical School in Surgery, has started as an Assistant Professor of Bioengineering at the University of Central Florida in Orlando.

Susan Beda Butts (*BS 1975*) of the Dow Chemical Company has become a 2018 ACS Fellow.

Amanda Cook (*PhD 2015, Sanford*) has become an Assistant Professor of Chemistry at the University of Oregon, Eugene.

A CHILDHOOD CHEMISTRY SET LEADS TO A LIFETIME OF SERVICE TO THE FIELD



Elliott Greenberg (PhD 1954, Westrum)

I was born in New York City in 1927, and attended the city public school system. When I registered as a freshman at the College of the City of New York I was asked to choose a major subject. The first items on the list were art and biology, neither of which interested me. The next subject was chemistry, and I remembered how much I enjoyed using the chemistry set, which I obtained as a young boy, by saving and redeeming the wrappers from ice cream bars.

After receiving my BS degree in chemistry, interrupted by a year of service in the US Navy's Electronic Technician Training Program, I attended the University of Michigan where I completed work for my PhD degree in physical chemistry in 1954, under the direction of Professor Edgar Westrum. My thesis work was in the area of low-temperature specific-heat measurements. While at the University of Michigan I very much enjoyed the opportunity, both as a teaching fellow and a half-time instructor, to teach various courses in general chemistry.

My wife and I moved to Park Forest, Illinois, and I began working at Argonne National Laboratory in the fall of 1954. My major area of research was in the field of combustion bomb calorimetry, where our group developed new techniques for burning materials in fluorine, and measuring the heat evolved in these reactions. I am the senior author of the first publication in this field.

I left Argonne in 1969 to become professor of chemistry at Prairie State College, in Chicago Heights, Illinois, until my retirement in 1988. During these years, I became very active in the ACS DIVCHED Committee on Chemistry for the Two Year College, and was elected to serve as the chairperson for the year 1990. I was recently honored as a 70 year member of the ACS.

I still reside in Park Forest. I have three sons, eight granddchildren and one great grandchild.



CHEMISTRY ALUMNUS RECEIVES HONORARY DEGREE, REFLECTS ON MULTIFACETED CAREER

David R. Walt, a distinguished alumnus whose own career exemplifies his message to students of the innate versatility of the field of chemistry, was awarded an honorary degree at UM commencement exercises this spring.

Lauded as a chemist, engineer, innovator and entrepreneur, Walt is a renowned researcher. He has also started several companies and is passionate about STEM education. He and his wife, Michele May, have also endowed a fund that supports summer research for undergraduates in the Department of Chemistry.

Walt also delivered the commencement address at the Rackham Graduate Ceremony on April 27.

He is a Harvard Medical School pathology professor and runs labs at Brigham and Women's Hospital and the Wyss Institute of Biologically Inspired Engineering at Harvard.

The thread that ties his Walt's research together is early-stage diagnostics for conditions such as breast cancer, Parkinson's disease, and tuberculosis. His work centers on creating micro-technologies and single molecule arrays. He has founded several startups using microwell technology for fast medical diagnostics.

With funding from the Gates Foundation, his lab is developing early detection technologies for carriers of TB who don't show signs of the disease that can be used in developing countries. "Treating people who

are non-symptomatic," he said, "will significantly reduce the spread of the disease."

The emerging field of immuno-oncology could employ technologies developed in his labs to scan for drugs useful in the body's fight against cancer. "There are over a dozen drugs on the market and each one is suited best to different types of immune systems. Instead of just picking one and hoping it works, using this methodology would be much more effective in treating different types of cancer," he explained.

He has also started companies that work on implementing biomedical technologies for disease detection.

Asked whether he prefers his work in academia or business, Walt responded, "They are both enjoyable because they use two completely different parts of your brain.

"In industry, you want to push things out

experience." Replicating the curiosity of laboratory research was his key goal for classroom implementation. He explained that they "didn't just want people to follow a cookbook recipe for a science experiment. Being able to ask questions and formulate answers...shouldn't be left out of an activity." Being able to think, plan, and coordinate activities to increase scientific literacy is a challenge in creativity.

Walt returns to campus annually as a member of the Leadership Council for the Life Sciences Institute. He has enjoyed coming back to campus to see the research and facilities. "So much has changed since I was a student here, and it is still a research-intensive, excellent, and beautiful place to pursue a research career," he said.

Determining the crystal structure of inorganic compounds as an undergraduate

"Every science industry—biotech, pharmaceuticals, chemical companies—needs a chemist!"

the door as efficiently as possible," he said. "You want to get technologies to market to help people. In academia, you want to pursue the coolest science with the newest instrumentation."

As though his research in the lab and with startup technologies did not keep him busy enough, he has also received funding from the Howard Hughes Medical Institute to make his research more accessible to the general public. His microarray technologies have been implemented in high school classrooms around the country.

"Accessibility," he noted, "is incredibly important in the technological, science-based world we live in."

He acknowledged how challenging it can be. "When you think about experiments in the lab, sometimes you need to wait many hours for a reaction to reach completion. It's simply not realistic to ask someone to do that in a high school environment."

One of the best parts of research, he said, is dealing with an "inquiry-based

fed his scientific curiosity and pushed him toward a research career. He laughed as he remembered working with then Assistant Professor Oren Anderson. "We had a big mainframe computer to perform X-ray Crystallography," he said. "I was never allowed to punch in the punch-cards to analyze the data that came out of our experiments... it would throw the computer system into an infinite loop if you made one mistake."

He emphasized the innate versatility that comes with the chemistry and encouraged students to follow their passions. "Every science industry—biotech, pharmaceuticals, chemical companies—needs a chemist!"

Walt graduated from the UM with a BS in chemistry in 1974. He earned his PhD in chemical biology at the SUNY-Stony Brook and was a postdoctoral fellow at MIT.

—Taylor Soucy

Nicole Camasso (*PhD 2017, Sanford; Postdoctoral 2017, McNeil*) is now an Assistant Managing Editor of the Journal of the American Chemical Society.

Theodore S. Dibble (*BS 1987; PhD 1992, Bartell*) is a Professor and Associate Chair of the Chemistry Department of the Environmental Science and Forestry (ESF) Campus of the SUNY system in Syracuse, NY. He was recently named to the NASA Panel for Data Evaluation that writes the triennial document for Use in Atmospheric Studies.

Allison Dick (*PhD 2007, Sanford*) is now a tenure track Assistant Professor of Chemistry at Wheaton College, IL.

Virginia (Dunning) Dikes (*PhD 1972, Taylor*) writes that she is very involved in the centennial commemoration of WWI, because her father fought in WWI. She has published his WWI memoirs and has given several presentations to those interested in American History. In 2017 she gave the keynote address to open the WWI exhibit at Rutgers University.

Alan Dunker (*BS 1968*) was recently honored as a 50 year member of the American Chemical Society.

Brian R. Gibney (*PhD 1994, Pecoraro*) was selected as a 2018 ACS Fellow. He is an Associate Professor of Chemistry at Brooklyn College, the City University of New York and was appointed the Executive Officer of the CUNY PhD Program in Chemistry in 2014. He was Chair of the New York Local Section of the ACS in 2017 and serves on the Society's Joint Board-Council Committee on Science. He founded two programs at the New York Local Section: the Nichols Fellows Program that supports summer undergraduate researchers and the Brooklyn Frontiers in Science Public Lecture Program that brings cutting edge science to the public. His research focuses on using designed metalloproteins to delineate the fundamental engineering of natural metalloproteins.

Alice Haddy (*BS 1981; PhD 1988, Sharp*) is a Professor in the Department of Chemistry and Biochemistry at the University of North Carolina at Greensboro, where she has been on the faculty since 1994. As a part of her research, she uses EPR spectroscopy to study Photosynthesis in plants and for collaborative projects. She

continues to enjoy teaching physical chemistry courses and has recently created an Honors course for non-science majors called, "Energy, People and the Planet."

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

Morton Z. Hoffman (*PhD 1960, Bernstein*), Professor Emeritus of Chemistry at Boston U. is the recipient of the Zaida C. Morales-Martinez Prize for Outstanding Mentoring of ACS Scholars.

Kami Hull (*PhD 2009, Sanford*) has moved to the University of Texas, Austin where she is an Associate Professor of Chemistry.

Naoko Ichiishi (*PhD 2016, Sanford*) has recently taken up a new position at Takeda Pharmaceuticals.

Caroline Chick Jarrold (*BS 1989*) is currently the Class of 1948 Herman B. Wells Endowed Professor and Chair of the Department of Chemistry at Indiana University. After completing her PhD in physical chemistry at U. California, Berkeley and a postdoctoral position at UCLA she took a position on the chemistry faculty at the University of Illinois, Chicago. In 2002 she moved to the University of Indiana, where she was the first woman promoted to full professor in chemistry. Her research uses physical and computational methods to study exotic heterometallic complexes, atmospheric radical species and decomposition of materials.

Dipannita Kalyani (*PhD 2008, Sanford*) has moved from St. Olaf College to a position at Merck.

Scott Milam (*BS 2006*) won the Michigan Science Teacher of the Year Award for 2017. He teaches chemistry at the Plymouth High School in Canton, MI. He has also been honored by receiving the Plymouth-Canton school Board's Mary Beth Carol Miller Award. See: <http://myumi.ch/aGbnM>.

Sumitra Mitra (*PhD 1977, Lawton*) has been inducted into the 2018 National Inventors Hall of Fame. Dr. Mitra invented the first dental filling material to include nanoparticles. She holds 98 US patents and their international equivalents. She retired from 3M corporation after more than 30 years of service and now runs Mitra Chemical Consulting with her husband.

Alumnus Tan Wins 2018 ACS Division of Analytical Chemistry Award in Spectrochemical Analysis

University of Florida chemistry professor Weihong Tan (*PhD 1992, Kopelman*) has received the 2018 ACS Division of Analytical Chemistry Award in Spectrochemical Analysis for his “pioneering contributions in spectrochemical analysis: ultrasensitive bioanalysis with DNA probes, ultrasmall optical biosensors, development of biophotonic nanomaterials and aptamer-based chemistry and biotechnologies.”

This award is made to researchers advancing the field of spectrochemical analysis and optical spectrometry in instrumental innovation and development, elucidation of instrumental event or processes, and authorship of influential publications in the field or instrumentation applications. This award was presented to Prof. Tan at the ACS award ceremony during the 2018 ACS Fall National Meeting.

Tan’s initial reaction to learning about receiving this prestigious award was to reminisce on his days at Michigan Chemistry where he learned to conduct innovative research in the then up and coming field of nanophotonics and biophotonics. He worked under Raoul Kopelman exploring “the very topic of spectrochemical analysis and optical spectroscopy. It was where I started the field where I got my current award.”

He is Distinguished Professor and a V.T. and Louis Jackson Professor at the University of Florida and Distinguished Professor of Chemistry and Molecular Medicine at Hunan University in China.

The staggering scope of his group’s research is divided into Bioanalytical Chemistry, Chemical Biology, and Molecular Medicine. While at Michigan, Tan developed near-field optical probes for biochemical sensing for single molecule and single cell analysis.

Thomas Pacansky (*PhD 1972, Overberger*) was recently honored as a 50-year member of the American Chemical Society. He stays current through attending scientific meetings and as an associate editor of the *Journal Bioactive and Compatible Polymers* (2012-present).

Nibedita Pal (*Postdoctoral 2016-18, Walter*) will become an Assistant Professorship at the Indian Institute of Science Research and Education at Tirupati, India.

Monica Perez-Temprano (*Postdoctoral 2012-15, Sanford*) has been named one of Chemical and Engineering News 2018 “Talented Twelve” (Aug.13/20, 2018 issue). She was cited for her work on development of organocobalt catalysts. She is a faculty member at the Institute of Chemical Research, Catalonia, Spain.



Weihong Tan with Raoul Kopelman

Through this work, he developed photonic probes for photo-nanofabrication—a term he coined. It is the process of combining nanofabrication techniques with luminescence to create nanoscopic materials smaller than a wave of light. Via photonanofabrication, Tan and his group make probes and biosensors which they implement in their research. His current research focuses on DNA nanotechnology and theranostics—diagnostics performed to determine the best targeted therapy for individual patients.

Tan has an outstanding career with over 650 peer-reviewed scientific articles, and an H-index of 122 (H-index is the number of papers a researcher has that are cited at least that many times). Tan also has 25 issued patents. Currently, he has a 12-member lab at UF, and has mentored 54 doctoral students, 12 masters’ students and 95 post-doctoral fellows/visiting scholars in addition to 85 undergraduate and high school students. He also serves as an Associate Editor for the *Journal of the American Chemical Society*.
—**Isabel D. Colon-Bernal**

Katherine Plass (*PhD 2006, Matzger*) visited the Department recently as a part of an Alum|NUM professional development panel. After a post-doctoral appointment with Professor Nathan Lewis at the California Institute of Technology, she joined the faculty at Franklin & Marshall College in Lancaster, PA, where she is an Associate Professor of Chemistry. She has been teaching general, inorganic and materials chemistry as well as supervising undergraduate research in nano-chemistry.

Robert A. Reynolds (*PhD 1998, Coucouvanis*). Andy Reynolds was a PhD student with Professor Coucouvanis 1991-7 and followed that up with an NIH post-doctoral fellowship at Northwestern University under Professor Chad Mirkin. In 2000 he entered industry as

FROM SPECTROSCOPY TO AUTONOMOUS DRIVING: THE PHOTONIC LINK!

Amine Taleb-Bendiab (PhD 1991, Kuczkowski)

This past summer, I had the opportunity to be part of the annual pre-Karle Symposium event [See: Alum|NUM on page 10]. I connected with senior graduate students to learn about their research work and career aspirations while I shared my career experiences and the perspective of an industry employer as they prepare for that exciting moment—a call or an email for a job interview!

At the alumni reception, I ran into some of my former professors and, unexpectedly, my graduate days “instrumentation and lab hands-on” mentor Dr. **Kurt Hillig**.

In talking with the graduate students, I sensed their genuine passion about their research as they described it to me, which led me to reflect on my career since graduation.

My graduate work was in physical chemistry, and more specifically in microwave spectroscopy under the guidance of Professor **Robert L. Kuczkowski**.

Today, as R&D Director at Valeo, I have the privilege of leading a large organization of talented team members. We are developing technologies and applications for the car of tomorrow. Valeo is an automotive tech company partnering with major carmakers worldwide.

On the surface, my job seems miles away from my PhD work in microwave spectroscopy. Though after further thoughts, is it really that removed from my graduate work?



Amine Taleb-Bendiab, Arthur Ashe, Kathy Dien Hillig and Kurt Hillig at the August Alum|NUM reception.

Well, let me rewind to as far back as my thesis defense and seminar day.

In December 1991 in preparing for my thesis seminar, I thought to run by my mentor, Dr. Kurt Hillig, the title that I had chosen. It was “Interconversion and Internal Rotation Motions in Weakly bound SO₂ complexes.” Not to my surprise, he found it rather dull, and he said, “if you want to draw a big crowd to your seminar, you need a catchy title.” He suggested “GEARs and TOPs – The Internal Motions in Weakly Bound SO₂ Complexes.” I thought, yes this title might attract a large audience, but it would be mostly from the mechanical engineering department. Instead, I stuck with my original title, and used gears and tops as an ice-breaker to ease myself through the rest of my presentation.

I guess my graduate work started to pave the way for my intrigue with motion, even if it was at the molecular level... I went on to do

STEPHEN ZAWACKY: MY CAREER AT PPG

After earning my BS degree in Chemistry from UM and my PhD in organic chemistry from Stanford, I joined PPG Industries in 1983 as part of their synthetic team in the Electrodeposition Group. I accepted the position because it involved two of my passions: synthesis of both small molecules and highly functional polymers and electrochemistry. I have never regretted that decision.

PPG’s synthesis chemists are expected to follow their work from the lab, to the pilot plant, the resin production facility, and all the way to the customer if necessary. This path has led to a variety of interesting experiences and to friends scattered all over the world. It has been very rewarding to watch my ideas move from a 2 liter flask in the lab to 5000 gallon reactors in plants in the United States and in Europe.

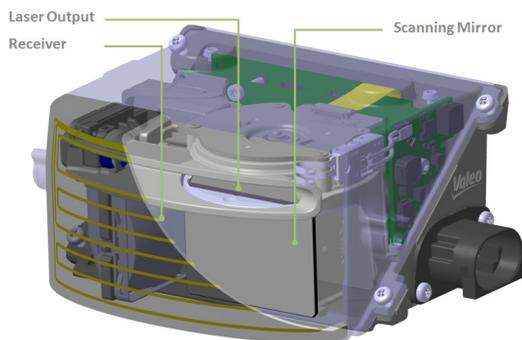
My work over that past 35 years at PPG has resulted in the issuance of 35 patents, most of which involve the technology behind electrodeposition. My key contributions have been in invention of new methods for the dispersion of polymers, new methods for the

control of their rheology, and the discovery of a new heavy metal free catalyst.

Most readers are driving cars primed by coatings containing technology for which I have patents. Along the way at PPG, my work has also touched upon such diverse areas as coatings for ocean-going vessels and for golf balls, but I have always considered this work as diversions, sabbaticals if you will, from my main work in electrodeposition.

Today I occupy the position of Associate Fellow at PPG, one of two in the company, and I spend my time mostly in an advisory and teaching capacity though I do venture into the lab from time to time.

As I look back upon my experiences at PPG, I am struck by how important was my education at the University of Michigan. From the fundamentals of organic chemistry taught to me by Professor Arthur Ashe to how to carry out research taught to me by Professor Richard Lawton, I was well prepared to meet the challenges of graduate education and a career in industrial chemistry.



This technology is expected to revolutionize the auto industry and transportation in general. An autonomous vehicle relies on sensors placed all around it, which act as its “eyes” and “ears.” These sensors are generally Time-of-Flight (ToF) sensors; in other words, they dynamically map out the space around the vehicle and as a result define the free space as it is moving. These maps are updated in the tens-of-a-millisecond range, and with high precision angular and distance measurements. One of the key sensors is the infrared laser-based Light Detection and Ranging (LiDAR). See the picture of our LiDAR as an example. Other sensors, such as radar, ultrasonic, and cameras are also used and required to complement the LiDAR function, whether from ToF or, in the case of camera, identify an object or road signage.

To sum up, it is rather gratifying to see such technologies no longer used only in the fundamental research or niche applications, but instead finding a place in more concrete applications such as autonomous driving. More importantly, the knowledge I gained during my academic research at the University of Michigan and NRCC, utilizing microwave and IR sources and detectors, proved valuable to my function nowadays from the sensing technology standpoint and the understanding of how these wavelengths can be impacted by the environment as they propagate.

I would like to highlight the last time I met my PhD thesis adviser, Professor Robert L. Kuczkowski, about 15 years ago. I informed him that I was no longer doing spectroscopy, but instead working with optical systems and sensors. He then replied, “You are still dealing with photons, aren’t you!”

my postdoctoral research at the Herzberg Institute of the National Research Council of Canada (NRCC). My work at NRCC was in THz and IR Laser Spectroscopy of short-lived molecular species, such as ions and radicals. I was privileged to have interfaced with Dr. Gerhard Herzberg, the 1971 Chemistry Nobel Prize recipient. Then in his early 90s, Dr. Herzberg was still an active member of the institute and still had continued passion for spectroscopy. More importantly, he was quite engaging in regular discussions with the research fellows at the institute, not only the established ones who were world-renowned spectroscopists but also the younger research fellows such as myself, about our own respective research.

After two years at NRCC, I joined a high-tech company, MPB technologies, where I was brought on for the development of THz and IR lasers. This was the transformation period of my career into the product development world.

Since moving to the automotive industry in 1998, I have been engaged in cutting-edge technologies, in particular in autonomous driving, which is viewed as one of the fastest-growing and disruptive applications in the automotive field.

an R&D Scientist and has now advanced to be President and CEO of Neo Grat Solutions in Lakewood , OH.

Stuart M. Rothstein (*PhD 1968, Blinder*) is retiring from his position a Professor of Physics and Chemistry at Brock University, St. Catharines, Canada and has become Professor Emeritus.

Larry Sanford (*MS 1975*) has retired from the City of Ann Arbor Water Treatment Services Unit after 40 years of Service. He was the Assistant Plant Superintendent/ Assistant Plant Manager for most of his tenure. He is now a Registered Official, Track and Field, with the Michigan High School Athletic Association.

Sydonie Schimler (*PhD 2017, Sanford*) has just started a position at the Dow Chemical Company.

Leonard D. Spicer (*BS 1964*) was recently recognized as a 50 year member of the American Chemical Society. He is currently a University Distinguished Service Professor of Biochemistry and Radiology at Duke University. He shifted his interests from his research training at UM and at Yale (*PhD 1968*) which were more in the chemical physics area. He has just stepped down as Chair of the DOE Pacific Northwest National Laboratory, EMSL Scientific Advisory Committee and PNNL Director’s Advisory Committee. He is still a full time Duke faculty member with active research.

David Taylor (*BS 1968*) has been honored as a 50 year member of the American Chemical Society. David is the son of Professor Robert Taylor, the long-time Associate Chairman of our Department. David writes that after finishing his undergraduate work at

UM, he earned his PhD in inorganic chemistry at University of Wisconsin, Madison. His degree was delayed two years due to service in the Vietnam War (1969-71). After postdoctoral work at Colorado State University he spent 36 years in the environmental field, most recently with the Environmental Protection Agency's Southwestern Regional Office in San Francisco. He retired in 2016 and lives in Redwood City, CA.

Jim Tchobanoff (BS 1968, MA Library Science 1971) has been honored as a 50 year member of the American Chemical Society. He writes that he is now retired, although he still does an occasional literature and patent search for a client. He and his wife recently traveled to Costa Rica and Russia are now looking forward to a month-long trip to Australia in 2019.

Julia Widom (Postdoctoral 2014-18, Walter) has been appointed Assistant Professor of Chemistry and Biochemistry at the University of Oregon, Eugene.

In Remembrance

Stephen F. Nelsen (BS 1962)

Stephen F. Nelsen died on September 23, 2017 in Madison, WI at the age of 77. He was born in Chicago in 1940. Following his undergraduate work at UM, Dr. Nelsen received his PhD in 1965 at Harvard University where he worked with P. D. Bartlett. He then joined the faculty of the University of Wisconsin, Madison. He was promoted to Professor of Chemistry in 1975 and became Professor Emeritus on his retirement in 2012.

Professor Nelsen was widely known for his research in physical organic chemistry, particularly the study of free radical, radical ion and electron transfer reactions. He was an expert on structure reactivity effects, lone pair effects and organic electrochemistry.

Professor Nelsen received an award from the Humboldt-Stiftung in 1988, was a Fellow of the Japan Society for the Promotion of Science in 1996 and a Fellow of the American Association for the Advancement of Science, 1999. He was a visiting Scientist at the Hahn-Meitner Institute, Berlin in 1979, 1981, 1982, 1984 and 1985.

He is survived by his wife Adrienne and daughter Erika.

Robert R. Sharp (Faculty Member 1969-2008)

With great sadness the Department reports the death of Professor Emeritus Robert R. Sharp on June 10, 2018, from an assault accompanying a home invasion in Ann Arbor.

Professor Sharp joined the faculty in 1969 as an assistant professor and was promoted to associate professor in 1974 and to full professor in 1987. He retired from the active faculty in 2008.

Professor Sharp graduated from Case Western Reserve University where he received BA and MA degrees in 1964 and a PhD in 1967. From 1967 until he joined the Michigan faculty, he was a postdoctoral fellow with Sir Rex E. Richards at Oxford University in England

Professor Sharp's principal area of research was in chemical applications of NMR spectroscopy. His early work involved studies of relaxation mechanisms of heavy nuclei, principally tin and lead, and led to his establishing the first absolute nuclear shielding constant scale for these heavy nuclei. He then applied flash induced NMR relaxation changes to the study of manganese oxidation states in the oxygen evolving photosynthetic complex, enhancing the understanding of manganese redox cycles in photosynthesis. This work led to detailed experimental and theoretical studies of NMR relaxation in paramagnetic transition metal complexes with results applicable to the development of contrast agents for clinical use in MRI radiological applications.

Throughout his career at Michigan Chemistry, Professor Sharp was an inspiring and enthusiastic teacher of both undergraduate and graduate students. He particularly excelled in the teaching of the very large introductory chemistry courses. We are very grateful for his many years of service to the Department.

Professor Sharp was predeceased by his wife Maria who passed away from cancer on April 20, 2018. He is survived by his son David, daughter-in-law Kristine and grandchildren Matthew and Anika of New York.

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George D. Mendenhall

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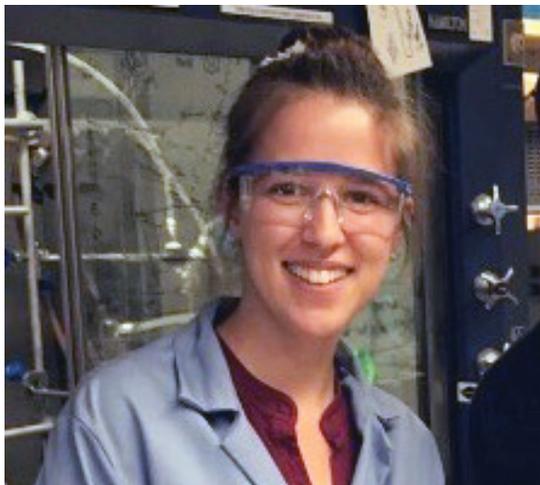


Photo by Kyle McDonald

Meet Ri Harris

Ri Harris is a senior majoring in Biomolecular Science. Her path to Michigan Chemistry exemplifies our commitment to finding innovative ways to support students. Ri first came to Michigan Chemistry from Washtenaw Community College through the Community College Summer Fellowship for Undergraduate Research Opportunity Program, a transition program with Department support. She is now a Peer Facilitator in UROP's Changing Gears program for transfer students. She is also a researcher in Professor Adam Matzger's group and an instructor for the Chemistry. She volunteers for FEMMES, an outreach for elementary school girls to encourage their interest in science. After her 2020 graduation, she plans to earn a master's degree in chemistry. "I am interested in teaching at a community college, but more so just in teaching and making science more visible and accessible to those who are not traditionally focused on."

ENDOWMENTS

Our endowments received infusions of funding this fiscal year. Endowments 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.

Richard J. Cook and Teresa Lahti Undergraduate Research Fellowship

Richard J. Cook and his wife, Teresa Lahti, have established the Richard J. Cook Undergraduate Research Fellowship. Cook graduated from the UM in 1969 (BS in Chemistry with honors). His undergraduate research experience, he reports, set him on his career path. Cook earned a PhD in Chemistry (Princeton

1973) and then joined the faculty at Kalamazoo College. He became well known for environmental work. From 1996-2008, he served as President of Allegheny College.

Hillig Graduate Student Endowed Fellowship

Two generations of Hilligs have earned PhDs in the Department of Chemistry, and that family history is being honored by an endowment from Dr. Kathy Dien Hillig and Dr. Kurt W. Hillig, II. This fund will provide merit-based support for students enrolled in the Department of Chemistry who are pursuing graduate degrees with an emphasis on analytical or physical chemistry.

Masato Koreeda Research Fund

Established in 2013 on his retirement to honor Professor Koreeda's dedication to Chemistry and his students, the fund supports student researchers, expanding vitally important research experiences.

Robert Kuczkowski Endowed Faculty Research Fund

Established by Emeritus Professor Robert Kuczkowski and faculty and friends, this award recognizes and supports an outstanding assistant or associate professor in Chemistry.

May-Walt Chemistry Summer Research Fellowship Fund

Among the programs that Michele May and David R. Walt support at Michigan is this fund for undergraduate researchers in the Department of Chemistry.

Robert Parry, Peter A. S. Smith, Robert Taylor Funds for Graduate Support

These funds were established to recognize favorite professors on their retirement and now support new generations of chemistry graduate students.

Wayne A. and Carol H. Pletcher Fellowship

The Pletchers endowed this fund to support graduate students. Wayne (PhD 1970) was also a postdoc at UM. He was formerly the director of Corporate Technical and Business Planning at 3M and president and CEO of Minnesota Technology, Inc. Carol (MS 1968), who earned a PhD in Biochemistry from the University of Minnesota, is a former vice president at Cargill and president of Pletcher Incorporated.

Contact Chemistry Chair Robert Kennedy, if you would like to explore giving opportunities. chem-chair@umich.edu phone: 734-647-2125

Thank you for your support! Some ways to direct your gift...

CSIE|UM Future Faculty Program 732330

Your gift will support seminars, workshops, and other programming related to teaching and learning, as well as travel to professional events for participants in the Chemical Sciences at the Interface of Education|UM program.

Kuczowski Endowed Faculty Research Fund 796725

Established by Emeritus Professor Robert Kuczowski and faculty and friends, this award recognizes and supports an outstanding assistant or associate professor in Chemistry.

Summer Chemistry Scholars Fund 318850

Funds for summer undergraduate fellowships, which directly support UM Chemistry and Biochemistry majors. Research opportunities are essential for students to compete for elite graduate programs and jobs in industry.

Chemistry Strategic Fund 308206

Seed funding for new faculty research and innovative research projects, curriculum development, research lab maintenance and upgrades, and purchase or repair of major instruments for the research and teaching labs.

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We'd like to hear from you!

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MichiganChem goes to the North Pole! *online at: lsa.umich.edu/chem*

Grad student Rachel Kirpes of the Pratt Lab was part of Expedition Arctic Ocean 2018, an international effort to better understand how the ocean affects weather in the Arctic. Check out her photojournal on our website.



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