Michigan Tech
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DEPARTMENT OF CHEMISTRY

2015 Newsletter
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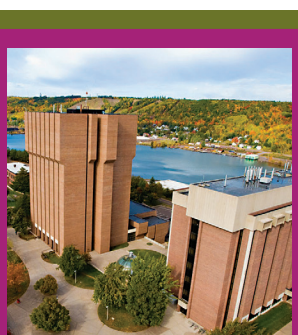

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Greetings from Department Chair Cary Chabalowski

Greetings alumni and friends of Tech Chemistry! Thanks to the generosity of folks like you, it's been a very good year for the Department of Chemistry! This year alumnus David Pruett and his wife Valeria once again funded a departmental fellowship to support a postdoctoral research position in support of Professor Marina Tanasova, as well as research funds to support three graduate students for the summer. Robert and Kathy Lane's very generous donation to the department provides full-time research support to a graduate student. Such support from alumni is absolutely crucial to attracting and retaining the best faculty and students to our department. On behalf of the entire department I want to thank all of the alumni who so generously support the educational mission of our department!

Our department's excellent teachers include Assistant Professor Tarun Dam, who was inducted into the University's Academy of Teaching Excellence last year, and this year is the recipient of the Michigan Tech Distinguished Teaching Award. This puts Dam into an elite group of educators here at Michigan Tech, and we're all very proud of him.

It's a pleasure to announce our newest tenured faculty members, Profs. Lynn Mazzoleni and Ashutosh Tiwari. Mazzoleni is an internationally recognized scientist in atmospheric aerosol chemistry, and will be performing research in Europe while on sabbatical this academic year. Tiwari is an important contributor in the study of the biochemical mechanisms of neurological diseases including ALS and Alzheimers.

We're also very delighted to welcome two new faculty members to the department; Xiaohu Xia, an analytical chemist from Georgia Tech University who joined the department in August 2014, and Kathryn Perrine, an experimental physical chemist who has joined us this fall from the University of California-Irvine.

More good news came in the form of a very generous allocation from the University's Board of Trustees: $3.6M in the coming year for renovating our undergraduate teaching labs ($600K) and the construction of a new chemical storeroom and distribution center ($3.0M) attached to the Chemical Sciences and Engineering Building. Both the teaching laboratories and the chemicals storage facilities are badly in need of modernization, making this a very timely funding decision. We're very grateful for the Board's support.

In December, seven of our faculty members attended the inaugural US Army Research Laboratory (ARL) Open House just outside Washington, DC. Collaborative research opportunities with the ARL could potentially provide access at no cost to cutting edge research equipment and facilities, as well as federal grants from various agencies within the DoD. Several faculty members have already had positive follow-ups with ARL researchers. We'll keep you posted as this exciting opportunity takes shape.

I encourage all of you to visit us in the beautiful Keweenaw. You'll find more exciting news about our department in this newsletter, so please read on! Finally, I want to wish all of you and your families a very healthy and enjoyable season.

Best wishes,
Cary

Tarun Dam Receives Distinguished Teaching Award

Tarun Dam joined the chemistry faculty as part of the third wave of the University's Strategic Faculty Hiring Initiative. Dam, an assistant professor of chemistry, is the recipient of the 2015 Distinguished Teaching Award in the Lecturer, Professor of Practice, or Assistant Professor category.

Dam received his MS and PhD degrees from the University of Calcutta, India. He came to the Albert Einstein College of Medicine in New York as a postdoctoral fellow and subsequently became a faculty member there. He continued his research in glycobiology and received the Young Scientist Award for his contribution to biocalorimetry, the measurement of the energy created or expended in biological or biochemical processes.

He joined the faculty in 2010 and started the Laboratory of Mechanistic Glycobiology, which is engaged in cutting-edge research related to human health and disease.

Although he has published 43 research articles, scientific reviews, and book chapters, Dam feels that teaching is as important as research. He teaches biochemistry (both introductory and advanced), pharmaceutical chemistry, and glycobiology.

Dam is a strong supporter of undergraduate research and tries to inspire students to pursue scientific research as a career. He has devised a teaching tool called Continuous and Rapid Testing (CaRT), which promotes student involvement, preparedness, and communication.

He has developed a new graduate-level advanced biochemistry course and numerous laboratory-based research courses. Dam is a core faculty member of the Biochemistry and Molecular Biology (BMB) graduate program at Michigan Tech and a member of Michigan Tech Life Science and Technology Institute.

He was inducted into Tech's Academy of Teaching Excellence in 2014.

"It was impossible to sit through Dr. Dam's lectures without getting excited about chemistry or science," one of his students said. "He knows the materials like he knows his name."

Dam says he feels humbled and honored by the award. "I especially feel grateful to my students for finding my teaching helpful and for showing unusual maturity, honesty and responsibility."

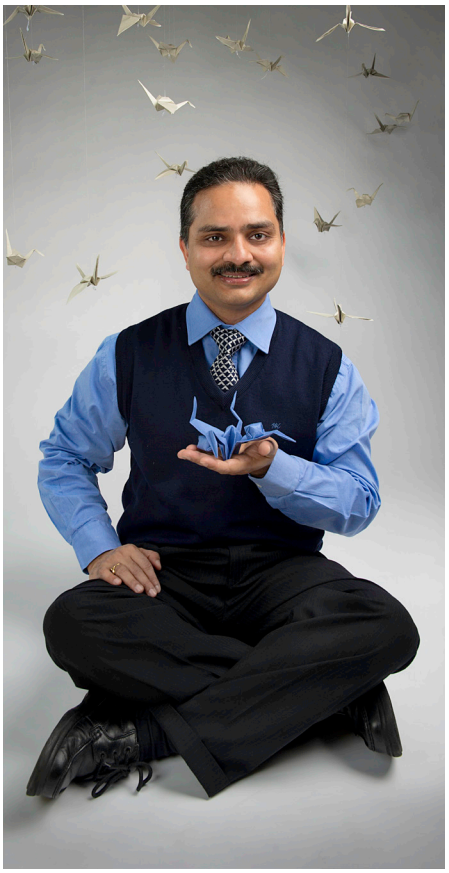
Boat's Prize—Suntara Fueangfung Honored at Sigma Xi Conference

Chemistry doctoral student Suntara (Boat) Fueangfung—advised by Professor Shiyue Fang—was recognized at the Sigma Xi 2014 International Research Conference. Suntara's research poster presentation, "Purification of Synthetic Oligodeoxynucleotides via Catching by Polymerization," was rated Superior in the chemistry graduate division.

The award for presentations rated Superior includes being nominated for membership by the Sigma Xi Board of Directors, payment by the Board of the initiation fee and the first year's dues, and a medal. The Fang research group is proud of Boat's achievements, and is sure he will continue his contributions to science.

From the Sigma Xi website: Sigma Xi, The Scientific Research Society, is the international honor society of science and engineering. One of the oldest and largest scientific organizations in the world, Sigma Xi has maintained a distinguished history of service to science and society for more than a century. More than 200 Nobel Prize winners have been members.

Flaws in Folding–Tiwari Researching the Small Errors Making Big Problems



Unlike neat diagrams in textbooks, which show big gaps between cellular components like the nucleus and mitochondria, cells are a jumble. And yet, fighting disease requires combating a specific cause at a specific part of the cell—no easy feat.

"Imagine going sixty miles per hour on a country road," says Assistant Professor Ashutosh Tiwari. "No problem, right? It's easy to see everything, maintain speed, and get where you're going. Now try to drive at that high speed in the center of a busy city. There's so much traffic that it will be impossible to maintain the speed, and very little room for error while you're driving."

Tiwari is examining how errors in protein folding lead to cellular inefficiency and contribute to the onset of diseases associated with aging. He and his team are developing the tools to find and correct the mistakes by targeting the right error, or misfold.

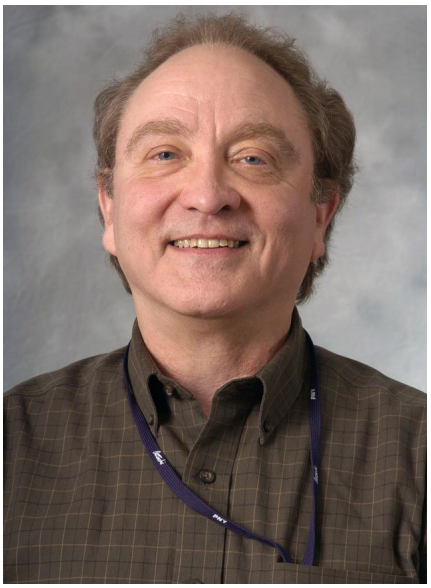
Cells are, by necessity, highly efficient with materials. Some proteins, like signaling proteins, last just a few seconds, while others, like the fibrous proteins in muscle, can last a year or more depending on their purpose. But errors in the recycling process can lead to a buildup of misfolded proteins that are highly hydrophobic, meaning they have sites on them that are very sticky, collecting nearby materials that the cell cannot then recycle.

These sticky sites take away from cell function, and as these errors accumulate over time, a broad variety of diseases become increasingly likely to be triggered, despite the fact that they are not related in root cause.

With molecular crowding playing a central role in how misfolded proteins behave, untangling this jumble is the first step to getting help where it is needed within the cell. Understanding the factors that regulate protein misfolding and their relationship to cellular toxicity will help us develop effective tools to combat these issues and formulate effective therapeutic strategies.

For the full article, visit www.mtu.edu/folding-flaws.

Bahne Cornilsen Retires from Michigan Tech



Bahne Cornilsen arrived at Michigan Tech in 1977 and by 1989 had already achieved the rank of professor. In more than 37 years in the department, he maintained an active research group, frequently collaborating with researchers not only outside the department but establishing ongoing relationships outside the University at places like Argonne and Oak Ridge National Labs. He mentored many graduate students who have gone on to further success in education and postdoctoral positions at institutions as varied as Michigan State University and Brookhaven National Lab.

Bahne always played an active role in the department, conscientiously participating in departmental meetings, committees, and searches. Students remarked on how willing he was to follow up with them to ensure that they mastered the material in challenging physical chemistry classes.

Though retired, Bahne has continued to mentor the next generation of scientists—even now he is working with an undergraduate student to bring a research project to a successful close.

He also went to Oak Ridge National Lab in May to conduct four days of experiments at the Spallation Neutron Source. Inelastic scattering of neutrons provides vibrational spectra, primarily of proton motions. He also looked at an in situ battery electrode, as he hopes to continue some research on battery electrode structure and local mineral structures. And of course he has the usual plans for traveling and visiting family. We all wish you the best in retirement, Bahne!

Alumna Allyce Gilligan Gives Students Career Tips

On, September 28, we were pleased to welcome back to campus Allyce Gilligan, one of our alumni. She graduated in 2012 and is currently employed at SC Johnson in Racine, Wisconsin. Originally hailing from Iron River, Michigan, Allyce obtained a degree in chemistry with a concentration in environmental chemistry.

While an undergraduate student, Allyce interned at SC Johnson for two summers. Currently, SC Johnson is looking to continue to recruit chemists for summer internships, so Allyce was here to both represent her company and provide tips to students on how to prepare for interviews.

On the eve of Career Fair, Allyce had made arrangements with us in advance to offer an information session which was well-attended by students. Allyce gave a nice overview of SC Johnson and their products as well as insight into the work culture, being a family-owned business. She also shared her experiences as an intern and, now in the past few years, as a full-time chemist.

Equally important and appreciated, Allyce gave the students tips and suggestions on how to best prepare for the Career Fair and interview. She suggested that students become very familiar with STAR (Situation, Task, Action, Results) which are behavior focused interview questions. She urged them to print out the questions, which are readily available on the internet, and have specific examples prepared for each. She cautioned students to be sure not to forget the last component, Results, so they are ready to provide the result of their action.

Some other suggestions that Allyce mentioned were (1) be sure to research the company well and know the products and specifically be able to say why they want to work there (2) have an "elevator speech" or introduction prepared, (3) get a LinkedIn account with a picture, and, (4) some tips on what to put on their resume (and what not to). There was a question & answer period at the end which gave students an opportunity to ask questions in an informal setting, primed by the pizza Allyce had provided from the Ambassador!

We have become aware over recent years that more of our graduates are seeking full-time employment, rather than going directly on to graduate school. We still have many graduates who are pursuing and being admitted to outstanding graduate programs (including ours!), but the balance seems to have tipped a bit more toward industry. As a result of that, our department is reaching out to companies to build networks, connections and solicit advice on how best to prepare our graduates for the industrial path.

In closing, Allyce indicated, "I'm excited to be able to come back and share my experience as an intern and how it led to a full-time position. I find it very rewarding whenever I can do any outreach to future chemists. It's great to hear more chemistry students are going into industry. SC Johnson has struggled in the past recruiting chemists since many seem to focus on the academic path. This year we are really trying to ramp up our efforts in educating chemists that industry is another viable career path."

New Faculty

Xiaohu Xia

Assistant Professor Xiaohu Xia has joined our Analytical Chemistry faculty group. Prior to his appointment at Michigan Tech, Xia was a postdoctoral fellow at the Georgia Institute of Technology from 2012 to 2014. He received his Ph.D. in Biochemistry and Molecular Biology from Xiamen University, China in 2011. While pursuing his doctoral studies, he also held a visiting graduate student position at Washington University in Saint Louis from 2009 to 2011. His current research interests include the design and synthesis of novel nanostructures and exploration of their applications in biomedicine and catalysis. He is excited to initiate his independent research career at Michigan Tech, and is looking forward to conducting interesting projects.

New Staff

Joel Smith—Chem Stores Assistant

I was born and raised in lower Michigan. After graduating high school, I moved to Houghton where I studied Pharmaceutical Chemistry and got a work-study position at the Chem Stores. After a few years, an opportunity presented itself to continue working as a full-time employee, which I happily accepted. This job keeps me pleasantly busy, and I look forward to holding onto it for years to come while also completing my degree. In my free time I like to practice archery, play video games, read books, solve Rubik's cubes, and go biking.

The fall 2015 faculty, staff, and grad student picnic at McLain State Park. Our grad students plan and organize it as a way to welcome new faculty, staff, and graduate students to the department. This is the second year we have done this picnic and we will likely continue it, as it is very popular!

David Kenny Obituary

David H. Kenny, associate professor emeritus in the Department of Chemistry, passed away at his home last February.

Kenny attended Cornell University, receiving his AB in Chemistry in 1949, before working at the General Motors Research Laboratory. He left GM and served two years in the U.S. Army Chemical Corps, then attended the University of Michigan and obtained his MS and PhD in Chemistry (1958). He subsequently taught at Eastern Michigan University for two years and at the University of Baghdad as a Visiting Lecturer on a Smith-Mundt grant.

Kenny started here when it was the Michigan College of Mining and Technology in 1962 as an assistant professor. He received tenure and promotion to associate professor in 1964. Kenny had a major responsibility for the Honors Program in first-year chemistry, also teaching general chemistry and organic chemistry.

He retired in 1988, receiving emeritus status in 1989. "Dave Kenny continued to visit the chemistry department for our special events long after he retired, so I knew him even though we didn't overlap professionally," says Sarah Green professor in the Department of Chemistry. "He was always a very cheerful visitor and was pleased to hear updates on the students and new faculty."

In addition to his long academic career with Michigan Tech, Kenny published the book *My Two Years in Iraq: A Memoir*. In it he recalls being recruited by the Department of State to become a Smith-Mundt Visiting Professor at the University of Baghdad from 1960 to 1962.

External Federal Funding:

Haiying Liu and **Ashutosh Tiwari** are the recipients of a grant from the US Dept. of Health and Human Services, National Institutes of Health. They received a $338,552 grant for their three-year research and development project "Radiometric Near-Infrared Fluorescent Probes for Lysosomal pH in Living Cells."

Doctoral student **Matt Brege** (Chem), with his advisor **Lynn Mazzoleni** (Chem/EPPSI), is the recipient of a $30,000 student fellowship from the National Aeronautics and Space Administration. The project is titled "Aqueous Phase Oxidation of Biomass Combustion Emissions in Cloud."

Lynn Mazzoleni: NSF Collaborative Research project for $114,576: **Yatavelli, R.L.N., L.-W.A. Chen, L.R. Mazzoleni**, and **A.C. Watts**, Collaborative Research: Nitrogen Partitioning and Evolution of Particulate Organic Nitrogen in Peat Fire Emissions, NSF Atmospheric Chemistry Program, 2015–17. Colleagues at the Desert Research Institute are leading this effort.

2015 Michigan Tech Research Excellence Fund Awards:

• Infrastructure Enhancement Grant:

Marina Tanasova, Chemistry: "Acquisition of a DNA Synthesizer" ($70,000) The DNA synthesizer will be used to develop new DNA sequencing technology, fluorescent DNA probes and novel modified oligonucleotides, directed mutagenesis with synthetic DNA, synthetic DNA as hybridization probes for DNA damage detection, and as templates for mechanistic characterization of DNA transcription and DNA replication in the context of mutagenesis and chemotherapy. This instrument can also be used in a variety of chemistry, biochemistry, and biotech courses, from first-year to graduate levels.

• Research Seed Grants:

Loredana Valenzano: "Introducing Crystal Engineering and Computational Chemistry in K-12: A Top to Bottom Seed Project Involving Visual Tools" ($12,250). The goal of the project is to make K–12 students aware of the hidden but fundamental ties linking chemistry and technology with physics, math, and engineering.

Tarun Dam, Chemistry: "Multifunctional roles of a soy protein in immunity and cancer" ($30,000). This project would look at the interaction between Soy-X and cancer cells; cancer detection, stopping the growth of cancer cells, monitoring the signaling property, if any, of Soy-X in gut epithelial cells, and investigating how this protein is processed by immune cells.

• Institutional Enhancement Grant:

Cantrell, W., C. Mazzoleni, L.R. Mazzoleni, and **R. Shaw** "From Aerosol Particles to Cloud Droplets—Acquisition of a Cloud Condensation Nucleus Counter" (Physics), Michigan Technological University Research Excellence Fund.

Student Awards

1st Year Chemistry Achievement Award
Jonathan Nelson

Studio Lab Excellence Awards
Shelby McGuire
Alexandra VanSumeren

Doc Berry Award
Rachel Fouts

Undergraduate Award in Inorganic Chemistry
Rachel Fouts

Outstanding Senior Research Award
Eponine Zenker

Biochemistry Research Award
Eponine Zenker

Outstanding Senior Award
Aura Winter

Leslie Leifer Award in Physical Chemistry
Wade Korf

Departmental Scholar
Peter Winegar

Outstanding Lower Division Chemistry Teaching Assistant
Nethaniah Dorh

Outstanding Upper-Division Chemistry Teaching Assistant
Zhichao Chen
Chelsea Nikula

Rebecca Sandretto/Susan Stackhouse Summer Fellowship
Erin Mathews

Ray E. and Eleanor K. Cross Endowed Graduate Fellowship in Chemistry
Ni Fan

Outstanding Graduate Student Research Award
Mu (Molly) Yang

Ambassador Awards
Sarah Hopson, Melanie Talaga, Joseph Fedie, Beilu Zhang, Jack Vaclavek, Jacob Pleiness, Sean Flattery, Rachel Fouts, Melissa Hallman, Jacquelyn Hood, Andrew LeSage, Alex Maday, Shelby McGuire, Jacob Meyers, Austin O'Dea, Ramandeep Rekhi, Tyler Sawall, Ashley Schuman, Alexandra VanSumeren, Audra Winter, Eponine Zenker and Andrew Perla

Stephen Hahn '82

Stephen F. Hahn, from Midland, earned his BS in Chemistry from Michigan Tech in 1982, going on to earn an MS from Central Michigan University in 1990. Steve joined Dow Chemical upon graduation from Tech and has worked in a variety of research and new business development functions since. He currently heads Dow's Ventures and Business Development group in the San Francisco/Silicon Valley area. He holds 41 U.S. and numerous international patents and has authored 40 journal publications and six book chapters.

Hahn was named Dow inventor of the year in 1990 and 1996, delivered the distinguished alumni lecture at Tech in 1996 and 2003, and received the Dow excellence in science award in 1999. He was a visiting professor of chemistry at the University of Minnesota in 2002. Hahn received the American Chemical Society Cooperative Research Award in 2008 and the Council for Chemical Research Collaboration Award in 2010.

Steve Hahn has represented Dow on several advisory boards including at the University of Connecticut Institute for Materials Science and at Michigan Tech. He currently serves on the advisory board for the Global Social Venturing Competition at the Haas School of Business at UC-Berkeley and the innovation grant committee at the Lawrence Berkeley National Laboratory.

Alumni Updates

1951

James D. Spain was recognized by the American Chemical Society on his 60th anniversary as a member. Congratulations, Jim!

2003

Our alumni speaker for the 2015 Chemistry Awards Banquet was **Michael Bultman** '03.

Michael earned his PhD in Organic Chemistry (with Prof. David Y. Gin) from the University of Illinois/Memorial Sloan Kettering Cancer Center in New York City in 2009. He is now a senior research investigator in process development at Bristol-Myers Squibb in New Jersey.

Michael's awards program presentation centered on being a Chemical Mercenary for Hire. He discussed how his Tech education set the foundation for his scientific career and served as the springboard to acquire the necessary skills to become a professional scientist in the pharmaceutical industry.

Michael's technical talk the following day, "Overcoming Electronics with Strategy: Development of an Efficient Synthesis of a Novel Antiretroviral" included a discussion of process chemistry for the commercial route developed for an HIV pharmaceutical currently in clinical trials and the evolution of that strategy to access a highly functionalized 6-azaindole scaffold.

Alumni speakers—are you interested?

Each year, our awards program features one of our alumni providing not only an enjoyable look at how their Tech education led them to their present position, but also a rewarding and interesting technical talk regarding their current work in chemistry. We also have a regular weekly seminar program throughout the academic year. If you are interested in presenting your work to former teachers and colleagues, as well as the newest generation of chemists, please contact us at chemistry@mtu.edu. We'd love to hear from you!

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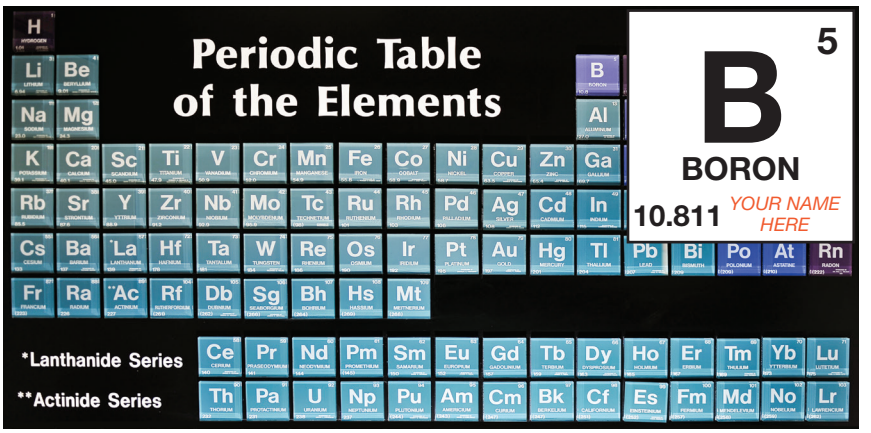
Giving



Elements of Success—2942

Our Elements of Success Periodic Table, located on the first floor of the Chemical Sciences Building, honors donors who give $1,000 or more to the chemistry program. Your name (or a name of your choice) will be engraved on your sponsored element and you will also receive your own personal tile. Our goal is a sponsor for each of the 118 elements on the Periodic Table. This year's featured element is Boron (B, atomic number 5). This intense and complicated little charmer needs a purpose in life—helping our chemistry department, perhaps?

You can see the lists of sponsored and available elements at www.mtu.edu/elements.

Other Giving Opportunities

All gifts to the chemistry department are used to enhance the education of our students. We have a giving web page—www.mtu.edu/chemistry/department/giving—to make sure your gift goes to the right place. Donations of any amount are welcome, and listed below are a few of the areas to which you can direct a gift. You may also use the enclosed envelope to make a gift.

Chemistry Learning Center—3181
The CLC is an important part of our department. Funding helps to provide quality coaching in a comfortable, supportive learning environment. This service continues to have a substantial impact on student success and retention.

Undergraduate research—3093
Support undergraduate student research and the development of valuable professional skills.

Graduate research—2969
Support graduate student research, travel, and professional development activities.