2017

2016-2017 ChE Newsletter

Department of Chemical Engineering, Michigan Technological University

ChE

Chemical Engineering

2016–2017

Spotlight:
Expanding the Unit Operations Lab

Michigan Technological University
1885

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Giving Opportunities

We are grateful to the many corporations, alumni, and friends who have generously donated to our Unit Operations Endowment Fund. We use funds from this account to make sure that we have best Unit Operations Laboratory in the nation.

The department has several other endowment funds, and all of them are very important for our growth. The Chemical Engineering Outreach fund supports undergraduate students wherever the needs are greatest, including helping our students travel to national meetings and conferences. Similarly we have a Mineral Processing Outreach Fund. We have used funds from this account to maintain our undergraduate laboratories.

We have started a new fund, the Junior Professorship Endowment. It will be used to chair a young professor in chemical engineering and help her/him develop a strong teaching and a research program.

If you have any questions with any of our funds, please do not hesitate to contact Professor and Chair S. Komar Kawatra at skkawatr@mtu.edu

On the cover:
The Unit Operations Lab's three-story solvent recovery unit (SRU) separates a mixture of ethanol and water.

Opposite:
Bill Colton '75, keynote speaker at the 2016 Convocation. See page 12.

Dear friends,

As many of you may know, this will be my final newsletter as chair. My term will end in 2017, and a new chair search is now underway. I want to thank all of you for everything we have done together to make the Department of Chemical Engineering great.

Over the years, I've had the tremendous pleasure to recruit many outstanding faculty members, including three Michigan Tech chemical engineering alumni—Adrienne Minerick, who is now associate dean of innovation and research for the College of Engineering, and assistant to the provost for faculty development. Caryn Heldt, whose pioneering virus research will improve human health, and Tim Eisele, who is fast becoming one of the nation's top experts in mineral processing.

Two more of our outstanding graduates recently joined our department as well, Dr. Rebecca Ong ('05), an assistant professor who specializes in the sustainability of lignocellulosic biofuels, and lecturer Jeana Collins, who will finish her PhD at Michigan Tech this summer. Her research areas include droplet microfluidics and dielectrophoresis. Dr. Lei Pan joined the department as an assistant professor, after completing a post-doc at Virginia Tech. His research focuses on fundamental studies of thin liquid films to improve the understanding of existing water-based mineral separation processes at the molecular level.

The outstanding quality and quantity of our students is my primary inspiration. When I first started as chair in 2007, the Department had 289 undergraduates and 23 graduate students. We welcomed 458 undergraduates and 40 graduate students this fall. Our overall average GPA for incoming freshmen in 2007 was 3.69; it is now 3.85.

None of this would have happened without the leadership and passion of our faculty and staff, and without the efforts of our advisory board, alumni, and the many friends who care deeply about chemical engineering at Michigan Tech. I am especially grateful to former College of Engineering Dean Tim Schulz, and also to Alexis Snell, our chemical engineering department coordinator, and Tony Rogers, associate chair.

I consider myself to be a professor first and foremost. I conducted research and taught classes each semester, and advised 25 graduate students while serving as department chair, 39 total. I look forward to continuing the same activities going forward, this time with far more time left over to devote to Geeta, my dear, beautiful, and beloved wife.

I hope you will keep in touch throughout the coming months and beyond. Feel free to contact me anytime, at skkawatr@mtu.edu.

S. Komar Kawatra
Professor and Chair

About the Department

The Department of Chemical Engineering at Michigan Tech is among the world's leaders in providing quality education and research. As of January 2017, we have 18 faculty, 7 staff, 458 undergraduate students, and 40 graduate students—including 22 PhD students.

We are housed in the Chemical Sciences and Engineering Building at the center of Michigan Tech's campus in Houghton. We offer programs leading to the Bachelor of Science in Chemical Engineering, Master of Science in Chemical Engineering, and the Doctor of Philosophy (PhD) in Chemical Engineering.

Our mission is to provide a high-quality educational experience that prepares graduates to assume leadership roles within the chemical and associated industries; to foster the pursuit of new knowledge and innovative scholarship in the chemical sciences and engineering; and to provide leadership to the chemical engineering profession through scholarship, teaching, and service.

Our facilities—including the Process Simulation and Control Center, Hazards Laboratory, and Carbon Technology Center—are state of the art. Our BASF and Kimberly-Clark classrooms offer multimedia equipment, videoconferencing, and audiovisual technology.

Our Faculty

Our world-class faculty have published nationally recognized textbooks on safety, environmentally sensitive engineering, rheology, and polymer engineering. They have won numerous honors for their achievements in research and teaching, including the A.M. Gaudin Award for Mining, Metallurgy and Exploration from the American Institute of Metallurgy, the Norton H. Walker Award from the American Institute of Chemical Engineers, and Michigan Tech's Distinguished Teaching Award.

Faculty research areas include chemical process design, polymers, advanced process control, chemical process safety, minerals processing engineering, catalysis and particulate processing, environmental engineering, polymer rheology, biochemical engineering, as well as alternative energy and sustainability. We also offer one of the only dedicated technical communication courses for chemical engineering in the US.

High school students in Michigan Tech's Summer Youth Program conduct an experiment in the UO Lab

Chemical Engineering Faculty

Gerard T. Caneba, PhD
Professor
University of California, Berkeley
Carbon nanotube/polymer composites precipitation polymerization

M. Sean Clancey, PhD
Senior Lecturer
Michigan Technological University
Technical communications

Tomas B. Co, PhD
Professor
University of Massachusetts
Process integrity, process modeling, plant-wide control

Jeana Collins, MS
Lecturer
Michigan Technological University
Reverse insulator dielectrophoresis

Timothy Eisele, PhD
Associate Professor
Michigan Technological University
Metals extraction, CO_2 sequestration

Caryn Heldt, PhD
Professor, Lorna and James Mack Endowed Chair
North Carolina State University
Biosensors, design of biomolecules

S. Komar Kawatra, PhD
Professor and Chair
University of Queensland, Australia
Iron and steel making, particle technology

Julie A. King, PhD
Lorna and James Mack Professor of Continuous Processing
Mechanical Engineering, University of Wyoming
Thermally and electrically conductive resins, composites

Adrienne Minerick, PhD
Professor, Associate Dean of Innovation and Research
University of Notre Dame
Electrokinetics, biomedical microdevices

Faith A. Morrison, PhD
Professor
University of Massachusetts
Rheology of complex systems, chemical engineering education

Michael E. Mullins, PhD
Professor
University of Rochester
Environmental kinetics and thermodynamics, engineered nanostructures

Rebecca Ong, PhD
Assistant Professor
Michigan State University
Lignocellulosic-based biofuels and biomaterials, sustainability of bioenergy production systems

Lei Pan, PhD
Assistant Professor
Virginia Tech
Mineral and coal processing

Tony N. Rogers, PhD
Professor
Michigan Technological University
Environmental thermodynamics, process design and simulation

John F. Sandell, PhD
Assistant Professor
Michigan Technological University
Fire protection and environmental engineering

David R. Shonnard, PhD
Professor, Richard and Bonnie Robbins Chair in Sustainable Materials
University of California, Davis
Biological engineering, alternative energy, sustainability

Wen Zhou, PhD
Assistant Professor
University of California, Los Angeles
Computational systems biology and bioinformatics

Post Doctoral Fellow

Hector Moncada Hernandez, PhD
Instituto Technologico y de Estudios Superiore de Monterrey
Dielectric characterization and electrokinetic manipulation of bioparticles in microfluidic devices employing dielectrophoresis

James and Lorna Mack Endow a Professorship and a Chair

Lorna and James Mack

JAMES A. MACK '59 and his wife, Lorna, have endowed a chair and a professorship in the Department of Chemical Engineering. **Julie A. King** has been named the James and Lorna Mack Professor of Continuous Processing. **Caryn L. Heldt** has been named the James and Lorna Mack Chair in Bioengineering.

King's research focuses on adding various carbon fillers to typically thermoplastic polymers to produce electrically and thermally conductive resins. She worked in industry with continuous processing for 10 years prior to joining Michigan Tech in 1996—three years at Exxon's Baytown, Texas, refinery and seven years at Conoco in Ponca City, Oklahoma.

King uses plastic to make composites that behave a bit like metals. "These composites could be used for the next generation of bipolar plates. We add various carbons—carbon black, synthetic graphite, carbon fiber, and carbon nanotubes—to a liquid crystal polymer and a polymer called polypropylene," she says. "The carbon conducts heat and electricity, and the thermoplastics are the glue that holds the composite material together."

Through Tech's Center for Fundamental and Applied Research in Nanostructured and Lightweight Materials, King and her colleagues have designed and tested a variety of carbon-thermoplastic composites. The results are promising, nearing Department of Energy targets for both electrical and thermal conductivity.

Heldt tracks down viruses. She finds ways to remove them from water and biotherapeutic drugs, and purifies them for vaccines. "Virus removal is more difficult than taking out bacteria; they are a lot smaller, and sometimes they can be more chemically inert," Heldt explains. Chemical properties are further complicated by virus shells. On the outside, enveloped viruses have an intertwined fringe of lipids, and this makes them easier to target for removal. Non-enveloped viruses, however, have a hard protein layer. To date, the only way to remove them is with expensive, single-use nanofilters. "We're interested in finding ways that don't require nanofiltration," says Heldt.

With a 2015 NSF CAREER Award of $525,000, Heldt is developing new virus removal techniques. "We want to take a different approach and learn more about the virus surfaces," she says. "If we have a better understanding of the chemistry of the surface of the virus, then we have a better chance of creating a removal mechanism that is more efficient." One hypothesis she will explore is how virus surfaces repel water. This hydrophobic tendency is understudied, but could impact virus removal.

Mack is the retired president and CEO of Cambex Corporation, a developer of specialty chemicals. His company has successfully combined biology with engineering—especially in the rapidly emerging field of tissue engineering and cell therapy and the development of small molecule therapeutics.

Mack earned his BS in Chemical Engineering at Michigan Tech, an MBA from Western New England College, performed graduate research at the University of Toledo, and received an honorary doctor of engineering degree from Michigan Tech in 2000.

Julie A. King

Caryn L. Heldt

Minerick Named Associate Dean for Research and Innovation, and Assistant to the Provost

ADRIENNE MINERICK, professor of chemical engineering with an adjunct appointment in biomedical engineering, was named the College of Engineering's first associate dean for research and innovation. In her new position, Minerick coordinates faculty and staff engagement with each other and with agencies that fund research projects, ranging from single-investigator one-year projects, to complex multidisciplinary projects involving several institutions and spanning years.

Adrienne Minerick

> We've been able to develop some exciting programs this year, such as Early Career Management committees, to help our newly hired faculty jumpstart their careers, networking for mid-career faculty, and team-building/ collaborative events for all. These foundations will make us more competitive for large initiatives."
> –Adrienne Minerick

According to College of Engineering Dean Wayne Pennington, the position has been expanded to include "innovation" as part of the associate dean's duties. "The addition further expands the University's goal of economic and social development, including support of technology commercialization," the dean said.

Pennington called Minerick uniquely qualified to help move the College of Engineering and the University as a whole, toward its goals.

"Adrienne is one of our leading researchers, working in the constantly expanding areas of health science and engineering," he said. "But she has also successfully created a start-up company based on some of her research, and the interaction of that company with the University, the SmartZone, Superior Innovations, and other groups engaged in economic development provides valuable experience that she can use to assist others to do the same."

Minerick joined the Michigan Tech faculty as an associate professor in 2009 and was recently promoted to professor. She has received numerous honors and awards, including the distinction of Fellow of the American Association for the Advancement of Science, a CAREER Award from the National Science Foundation, the Raymond W. Fahien Award from the American Society of Engineering Education, and Michigan Tech's Fredrick D. Williams Instructional Innovation Award.

"We've been able to develop some exciting programs this year, such as the Early Career Management committees, to help our newly hired faculty jumpstart their careers, networking for mid-career faculty, and team-building/ collaborative events for all," says Minerick. "These foundations will make us more competitive for large initiatives." For the 2016-17 academic year, Minerick will also serve as assistant to the provost for faculty development. In this new role, she will continue to promote professional development and career success among early- to mid-career faculty across campus.

Unit Operations Lab

UO Lab is dedicated to S. Komar Kawatra

Komar and Geeta Kawatra

Guests included members of the External Advisory Board, from r to l: Tom Prausa '03, 3M; Kurt Murkada, Freeport McMoran, Glenn Mroz, Michigan Tech; Brad Rick '84, Amway Corp; Glenn Lawrence '75, Merck; David Kasprzyk, The Dow Chemical Company; Sam Smith '94, Bemis; Jeff Baker '86, Dow Corning; Dave Reif, Tyco; Komar Kawatra, Michigan Tech; Mark Mleziva '92, Kimberly-Clark Corporation.

S. KOMAR KAWATRA, Department chair, was honored for his vision and fund-raising efforts for Michigan Tech's Unit Operations Laboratory. Members of the Department's External Advisory Board, Michigan Tech President Glenn Mroz, and Dean of Engineering Wayne Pennington all spoke at the dedication ceremony.

A recognition plaque was installed near the new window into the lab, which is now dedicated to Kawatra for his efforts to ensure that the facility remains the best Unit Operations Laboratory in the country.

Michigan Tech's Unit Operations Laboratory is a state-of-the-art chemical engineering teaching facility with a three-story open bay and 6,500 square feet of learning space. Students currently operate two fully-automated pilot plants: a three-story distillation column (solvent recovery unit) and a two-story batch polymerization reactor. An upcoming UO Lab expansion will make room for additional pilot plants.

"This lab is an example of the practical, hands-on education available to Michigan Tech students," said Kawatra. "We are very proud of our donors, faculty, and staff, who maintain this excellent facility."

"Thank you, Komar, for your diligent devotion in providing Michigan Tech students with the necessary resources to become accomplished chemical engineers around the world."

–Glenn Mroz,
President, Michigan Tech

More about Dr. Kawatra

RESEARCH

Chemical engineering specializing in instrumentation and on-line analysis for monitoring and control of chemical and particulate process plants, and the treatment/ remediation of chemical and industrial wastes.

EXPERIENCE

- Professor and Chair, Department of Chemical Engineering Director, Michigan Tech Advanced Sustainable Iron & Steel Making Center (ASISC)
- National Research Council Scholar, Canada
- Scientific Officer, Bhabha Atomic Research Centre (BARC), India.

EDUCATION

- PhD, Metallurgical Engineering, University of Queensland, Australia
- BS and MS, Physics, University of Poona, India

SELECTED HONORS & AWARDS

- Fulbright Scholarship, 2014
- Robert H. Richards Award, American Institute of Mining and Metallurgy
- Taggart Award, Society for Mining, Metallurgy and Exploration
- Frank F. Aplan Award, American Institute of Mining, Metallurgical, and Petroleum Engineers

BOOKS, PUBLICATIONS

- 150-plus technical publications, and 8 books
- Coauthor, "*Coal Desulfurization:*
- *High-Efficiency Preparation Methods*," a reference book for practicing engineers.
- Editor-in-Chief, *Minerals & Metallurgical Processing Journal*, and *Mineral Processing & Extractive Metallurgy Review Journal.*

Komar Kawatra

Graduate Students Advised: 39

- Basak Anameric, MS, PhD
- Kimberly Anderson, MS, PhD
- Ankur Athuni, MS
- Abhaya Bakshi, PHD
- Aimee Blanchard, PhD
- Patricia Buis, PhD
- Nicholas Burrows, MS
- Paul Campbell, MS
- Joshua Carlson, MS, PhD
- Justin Carlson, PhD
- Victor Claremboux, MS
- Benjamin Conard, MS, PhD
- Christopher Copeland, MS, PhD
- Timothy Eisele, MS, PhD
- Robert Greenlund, MS, PhD
- Jithendar Gujja, MS
- Joseph Halt, MS, PhD
- Howard Haselhuhn, MS, PhD
- Matt Hess, MS
- Charlotte Jeltema, PhD
- Marissa Knudsen, MS
- Jacob McDonald, MS, PhD
- Scott Moffatt, MS
- Sushil Pachpinde, MS
- Steven Perry, MS
- Stephen Ripke, MS, PhD
- William Schuessler, MS
- Hrishikesh Vilas Shinde, MS
- Kyle Shoop, PhD
- Robert Snay, MS
- Brett Spigarelli MS, PhD
- Urvashi Srivastava, MS, PhD
- Laura Starkey, MS
- Henry Walqui, MS, PhD
- Lu Wang, MS
- Geetha Boreddy, MS
- Daniel W Collins, MS
- Bhaskar Halami, PhD
- Jeremy Pletka, MS
- Michael Taylor, MS
- Muralidhara Thimmaiah, PhD

Help Create World-Class Chemical Engineers

Expand Our World-Class Unit Operations Lab!

Panoramic view of the first and basement floors of the UO Lab North Wing

The solvent recovery unit, a three-story distillation column in the UO Lab

Expansion and upgrades in the UO Lab will allow 100 additional undergraduates to major in chemical engineering at Michigan Tech each year.

To Make a Gift, Please Visit mtu.edu/chemical/department/giving

Thank you for your support!

- We will add 3,000 square feet of high bay laboratory space to the west of the existing Unit Operations Lab. We have a suite of pilot plants in mind for the expansion space, but the first two additions (already under construction) will be "Solvent Extraction/ Electrowinning" and "Forest-Based Biofuels."
- These changes will open new research opportunities for master's and doctoral students.
- We must raise $3 million in order to complete the UO Lab expansion by spring 2018.
- Please join us in this effort. We cannot do it without you!

TOP Stefan Wisniewski, research associate, installs the new solvent extraction/electrowinning pilot plan, donated by Solvay and Freeport McMoran. MIDDLE A senior student conducts a unit operation to study fluid flow through pipes and valves. BOTTOM Students run the liquid/liquid separation unit.

Global Future: People, Progress, Energy and Engineering

WILLIAM M. (BILL) COLTON was the keynote speaker for the 2016 Chemical Engineering Convocation. Colton is vice president of corporate strategic planning for Exxon Mobil Corporation. In this role, he oversees all of the corporation's strategic planning activities and the development of its *Energy Outlook*, ExxonMobil's assessment of global energy trends.

Colton earned his BS degree in chemical engineering from Michigan Tech in 1975. He joined Exxon Corporation upon graduation, and his career has been spent in both upstream and downstream businesses throughout ExxonMobil, including project development, refining, lubes, synthetic fuels, and natural gas marketing. Colton also worked in finance and planning positions, including ExxonMobil corporate headquarters and eight years overseas in Tokyo and Bangkok. Colton's previous assignment was as the corporation's assistant treasurer.

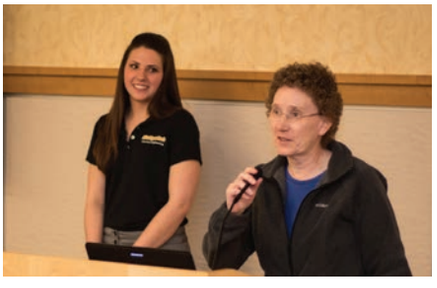
"Energy underpins standards of living everywhere in the world, and the need for affordable and reliable energy in the 21st century remains vast."

—William M. Colton,
VP Strategic Planning, ExxonMobil

"By 2040, the world's population will have reached 9 billion, and global GDP will have more than doubled," noted Colton in his address. "This economic progress translates into improved standards of living for billions of people. Energy underpins standards of living everywhere in the world, and the need for affordable and reliable energy in the 21st century remains vast. Global energy demand is expected to grow 25 percent by 2040 and, to keep pace with demand, the world will need to pursue all economic energy sources. These sources include oil, gas, coal, nuclear, and renewables. At the same time, the CO_2 intensity of the global economy is expected to be cut in half by 2040.

William Colton

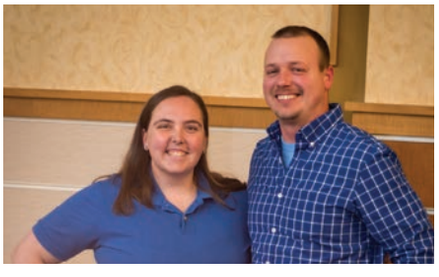
"These advances, for the economy, for people's living standards, for the expansion of energy types and supplies, and for the environment, are enabled by technology. Technology has the highest potential to help meet our economic, energy, and environmental goals—reinforcing the critical role played by scientists and engineers."



Julie King won the AIChE Teaching Professor of the Year Award, with Julia Zayan (left)

Olivia Munoz (l) won the Kimberly-Clark Professional Ethics Award, presented by Laurie Couture-Dorschner, Kimberly-Clark

David Shonnard won the AIChe Research Faculty of the Year Award, presented by Jacqueline Harms, AIChE Student President



Richard Machiela won the Outstanding Graduate Teaching Assistant of the Year Award, presented by Jacqueline Harms

Chemical Engineering Class of 2016

Michelle Hoard, Jonathan Iafrate, Dylan Turpeinen, and Kyle Thompson won the Dow Chemical Marriott W. Bredekamp Award, presented by Timothy Eisele

Robert Parker won the Kimberly-Clark Communication Award, presented by Laurie Couture-Dorschner

Paul Langford, Travis Pellosma, Alex Reichanadter, and Cameron Roman won the UOP Davis W. Hubbard Plant Design Team Award, presented by Tony Rogers

SUPPORT FROM MRS. KAREN HUBBARD, KIMBERLY-CLARK, DOW CHEMICAL, DOW CORNING, AND UOP MADE THIS YEAR'S CONVOCATION POSSIBLE.

CPM Enterprise Team: Improving Lives Through Innovation

CONSUMER PRODUCT MANUFACTURING (CPM) aspires to empower students with the entrepreneurial, technical, and professional skills to conceive, develop, and market successful products in a company-like setting. Students come from many disciplines and use hands-on experiences to identify and solve real-world engineering problems. CPM aims to exceed the expectations of company sponsors, improve the lives of consumers through innovation, and develop our team members into highly marketable professionals.

Project Highlights

CPM team members lead and manage projects that solve real-world engineering problems, including increasing the reliability of an industrial automotive parts-washing machine, designing an operator interface for earth moving machinery, and developing a dryer to help small-scale hops growers.

Additional projects include modeling more accurate flooding predictions for the Midland, Michigan area, utilizing food waste as an alternative energy source at Michigan Tech, and integrating energy absorbing material into athletic equipment.

CPM team members

CPM is also investigating the use of recyclable materials in flexible packaging, designing a parking structure for campus, modeling wind to extend the life of mounted banners, and studying ultrasonic welding processes—as well as brainstorming innovative product ideas within the team.

ADVISORS

Tony Rogers and Sean Clancey, Chemical Engineering

SPONSORS

Wisconsin Southern Railroad, Caterpillar, Fives Cinetic Corporation, Worham Acres LLC, Keweenaw Economic Development Alliance (KEDA), Michigan Technological University, The State of Michigan Research Excellence Fund, Michigan Department of Agriculture and Rural Development (MDARD), nanoMAG—A Thixomat Company, Razor Edge Systems, and Dr. Robert Carnahan

Michelle Hoard: National Science Foundation Graduate Research Fellow

MICHELLE HOARD '16, has won a National Science Research Fellowship.

Hoard interned this summer with the National Center for Toxicological Research, a division of the FDA in Jefferson, Arkansas, where she worked with the Electron Microscopy group to characterize nanoparticles. In the fall she will attend graduate school at the University of Minnesota—Twin Cities. She intends to continue her focus on nanomaterials and nanoparticle drug delivery.

The NSF Graduate Research Fellowship is one of the most prestigious and competitive programs supporting graduate study in science and engineering. The fellowship includes a stipend of $46,000 per year for tuition and fees for up to three years. Fellows have the opportunity to conduct collaborative research with international researchers in over 20 countries and undertake research internships in national laboratories in the US.

"One of the exciting aspects of obtaining a PhD to me is that it opens the door to many different career paths," says Hoard, who earned her BS degree in April. "One of my career aspirations is to become a professor. I would love to teach and mentor students." Another is to become an entrepeneur.

Michelle Hoard

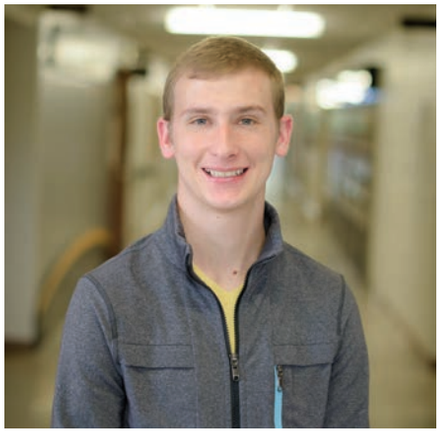
Dylan Turpeinen Wins Portage Health Scholarship

DYLAN TURPEINEN has been awarded a Portage Health Scholarship. Turpeinen graduated from Houghton High School in 2012 and decided to stay in the Houghton area to pursue a Bachelor of Science in Chemical Engineering at Michigan Tech. He worked as an undergraduate researcher with Caryn Heldt and Julia King, fabricating and testing graphene nanoplatelet (GNP)/cellulose biosensors.

He shared his enthusiasm for biosensors with Summer Youth Program (SYP) participants, teaching high school and middle school students how to utilize a multi-meter and biosensor to identify proteins.

Turpeinen hopes to put his chemical engineering to work to help fight malaria with biosensor devices. "This scholarship allowed me to start my graduate research last spring. I couldn't be more excited to get in the lab," he said.

The scholarships are part of a Michigan Tech-Portage Health Foundation partnership established to support health-related research and education, jobs and community health.



Dylan Turpeinen

Adam Schmidt: CopperDog is a Dream Come True

ADAM SCHMIDT fulfilled a lifelong dream by competing in the Iron Line sled dog race at the George Young Recreation Complex in Iron River, Michigan. The third-year chemical engineering major competed in an 80-mile race last February as part of the CopperDog 150 weekend in Houghton and Keweenaw counties, leading a six-dog team.

Schmidt's love affair with sled dog racing began in a Wisconsin elementary school more than a decade ago. When Schmidt was a fourth-grader at Park Community Charter School, in Kaukauna, Wisconsin, librarian Mary Vander Loop taught her students a strange new word. "She introduced us to the Iditarod and dog sledding," Schmidt recalls. "She would read us books and set up displays with different checkpoints. The best part of the race season was hearing the Iditarod Song through the loudspeakers and everyone singing along."

So how does a man who describes himself as a "cat person" end up training a team and mushing in a prestigious sled dog race? "I didn't even think about dog sledding when I came up to Tech," Schmidt says. "But then OAP (Outdoor Adventure Programs) offered dog sled rides at the Otter River Sled Dog Training Center. I was so excited."

Adam Schmidt

The following fall Schmidt contacted Otter River musher Tom Bauer and almost immediately started taking care of three sets of puppies. Helping out around the kennel led to training the team that competed with Schmidt in the CopperDog.

Schmidt says balancing school and his training has been a challenge. While training for the CopperDog, he went to the kennel four days a week to work with his team. In addition, he is quite involved in campus activities and holds leadership positions in several student organizations, while carrying a full course load.

Schmidt keeps his expectations realistic. "My first priority is keeping my team and myself safe." Due to the closeness of the mushing community, Schmidt learned a great deal from the experience. "Many of the mushers help me learn because that is what they do. This sport creates a family atmosphere with great support and understanding."

And with that comes the satisfaction of seeing a dream come true. "After putting all that time into training, when I came off the starting line of my first race I smiled that I was actually doing what had been my dream. I couldn't believe it."

OXE Builds New Chemical Engineering Learning Center

OMEGA CHI EPSILON (OXE), the Chemical Engineering Honor Society, has made great progress this year in increasing membership and providing learning experiences to students in the Department and the community. Student members of OXE transitioned the chemical engineering learning center from a volunteer organization to one with paid positions, with assistance from the Department. "This allows the learning center to have a more stable structure," notes OXE advisor, Caryn Heldt. OXE will now be able to serve a significant number of students in the school year to come.

OXE, which is open to juniors and seniors only, inducted 25 new members this semester—a large number for an organization with a high GPA requirement. OXE is one of the founding organizations of the Western UP Science Fair, and also conducted outreach to underclassmen on co-ops and internships.

OXE members

Check out OXE on Facebook at:
fb.com/mtuoxe

Chem-E Car places second in Regional Competition

MICHIGAN TECH'S Chem-E-Car team took second place at the American Institute of Chemical Engineers' (AIChE) 2016 North-Central Regional Conference Chem-E-Car Competition. Seventeen universities participated.

The competition is designed to engage college students in designing and constructing a car powered by a chemical energy source that will safely carry a specified load over a given distance and stop.

The Michigan Tech team's chemical energy source was a silver oxide battery of their own design. The team was given a payload of 195 grams and a distance of 19.5 meters.

Their car's stopping reaction (the chemical reaction that caused the vehicle to stop moving) was a vitamin C clock reaction. The solution for the vitamin C clock reaction starts clear, then instantaneously turns a dark violet. The time it takes for this to happen is based on the concentration of products.

The solution is placed between an LED light and a photo diode. When the solution is clear, the photo diode picks up light from the LED and continues to run. When the solution changes color, the light from the LED is blocked, and the photo diode signals the motor of the vehicle to stop.

Supporting the team were Associate Professor Tomas Co, advisor, as well as Associate Professor Tony Rogers, and Matt Heyse.

Top Five Universities at Chem-E-Car Regionals

These top five schools qualified to compete at the AIChE's national competition in San Francisco in November.

- **Michigan State University**, with a distance from target of 0.11 meters.
- **Michigan Tech**, distance from target 0.41 meters.
- **University of Michigan Team B** (U of M had 2 teams), distance from target 0.50 meters.
- **Purdue University**, distance from target 0.51 meters
- **Trine University**, distance from target 1.02 meters

Alternative Energy Enterprise Team Works Locally

ALTERNATIVE ENERGY ENTERPRISE (AEE) provides opportunities for students in multiple academic disciplines to research and develop alternative energy sources. Students conduct projects, research, and development in conjunction with industry sponsors to produce viable solutions to real-world energy problems.

Project Highlights

AEE focuses on designing and implementing alternative energy solutions for use in the community. The AEE Solar team assisted the Ford Forestry Center in Alberta, Michigan, in determining the optimal locations for PV solar panels. The AEE Biofuels team discovered methods to improve heat transfer in a pyrolysis reactor, therefore improving biofuel yields, which could be further upgraded for transportation fuel. The AEE Fuel Cell team integrated a hydrogen fuel cell into a battery-powered electrical ladder, donated by JLG, to extend its operating time.

The AEE Geothermalteam is developing an educational display on geothermal heating and cooling with heat pumps for the Keweenaw National Historic Park Visitor Center in Calumet, Michigan. Members of AEE are also collecting crude biofuel from the pyrolysis pilot plant in the Unit Operations Lab.

ADVISORS

Jay Meldrum, Keweenaw Research Center and David Shonnard, Chemical Engineering

SPONSORS

Pavlis Honors College, JLG, National Park Service, ArcelorMittal, Richard and Bonnie Robbins Endowment, and Keweenaw Research Center

AEE team members at Michigan Tech's annual Design Expo

Tony Rogers Honored by Fraternities and Sororities

Rogers receiving the 2016 Greek Life Outstanding Faculty Award.

Student members of the Michigan Tech Greek Life community of fraternities and sororities selected Chemical Engineer Professor Tony Rogers to receive the 2016 Greek Life Outstanding Faculty award. Rogers is pictured with Danielle Janny '16, who now works as a process engineer for Flint Hills Resources in Minneapolis, Minnesota.

Rogers was chosen for his dedication to supporting students and helping them succeed academically, his passion for teaching and research, his innovative teaching methods, and his efforts to promote academic integrity among students.

Phosphorus Eaters

Using Bacteria to Purify Iron Ore

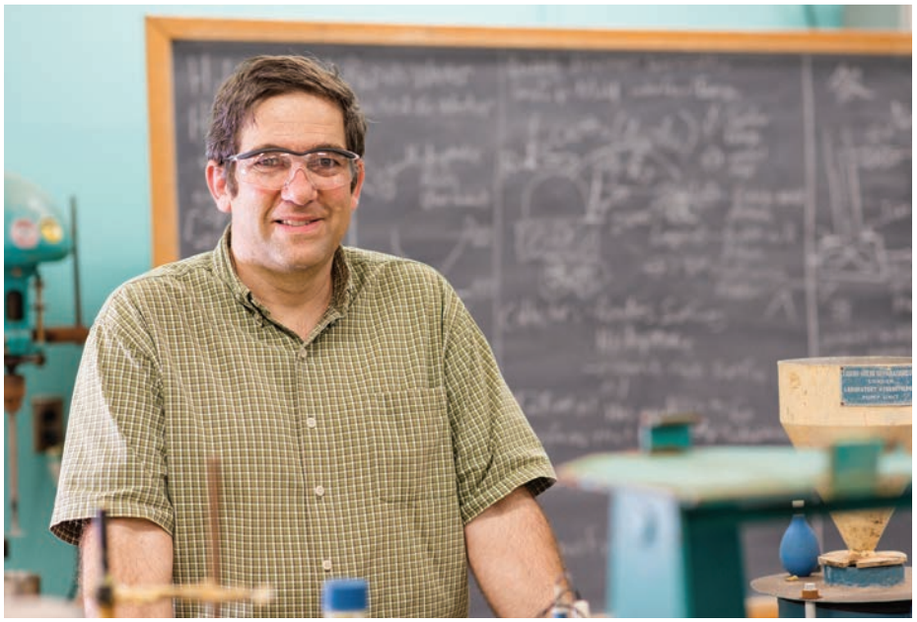
THERE ARE MANY IRON ore deposits around the world which are extensive, easy to mine, and have very high iron contents, but are difficult to use because of their high phosphorus content. Phosphorus makes steel brittle and difficult to work. Phosphorus content in steel should generally be less than 0.02 percent.

Often, phosphorus is so finely disseminated through iron ore that grinding and physically separating out the phosphorus minerals in a beneficiation plant is completely impractical.

Tim Eisele is developing communities of live bacteria to inexpensively dissolve phosphorus from iron ore, allowing a low-phosphorus iron concentrate to be produced.

"Beneficiation plant processing only works if the phosphorus mineral grains are bigger than a few micrometers in size," says Eisele. "For finely dispersed phosphorus, until now, there really hasn't been a technology for removing it."

Phosphorus is critical to all living organisms. Eisele's experiments are designed so that organisms can only survive if they are carrying out phosphorus extraction. He uses phosphorus-free growth media. "We've confirmed that when there is no iron ore added to the media, there is no available phosphorus and no bacterial growth," he says.



Timothy Eisele

Anaerobic bacteria in the flask dissolve iron in the ferrous state. Eisele recovers it using electrolysis, producing electrolytic iron.

Eisele is investigating two approaches—one using communities of aerobic organisms to specifically attack the phosphorus, and another using anaerobic organisms to chemically reduce and dissolve the iron while leaving the phosphorus behind. He obtained organisms from local sources—his own backyard, in fact—where natural conditions select for the types of organisms desired. He originally got the idea for this approach as a result of the high iron content of his home well water, which is caused by the anaerobic iron-dissolving organisms.

Eisele cultivated anaerobic and aerobic organisms in the laboratory to fully adapt them to the ore. "We use mixed cultures of organisms that we have found to be more effective than pure cultures of a single species of organism," he explains. "The use of microorganism communities will also make it more practical to implement them on an industrial scale, where protecting the process from contamination from outside organisms may be impossible."

John T. Patton Wins Honorary Alumni Award

Chemical Engineering Professor Emeritus

EACH YEAR members of the Michigan Tech Alumni Association Board of Directors review dozens of nominations of outstanding alumni and friends to determine 2016 award recipients.

John T. Patton, former professor of chemical engineering, 1968-77, has won the 2016 Honorary Alumni Award, which honors individuals who have provided service and support of the university characteristic of dedicated alumni.

A Fort Worth, Texas, native, Patton earned his BS (1953), MS (1958), and PhD (1959) in Chemical Engineering from Oklahoma State University. He joined Exxon USA as a section head responsible for research on enhanced petroleum operations in 1959. He held progressively responsible positions in Exxon until 1968 when he brought his extensive process design and operations experience to Michigan Tech as professor of chemical engineering plant design and economics.

> "I never had a bad student. I never had a student graduate without two or three job offers. I don't think any other professor at any other university can say that."
>
> —John T. Patton

John T. Patton

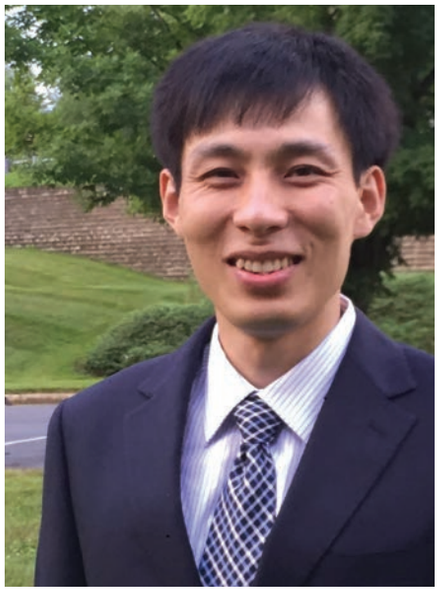
Patton played a definitive early role in the quality of design chemical engineering experiences at Michigan Tech. Within three years his design students started receiving national recognition from AIChE. During his tenure at Michigan Tech, his students twice won the national AIChE Design Contest for undergraduates. He also initiated a viable graduate program and elevated the quality of the undergraduate curriculum, which then received full national accreditation.

In 1977, Patton left Michigan Tech to become Professor and Department Head of Chemical Engineering at New Mexico State University; a position he held until 1989, retiring as professor emeritus in 1994.

Patton founded a design and research corporation, Computer Bio/Engineering Institute Inc. of El Paso, Texas in 1967. As president and chief engineer, he maintains an active consulting practice on the design and operation of a multitude of chemical plants ranging from biosynthesis processes to oil field production facilities. Patton has 26 patents and over 42 publications in areas of enhanced oil and gas recovery, biosynthesis, and advanced co-generation.

Patton traveled to Michigan Tech to receive his award during a wine and cheese reception September 21, 2016. The reception was held on the first floor of the Chem Sci Building, near the Unit Operations Laboratory Window. "I can't thank you enough for the opportunity to come back here," he said. "I never had a bad student. I never had a student graduate without two or three job offers. I don't think any other professor at any other university can say that. You have selected what I consider to be the best undergraduate education in the whole world."

New Faculty



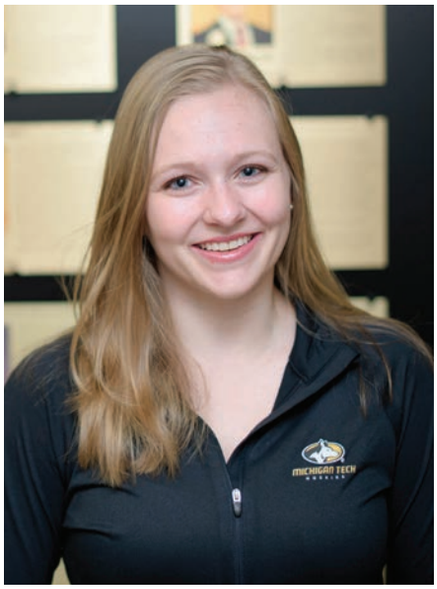
Lei Pan

LEI PAN joined the Department of Chemical Engineering this fall as assistant professor after having served as a postdoctoral researcher at Virginia Polytechnic Institute and State University. Pan received his BS degree in Mineral Processing Engineering from Central South University in China in 2008 and MS and PhD degrees in Mining Engineering at Virginia Tech in 2009 and 2013, respectively.

Pan's research focuses on fundamental studies of thin liquid films to improve the understanding of existing water-based mineral separation processes at the molecular level in order to develop sustainable resource recovery technologies from first principles.

"As lithium-ion battery technologies becomes more readily accessible and affordable, the need to develop a diverse, sustainable domestic supply chain for raw materials is critical," says Pan. He will address this supply chain challenge through fundamental studies, visualization, and modeling.

Pan's research interests also include wetting and dewetting of fluids in confined geometries.



Jeana Collins

JEANA COLLINS joins Michigan Tech's Department of Chemical Engineering as a lecturer. She will receive her PhD in Chemical Engineering at Michigan Tech in 2017. She has worked at Tech as a graduate teaching assistant as well as a mentor for current undergraduate researchers. Collins is a recipient of the Outstanding Graduate Student teaching award.

She is a member of Omega Chi Epsilon, a chemical engineering honor society, as well as Tau Beta Phi engineering honor society, the University of Minnesota Duluth Alumni Association and Order of the Engineer. Collins also coaches Tech's dance team and mentors students in time management, coursework, and prioritization.

Rebecca Ong

REBECCA ONG joins the Department as an assistant professor.

Ong earned a PhD in Chemical Engineering at Michigan State University in 2011. She earned a BS in Chemical Engineering and a BS in Biological Sciences (Plant Sciences) from Michigan Tech in 2005.

Ong's research interests include sustainability of lignocellulosic biofuels, biomass characteristics that influence digestibility, and production of co-products from lignocellulosic biomass.

During Fall semester of 2015 Ong was a part-time Instructor in the Department, and until this August was a Research Assistant Professor at Michigan State University and the Great Lakes Bioenergy Research Center (GLBRC) in East Lansing, Michigan.

New Staff

Alexis Snell

Scott Wendt

Taana Kalliainen

Sue Niemi

WE WELCOME FOUR NEW STAFF:

Departmental Coordinator **Alexis Snell**, from the Michigan Tech Rozsa Center; Staff Assistant **Taana Kalliainen**, from the Department of Physics; Staff Assistant **Sue Niemi**, from the Department of Humanities. **Scott Wendt**, Manager of Laboratory Services, from Calumet Electronics in Calumet, Michigan. Wendt earned a BS degrees in both Chemical Engineering and Chemistry from Michigan Tech in 1991.

Turning Straw into Gold

Pyrolysis as a Biofuel Conversion Technology

Alesha Fumbanks

"Helping with graduate level research was one of the best experiences I had at Michigan Tech. I like learning things in a hands-on environment."

—Alesha Fumbanks '15

ALESHA FUMBANKS '15 spent her senior year as an undergraduate researcher, investigating the best use of rice straw as feedstock for the production of biofuel.

Fumbanks worked with chemical engineering graduate student Suchada Ukaew, and Robbins Chair and professor David Shonnard to investigate pyrolysis as a conversion technology for rice straw. Pyrolysis is a technique for decomposing organic materials at high temperatures in the absence of oxygen. After pyrolysis, the resulting material from the rice straw can be converted to a hydrocarbon biofuel.

In the lab, Fumbanks prepared rice straw samples for the pyrolysis process. She also helped Ukaew, a Royal Thai Scholar, perform composition analysis, measuring the hemicellulose, cellulose, and ash content. The team used fast pyrolysis, a thermal conversion process where rice straw is directly converted to liquid fuel. Rice straw is rapidly heated (within one second) to temperatures between 500-600°C in the absence of oxygen, and the produced vapors are condensed rapidly. The result may include anywhere from 35-55 percent liquid bio oil, 20-25 percent solid char, and 20-30 percent gas. "Through our research we found that the large ash content of rice straw might pose a hindrance to it being used as a biofuel via pyrolysis," Fumbanks explained. The team also investigated a pretreatment step that would remove ash and other mineral components.

"The global production of rice straw is about 730 million metric tons per year, making it one of the world's most available biofuels feedstock," added Ukeaw. "Open-field burning of rice straw not only increases in greenhouse gas emissions and air pollution, but it also destroys soil nutrients and soil fertility. Fast pyrolysis is one way to add value to rice straw."

"Helping with graduate level research was one of the best experiences I had at Michigan Tech. I like learning things in a hands-on environment. "Alternative energy captured Fumbanks's interest when she was a first-year college student. Upon graduatin in 2015 Fumbanks joined energy powerhouse Enbridge Corporation as an engineer. She will work in a different US or Canadian location of the company every year over four years. Her next goal? Fumbanks is considering law school and a career in patent law.

Handheld Malaria Detector

Creating a Low-Cost Biosensor with Graphene

MALARIA IS CAUSED by Plasmodium parasites, transmitted by the bite of an infected mosquito. The parasite enters the blood, travels to the liver and then re-enters the bloodstream, invading the red blood cells.

Infected red blood cells burst, releasing even more Plasmodium parasites into the blood. This happens every 24-48 hours, causing cycles of fever, chills, and sweating. Prompt diagnosis and treatment is essential.

Pennie Winters '16 worked with three chemical engineering professors—Caryn Heldt, Adrienne Minerick, and Julie King—to design, build, and test a malaria detection microdevice with the potential to help many people in malaria-ridden countries.

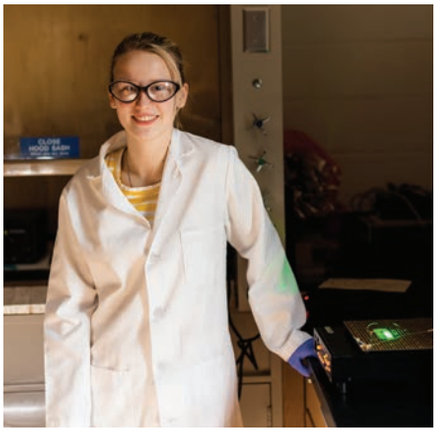
"Our group used a four-probed graphene device as a biosensor for the detection of malaria parasites, viruses and pathogens," Winters explained. The goal: to create a low-cost, handheld device. Their preliminary work focused on placing a drop of sample on graphene paper. The team added a polydimethylsiloxane (PDMS) polymer channel to the four-probed device to obtain a more accurate result.

Winters used the protein BSA to test the device. The device works by pumping a sample through the channel and across the graphene paper. A set current is conducted through the outer electrodes and we can measure the voltages across the inner electrodes. Current and voltage data is used to calculate surface resistivity," she says.

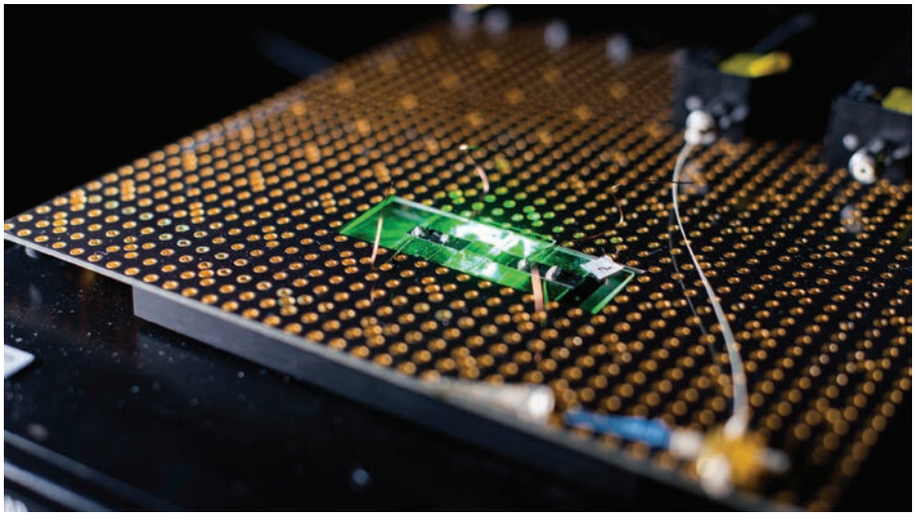
> "I enjoy being able to work with my hands on something meaningful. That is the best part of becoming an engineer, having the opportunity to make the world a better, safer, and healthier place."
>
> —Pennie Winters '16

Winters's work in the lab was done in stages. "One day I'd go in to mix up the PDMS polymer and mold my channels so they could sit in the oven to cure. The next day I would fabricate my devices using glass slides, epoxy, tape, and graphene paper, and adhere the PDMS channels. Then I would make my BSA solutions at a few different concentrations. Finally I would take my devices and test them using the pumps and solutions to determine how the electrical resistance of the paper changes with different protein concentrations."

The most difficult part, she said, was gaining a clear understanding of the project. "Every time I went into the lab I learned something new about my devices. It was challenging to learn that research takes patience and time. The project helped me learn the importance of taking my time, being patient, being careful, and being observant."



Pennie Winters



The group's malaria detection microdevice

Tayloria Adams

Taking Dielectrophoresis to the Next Level

THE NATIONAL SCIENCE FOUNDATION recently awarded alumna Tayloria Adams a prestigious Postdoctoral Research Fellowship in Biology. Adams earned her Master's and PhD in Chemical Engineering at Michigan Tech, graduating with nine scholarships, fellowships and awards, three peer-reviewed journal publications, a book chapter, and Patent No. WO2015051372-A1. Her doctoral research examined the dielectric behavior of human mesenchymal stem cells, for cell sorting in microfluidic devices.

Q: How did you come here?

A: While on the hunt for a graduate school I was drawn to universities in Michigan for two reasons: my mother lived in Detroit for a while before I was born, and affirmative action was started in the state. I applied to Michigan Tech and scheduled a visit. The environment was very welcoming, which got me hooked!

Meeting Dr. Adrienne Minerick during the last year of my master's degree was icing on the cake. My first interactions with her were in the classroom as I took her Advanced Reactive Systems course. I enjoyed her teaching style. She put a lot of effort into giving meaningful lectures and keeping students engaged. I looked into her research and I was very interested in dielectrophoresis, especially its use in studying red blood cells. The rest is history!

Q: What was the most challenging aspect of your studies at Michigan Tech?

A: Research. There is a huge learning curve when entering a new research field. Learning how to design experiments effectively and accepting that there is no such thing as a perfect experiment are both great challenges. Something will always go wrong, but working through it to still collect the necessary data is what builds character and improves research skills.

Q: What have you done since graduation?

A: I worked in the Michigan Tech Center for Diversity and Inclusion (CDI) for one year after graduation, as the outreach coordinator. That year gave me the opportunity to grow as a mentor and advocate for underrepresented minority students.

I am now conducting postdoctoral research in the Department of Neurology at the University of California, Irvine, in Lisa Flanagan's lab, studying neural stem and progenitor cells (NSPCs) and their therapeutic potential. NSPCs are desirable because they form the three cell types of the central nervous system, astrocytes, neurons, and oligodendrocytes. However, one challenge is that NSPCs are grown as heterogeneous mixtures and we have little information regarding, which cells are best for neural repair. I'm using

> "I am the first black woman to receive a PhD in chemical engineering at Michigan Tech. I hope this will encourage others!"
>
> –Tayloria Adams '11 '14

dielectrophoresis, an electrokinetic separation technique, as a method to target and enrich specific cells NSPCs. My goal is to effectively sort and characterize them.

Q: You worked hard to educate and engage diverse people about the challenges facing underrepresented students at Michigan Tech. How would you describe the difference you made?

A: I am passionate about three things: healthcare related research, minority student success in STEM, and social justice; these areas are my calling. Working at Michigan Tech's CDI provided me an outlet to engage in important conversations and be a part of the work. CDI was also very supportive

Tayloria Adams

of my research, I was able to practice research presentations in the center, use the space as a writing sanctuary when I was completing my dissertation, and almost all of the staff was present at my dissertation defense, which was immensely important to me.

One of the best parts of my graduate education is that my daughter Aiyanna experienced college life at the undergraduate and graduate level before reaching college age. She's learned about important campus resources such as CDI, and I am confident that this exposure has played a part in preparing her for college. As a parent this is something I am very proud of and would consider a success.

My greatest frustration was the decline I saw in the number of African American students enrolled at Michigan Tech during my time there. A second frustration is the representation in faculty members. Michigan Tech is a great institution but these are areas where growth would make a huge impact on the community. I would say the difference I've made so far is showing what's possible; but there is much more work to be done!

To learn more about Adams's research, visit tayloriaadams.com.

Oil Sands

Improving the Process, Reducing the Footprint

CANADA'S OIL SANDS, located in northern Alberta, are one of the largest known hydrocarbon deposits in the world, third behind those in Saudi Arabia and Venezuela. The vast majority of Canada's oil sands deposits are located at depths of 1,300 feet below the surface.

Bitumen (heavy oil), the hydrocarbon resource found in oil sands, is very viscous—think molasses or peanut butter—and therefore requires special extraction methods to get it out of the ground and into a state where it is fluid enough for transportation to refineries.

As Bitumen Treating Engineering Team Lead at ConocoPhillips, Chris Copeland is dedicated to developing and implementing cleaner, more efficient methods of extracting bitumen from oil sands.

Less than a month after earning his PhD in chemical engineering at Michigan Tech, Copeland accepted his first position with ConocoPhillips in June 2007 as a research engineer in their heavy oil R&D division in Bartlesville, Oklahoma. He was hired to evaluate technologies for water treatment and steam generation to support the company's oil sands business in Canada, which had just begun.

"ConocoPhillips utilizes a process known as steam-assisted gravity drainage (SAGD)," Copeland explains. "The purpose of my work was to develop new and innovative water-treatment and steam-generation processes to improve the economic viability of oil sands, reduce environmental footprint, reduce water usage, and reduce CO_2 emissions."

Christopher Copeland

SAGD is used to extract deep deposits of bitumen without removing the soil and materials above it. The process involves injecting high-temperature steam underground through a horizontal well to melt the bitumen, allowing it to flow to an adjacent horizontal well. From there, it is pumped to the surface for further processing. Unlike strip mining, with SAGD most of the land above a bitumen reservoir can be left intact. "SAGD has a much smaller footprint than traditional mining methods," notes Copeland.

Copeland moved to Calgary in 2011 to become a facilities engineer responsible for the water treatment plant at the ConocoPhillips' Surmont SAGD facility. He was charged with optimizing chemical consumption, improving filtration efficiency, and reducing steam-generator fouling. These initiatives were all successful, resulting in significant improvements to plant performance, and Copeland was promoted again. He now leads the team of engineers responsible for bitumen gathering and treatment at Surmont. His team also explores improvement opportunities for the new Surmont Phase 2 SAGD facility currently under construction.

Conoco Phillips Oil Sands Surmont Operations Facility in Alberta, Canada

Chemical Engineering Inducts Seven into Distinguished Academy

Members of the Distinguished Academy are associates of the Department whose careers have been marked by extraordinary accomplishments or exemplary service to the profession.

Robert D. Carnahan '53

Carnahan got his professional start with the US Navy working with underwater ordnance. Over his career he has authored more than 60 referred technical publications and has been granted 16 patents. Carnahan was awarded the Michigan Tech Board of Control Silver Medal and has been inducted in two other academies at Michigan Tech, Business and Economics and Materials and Metallurgical Engineering.

Robert D. Carnahan

Christopher Copeland

Michael J. Cleveland '82

Currently Cleveland is the global business director for refining technology in the Process Technology and Equipment business of Honeywell UOP. Before assuming his current position last year, he served as the vice president and general manager for Latin America of UOP LLC, based in Rio de Janeiro, Brazil. Cleveland and his wife Marie are members of the Michigan Tech McNair Society and Founders Society.

Michael J. Cleveland

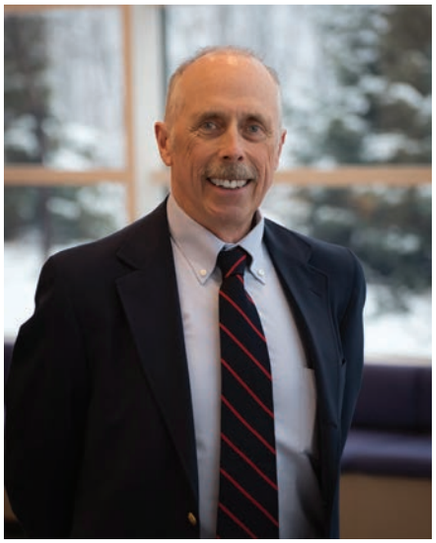
Christopher Copeland, '05 (MS), '07 (PhD)

Working with Komar Kawatra, chair of the Department of Chemical Engineering at Michigan Tech, Copeland designed and developed a new laboratory test method for evaluating the effectiveness of dust suppressants. After leaving Michigan Tech, Copeland accepted a position as a research engineer at ConocoPhillips. In 2014, Copeland was charged to lead a team of engineers responsible for the bitumen and gas treating facilities.

William M. Colton

William M. Colton '75

Colton is vice president, Corporate Strategic Planning for Exxon Mobil. In this role, he oversees the corporation's strategic planning activities and the development of its Energy Outlook, Exxon Mobil's assessment of global energy trends. Colton is on the board of the National Bureau of Asian Research.



Kerry Irons

Kerry Irons '72

Irons holds a BS in Chemical Engineering and an MBA from Michigan Tech. He joined the Dow Chemical Company in 1973 and retired in 2004 after a 30-year career in chemical process research with his final role as Senior Technical Leader in Core R&D, Engineering Sciences Market Development. For 10 years, Irons was on Dow's Michigan Tech recruiting teams, serving as team leader. In 2013, he was elected to the Michigan Tech Alumni Association Board of Directors and is now serving as secretary.

Laurie Couture-Dorschner, '79

Couture-Dorschner began her career with Bemis Company in Minneapolis holding various engineering and manufacturing positions. She joined Kimberly-Clark in 1984 earning patents for her innovative materials and processes. She was the lead product developer for the launch of the highly successful HUGGIES Little Swimmers swim pants. Throughout her career she was actively involved in recruiting for Kimberly-Clark and led the semiannual recruiting events at Michigan Tech. She is a member of the President's Council of Alumnae.

Laurie Couture-Dorschner

Karen Mikkola Swager

Karen Mikkola Swager '92

As vice president, concentrates for the phosphates business unit of the Mosaic Company, Swager provides overall direction and guidance and day-to-day support for all concentrates operations in the phosphates business unit. She was appointed by then-Florida Governor Charlie Crist to serve on the Board of Directors for the Florida Institute for Phosphate Research. The Florida Chapter of the Society recognized her for Mining, Metallurgy, and Exploration with the "Hero of the Year Award."

mtu.edu/chemical

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All Your News That's Fit to Print

Tell us your latest news: How has your Michigan Tech education helped you in your current position? Do you have any advice for our current students as they look forward to jobs in chemical engineering? Please submit your entry for the new Class Notes section of the Michigan Tech Chemical Engineering newsletter. Email your news and photos to Alexis Snell at aesnell@mtu.edu. We look forward to hearing from you!

Michigan Tech is a leading public research university, home to more than 7,000 students from 60 countries around the world. Founded in 1885, the University offers more than 120 undergraduate and graduate degree programs in science, technology, engineering, and mathematics. Our beautiful campus in Michigan's Upper Peninsula overlooks the Keweenaw Waterway and is just a few miles from Lake Superior.