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2010

## 2009-2010 ChE Newsletter

Department of Chemical Engineering, Michigan Technological University

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A photograph of three students in a chemical engineering laboratory. They are wearing hard hats and safety glasses. One student is holding a clipboard and looking at it, while the other two are looking on. They are surrounded by blue pipes and various pieces of equipment.

# ChE

CHEMICAL ENGINEERING  
2009-2010

**WORKING TOGETHER:  
GRADUATE AND  
UNDERGRADUATE EDUCATION**

**MICHIGAN  
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*Please contact Komar Kawatra  
skkawatr@mtu.edu if you have  
any questions.*





DEAR FRIENDS,

By all measures—student enrollment, donations, scholarly activity, student achievement, and diversity—the Department is moving forward at a rapid pace. This progress is a result of the collective effort of the faculty, staff, students, alumni, and friends. I thank all of you for your efforts, and look forward to further progress in the future.

Our mission is very simple: to train quality students who will be sought after by industry. If the demands of industry call for more PhDs, or for more BS degree-holders, we will focus our efforts to meet their needs. However, this does not mean that we will ever divert our focus completely to undergraduate education, or to graduate education, as both are complementary and we need strong programs in both areas. For example, the cover of this newsletter shows a PhD student working with two undergraduates. The graduate student is conducting research in a new method for sequestering carbon dioxide, while the undergraduates are learning the principles of experimental design and the operation of gas-scrubbing columns. The PhD thesis will involve installing the scrubber at an industrial location, and again undergraduate students will be involved in order to provide them with practical experience in an operating facility.

We can achieve our mission by integrating undergraduate and graduate education, thereby improving the quality of both. This makes it possible for us to carry out cutting-edge research while also providing the hands-on undergraduate education that our students need in order to succeed.

We are building our program with the help of our alumni, and your feedback is very important to us. Please send your feedback regarding our educational programs to [skkawatr@mtu.edu](mailto:skkawatr@mtu.edu).

S. Komar Kawatra  
Professor and Chair  
Department of Chemical Engineering

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*On the cover:* PhD student Brett Spigarelli works on CO<sub>2</sub> sequestration research with undergrad students Katrina Swanson, Jannelle Paddock and Allison Springer-Wilson. This research is funded in part by John Simmons, Carbontec Energy Corporation.

## 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 July 2010, we have eighteen faculty, eight staff, 325 undergraduate majors, and forty-six graduate students, including thirty 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 which 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.



**Chemical Engineering Faculty****Gerard T. Caneba, PhD**University of California–Berkeley  
*Carbon nanotube/polymer composites  
precipitation polymerization***M. Sean Clancey, PhD**Michigan Technological University  
*Technical communications***Tomas B. Co, PhD**University of Massachusetts  
*Process integrity, process modeling,  
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Sao Paulo, Brazil  
*Agglomeration technologies applicaton  
for industrial waste and mineral ores*



## Brodeur-Campbell meets with state legislators

DOCTORAL STUDENT MICHAEL BRODEUR-CAMPBELL headed to Lansing along with three other graduate students to talk with legislators about their graduate studies and future plans. Participating in an observance of Graduate Education Week during the month of April, they joined more than 70 others from universities across the state, meeting with their hometown legislators and displaying posters about their research in the west and south first-floor corridors of the Capitol.

Brodeur-Campbell, who is originally from Port Huron, Michigan, earned his bachelor's degree in chemical engineering and business administration at Michigan Tech. His research focuses on improving the enzymatic breakdown

of cellulose to glucose, a vital step in the production of ethanol from plants. This step has proved a major hurdle to commercial production of this kind of ethanol, which does not compete with the food supply, due to the high cost of the enzymes and the length of time they take to work.

Michigan ranks ninth in the US for the number of research-based doctorates, with 2,720 awarded in 2008-2009. Of those, 67 were awarded at Michigan Tech.

It was the first time Brodeur-Campbell had visited the Capitol. "I think being politically engaged is important. Graduate Education Day did some good for increasing the visibility and value of graduate studies in the state."



Michael Brodeur-Campbell

## VanBelle wins Gilman Scholarship

NICOLE VANBELLE has been named winner of the prestigious Benjamin A. Gilman International Scholarships for study abroad. She was among 900 undergraduates selected for the competitive scholarships from more than 3,000 applicants nationwide.

VanBelle, a chemical engineering major from Kentwood, Michigan, is one of the first Gilman STEM (Science, Technology, Engineering and Mathematics) Pilot Scholarship recipients. She is one of 125 students across the country who received the Gilman STEM scholarship for 2010. She will receive \$3,000 to study with the Japan Center for Michigan Universities in Hikone, Japan, during the summer of 2010.

"Studying abroad is not always advocated for engineers," she observed. "I hope to show all of my fellow engineers at Michigan Tech that studying abroad can be just as positive as an internship or co-op." She plans to give



Nicole VanBelle

presentations about her experiences in Japan to Tech classes and at the Portage Lake District Library.

The Gilman Scholarships are funded by Congress, sponsored by the Bureau of Educational and Cultural Affairs at the US Department of State, and administered by the Institute of International Education.

## Taylor studies new reactor fuel at ORNL



Amanda Taylor

SOPHOMORE AMANDA TAYLOR interned at Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee, for ten weeks last summer.

At ORNL, a science and technology laboratory managed by UT-Battelle for the US Department of Energy, Taylor examined the characteristics of a new kind of reactor fuel. She had the honor of performing the first simulations ever on this novel alternative fuel, which is the brainchild of her mentor at ORNL, Daniel Hollenbach of the Nuclear Science and Technology Division.

She ran a series of three computer tests on nuclear fuel rods made from a heterogeneous mixture of Uranium Dioxide ( $UO_2$ ) and long, thin graphite fibers. Graphite fibers were selected

because of their high thermal conductivity and low neutron absorption characteristics. "All current power reactors use  $UO_2$  fuel because it is chemically stable and easy to manufacture. It also has minimal parasitic neutron absorption in material other than uranium," notes Taylor.

The first test determined the neutron characteristics of the new fuel. That test ran for 24 hours or more. The second, a burn-up characteristics test, determined the amount of neutron absorption. The third test determined the level of thermal conductivity.

"Adding graphite, which conducts heat very well, did in fact help create a more efficient fuel with higher thermal conductivity. We also found that by

adding graphite, less Plutonium-239 was created, which means less toxic waste," she says.

For an intern, Taylor found herself handling quite a bit of responsibility. At the time of her research, the formula of the fuel was "business-sensitive," she says. It's now patented. "At first, I didn't know what I was doing. But by the end of the internship, I didn't want to leave."

Taylor recently presented her work at the American Association for the Advancement of Science annual meeting in San Diego, California. Her research paper will be published in the *Journal of Undergraduate Research*. This summer, she is studying Spanish and traveling in Puntarenas, Costa Rica.



## Workman leads windpower group at Michigan Tech

THE MICHIGAN TECH COMMUNITY generates greenhouse gases equal to about 73,000 tons of carbon dioxide a year, according to a study recently completed by the Green Campus Enterprise (GCE). That's about 10 tons for every student and employee on campus.

So much for the bad news. The good news is that wind power and other green measures may have the potential to lighten Tech's ponderous footprint.

The Green Campus Enterprise team hopes to lay the groundwork for the possible installation of wind turbines to generate electricity on campus. Charles Workman, a chemical engineering major, leads the team's wind power group. "Electricity accounts for 47 percent of Michigan Tech's carbon footprint, and wind energy can reduce it significantly."

Workman and his GCE teammates are studying wind turbines as a source of power and are requesting funding for a year-long study of wind speed and direction to determine the cost and benefits of installing wind power on or near campus.

Surveys showed extensive support for wind power within the campus community, but some have expressed concerns about their appearance, issues of eminent domain and right-



Charles Workman

of-way, and the turbines' potential for endangering wildlife. The group has consulted the Keweenaw National Historical Park, the US Fish and Wildlife Service and the National Wind Coordinating Committee for advice on addressing socio-economic and environmental concerns.

"We want to inspire individual change in the campus culture," explains Workman. "It's great to work with people whose motivation comes from within."



## Research scholar Roeser makes astonishing contribution



Mackenzie Roeser, Roger Turpening, and Scott VanderLugt

IF YOU'VE EVER BEEN TRANSPORTED by a breath of L'Air du Temps or Chanel °5, then you know something of the sandalwood tree. The oil found in its heartwood forms a base note in some of the world's great perfumes at about a thousand dollars a pound.

It takes 12 to 15 years or longer to grow a sandalwood tree that contains an appreciable amount of oil, which is concentrated in the wood in the center of its trunk and in its roots.

To collect the oil, loggers first yank the tree out of the dirt, roots and all.

Sometimes they find oil. Sometimes they don't, and all they are left with for years of effort nurturing a potentially precious tree is a few bundles of incense sticks—and a profound regret at not waiting another year or two. Michigan Tech Geophysicist Roger Turpening has crafted a tree imaging system using seismic technology. The system could result in huge savings to sandalwood growers. It also has potential in the more mundane but potentially lucrative lumber industry.

Until recently, it had one minor

drawback: it took 16 minutes to generate an image. That wouldn't be excessive for someone deciding whether or not to harvest a \$3,000 sandalwood tree. But in a sawmill, 16 minutes is an eternity.

Turpening presented his research before a group of undergraduates in the Research Scholars Program. The College of Engineering sponsors the program, which links faculty with students interested in research. Without great expectations, Turpening talked to the group and mentioned the time problem. This caught the attention of a first-year chemical engineering student lounging in the back of the room, Mackenzie Roeser, of Huntley, Ill., and his friend, Scott VanderLugt, of Kalamazoo, a computer science major.

"Roger did his presentation, and we thought it was cool," said Roeser. When the two heard how long it was taking to generate the images, they thought they might have a solution.

Roeser and VanderLugt took the code, written in MatLab, and rewrote it in Java, changing a critical subroutine along the way. "Their contribution is just astounding," says Turpening. "What used to take 16 minutes now takes 11 seconds." At the end of the day, Roeser and VanderLugt had slashed the time it took to generate an image by over 98 percent.

Both students are in the University's Honors Institute, and Roeser is in the Research Scholars program.

## Pavlis students head to Ghana and Argentina



School children in the village of Kranka, Ghana.

THE PAVLIS INSTITUTE for Global Technological Leadership offers unique course work combining technology, business, communications and global understanding. It is modeled on the experiences and skills of Michigan Tech chemical engineering alumnus Frank Pavlis '38 who devoted his career to managing innovation worldwide. Acceptance to the program is competitive. Selected students are invited to apply the summer before they start school at Michigan Tech.

Several chemical engineering students participate in the program, including Alison Springer-Wilson, Alesha Fumbanks, Brandi Lundquist, Hannah Hafner, Sarah Piccard, and Brittany Precht.

Pavlis students take part in an International Experience between their junior and senior year, spending the month of July abroad. This summer Alesha Fumbanks will be traveling to Argentina and Brandi Lundquist will be traveling to Ghana. Last summer Allison Springer-Wilson traveled to Ghana, visiting two villages along with seven other Pavlis Institute students.

Springer-Wilson was a member of the Pavlis laptop team. In Africa, a continent-wide program requires students to be computer literate upon completion of secondary schooling. By 2012, this requirement will expand to students completing primary schooling. Unfortunately, numerous villages are poverty-stricken and

cannot afford to purchase their own computers—the majority of students have never seen a computer. In the months leading up to the journey the Pavlis students raised several thousand dollars from industry donors, friends, and family to purchase twenty-three laptop computers to bring to Ghana. Each laptop came with a wireless router, a mouse, and a flash drive. Springer Wilson and teammates hand-carried the laptops on the plane to Ghana, and then delivered them, in person, first to a school in Kranka, and then Sunyani, meeting with six classes in three days.



## Pre-college women test out the Unit Operations Lab



WIE high schoolers display what they learned in the U.O. Lab about liquid-liquid extraction.

THE WOMEN IN ENGINEERING (WIE) workshop allows female high school students the opportunity to spend a full week on campus investigating careers in engineering and science during the summer. WIE students (average GPA of 3.95) enjoy hands-on learning in engineering labs—including the chemical engineering department's world-class Unit Operations Laboratory.

The UO Lab is used to produce polydimethylsiloxane, a type of silicone used in a variety of products, including

shampoos and solvents. A 2008 gift from Dow Corning, which covered the cost of key upgrades and improvements, cut the 14-hour heating time in half. This has enabled the department to open the lab to WIE students and other precollege students who take part in Michigan Tech's Summer Youth Program. Dow Corning's gift was also used to upgrade systems in the control room, where students monitor and control all steps of the chemical production process.

Interested in learning more about the Summer Youth Program? Contact Steve Patchin at 906-487-2219, email [shpatchi@mtu.edu](mailto:shpatchi@mtu.edu). Or check out SYP online at [www.youthprograms.mtu.edu](http://www.youthprograms.mtu.edu).

## An exchange student in Finland

*ERIC NEFF, a chemical engineering major at Michigan Tech, spent last spring semester as an exchange student in Finland. He wrote this dispatch on January 27, not too long after he arrived.*

Moi! (Hi, in Finnish) When your phone wakes you up in the morning, you hit "Off." When my phone wakes me up I stare at it before remembering to press "Pois."

That's the first reminder I get that I'm not in Houghton any more, much less the US. This semester I'm studying abroad at the University of Oulu in Oulu, Finland. I've only been here for a few days, but I've already encountered a lot of differences from life in Houghton. Adjusting to a new environment, culture, winter and language has been a full time job.

"In Englanti?" (In English?) It seems like I am saying that all the time. One of the biggest challenges is the language barrier. Finnish and Swedish dominate, with English rarely appearing beyond product names, if at all. The sun is conspicuously absent from the city sky here, hiding behind treetops while it's above the horizon. "Above the horizon"



Eric Neff makes the acquaintance of the famous Toripolliisi statue in Market Square of Oulu, Finland.

may be a bit of a stretch, since daylight only lasts from 9:30 a.m. to 3:30 p.m.

Speaking of daylight, mine is gone for the day, and I have more Finnish culture to absorb. Hyvästi! (Goodbye!)

## Springer-Wilson wins PCA Women of Promise award



Alison Springer-Wilson (right)

ALISON J. SPRINGER-WILSON has been awarded the Women of Promise award from the Michigan Tech Presidential Council of Alumnae.

The PCA recognizes current female students from each academic department who go above and beyond what is expected of them in terms of being a well-rounded student. The award goes to students who have demonstrated academic achievement, campus and community leadership, good citizenship, creativity and other characteristics of high-achieving individuals.

Springer-Wilson, who plans to graduate with a BS in chemical engineering in Spring 2010, is a member of the American Institute of Chemical Engineers. She is an Honors Student, and is also enrolled in the Pavlis Institute for Global Technological Leadership. She is an athlete, competing on the Michigan Tech Cross Country, and Women's Track teams, and is a member of the Inter-Varsity Christian Fellowship.

She has also received several scholarships, including the Ted Rozsa '36 Endowed Scholarship, and the Fred W. Varney Endowed Scholarship.

## ENTERPRISE TEAM UPDATES

### CPM—Building a better boiler

SINCE THE FALL OF 2000, the Consumer Product Manufacturing (CPM) Enterprise has provided opportunities for students to develop new products and improve manufacturing operations. A wide range of projects and sponsors, which include local businesses, makes for an unique and interesting educational experience.

This fall, CPM students are wrapping up a project to improve the canning operation at the Keweenaw Brewing Company's facility in South Range. They also began a new initiative to improve the operation of wood boilers designed for small businesses and residential users. If the stack emissions of particulates and gases can be reduced or controlled, the market for these small heaters would likely expand for town and city use. The combination of a sustainable fuel source, good environmental footprint, high thermal efficiency, and inexpensive cost of operation would satisfy the wants and needs of many potential customers.

To pursue this business opportunity, CPM students are currently investigating combustion theory and wood boiler operation in an effort to design a better small-scale system than what



Team member Ben Stenske checking out the wood boiler

is currently available on the market. A local business is showing significant interest in their research. CPM students plan to investigate the patentability of their new wood boiler configuration, construct a prototype, and perform an analysis of the anticipated financial benefits to the purchaser.

Who knows, someday you may heat your home with a CPM wood boiler! Check out the team online at <http://cpmenterprise.mtu.edu>.

The Consumer Product Manufacturing Enterprise took first place and a \$300 prize in the Enterprise category at the 2010 Undergraduate Research Expo at Michigan Tech in April. This is the sixth time the team has won the Expo competition in the past ten years.

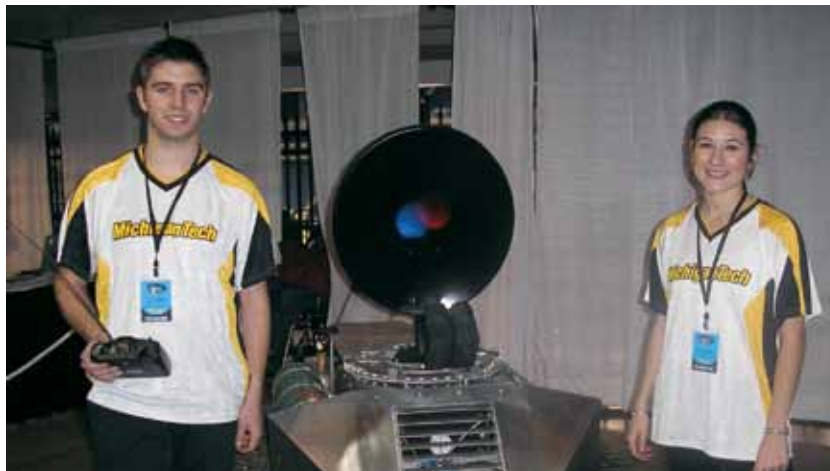


## ENTERPRISE TEAM UPDATES continued

### AFG—Powering the future

THE ALTERNATIVE FUELS GROUP ENTERPRISE has been working on energy related projects since fall 2003. The team is partially supported by the US Department of Energy and Michigan Tech alumna Sally Heidtke.

Current projects include designing a hydrogen economy for a large city, designing an alternative energy cabin, capturing waste heat from a fuel cell, designing a solar powered car, and



Aaron Longstreet and Kelsey Sprenger show off "Little Brother" (a fuel cell-powered unmanned ground vehicle) to young minds at the YES Expo in Detroit, Michigan.

developing curriculum materials for wind energy.

The team is comprised of twenty-six students from various departments, including chemical engineering,

mechanical engineering, electrical engineering, and civil engineering. Check out the team online at [www.enterprise.mtu.edu/afg/](http://www.enterprise.mtu.edu/afg/)

## AIChE STUDENT CORNER

### Mazure and Krystof excel at AIChE Design Competition

TWO MICHIGAN TECH chemical engineering graduates were among the best in the US at the Fall 2009 AIChE's National Student Design Competition in the individual category.

Terry Mazure and John Krystof placed second and third, respectively, for their solutions to a large-scale chemical engineering design problem.

Every year, the American Institute of Chemical Engineers challenges students to tackle a problem that typifies a real, working, chemical engineering design situation.

Chemical engineering faculty members Dan Crowl and Tony Rogers incorporate the problem in the senior design lab course, CM4861. "It's very open ended, and it takes about a hundred hours to complete," said Crowl. "This year, they designed a chemical process to produce 500 million gallons of butanol a year by fermentation, size all the equipment, cost all the equipment, and do a complete cash flow analysis to determine if it would be commercially viable. Then they had to write and submit a report, which typi-



cally runs 50 or more pages."

All students in the class must do the work individually, without assistance from anyone. "It's very competitive," he added. "This is a high honor for our design program."

Mazure is now a design engineer for Dow Corning, in Midland, and Krystof works with Hemlock Semiconductor, a subsidiary of Dow Corning. Both were honored at the AIChE Fall National Meeting in Nashville.

## AIChE STUDENT CORNER continued

### Chem-E Car wins most creative drive system at AIChE Regional Conference

CREATING A CHEM-E CAR gives undergraduate students the opportunity to work on a real-life engineering project. Students apply the material they have learned in courses such as Kinetics and Process Control.

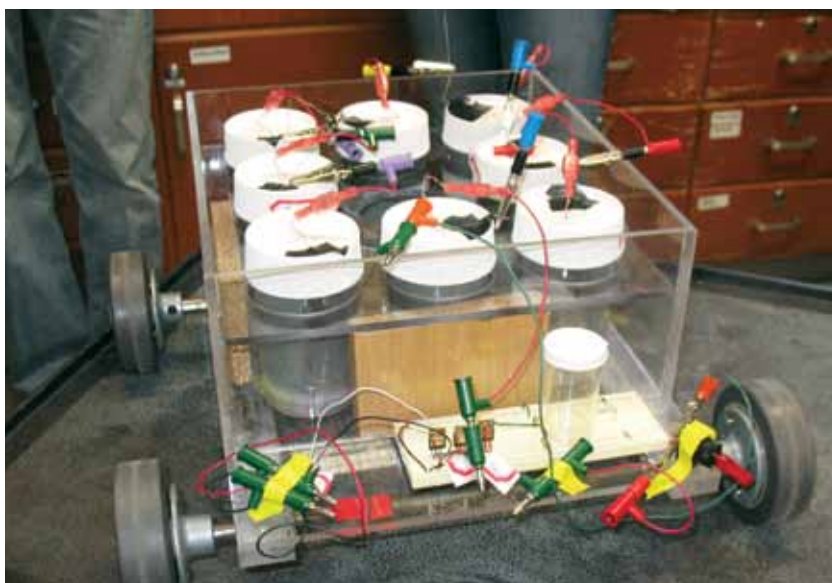
The Chem-E Car is powered and controlled by chemical reactions and is about the size of a shoe box. At competition, the Chem-E Car must travel a certain distance and carry a payload of water to test the reliability of the drive train and stopping mechanism.

The team is comprised of chemical engineering undergraduate students and AIChE members. Members must seek assistance from outside of the Chem-E Car team and receive help from faculty and other engineering students.

This past semester, the Michigan Tech Chem-E Car team finished sixth overall at the AIChE North Central Regional Conference in Athens, Ohio. The team qualified to compete at the Annual AIChE Conference in Salt Lake City, Utah this fall. They also received second in best poster presentation, and first in most creative drive system. In the past, the team has been to Akron, Chicago, Philadelphia, Nashville, San Francisco and Salt Lake City.



The Chem-E Car team



### FUNDING

If you would like to fund AIChE for activities such as Chem-E Car, plant tours, or regional conferences, please contact Dr. Komar Kawatra at [skkawatr@mtu.edu](mailto:skkawatr@mtu.edu).

## Everything you always wanted to know about oobleck...

"IT IS NOTHING LIKE YOU would imagine." That's what Michigan Tech chemical engineering major Michael Via says when asked what it is like to run across a 4 foot by 12 foot by 9 inch pool of oobleck.

Oobleck is the word co-opted from a Dr. Seuss children's book that has come to refer to a suspension of corn starch in water. Such a suspension, made by mixing corn starch and water in a 3:2 ratio by volume, is shear-thickening, and the surprising flow properties of oobleck have made it a favorite among the ooze-and-goop demonstrations that are used to get kids interested in science.

Via and his colleagues in the student chapter of the American Institute of Chemical Engineers (AIChE) got the idea for the oobleck run from a video on Youtube.com. The video showed TV personalities from the Spanish television program El Hormiguero running across a very deep pool of oobleck.



Setting up the oobleck pool

Impressed with the spectacle and curious to try it themselves, the AIChE group decided to give it a go.

Armed with a "why not?" attitude, a cement mixer, and university

connections at the Grain Processing Corporation, AIChE chapter president Tony Michalski arranged for a pallet (1500 lbs) of cornstarch to arrive at the Michigan Tech campus in late March. AIChE member Mike McLain volunteered to construct a sturdy frame, which, when lined with heavy plastic sheeting, made a secure container for the run. Michigan Tech's Spring Fling celebration was the chosen venue for the experiment, and, after signing a legal waiver, all comers were invited to give the oobleck a try.

"When you first look at the pool," says Via, "you can see ripples propagating across the fluid as if it were the surface of a pond." It does not look possible to walk on the fluid. "But, when you run on it," Via says, "it gives very minimally to your body weight, similar to running on a wood floor.

### DO IT YOURSELF

For those who would like to try to reproduce the oobleck demo, here's some advice from the Michigan Tech crew. Getting on and off the oobleck is messy and can be slippery; carpeting should be used at both ends so that this can be done safely. Since the cornstarch is difficult to clean from the carpeting, disposable carpet scraps are recommended for this purpose. A powered cement mixer is a must, since a large volume of oobleck is needed for the run. The oobleck is non-hazardous, but depending on your locale, disposal may be difficult and should be planned for ahead of time.



## but were afraid to ask

There is also an amazing amount of traction. It looks as though it would be very slippery and hard to keep your balance on, but it is actually the opposite. The surface is quite tacky and very easy to run across." As long as you keep moving, that is.

Running across the top of a fluid is the main draw of trying the oobleck run, but the secondary experience is sinking into the fluid. Once you stop moving, you sink into the suspension. "Sinking into the oobleck is beyond description. It's something that you just have to experience for yourself," says Via. Trying to pull a foot out of the oobleck can be difficult if you pull hard and fast. A slow easing-out of the foot (low deformation rate) will work just fine.

Via knows a thing or two about oobleck from his study of rheology, the science of deformation and flow. Concurrent with his experimental work with the oobleck, Via was taking a course in polymer rheology with Associate Professor Faith Morrison. "My study of rheology helped me explain to others what was occurring during the run, but I feel that the run helped my study of rheology more than my study of rheology helped the run."

One final piece of advice from Via: "Laying down and being fully covered in the oobleck is also an amazing experience, but I don't recommend it for anyone who is claustrophobic."

Check it out on Youtube.com; search for Michigan Tech oobleck.

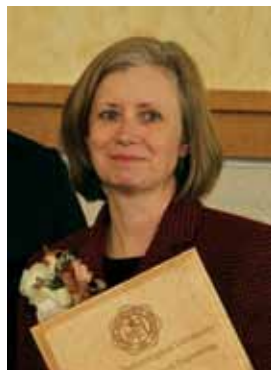


An "amazing" experience.



Rheology in action!

## Convocation 2010



Dr. Maureen L. Johnson

THE DEPARTMENT OF CHEMICAL Engineering convocation is held each April to honor graduating seniors, as well as to recognize the support of alumni and friends, and industrial sponsors.

Dr. Maureen L. Johnson '83, was this year's keynote speaker. Johnson is Exploration & Production Vice President of Operations Technology, Operating Management System, Continuous Improvement and Activity Planning at BP America Inc. Johnson earned a PhD from Rice University. She lives in Houston with her husband, Todd Torczon and their two young sons.

"Graduation from Michigan Tech was a tremendous milestone for me. Hopefully it will be for you, too," Johnson told the group. Since graduating, Johnson said that she'd changed, and that the landscape in industry has changed. "Corporations at the top have changed a lot in the past 25-30 years. And students have changed, too."

Johnson shared some excellent tips. "First of all, you need to survive in changing times, so put on your boots, go out there and solve real problems.

Talk to people in the field. Have the technical depth you need in order to connect with the people who do the work."

Johnson suggested making career moves strategically, and also to choose your boss carefully. "Your boss can give you the 'mushroom treatment' or be a great mentor and source of encouragement."

"When I first started I went out of my way to become known as a good engineer, and not a female engineer," she said. "Then I realized that some of those female strengths could be

beneficial in the workplace. It changed my outlook."

Another bit of advice: "Expose yourself to the people you want to work with, and go out of your way to help them."

Last but not least, family is a source of strength and renewal, she said. "They know you well and can give you truly great advice as a result."

"As chemical engineers, you will all have opportunity coming your way," added Johnson. "I hope that you will have many wonderful opportunities—and that you will say 'yes!'"



Kimberly-Clark Communications Award-winner Bryan Koepp, along with Sean Clancey and Komar Kawatra.



Graduating Class of 2010

## Convocation 2010 Awards

### TEACHER OF THE YEAR

Dr. Jason King

### RESEARCH MENTOR OF THE YEAR

Dr. Julie King

### TEACHING ASSISTANT OF THE YEAR

Kristen Gabby

### CHEM-E CAR MENTOR OF THE YEAR

Matthew Chye

### PAWS (Prevent Accidents With Safety) AWARDS

*Spring Semester*

Nicole Dorman

*Fall semester*

Ryan Bischer

Scott Docsa

Benjamin Faubert

Kelsey Gossen

Matthew Hehn

Jacob Roberts

### MARIOTT W. BREDEKAMP AWARD

*Sponsored by Dow Chemical, this award recognizes outstanding performance in the Chemical Engineering Unit Operations Laboratory.*

Kelsey Gossen

Matthew Browne

Kara Culver

Ashley Maes

### KIMBERLY-CLARK COMMUNICATIONS AWARD

Bryan Koepp

### KIMBERLY-CLARK PROFESSIONAL ETHICS AWARD

Kelsey Sprenger

### DAVIS W. HUBBARD PLANT DESIGN TEAM AWARD

*Sponsored by UOP, this award is given to the outstanding team in Chemical Engineering Plant Design during each academic year. It recognizes technical ability, consideration of the safety and environmental aspects of process design, outstanding written and oral communication skills, and overall teamwork and professionalism.*

Matthew Hehn

Nicholas Shimondle

Eric Ball

Howard Haselhuhn



## Distinguished Academy of Chemical Engineering

The Distinguished Academy of Chemical Engineering inducts honorees who have obtained the highest levels of leadership in their careers, communities, and society as a whole. Congratulations to the esteemed alumni listed below. All were inducted and celebrated at a special dinner at the Memorial Union Ballroom on campus at Michigan Tech on April 7, 2010.



David P. Bednarz, '82  
Vice President Iron Resources  
*Steel Dynamics Inc.*



James J. Graham, '70  
President & CEO (retired)  
*ConverDyn*



Michael Gregory, '69  
Vice President  
*The North American  
Coal Corporation*



Dr. Anton J. Pintar, '62  
Professor Emeritus  
Chemical Engineering  
Michigan Technological  
University



Susan M. Lewis, '87  
Global Manufacturing  
Director  
*Dow Chemical Company,  
Agro Sciences Division*



Ms. Linda J. McNally, '79  
Supply Chain  
Executive Director  
*Dow Corning Corporation*



James L. Sanderson, '73  
Executive Director/  
Corporate Procurement  
*Dow Corning Corporation  
(retired)*



Tim Schulz, Dean,  
College of Engineering



Brandi Lundquist,  
senior undergraduate student



James Graham, '70,  
ConverDyn



David Bednarz, '82, Newly-  
inducted Academy member



Vince Vellella, '60,  
Veltech Corporation



Urvashi Srivastava,  
graduate student



Maureen Johnson, '83, BP  
and James Brozzo, '53,  
Dow Chemical Company (retired)



Alan McNally,  
Dow Corning Corporation



Ed Fisher, Professor Emeritus,  
Michigan Tech

## Harma receives AIME award

RON HARMA '60 received the prestigious Robert H. Richards Award from the American Institute on Mining, Metallurgical and Petroleum Engineers (AIME) at the annual meeting in Phoenix, Arizona. The award recognizes achievement in any form that unmistakably furthers the art of minerals beneficiation in any of the branch member societies of AIME.

The award citation reads: "For his outstanding contributions to the iron ore industry and SME, his pioneering role in the development of Tilden and his relentless efforts to introduce new technology for iron ore concentration".

Harma's career began with Kennecott Copper Corporation in Salt Lake City, Utah in 1961 after leaving Michigan Tech with three degrees: a BS and MS in Metallurgical Engineering, and a BS Engineering Administration. He moved to Ishpeming, Michigan in 1963 where he held a number of technical and management jobs for Cleveland-Cliffs Iron Co. In 1987 he was transferred to the corporate office of Cleveland-Cliffs in Cleveland, Ohio where he held senior management



Ron Harma, '60

positions in R&D, technical project development and international business development until retiring in 2001 with over 37 years of experience in all aspects of the iron ore business.

In semi-retirement he has done extensive international consulting mostly for iron ore, but has also dealt with projects for iron and steel, ferroalloys, manganese ore, copper ore and industrial minerals. The projects

have been in Brazil, China, Europe, Mexico, Ukraine, Siberia and the remainder of North America.

Harma served on the Michigan Tech Fund Board of Trustees for 10 years and also on the Michigan Tech College of Engineering Industrial Advisory Board for 13 years. He has been a member of the Michigan Tech Fund's Presidents Club for 13 years. In 2003 he was elected to the Department of Chemical Engineering Academy.

He was chairman of the SME Upper Peninsula chapter and served on and chaired many local and national committees. He has written several technical papers and made many presentations. In 1986 he was awarded the SME-AIME distinguisher Member Award.

Harma is married to the former Ann Marie O'Leary of Hancock. They are Florida residents and maintain a second home in Westlake, Ohio. They have two children and three grandchildren. His son Jeffrey R. Harma is also a Tech Graduate with BS degrees in Electrical Engineering and Engineering Administration.



## Tremendous support comes from the Marshall Family Fund

ROBERT, REX AND PAUL MARSHALL, brothers and business partners, have given an estate gift of funds of nearly \$700,000 to support the Marshall Family Endowed Scholarship Fund for engineering students who demonstrate financial need and scholastic achievement. Robert Marshall earned a bachelor's degree in chemical engineering from Michigan Tech in 1942 and founded the Aluminum Supply Company in Detroit in 1948.



## Holly Hillberg receives ATHENA Award



Holly Hillberg, '83

HOLLY HILLBERG '83, chief technology officer and vice president of Carestream Health, Inc., was honored by the Women's Council of the Rochester Business Alliance as the recipient of its 2009 ATHENA Award. She was chosen for the award from a field of 19 finalists nominated by the community. Nearly 800 people attended the award luncheon, which is given annually to a local professional woman who has demonstrated significant achievements in business, community service and the professional advancement of women.

"Holly has been an invaluable member of our leadership team as we've built an independent health care company," said Kevin J. Hobert, CEO of Carestream Health in support of her nomination for the ATHENA Award. "In addition to her many contributions to our business, Holly serves as a mentor to others, both in our company and in the broader community. Her service to, and passion for, our community is inspiring."

Hillberg has served in her current role at Carestream Health since 2006, leading a global team of research and development professionals in creating and commercializing digital solutions for health care institutions worldwide. She is also responsible for leading technology and intellectual property strategy, setting direction for advanced research and innovation and driving key commercialization efforts.

Prior to her work at Carestream, she spent more than a decade at Eastman Kodak Co, serving in a variety of positions, including director of corporate engineering and vice president of R&D. She presently serves on the Michigan Tech College of Engineering Advisory Board, and was inducted into the Presi-

dential Council of Alumnae in 2007.

For the past thirteen years, Hillberg and her husband Willy have been actively involved in youth ministry, having led twelve domestic and international youth missions to such places as the Amazon, Africa, Russia, New York City and Philadelphia.

The ATHENA Award was first presented in 1982 in Lansing, Mich., and has grown to include presentations to more than 5,000 individuals in hundreds of cities in the United States, as well as in Canada, China, Russia and the United Kingdom. The award is a hand-cast bronze sculpture symbolizing the strength, courage and wisdom of the recipient.

## Hoffman wins Gaudin Award

GLENN HOFFMAN, who earned his MS in Metallurgical Engineering from Michigan Tech in 1977, recently received the 2010 Antoine M. Gaudin Award at the annual conference of the Society for Mining, Metallurgy, and Exploration (SME) held in Phoenix, Arizona. SME presents the annual Gaudin award to professionals for scientific or engineering contributions that further understanding of the technology of mineral processing.

Hoffman's lecture at the conference, "Truth & Consequences—A Prescription for Innovation" was a candid review of technology innovations developed during the course of his career as an engineer in ferrous



Glenn Hoffman, '77

and non-ferrous metallurgy. He currently is President/CEO of Cardero Iron Ore Company, a wholly owned subsidiary of Cardero Resources, Inc.

## Reception celebrates new James and Lorna Mack Endowed Chair

MICHIGAN TECH chemical engineering alumnus James A. Mack '59 and his wife, Lorna, donated \$2 million to establish an endowed chair in cellular and molecular bionengineering in the Department of Chemical Engineering. Mack recently retired as President and Chief Executive of Cambrex Corporation, a developer and marketer 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.

Professor Ching-An Peng, who came to Michigan Tech from National Taiwan University, is now the first holder of the James and Lorna Mack Endowed Chair. Peng's research interests include drug/gene delivery, tissue engineering, nanomedicine, and biological transport. He earned a PhD in Chemical Engineering at the University of Michigan.

On Thursday, August 6, James and Lorna Mack visited campus for a special reception to celebrate the endowment and welcome Dr. Peng to the campus community. In attendance were President Glenn Mroz, Provost Max Seel, Dave House Professor and Dean of the College of Engineering Tim Schulz, and Chemical Engineering Department Chair S.K. Kawatra.



Lorna Mack



James Mack



*From l to r:* Glenn Mroz, Gail Mroz, Shea McGrew, Ching-An Peng, Lorna Mack, Jim Mack, Komar Kawatra, Tim Schulz, and Max Seel.

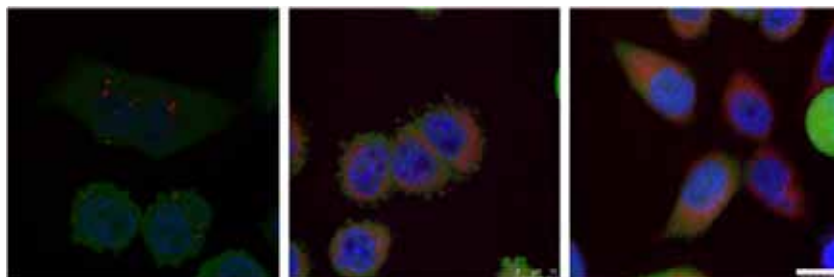
## Cancer nanotechnology



Ching-An Peng

MANY CANCER TREATMENTS have their own sets of risks and consequences. Among those is chemotherapy, which introduces poisons or toxins into the body to damage, shrink, or kill cancerous cells. Unfortunately, chemotherapy also can destroy healthy cells, leaving the patient with serious, unpleasant side effects.

Phototherapy and molecular targeting are two separate methods that have shown great potential as localized—and therefore less invasive—cancer treatment. Professor Ching-An Peng, who holds the James and Lorna Mack Endowed Chair, has been work-



Neuroblastoma cells expressed with green fluorescent protein are co-cultured with carbon nanotubes that are tagged with monoclonal antibody and red fluorescent dye. The cell nucleus is stained with blue fluorescent dye.

ing to fine tune them both. "Among the many nanomaterials designed and synthesized for biomedical applications, the carbon nanotube, because of its unique ability to absorb near infrared light, is a promising option for localized phototherapy," Peng explains. When armed with a specific monoclonal antibody, a carbon nanotube can be ingested by corresponding cancer cells. This internalization occurs via a biochemical process whereby cells engulf the nanotube with their cell membrane. Peng and his team have conducted phototherapy experiments using two different antibodies. One antibody is able to specifically target neuroblastoma cells. Neuroblastoma,

a cancer of the sympathetic nervous system, is the most common cancer in infants.

The other antibody is able to recognize glioblastoma stem-like cells. Glioblastoma is the most common and most aggressive primary brain tumor in adults. "Cancer cells ingested with antibody-tagged carbon nanotubes and irradiated with 808-nm near infrared laser light which can pass through the skin were all found to die under this light while other cells were unaffected," says Peng.

Peng and his team are also investigating the use of prodrugs as an effective treatment for colorectal cancer.

### Want to make a gift to the Department of Chemical Engineering?

ALTHOUGH MICHIGAN TECH is a state institution, it receives less than one-third of its funding from state appropriations. Your gift helps keep our department on the cutting edge. There are three ways to give:

Use Michigan Tech's online gift form at [www.mtf.mtu.edu/gift](http://www.mtf.mtu.edu/gift). • Call the Michigan Tech Fund at 906-487-2310. • Mail a gift to the Michigan Tech Fund using the enclosed envelope. • In order to make sure 100 percent of your gift goes to the Department of Chemical Engineering, please specify chemical engineering account #3198. Many, many thanks!



New faculty expand department research areas



Timothy Eisele

ASSISTANT PROFESSOR Timothy Eisele earned BS and MS degrees in metallurgical engineering, and in 1992, a PhD in metallurgical and materials engineering—all from Michigan Tech. As a research engineer, he has worked on a wide range of projects involving processing of particulate materials including coal, fly-ashes, scrubber sludges, metallurgical slags, machining wastes, copper ores, iron ores, phosphate, and many other similar materials. His studies have resulted in improved processing techniques that use column flotation, bacterial processing, and hydrocyclone separators. He has also carried out research to improve the energy efficiency of particulate crushing and grinding, which is notoriously inefficient. His current research concentrates on metals extraction using microorganisms, as well as improved methods for capturing, sequestering, and utilizing carbon dioxide to reduce industrial greenhouse gas emissions.



Adrienne Minerick

ASSOCIATE PROFESSOR Adrienne Minerick recently arrived at Michigan Tech from Mississippi State University, where she was a tenured associate professor. She earned an MS and a PhD from the University of Notre Dame and a BS in chemical engineering from Michigan Tech in 1998. Minerick is the recipient of a 2007 National Science Foundation CAREER Award. Her research interests include electrokinetics, predominantly dielectrophoretic characterizations of cells, and the development of biomedical microdevices. In 2008, Minerick's research was the subject of a featured perspectives article and journal cover in *AIChE Journal*. She is an active mentor of undergraduate researchers and served as co-PI for the NSF Research Experiences for Undergraduates (REU) program, "Chemistry-Chemical Engineering: The Bonds Between Us". Research activities in Minerick's MD-ERL (Medical micro-Device Engineering Research Laboratory) at Mississippi State also inspired the development of Desktop Experiment Modules (DEMos) for use in undergraduate chemical engineering classrooms or as outreach activities in area schools.



Caryn Heldt

ASSOCIATE PROFESSOR Caryn Heldt will be joining the faculty in August 2010 after completing a postdoctoral fellowship at Rensselaer Polytechnic Institute. Heldt received a Bachelor of Science degree in Chemical Engineering from Michigan Tech in 2001, and worked for BASF in a variety of roles through the company's Professional Development program. She received her PhD in Chemical Engineering from North Carolina State University in 2008.

Heldt's research is focused on using the molecular recognition of proteins and small molecules to improve human health. "Many different biological processes involve the interaction of proteins with other proteins or small chemical molecules, including enzymatic reactions, viral entry into cells, and cell-to-cell signaling. Abnormal protein interactions can cause diseases, like Alzheimer's and prion diseases," she explains. Heldt will design small molecules and peptides that mimic the natural interactions of these molecules to slow disease progression, remove harmful contaminants from water and biotherapeutics, and create biosensor surfaces to detect bacteria and viruses in the environment.

## Morrison elected SOR president



Faith Morrison

LAST OCTOBER 2009, Chemical Engineering Professor Faith Morrison was inaugurated as the President of The Society of Rheology (SOR), the largest professional organization in her field. Morrison, who served as Vice President of The Society of Rheology from 2007–2009, has been active in the SOR since 1990. The Society of Rheology was founded in 1929 and is part of the American Institute of Physics.

Rheology is the study of deformation and flow. If you google “What is rheology anyway,” you will find Morrison’s article of that title, which gives

a layman’s explanation of the field. If you have ever struggled with getting ketchup out of a bottle, or kneaded dough for bread or rolls, you have faced a rheological problem. “Rheology is all around us,” says Morrison. “The design of motor oils with those mysterious ‘additives’ is all about making the oils flow better under different conditions. That’s rheology.”

Morrison has been the editor of the Rheology Bulletin since January 2004, and she is author of the textbook *Understanding Rheology* (Oxford 2001). She is currently negotiating with publishers for her second book, an introductory fluid mechanics text, which is expected to appear in 2011. Morrison’s course CM4650 Polymer Rheology has been offered since 1991 and has grown to an enrollment of 22 students in Spring 2011.

“Michigan Tech is unique in the world in providing in-depth rheological education at the undergraduate level,” says Morrison who also teaches a rheology lab each Fall.

Alums with jobs in industry report that their academic preparation in rheology has made a difference in their careers. Adds Morrison: “I can tell you it feels great when I see an email in my inbox with the subject ‘Rheology Rules!’. Thanks Christina!” (Morrison recently received that message from Christina Simpson, ’07).

**Studying rheology as a junior or a senior puts Michigan Tech graduates ahead of their peers.**

**Rebecca Heimerl (2009) took rheology at Tech and is now a graduate student at the Illinois Institute of Technology. She has chosen a PhD topic in rheology.**

**Adam Mix (2008) is now a PhD student on a rheological project at the University of Wisconsin–Madison.**

## Shonnard directs SFI



David Shonnard

PROFESSOR DAVID SHONNARD, Richard and Bonnie Robbins Chair in Sustainable Materials, has been named director of the Michigan Tech Sustainable Futures Institute (SFI).

SFI approaches sustainability from a holistic systems perspective focusing on water, energy, industrial ecology, environmentally-conscious manufacturing, public policy, and green engineering.

Shonnard is conducting cradle-to-grave,

life cycle analyses for two major alternative-energy projects recently funded by the US Department of Energy. They are among 19 industry-led projects receiving grants totaling \$564 million from the American Recovery and Reinvestment Act, commonly known as federal stimulus funds. Shonnard is also involved in a third DOE-funded project, working to turn wastewater pollutants into ethanol. For more information, visit [www.sfi.mtu.edu](http://www.sfi.mtu.edu).

## Li wins Research Excellence Fund Award



Wenzhen Li

CHEMICAL ENGINEERING assistant professor Wenzhen Li was recently awarded a research seed grant from the Michigan Tech Research Excellence Fund.

Li's current research focuses on the design, synthesis and characterization of novel nanostructured materials as highly active, durable, and inexpensive electro-catalysts for proton exchange membrane fuel cells (PEMFCs)—renewable electrochemical energy devices which can efficiently convert chemical energy stored in hydrogen, or methanol into electrical energy with zero emissions.

Fifty-five proposals, totaling \$1.5 million, were submitted. A committee formed by Michigan Tech's Vice President for Research, Dave Reed, awarded \$472,527 to 27 award recipients on campus.

## Chris Abramson honored

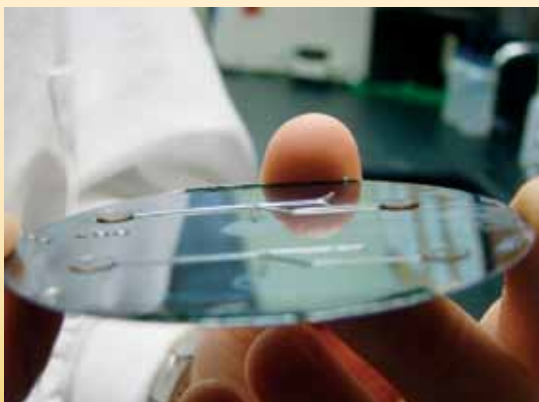


Chris Abramson

EACH YEAR the Michigan Tech Staff Council bestows Making a Difference awards to staff members who have excelled.

Chemical Engineering Department Coordinator Chris Abramson was honored in the Serving Others category. "Our department is quite large, with 300 undergraduates, all of whom Chris must deal with at some point," notes Department Chair S. K. Kawatra.

"Chris acts as the contact point between the department, the rest of the university, and to a large extent the outside world. This is a very demanding job. Chris does an outstanding job of balancing everyone's specific and sometimes contradictory needs, and without her efforts the department could not function. She not only does her job with unfailing thoroughness, she is also exceedingly pleasant to everyone that she deals with."



PICTURED: A DC dielectrophoretic microdevice patterned Si wafer, engineered by Associate Professor Adrienne Minerick, director of the Medical micro-Device Engineering Research Lab. A flexible elastomer (PDMS) is cast on top of this wafer to create channels and chambers with all of the raised features. This elastomer casting is then sealed onto a glass slide and blood samples introduced into the ports for electrokinetic testing. Minerick explores the use of electrokinetics, specifically dielectrophoresis, in microdevices with the goal of developing medical diagnostic devices to detect and quantify diseases and disease progression.



## Jason Keith tops in teaching

ASSOCIATE PROFESSOR Jason Keith will receive the Fredrick D. Williams Instructional Innovation Award, which recognizes faculty who have developed or adopted new and innovative approaches to instruction.

Keith was cited for designing educational modules for infusing fuel cells and alternative energy into the chemical engineering curriculum. The application has had "a national impact on engineering education," according to William Kennedy, director of the Center for Teaching, Learning and Faculty Development, which bestows

the recognition.

Keith, who earned his PhD at Notre Dame and has taught at Michigan Tech since 2000, will receive a monetary award of \$2,500 at an awards dinner in the fall.

The award is named for Fredrick D. Williams, who served as a director of the Michigan Tech Center for Teaching Excellence and as a longstanding member of the faculty of the Department of Chemistry. Three faculty members have received the award since its inception in 2005.



Jason Keith

## New book touts robust, flexible polymerization process



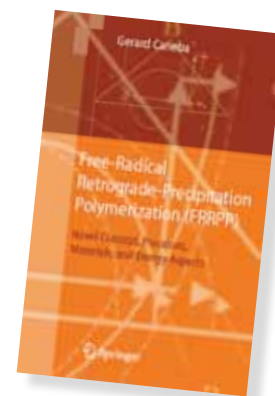
Gerard Caneba

A NEW BOOK by Chemical Engineering Professor Gerard Caneba pertains to the unique phenomenological features of a potentially runaway polymerization reaction process that is apparently brought under control through a mass and energy confining mechanism. Referred to by the author as a "third-world method to produce Multipolymers," the free-radical retrograde-precipitation polymeriza-

tion (FRRPP) process was introduced by Caneba in the early 1990s as a chain polymerization method, whereby phase separation is occurring while reactive sites are above the lower critical solution temperature (LCST).

Caneba attempts to explain a collection of experimental observations, including entrapment of reactive intermediates as well as their energy contents, nucleated thermal hot spots beyond adiabatic rise temperatures, and nanoscale confinement behavior that has been used for fine patterning of polymers.

FRRPP-based materials are relevant in energy and environmentally responsible applications. "There are no special chemical mediators needed. Control of conditions and product distribution is done by process means, based on a robust and flexible free-radical-based



**Free-Radical  
Retrograde-Precipitation  
Polymerization (FRRPP):  
Novel Concept, Processes,  
Materials, and Energy Aspects**  
by Gerard Caneba  
Hardcover 1st Edition  
ISBN: 978-3-642-03024-6

chemistry. Thus, it can readily be implemented in the laboratory and in production scale."

## 2009 Industrial Advisory Board meeting

In October 2009 our Industrial Advisory Board met to review the department's recent progress and chart a path for future improvements. The annual meeting is a way to ensure that the department is fulfilling its commitment to stakeholders by maintaining healthy graduate and undergraduate programs.



Bill Brake, *Cleveland Cliffs*



Gene Chamberlin, *Archer Daniels Midland*



Donald Dixon, *Dixon Global LLC*



Susan Lewis, *Dow Chemical Company*



Mark Mleziva, *Kimberly-Clark Corp.*



Tom Prausa, *3M Company*



James Sanderson, *Dow Corning Corp.*



John Sparks, *Grain Processing Corp.*



Ryan Stoeger, *Mosaic*

Industrial Advisory Board members not pictured: Paul Dean, *The Dow Chemical Company*; Wayne Enderle, *BASF*; Chris Gosling, *UOP LLC*; Mary Korppi, *Newmont Mining Corp.*; Karen Mikkola Swager, *Mosaic*; Dave Reif, *Emerson Processing*; Vince Vellella, *President, VELTEC*; John Wright, *Pfizer Inc.*



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# MichiganTech

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