

ChE *news*

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Closing the Circle on Algae Biofuel

By Kate McAlpine, Marketing & Communications, College of Engineering

Turning algae into a biofuel that can readily replace petroleum looks promising, but one of the big roadblocks to mass-producing the algae is the need for fertilizer. Although algae have trouble reusing the nitrogen and phosphorus left in the water after their predecessors have been converted to bio-oil, Nina Lin's research group found that oil-producing bacteria can survive on those algae remnants.

Phil Savage's group has shown that 90 percent of the chemical energy in the algae can be captured in biocrude oil, and biocrude can already be refined to 97 percent purity. But algae need

nitrogen and phosphorus in their environment, and fertilizer is a major cost, said Lin.

Because the nitrogen and phosphorus tend to stay in the watery byproduct when the algae has been "pressure-cooked" into oil, many researchers had assumed that it could fertilize the next batch of algae.

"Most of the nitrogen and phosphorus is in the form of ammonia and phosphate, which should be readily available for the algae," said Michael Nelson, a PhD student in Lin's group and first author on the paper to appear in the May issue of *Biorescience*

Technology. Lin and Nelson are in the photo above.

But others hadn't considered what happens to the carbon compounds at temperatures around 660 degrees Fahrenheit and pressures of nearly 200 times that of Earth's atmosphere.

"It's like charred meat – the surface contains compounds that are thought to be carcinogenic. Nasty compounds form at unnaturally high temperatures," said Nelson.

Researchers could get algae to grow in the presence of the watery byproduct and its toxic carbon compounds,

Note From the Chair



Another year has flown by! The department continues to excel, again reaching new heights in teaching and research. There were a number of changes occurring with our faculty this past year. One was the addition of Andrew Tadd as a full-time lecturer. He has assumed some of the duties of the recently retired Barry Barkel, including helping to teach the design course. Andy has been with the department for some time as a research scientist and as a part-time lecturer, and we are very fortunate he has chosen to stay at Michigan!

We have completed our partial faculty moves to North Campus Research Complex (NCRC) and, as we reported last year, have helped established a new, interdisciplinary Biointerfaces Institute at NCRC, led by our own Joerg Lahann. Six of our faculty are included in that interdisciplinary group, so our center of gravity has moved slightly east and north of the Dow Building.

Speaking of our facilities, this coming year looks to be a turning point in the department's history. Currently the department is located in six different buildings, creating challenges to our tradition of interdisciplinary collaboration. We are also growing at both the graduate and undergraduate levels – we graduate more BSE ChE students than any other ChE program in the country. We would like to consolidate our space into a brand new chemical engineering building! If you have been wondering how you can make an impact on what we do here, and you have significant resources, this may be your opportunity.

As you will read in this newsletter, there are many other things happening here on campus. Our faculty continue to receive awards. Charles Monroe won a CAREER Award from NSF, Mark Barteau was

installed as the first DTE Energy Professor of Advanced Energy Research, and Ron Larson was named a Distinguished University Professor. Our undergraduate student services continue to improve as Susan Montgomery and the undergraduate office staff moved into a new advising suite to better serve the close to 500 undergraduates. We are completing construction of the new product design lab for a course that Barry Barkel developed many years ago.

As I start my second term as chair, I can't help but be humbled by the ongoing achievements of our faculty and students. I am honored to chair this department, and I see only good things ahead of us. With the support of loyal alumni, there is no limit to what we can accomplish!

Go Blue!

Mark A. Burns

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Barteau Installed as DTE Energy Professor



Mark A. Barteau, the director of the University of Michigan Energy Institute, was installed as the inaugural DTE Energy Professor of Advanced Energy Research on April 25. He presented a lecture titled "Perspectives on Energy & Catalysis." David Munson, the Robert J. Vlasic Dean of Engineering, and Stephen Forrest, the U-M Vice President for Research, spoke before the lecture about Barteau's remarkable career and thanked DTE Energy for their generous gift to create the professorship, as well as their ongoing support of the University. Fred Shell, vice president of Corporate and Government Affairs, and president of the DTE Energy Foundation, spoke on behalf of the Foundation and accepted the professorship medal presented to the Foundation by the College of Engineering. We were also honored to have several DTE Energy employees, a number of whom are U-M alumni, attend the ceremony.

The DTE Energy Foundation is the first corporate foundation to endow a professorship in the department. DTE Energy, a major energy company in Michigan, believes strongly in the value of investing in cutting-edge sustainable energy research to secure our world's energy future. As a regional energy provider, the company has a strong partnership with the College and the University and is a popular employer of Michigan graduates. DTE Energy employee and Chemical Engineering alumna, Sharon (Tavery) Pfeuffer (BSE '84), chief engineer,

Fossil Generation, recently joined the ChE Alumni Board. Read about Pfeuffer on page 17.

The new professorship is further catalyzing the collaborative relationship with DTE Energy. To further build connections between the College and DTE Energy, Barteau and Burns were invited to update U-M engineering alumni at DTE Energy about the current research and future plans of the Michigan Energy Institute and the department.

The department values engagement with industry to advance research that is relevant to society's needs and to prepare students for productive careers. We thank DTE Energy and DTE Energy Foundation for their commitment to partnership.

Thanks to Susan Shields, Senior Director Corporate and Foundation Relations, for information about the partnership between the University and the DTE Energy Foundation.

Tadd Appointed Lecturer



The department is pleased to announce that Andrew Tadd has joined the faculty as a lecturer. Dr. Tadd completed his PhD at Michigan in 2006, working on catalyst development and optimization with his thesis advisor Johannes Schwank. He remained at Michigan, first as a postdoctoral researcher, then as an assistant research scientist from 2007 to 2012. While working primarily in a research capacity, Dr. Tadd also taught part time, initially with the junior heat and

mass transfer laboratory, ChE 360. In the 2012-2013 academic year, Tadd led the instruction of our senior-level process design course, ChE 487.

Prior to joining U-M as a graduate student in 2001, he earned an MSChE from the University of Toledo and a BSChE from The Ohio State University. After completing his bachelor's degree, he had several years of industrial experience in capital projects and process, where he acquired skills that have proved useful as he leads our senior design and separation processes courses.

Based on his experience teaching the course last year, he is looking forward to working with a new class of seniors. "It's a privilege to teach the design course because of the great work that was done by the previous instructors, especially Barry Barkel, to build the course into what it is today," Tadd says. "It's the first chance the students have to put everything they've learned together and I enjoy guiding them through the experience of designing a complete process."

Algae Biofuels

CONTINUED FROM PAGE 1

“but they had to dilute the heck out of it,” said Nelson. If the algae-to-water mass ratio was 20:80 before the conversion to oil, fresh algae couldn’t handle the byproduct in concentrations of more than half a percent.

Instead of writing off the watery leftovers, Lin’s team tried to grow oil-producing microbes with the stuff. They tested the well-known *Escherichia coli* bacteria and *Saccharomyces cerevisiae* (brewing yeast) as well as the hardy *Pseudomonas putida* bacteria, a research candidate for remediating oil spills.

The brewing yeast didn’t do so well, but the team was pleased to find that *E. coli* and *P. putida* could grow well by feeding on the byproduct at 20 percent concentration.

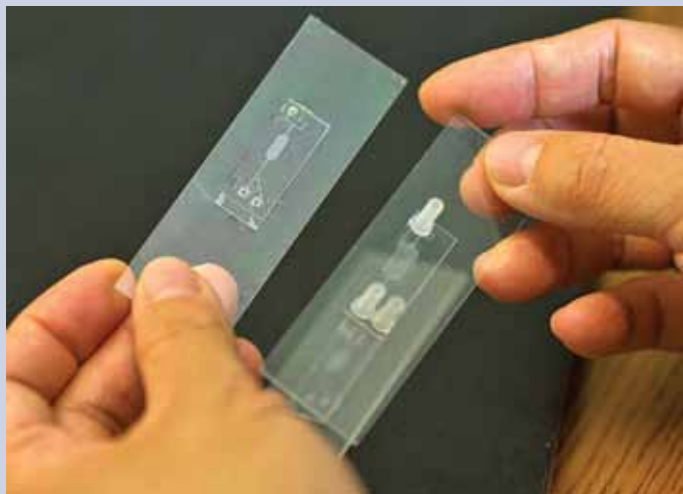
Nelson made sure that the remainder of the solution only controlled the pH of the fluid and provided the trace amounts of metals that are missing from the watery byproduct. “I was very careful not to cheat,” he said, either with expensive chemicals or extra nutrients.

Now, the team is pressure-cooking the bacteria like they did the algae to find out what quality of oil it makes. They have also been growing many generations of bacteria, feeding them only on the watery product from algae reactions, also known as the “aqueous phase.”

“Because we don’t know exactly what’s in this aqueous phase or how to rationally engineer our species, we decided to use natural selection to evolve and isolate strains that are proved to have better fitness in this toxic and demanding environment,” said Lin. “We’ve been seeing some very encouraging results.”

In the future, they would like to explore whether the algae respond better to the watery byproduct if it’s reintroduced after the bacteria have eaten some of the carbon compounds. Since algae often coexist with other microbes, and some can degrade certain molecules that are toxic to algae, Lin said, “We’re hoping this might actually happen in our system.”

Biofuel Research Awarded Two NSF Grants



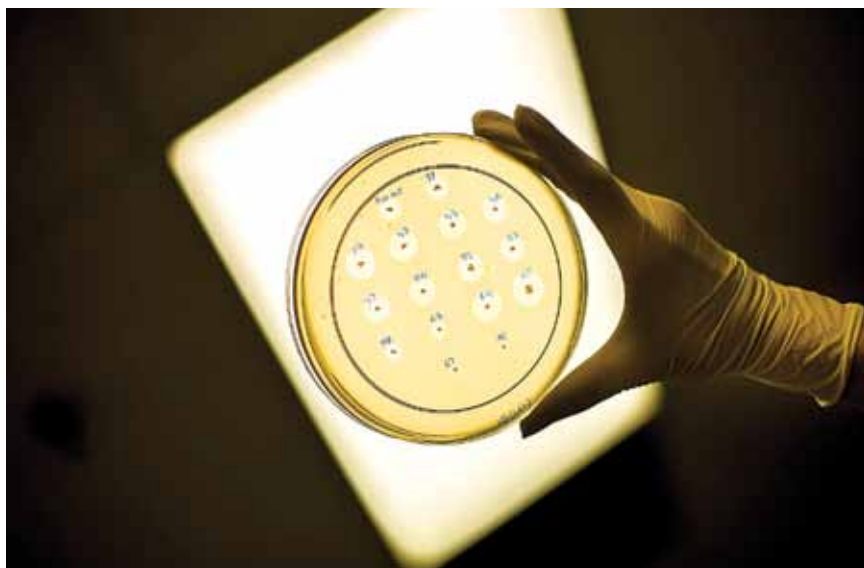
Nina Lin and her collaborators received two National Science Foundation grants to continue their work on biofuels. The first is a \$2 million federal grant to identify and test naturally diverse groups of green algae that can be grown together to create a high-yield, environmentally sustainable and cost-effective system to produce next-generation biofuels. Bradley Cardinale from the School of Natural Resources is the primary investigator (PI), and Lin and Phil Savage are co-PIs. Lin’s lab will be modifying various laboratory techniques so the team can expand the search for multispecies assemblages that exhibit high yields and efficient waste recycling. Savage’s lab will use hydrothermal liquefaction to measure the quantity and quality of the combustible oils, or biocrude, produced by the various algae combinations—from both the laboratory and field experiments. His team will also compare the ability of single and multispecies systems to reuse and recycle wastes for additional growth.

Lin and Neil Marsh from the Department of Chemistry have received a \$423,000 NSF award to do more research on their project seeking ways to make better, more efficient biofuels, one could directly substitute into current conventional fuel technology. More specifically they will try to engineer microorganisms—bacteria or photosynthetic organisms like algae—to produce the molecules that make up gasoline.

From articles by Jim Erickson from U-M News Services and Amy Mast from the U-M Energy Institute. Photo of microfluidic device that can generate nanoliter droplets to grow algae. Both this photo and cover photo were taken by Joseph Xu, Michigan Engineering Communications & Marketing.

Squashing Superbugs: Killer Coatings

By Kate McAlpine, Marketing & Communications, College of Engineering



Tubes, catheters and other artificial points of access into patients' bodies allow the direct delivery of drugs and nutrients, and help with breathing and more, but these conduits also pose a risk. If bacteria can get into them, they have a shortcut past the patient's defenses. Erdogan Gulari believes that these devices could be made to fight off the bacteria with a coating of antimicrobial molecules.

When humans get sick, we usually absorb viruses or bacteria through mucus membranes, such as the moist tissues of our eyes, noses and mouths. These sites are reasonably protected, but a frog's skin is like one big mucus membrane. So why aren't they sick all the time?

It turns out that frogs produce a huge range of microbe-killing peptides, which are small protein-like molecules, on their skins. These peptides open holes in the cell membrane of a bacterium, killing them. Humans use antimicrobial peptides as well – some immune cells that swallow bacterial invaders slay them with peptides.

Gulari's team is developing a way to tweak natural peptide designs to fight target microbes more effectively. Because designing peptides is still a trial-and-error affair, this means producing and testing thousands to millions of them.

"If you synthesize peptides chemically, just one of them may cost a couple thousand dollars, whereas if you use a yeast or *E. coli* cell to synthesize them, you can get tens of thousands of them at almost no cost," said Gulari. "So we use nature to do the legwork."

They started with the peptide Plantaricin-423, which is harmless to humans but capable of killing the food-borne pathogen *Listeria*. Peptides and proteins are strings of molecules called amino acids, and Plantaricin-423 contains 37 of them. The first 18 bind the peptide to the target cell membrane. Since Plantaricin-423 already attaches to *Listeria* but not human cells, Gulari's team left those alone.

To make the peptide deadlier, they changed the 19-amino-acid hole-poking section. A computer program randomly assigned one of six amino acids to each spot, with the option to shorten the chain by one or two amino acids. That resulted in about 12,000 different peptides. They then made DNA blueprints for each of these designs and slipped them into *E. coli* cells, where the bacteria's machinery could begin churning out peptides.

"We can process large petri dishes of 4,000 or 5,000 colonies, so that's 4,000 or 5,000 different peptides being pro-

duced," said Dr. Saadet Albayrak Guralp, a research associate in Gulari's lab. With those production levels, she isn't fazed by the idea of testing hundreds of thousands of peptides, up to around a million.

To find out how well the peptides worked, the team grew the *Listeria* on the same petri dish. The laboratory *E. coli* bacteria were designed with leaky cell membranes, so the peptides escaped into the petri dish, creating *Listeria*-free zones around the *E. coli* colonies.

The sizes of those zones gave Gulari's team a general idea of how well the peptide discouraged the growth of the *Listeria*, but that measure is also dependent on how well the *E. coli* hosts produce the peptides. The group isolated the most promising peptides to find out how potent they were at killing the *Listeria*. It turned out that the best could keep the bacteria at bay with half the concentration of the original Plantaricin-423.

She and Gulari hope that the method may also uncover peptides that can fight off other hospital bugs such as staph and those that cause pneumonia in patients on ventilators.

But no preventative method is completely successful, so doctors will continue to deploy antibiotics to fight infections. Designer peptides may become new drugs as well if they can be coated so that the body doesn't break them down before they reach the infection. But new antibiotics aren't the only options – another team is exploring ways to make the current antibiotics work better.

For more stories about how Michigan engineers are working to help fight antibiotic-resistant bacteria, including Mike Solomon's research project with medical colleagues to find ways to destroy colonies of bacteria, please visit:

<http://www.engin.umich.edu/college/about/news/dme/superbugs/>

Photo of peptide test plate above by Joseph Xu, Michigan Engineering Communications & Marketing

Department Honors

FACULTY



Mark Barteau presented the 2013 Stanley Katz Memorial Lecture in the Department of Chemical Engineering at City College of New York.

Barteau was appointed this year to the Board on Chemical Sciences and Technology of the National Research Council for a 3-year term that began September 1, 2013. He was also appointed the associate editor of Wiley's interdisciplinary review publication, *WIREs Energy and Environment*, in April 2013.



Omolola Eniola-Adefeso was promoted to associate professor with tenure.



Sharon C. Glotzer presented the 2013 P.V. Danckwerts Memorial Lecture, titled "Assembly Engineering: Materials Design for the 21st Century," on April 23 during the 9th European

Congress for Chemical Engineering in The Hague.



Nick Kotov was awarded the 2013 Langmuir Lecture Award from the American Chemical Society (ACS). He delivered a plenary lecture in a special session of the Colloid and Surface

Chemistry Division program at the 2013 Fall ACS National Meeting in Indianapolis, Indiana.



Ronald Larson was selected to receive the Stephen S. Attwood Award this year. The Attwood award is the highest honor awarded to a faculty member of the College of Engineer-

ing. It recognizes "extraordinary achievement in teaching, research, service, and other activities that have brought distinction to the College and University."



Charles Monroe received the National Science Foundation CAREER Award. Monroe's CAREER research will focus on elucidating the fundamental reaction mechanisms and

material interactions that determine how flow batteries behave, and will use this knowledge as a foundation for computational models that accurately simulate flow-battery operation.



Michael Solomon received the Chemical Engineering Department's Outstanding Achievement Award for 2013. Solomon has also been recognized with numerous other awards

at Michigan, including a 1938E Award from the College and a Henry Russel Award from the University.



Phil Savage was named editor-in-chief of the American Chemical Society journal *Industrial & Engineering Chemistry Research* (I&EC). He will begin his editorship in January 2014.



Angela Violi received a Faculty Recognition Award this year. The awards are given to mid-career faculty who have demonstrated remarkable contributions to the

University through outstanding teaching or mentoring, scholarly research or creative endeavors, or distinguished participation in service activities.

STUDENTS

Our most recent National Science Foundation Fellowship recipients are: **Julia Faeth** (Savage Lab) and **Lianette Rivera** (Nagrath Lab), and first-year graduate student, **Jennifer Jocz**, a 2013 BSE ChE graduate of our program.

The Michigan Synthetic Biology Team (MSBT) received a gold medal and a major award ("Best new biobrick, natural") at the 2012 Americas East regional iGEM competition for their project "A Genetic Toggle Switch Using Recombinases". MSBT also received an Oil Sands Leadership Initiative (OSLI) lifetime achievement award at the iGEM 2012 world championship jamboree. ChE participants in MSBT include undergraduate members **Alison Banka** and **Scott Spangler**, and advisor and graduate student **Jeremy Minty** (Lin Lab).

Daniel Sobczynski (Eniola-Adefeso Lab) and **Sida Steven Wang** (Lin and Burns Labs) received NIH Cellular Biotechnology Training Program Grants.

Jake Jordahl (Lahann lab) was accepted into the Microfluidics in Biomedical Sciences Training Program (MBSTP) starting with the Fall 2013 term.

Larson Distinguished University Professor



Ronald G. Larson was named the A.H. White Distinguished University Professor of Chemical Engineering, in recognition of his extraordinary advances in polymer science, his teaching, and service to the College of Engineering and the chemical engineering community.

Larson is a distinguished engineer in the field of polymer science & engineering. He came to the University in 1996 after sixteen years with Bell Laboratories in New Jersey. His research focuses on the structure and dynamics of “complex fluids,” sometimes also called “soft matter,” which includes polymers, colloids, surfactants, and lipids. They appear in materials as diverse as plastics, shampoos, paints, and biological fluids. He is the author of three important textbooks, including *The Structure and Rheology of Complex Fluids*. His accomplishments have earned him several major awards from professional organizations, including election to the National Academy of Engineering and the Alpha Chi Sigma Award from the AIChE.

He was chair of the department from 2001-2008, during which time he recruited some outstanding faculty, including associate professor-level hires Nick Kotov

and Sharon Glotzer, who have given the department a leadership role in nanomaterials, as well as outstanding assistant professors, who are rapidly becoming leaders in chemical engineering. While serving as chair, Larson continued to improve the scope of the department’s research, with an emphasis on hiring top researchers and promoting faculty collaborative projects. He has served on numerous College committees and helped launch important initiatives such as the University of Michigan Shanghai Jiao Tong University Joint Institute.

Larson formed the ChE Alumni Advisory Board during his chairmanship. One of the board’s first projects was to help the department evaluate the graduate and undergraduate programs, and to suggest changes for improvement. The board members have also assisted the department to publicize its strengths and to solicit more funding.

With this most recent honor, Larson chose to remember Alfred Holmes White, who taught at U-M from 1897 until he retired in 1943 as chair of the department, which he helped found in 1898. Larson is also

the George Granger Brown Professor of Chemical Engineering. He admires White and Brown, shown in the photo below. Both were former faculty members and chairs of the department who guided it through its first half century. Their work laid the foundation for what the department is today—an institution whose researchers and educators continue to make important contributions to the profession and to society worldwide. As chair, Larson was inspired by their dedication and hopes that his contributions to the department will prove to be valuable to the department in this century. He notes that the total tenure as chair for White, Brown, and himself was 44 years—a good chunk of the department’s 115-year history.



Alfred H. White and George Granger Brown in 1938.

Larson has expressed his delight in being named a Distinguished University Professor. “It is hard to imagine a greater honor, coming from an institution that I love, and has done so much for me. Considering others who have been named to this honor makes this especially gratifying.” He wants it to be recognized that the University and especially the Chemical Engineering Department and its faculty, staff, and students, have been a major factor in his progress in research, teaching, and service and should consider this honor theirs as well.

Research Highlights

Leading nanoscientists created beautiful, tiled patterns with flat nanocrystals, but they were left with a mystery: Why did some sets of crystals arrange themselves in an alternating, herringbone style? [Sharon Glotzer](#) and her group were among the experts asked to answer this question. Initially the simulations they produced showed that if the equilateral hexagons interacted with one another only through their shapes, most of the crystals formed the foreshortened honeycomb pattern – not the herringbone. Now they knew that something else was going on, that it wasn't just a packing problem. They discovered that if the edges that formed the points were stickier than the other two sides, the hexagons would naturally arrange in the herringbone pattern. Their study showed that making subtle changes like this in building block architecture produces profound changes in the larger self-assembled pattern.



A fungus and *E. coli* bacteria have joined forces to turn tough, waste plant material into isobutanol, a biofuel that matches gasoline's properties better than ethanol. [Nina Lin](#) and recent PhD graduate, [Jeremy Minty](#), believe that the principle could also be used to produce other valuable chemicals such as plastics. Gallon for

gallon, isobutanol gives off 82 percent of the heat energy gasoline provides when burned, compared to ethanol's 67 percent. Ethanol also has a tendency to absorb water, corroding pipelines and damaging engines, but isobutanol doesn't mix easily with water.

Equally important, this system makes isobutanol from inedible plant materials, so fuel production won't drive up food costs. Lin's team used corn stalks and leaves, but their ecosystem should also be able to process other agricultural byproducts and forestry waste. A paper on this research was published in *The Proceedings of the National Academy of Sciences* on August 12.

Tuberculosis (TB) is still a major cause of death due to the development of antibiotic resistance and an incomplete understanding of the host immune response to the pathogen that causes it, *Mycobacterium tuberculosis* (Mtb). The central feature of the immune response is the formation of an organized structure of immune cells at the site of infection, termed a granuloma. In a recent study in *PLoS One*, [Nick Cilfone](#) from [Jennifer Linderman's](#) group used a computational model to show that the balance of a pro-inflammatory cytokine (TNF) and anti-inflammatory cytokine (IL-10) results in a steady state that allows bacteria to survive but minimizes pathology in the host. The computational model can be used to do *in silico* testing of potential therapies.



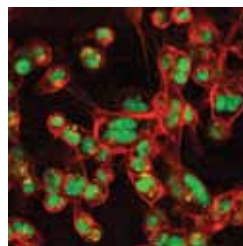
Ford has recently supplied one of its most advanced batteries to a team of electrical, mechanical and chemical engineers at Michigan, including ChE assistant professor [Charles Monroe](#).

In collaboration with Ford and General Electric, the team is beginning a project that will monitor the thermal and mechanical stresses on battery cells and develop a battery management

scheme to reduce those stresses and prolong battery life. Monroe's group will investigate the battery's materials and chemistry, clarifying what the temperature and strain data can say about what is happening within the cell.

A U-M Global Challenges project titled "Researching Fresh Solutions to the Energy/ Water/ Food Challenge in Resource-Constrained Environments" was funded by the University's Third Century Initiative. An interdisciplinary team of University of Michigan faculty and students led by [Johannes Schwank](#) and including [Mark Barteau](#), [Phil Savage](#), and [Galen Fisher](#) will conduct case studies of microenvironments representative of developing world settings where a better synergy between energy, water, and food supplies are needed.

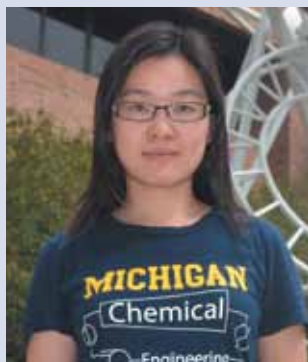
First, technology gaps will be identified that prevent off-grid communities from properly functioning. Then appropriate low-cost, sustainable solutions will be explored to fill these gaps and the impact of these solutions on the balance between distributed energy, food, and water will be modeled and validated experimentally. The project will not only explore the high-tech alternative energy solutions but more importantly focus on simple, low-cost solutions.



[Greg Thurber's](#) research on tracking drugs at the single cell and subcellular length scale was published in the February 19th edition of *Nature Communications*. Currently, drugs failing in clinical trials are often discarded without an understanding as to why they were unsuccessful. Using a combination of microscopy of active fluorescent drugs and finite element modeling, the *in vivo*

distribution of a drug can be observed diffusing through the tissue and binding to its therapeutic target. By imaging drug distribution at a higher resolution than was previously possible, researchers can conduct a detailed failure analysis including whether the candidate is unable to reach its target or impart a therapeutic effect.

Focus on Our Graduate Students



Air Products Fellowship Helps Her Evaluate Her Skills

Last year, graduate student Jing Liu was awarded the first Air Products Graduate Fellowship at Michigan. Liu, who received her bachelor's degree from Wuhan University in China and master's degree from University of Illinois at Chicago, came to Michigan in January 2010. She has been working on lithium-oxygen battery modeling with her advisor, Charles Monroe. "This fellowship with Air Products was a great opportunity for Liu to get out into the 'real world' and get exposed to a totally new research area," he said. "I think the experience has greatly improved her intellectual flexibility and her confidence when facing new problems."

At Air Products in Allentown, PA this summer, Liu worked in an industrially relevant research area. Under the supervision of Dr. Madhukar Rao, she developed models to study surface cleaning in semiconductor fabrication. She worked closely with two divisions in the company; she conducted experiments with the Semiconductor Group and worked on model structures with the Computational and Modeling Center.

She was able to expand her professional network this summer and picked up many relevant skills that will benefit her after graduation. Liu says the experience showed her how teamwork and cooperation – both within and between groups – can guarantee a company's success. In her project, experimentalists provided measurements of the surface-cleaning process to the modeling group, to help them develop a theory describing it. In turn, this new theory will help experimentalists develop more effective surface-cleaning techniques.

Liu knows that she will need both a deep and a broad command of the information related to her field. "Working in a company is quite different from doing research as a student," she says. "There are many situations in industry that require people to quickly switch from one project to another. Possessing a wide-ranging knowledge base will make it easier to handle these quick transitions." At the same time, Liu knows that her extensive background in specific areas and the problem-solving abilities she has acquired as a doctoral student will be essential to an industrial research organization.

She recommends the practical experience to other PhD students. "Our doctoral study is preparing us to be research leaders in companies and universities after graduation," Liu says. "Finding out more about what will be expected of you after you finish your degree will help you quickly evaluate your current skill set, and learn what skills you still need to better prepare yourself professionally."

He Returns Home For His Dream Job

As Salt Lake City native Michael Hoepfner was completing his PhD this year, he knew he wanted to find a faculty position out West so he could resume all the mountain sports he loves so much. When he was offered an assistant professor position in the Department of Chemical Engineering at University of Utah, his alma mater located in his hometown, he didn't need too much time to make up his mind. His advisor, Scott Fogler, was delighted to have another one of his students join the ranks of academia. Some of Fogler's other former students working in the academic world include Karsten Thompson at Louisiana



State University, Steve LeBlanc at the University of Toledo, Michael Senra at Lafayette College, and Ryan Hartman at the University of Alabama.

At Michigan, Hoepfner used neutron and x-ray scattering to study the nanoscale structure of a petroleum fraction called asphaltenes. The world needs to find more efficient methods of obtaining oil. Unfortunately, nearly every step in the production and processing of petroleum has the potential for asphaltene-related problems. Hoepfner hopes his research

findings will improve the scientific world's understanding of complex materials, specifically asphaltenes, and will open new opportunities for scientists to investigate petroleum from a nanoscience perspective.

In addition to his research, Hoepfner enjoyed mentoring students from Chulalongkorn University in Thailand who come to work in Fogler's lab each year. Michael also served in several undergraduate courses, including a thermodynamics course and the junior lab course. As one of the best-travelled graduate students in the department, he visited national and international research labs, including the Institut Laue-Langevin in Grenoble, France where he conducted neutron scattering experiments. He also had the opportunity to attend conferences in London, Paris, Rio de Janeiro, and British Columbia.

As he settles in at Utah, he is already assisting other faculty in starting a new petroleum engineering master's program, and is pleased to announce that he already has his first graduate student. Hoepfner says he will miss many activities and places in the area, such as Michigan football, the Metroparks, and the many beaches on the Great Lakes. He will also miss the beer and cheddar & ale soup from the Grizzly Peak Brewing Company and his late night take-outs from No Thai!. He did find a connection to Michigan when he first arrived at the University of Utah. As it turns out, he was assigned the old office of Michigan alumnus Noel de Nevers (PhD '59), who was relocated to another office as a professor emeritus. De Nevers thought it was fitting that another Michigan man will occupy his office!

Graduate Volunteers Mentor Young Students



ChE graduate students have been donating their time and expertise to work with middle and high school students who have an interest in pursuing a career in science, technology, engineering, and mathematics (STEM) areas. An example of this is the Skyline Internship Program, which pairs a rising senior from Skyline high school in Ann Arbor with a graduate student mentor in the College of Engineering. These high school students are part of the Design, Technology & Environmental Planning (DTEP) Magnet Program, which is directed by Mr. Tom Pachera. The internship program, run entirely by Engineering graduate students, allows students to apply science, technology, engineering, and mathematics, to find practical solutions for real-world issues.

Lianette Rivera, a first-year chemical engineering graduate student and Chemical Engineering Graduates Society (ChEGS) outreach officer, coordinated the 2013 program. The mentors work with their Skyline students to develop a small research project in the graduate student's area of expertise. At the conclusion of the program, the Skyline students present their findings to their peers, their teacher, and all the graduate student mentors. The audience members are encouraged to provide

constructive feedback on the presentations. The internship program is intended to give high school students an idea of what a career in research and development might be like.

Thirteen students were selected for this summer's internship program. Seven of them were paired with the following chemical engineering graduate students: Jeff Lowe, Molly Kozminsky, Chang Yup Seo, Lianette Rivera, Brittany Lancaster, Julia Faeth and Youngri Kim.

Julia Faeth, a 2nd year student in Phil Savage's lab, trained David Pacurar, her intern this summer, to investigate fast hydrothermal liquefaction of microalgae to produce biocrude. Faeth and Pacurar are in photo on the left. To do this, Pacurar needed to learn how to load reactors, safely use a fluidized sand bath as a heating medium to perform the reaction, and recover and measure the products. Together, they explored the effect of reaction time on yields of biocrude and reaction byproducts,

which can be either solid or water-soluble.

"Serving as a graduate student mentor is important to me," Faeth says, "because it allows me to help high school students figure out if engineering is a good fit for them." She grew up in a small rural town in Ohio, and didn't have much exposure to engineering and engineers. She knows she would have appreciated a program that gave her the opportunity to work in engineering research labs.

Graduate students and undergraduate students also lend their time to College of Engineering programs such as the Summer Engineering Exploration Camp (SEE Camp), hosted by the Society of Women Engineers every summer. SEE Camp is a weeklong camp for high school students, boys and girls, interested in studying engineering. They have the chance to explore different engineering disciplines through interactive faculty and student presentations, activities, and tours.



Summer Engineering Exploration Camp (SEE Camp) participants "testing" the Oobleck.

This year the graduate and undergraduate ChE volunteers used 150 pounds of cornstarch and water to make an "Oobleck" tank to introduce the concept of Non-Newtonian fluids to the high school visitors. This substance's funny name comes from the Dr. Seuss book "Bartholomew and the Oobleck." Oobleck exhibits shear

thickening properties: a person running in the tank will be able to traverse the surface as though it were solid, but a person standing still sinks into a gooey liquid. The common explanation for this is that the starch-water mixture is a suspension and the starch particles lock when pressure is applied. Through educational events such

as these, ChEGS aims to engage younger students in the chemical engineering field, by demonstrating its importance in industry and other professional settings, as well as its underlying presence in everyday life.

Alumni Bring Their Children to Campus



On August 9, ninety Michigan Engineering alumni brought their children or grandchildren to a day-long summer camp on North Campus. The "Xplore Engineering" event offered a day of experiential learning through a selection of nine workshops, which covered topics ranging from environmental engineering to robotics. Several of our ChE graduate students organized the ChE workshop.

The event was organized by MconneX, a U-M College of Engineering initiative aimed at offering opportunities for alumni to reconnect with the Michigan Engineering community. It included the

workshops, lunch with the Solar Car team and a tour of Crisler Center and Michigan Stadium.

Each pair, which included a child or grandchild entering fifth to eighth grade, took part in three workshops throughout the day. They could be seen in a variety of tasks across campus, including breaking bones in biomedical engineering, building bridges in civil engineering, walking across non-Newtonian fluids in chemical engineering and driving underwater vehicles in the reflecting pool.

The ChE graduate students gave their visitors a short presentation describing different types of fluids (like shear thick-

ening fluids and Bingham plastics).

Using this information, the children performed a hands-on investigation of five everyday fluids, including whipped cream and mayonnaise. They classified the fluids by type, then had a brief discussion about the reasons behind each classification. At the conclusion of the classroom portion of the workshop, students went outside to explore Oobleck, a shear thickening fluid, described in the article above.

Andrew Smydra (BSE '83) and his 11-year-old son, Ethan, shown to the left, enjoyed the event. "Xplore Engineering at Michigan provided a great opportunity for my son and me to enjoy a day together exploring science and engineering with hands-on activities," Smydra says.

Sandra Hines, the MconneX manager and event organizer, plans to hold the camp again next summer, and is thinking about scaling up to a longer event. "Based on the tremendous response this year, we are definitely excited about doing it again next year. We are even thinking about expanding it to a multi-day program."

MConneX webpage:
www.engin.umich.edu/mconnex

Some material about this event was written by Jennifer Judge Hensel, College of Engineering Communications & Marketing

Edwin H. Young—1918-2013



Professor Edwin H. Young passed away at his home in Ann Arbor on September 12, 2013, a few months short of his 95th birthday. Young, born in Detroit, Michigan, earned his bachelor's degree from the University of Detroit and two master's degrees from the University of Michigan, one in chemical engineering in 1949, and another in metallurgical engineering in 1952. He was a faculty member in the department for 42 years before retiring in 1989.

He was active in his profession, and served as president of the National Society of Professional Engineers in 1968-69. He maintained a consulting practice for many years, and was in the U.S. Naval Reserve, where he was promoted to Captain in 1964. He served as a deacon and head usher at Grace Bible Church, and for more than 40 years taught an adult Sunday School class.

Young is survived by his wife, Signe; his son, David, and daughter-in-law, Rebecca; and his granddaughter, Deborah. His daughter, Barbara, preceded him in death.

Reminiscences of Edwin H. Young, by James O. Wilkes (September 15, 2013)

Professor Young was the epitome of the professional chemical engineer. He was among the remarkable group of faculty who joined the department in the 15 years following World War II, and who were strongly oriented towards chemical engineering practice. As a teacher, his forte was chemical process design, particularly because of his strong backgrounds in both chemical engineering and metallurgy, and further evidenced by his coauthorship (with Lloyd Brownell) of the 1959 landmark text *Process Equipment Design*. As a researcher, he was an expert in heat transfer, and from 1958-1988 he led a succession of doctoral investigations involving long-tube vertical evaporators, nucleate pool boiling, refrigerants, turbulators, and finned and fluted tubes. As an engineer, he had an enviable record of promoting engineering as a profession, and these activities were recognized by a series of awards at the national level. As a colleague and friend, he was unfailingly cheerful, professional, and encouraging; he could always be counted on for his insight and wise advice, on both personal and engineering levels.

Memories from the Fall 1984 Chemical Engineering ChE 487 senior design class

Professor Young made a significant impression on his senior design students, teaching them lessons that they remember to this day. Ann Heil, Supervising Engineer at the Los Angeles County Sanitation district, recalls "In his class, I not only learned the technical aspects of chemical engineering design, but the practical aspects as well. My most enduring memory of the class is that our final design report was due at a specific time, not a minute later. If it was a minute late, it would not be accepted and none of the tremendous amounts of work we had done on it would matter. This was an excellent lesson about

how deadlines work in the real world, and I have never forgotten it."

Bob Pociask, Regional Sales Director at Univation Technologies, LLC, recalls Young stressing the importance of defining the problem. "Nine months after graduation, I was faced with a design issue in a multi-million dollar complex that we didn't have a clear idea how to solve," he recalls. "By applying his methodology, we went back to first principles and worked through the night (just like 486/487!) and solved it." Those who have experienced some of the challenges of working in the Dow building will appreciate Bob's recollection of the first year in the Dow building, where there were already many building related "issues" such as water running down the stairwell walls. Young shared with the class this bit of wisdom, "Remember, this building was built by the low bidder!" — a lesson Bob has never forgotten.

Young also made sure that it was clear that students should set high expectations of themselves and not be so concerned about the grading scale. Mark Kay, Director of North American Distribution Sales at NOVA Chemicals recalls going to Young's office hours to, as he writes "sleuth around and understand the big drivers as to how he was going to grade the design project: What areas will he look to? How does he determine the grade?" Mark adds "Exasperated, or just impatient, with a smile on his face, he says to me 'I don't know Mark, maybe it all depends on my mood the day I grade your team's report. Maybe I'll roll a set of dice...' I laughed, I got it. He wasn't going to say. Nice, very classic Ed Young."

Second Annual Symposium

The department held its 2nd Annual Graduate Symposium on May 6 in the Gerald R. Ford Presidential Library on North Campus. The symposium, organized entirely by the graduate students, brought together about 130 people, including faculty, alumni, current graduate students, and representatives from companies that recruit Michigan students.

The symposium featured a keynote address by alumna Deborah Mielewski (B.S.E. '86, M.S.E. '93, and Ph.D. '98), in photo below, titled "Greening the Blue Oval: Sustainable Material Research at Ford." The talk focused on the advances made in producing automotive components from biological feedstocks, such as the use of soy-based foam



seat cushions in the 2008 Ford Mustang. There were 18 talks presented by PhD students who would be graduating within the next 18 months, and 11 poster presentations from first to third year students. Awards for best presenta-

tion, best poster, and outstanding research, service, and teaching were presented to different graduate students at the closing banquet.

We would like to thank the sponsors of the symposium, Dow Chemical, Praxair, and Phillips 66, for their support. We would also like to thank the industrial representatives who attended, especially those who volunteered to judge student presentations and posters.

Watch the department newsletters for information about the 2014 Annual Graduate Symposium. There are opportunities for companies to be symposium sponsors, which is very much appreciated by the students and the department. Contact Phillip Savage (psavage@umich.edu) for more information about sponsorships and attending the symposium next year.

Annual Department Lectures

Donald L. Katz Lecture



Michael F. Doherty, Professor of Chemical Engineering and Department Chair at the University of California Santa Barbara, was our lecturer this year for the 43rd Annual Donald L. Katz Lectureship in Chemical

Engineering. Professor Doherty, with Chair Mark Burns in photo at left, presented two lectures during the event on February 14 and 15. His first lecture was titled "Crystals Are Like People: Growth and Defects Are What Make Them Interesting," and his second lecture was on "Rapid Process Design: Sorting the Wheat from the Chaff."

Doherty's research interests include process systems engineering with particular emphasis on crystal engineering, and separation with chemical reaction. In 2008, he was named one of the "One Hundred Chemical Engineers of the Modern Era (post-1945)" by the American Institute of Chemical Engineers.

The dinner and lecture were held this year in the Gerald R. Ford Presidential Library on North Campus. The department also honored faculty for their many achievements this year, and recognized the PhD students who are graduating this year.

Walter J. Weber, Jr. Lecture



The Weber Lecturer this year was David T. Allen, the Gertz Regents Professor of Chemical Engineering, and the Director of the Center for Energy and Environmental Resources, at the University of Texas at Austin. He is the author of seven books

and over 200 papers in areas ranging from coal liquefaction and heavy oil chemistry to the chemistry of urban atmospheres. His recent work has focused primarily on urban air quality, the engineering of sustainable systems, and the development of materials for environmental and engineering education.

The lecture was held in the Gerald R. Ford Presidential Library on March 21. Professor Allen delivered a lecture about the environmental impacts of fracking for shale gas titled "Atmospheric Impacts of Expanded Natural Gas Use." A graduate student poster session followed the lecture. The Walter J. Weber Jr. Award is given each year to recognize a graduate student for outstanding research in sustainability. This year's recipient was Peter Valdez (Savage lab). Second place went to Kevin Dahlberg (Schwank lab), and third to Kyle Anderson (SangHyun Lee lab in Civil and Environmental Engineering).

Glassblower Creates Sculpture for Alumnus



Chemical Engineering Chair Mark Burns recently presented Dan (BSE '60, BSC '60) and Nancy Chapel with a sculptural glass plasma display in appreciation of their recent gift to the department. In 2012, the Chapels generously endowed the Dan Chapel Professorship in Chemical Engineering. Burns asked Harald Eberhart (below), the department's master glassblower, to create a glass sculpture uniquely designed for Dan & Nancy. The Chapels are owners of Cardwell Hill Cellars, a boutique winery located in Oregon,



so Eberhart decided to create a work that would represent their passion for winemaking—a vine of grapes. Eberhart was given complete artistic license for the project and he created a beautiful one-of-a-

kind plasma display for the couple. This is not the first art piece he has made for a Michigan alumnus; two years ago he made a custom work for Larry Page, co-founder of Google.

The vine was made from Pyrex® glass and the leaves were formed with uranium glass that was blown hollow; they both contain pure argon gas. The grapes, also blown

from Pyrex® also, have an inner tube with a hollow sphere at each end. The sphere was filled with steel wool so the energy would be distributed evenly in all directions to ignite the neon gas inside to produce the plasma.

In the pottery base sits a single electrode transformer with a hot lead wire that is embedded on “sticky” aluminum foil. The foil acts as an “antenna” to ignite the entire glass display. To make the piece safer for display, the neon and argon is illuminated using radio frequency (60 Hz/14 V/ 1 amp), rather than electrodes. A wall adapter reduces the line power to a lower voltage.

Eberhart likes to push the envelope of 3D glass technology when he designs new

pieces to show the public the versatility of the art form. The skill needed to create such pieces is much higher than needed to produce the common 2D neon signs you see in restaurants & bars. Only expert research glass blowers like Eberhart have the skills to design these three dimensional sculptures. This kind of artistry lends itself best to designing nature forms such as trees, flowers, and imaginary characters. So Michigan alumni may be disappointed to learn that Eberhart would probably have to say “no” to any requests to make a Block M, the Big House, football helmets, or most other Michigan man-made icons.

Free Textbook Scholarship Directly Benefits Students

“What, you don’t give away free t-shirts?” That’s a question Susan Montgomery sometimes gets when she’s staffing a ChE departmental t-shirt sale. Her reply is always “Well, we may not give away free t-shirts, but we give free textbooks to students in financial need...”

The department has made it a priority to see to it that all of our students, regardless of financial status, have access to textbooks for their core ChE classes. As one of our applicants put it “textbooks are a high priority for me, but if the money isn’t there when these other expenses are taken care of, then I will have to conserve money somewhere and usually for me that means not getting the textbook for a class.” In some cases online textbooks might be available, but for ChE courses that is not an optimal solution. Neither is renting textbooks, as students need their books as refer-

ences for future courses. Through the contributions of supportive alumni, last fall and winter we were able to provide students with 50 sets of textbooks for core chemical engineering core course.

The program has a great impact on students. As alumna Tiffany Frederick, now a product engineer at Chrysler LLC describes it, “having the opportunity for free books was a huge relief for me. I received financial aid for tuition and worked part time for living costs, but there was always a worry about how I was going to get books for the semester and if I would have to skip some to pay for others. I know a few others who also greatly appreciated the free textbooks when things were tight.” We appreciate the generous support of alumni who have made this program possible.

ChE Skills Come in Handy for Entrepreneurs



When Molly (Macdonald) Ging (BSE '96) was taking Material and Energy Balances she probably never figured one day she would become “The Diaper Lady” or that she would own a retail shop focusing on baby products. Her frustrating search for cloth diapers as a new mother made her realize a market existed for such products. From selling cloth diapers out of her basement, to her current 4,000 ft² “The Little Seedling” store in Ann Arbor, Ging, above, has put many of the lessons from ChE courses to use to become a successful entrepreneur in an area she is passionate about. “Changing careers is never easy but when you find something you are passionate about it makes the transition easier,” she says. “Owning your own business takes dedication and long hours, something every ChE knows well.”

Rishi Narayan (BSE '03, MSE '05) realized he had an entrepreneurial streak during his sophomore year, in 2001, when he and a childhood friend and fellow engineering student Ryan Gregg decided to start a business and sell custom t-shirts out of their West Quad dorm room. “Balanc-



ing ChE classes and running a business over a five-year period was definitely a challenge. However, I got better at time management with practice—having patient classmates and professors throughout college definitely helped too!” Over a decade later their little shirt company has grown into Underground Printing (UGP) a national custom apparel provider and collegiate merchandise retailer with 19 locations in

11 states. “The funny thing is, all those problem sets and design projects really change how you think, build, and problem-solve. I think that really has a lot to do with the success of UGP.”

From the water skiing and wakeboarding schools he started while in college to his years hanging out on a beach in the Dominican Republic, a passion for board sports has been the driving force behind Scott Taylor’s career. Taylor (BSE NAME '05, MSE ChE '06) worked at a start-up company for two years after graduation, then moved to the Caribbean, where surfing and kite boarding ruled his life. His chemical engineering analytical skills came in handy when he and another like-minded engineer decided to team up to develop a revolutionary, first of its kind product that enables anyone to easily and automatically film action, from a distance, with no camera operator (Taylor is on the right in photo to the left). “Even though I’m not directly in the chemical engineering field, I use the fundamental concepts and problem solving skill every day,” reports Taylor. He highlights the importance of networking to his success. “The University is a huge networking hub and I encourage students to take advantage of it. When you graduate, everyone has been trained with the same skills as everyone else, but the people you know can really make a difference,” he reports. For more information about Taylor’s product, see www.SOLOSHOT.com.

John McKetta's Wonderful Life



John J. McKetta, Jr. (BSE '43, MS '44, PhD '46) was born in 1915 in Wyano, PA, a small coal-mining town with a population of 225 on the western side of the state. All the town's residents then were immigrants brought to the US from Europe to mine coal. His parents were both Ukrainian and had no education at any level. Because his parents and many others in Wyano continued to speak their native languages after they came to America, McKetta didn't learn English until he started school. After high school graduation, he started working at the local mine. Even though he was scared every minute he was in the mines, he spent the next two years digging coal with a pick and shovel for 25 cents per ton, alongside his brother and father. The work was hazardous and numerous roof cave-ins resulting in fatalities occurred during his time in the mines.

In 1935, his brother gave him a book titled "Coal Carbonization" and he learned about engineers who made chemicals from coal. He knew instantly that he wanted to do this rather than dig it. Within a week, he went to Carnegie Tech, now Carnegie Mellon, to talk to the head of the chemical engineering department to learn more about the profession. He couldn't afford to enroll in their program so he set out to find a college where he could work and attend school. Tri-State College (now Trine University) in Indiana was the only college that offered him both opportunities so he headed there in fall

1935. He says he took his dirty mining cap with him to school so he would always be reminded how lucky he was to be getting an education.

After receiving his degree from Tri-State, he came to Michigan to work at Michigan Alkali in Wyandotte, now part of BASF. While working there, he heard that University of Michigan chemical engineering faculty were making chemicals from gas and petroleum and were consulting with a company named "Dow" and that Dow was building a "chemicals from gas" plant in Freeport, Texas. He drove to Ann Arbor in November 1941 to meet the faculty members; the chairman of department, "Great God" Brown (a nickname many students called G.G. Brown), and the "great" Donald L. Katz, who remained McKetta's senior professor and dearest friend until his death in 1989. They suggested that he pursue a graduate degree at Michigan, so he agreed to enroll in the program for the winter term in 1942.

While at Michigan, he and his doctoral advisor, Katz, developed a set of tables relating to underground temperature and pressure in gas and oil wells that reveal the composition of the surrounding terrain, which are still in widespread use. Of all the many awards and honors McKetta has received in his life, none was as thrilling as being awarded the Donald L. Katz Award from

the Gas Processing Association many years later. This award is in the McKetta Library in the McKetta Department of Chemical Engineering at Texas, right under Katz' photo, which was inscribed by Katz, "to the best graduate student any faculty member could ever be so lucky to have, Johnny McKetta, with my deepest personal and professional wishes."

Another important person he met while at Michigan was his wife, Helen "Pinky" Elisabeth Smith, of Kalamazoo. McKetta gave her the nickname "Pinky" after she wore a pink blouse on their second date. Helen had received her BA in English from Western Michigan University, then Western State Normal School, and was working as the secretary to the dean of men at the University of Michigan. They married on his birthday on October 17, 1943, after a six-month courtship. He says their marriage "must have been arranged in heaven because we had 69 fantastic wonderful years together before her death in 2011."

After he finished his doctoral degree, he joined the faculty of the University of Texas' (UT) Chemical Engineering Department in 1946, where he would stay for the remainder of his career, serving also as vice chancellor of the UT System and dean of the College of Engineering. Throughout his career, he would never



forget his coal mining days, and his desire to find ways to find more efficient ways to create energy motivated him in his professional life. He became an international authority on the thermodynamic properties of hydrocarbons and served as energy advisor to Presidents Nixon, Ford, Reagan, and Bush Sr. He published over 400 papers and has written or edited 87 books, including the 69-volume *Encyclopedia of Chemical Processing Design*. He was elected to the National Academy of Engineering, and in 2009, was selected by AIChE as one of the "50 Chemical Engineers of the Foundation Age." He also served as president of AIChE in 1962.

After nearly 70 years at the University of Texas at Austin, McKetta was honored by the University in 2012 when his department, with financial support from many of his former students, was renamed the John J. McKetta Jr. Department of Chemical Engineering (McKetta is on the right in the front row in the photo to the left taken at the dedication). This was not the first chemical engineering department named after him though. Fifteen years earlier, John McKetta's undergraduate alma mater, Trine University, named their Chemical Engineering and Bioprocess Department after him as well.

In spite of all the honors he has received he always found a way to put his students first. "The highlights of my career were all with my students in the classroom," McKetta says. "I've always said to never, ever forget the students. I felt that if our responsibilities to, and concern for the students ever became secondary, we would be violating the trust we accepted as a faculty member." He says he considers his students his family. At 98, he still calls his former students who are over 65 on their birthdays each year. It probably wasn't a surprise to anyone that he was selected this year as one of the "most inspiring professors" at the University of Texas.

For more information about Dr. McKetta, please visit the webpage for the McKetta Department of Chemical Engineering at the University of Texas at Austin at www.che.utexas.edu

Their Fancy Calculators Always Gave Them Away



When Sharon (Tavery) Pfeuffer (BSE '84) was a freshman in high school, she interviewed a chemical engineer at Detroit Edison for a research paper on careers. His work sounded intriguing to her and four years later she ended up at Michigan in the College of Engineering, ready to select chemical engineering as her major. She realized quickly she had chosen one of the toughest curricula in the College, one where some of the classes in the early 80s had 50% failing rates, graded on the curve. It helped that she roomed with two classmates, Margo (Radwan) Heberling and Sandy Marikis. At one point, the graphical version of the steam tables from Thermodynamics was the "art" on the wall in their campus apartment. The ChEs were sure their fourth non-engineer roommate was ready to get rid of them by graduation!

"I remember waiting in the cold for the bus to north campus for 8 a.m. classes. I could always tell which students were engineers and which were the art majors," she says. "We had the heavy backpacks and impressive TI calculators, while the art students dressed in black and had huge portfolio cases." Margo, Sandy, and Sharon remained a team as undergraduates and were design partners in their senior year along with one really patient male ChE student.

After graduation, she worked at Wisconsin Electric in Milwaukee for a few years, and then moved to Naples, Florida to work for Florida Power and Light. She had many different engineering roles in power plants, and was involved in converting the oil-fired plant to a combined-cycle gas plant. In 2001, she moved back to Michigan to join Detroit Edison, now DTE Energy. Early in her career she had roles in plant chemical engineering and performance engineering, hands-on plant roles that she enjoyed. Along the way she moved into plant management roles, eventually moving to the role of director of engineering for DTE Energy's fossil fuel power plants. In recent years, environmental regulation, and the public focus on issues, including air and water quality, have put the power industry on the front page of the news, making her work more interesting, and sometimes more challenging. She has spent much of her career working on making power generation cleaner, more efficient, and more cost-effective. Technologies developed by chemical engineers are paving the way for ever-cleaner power plants. She says her career is challenging, but one she still enjoys!

She met her future husband, Bill Pfeuffer, while she was at Michigan. Bill started his career as an attorney, but a decade ago followed his heart to a new career in elementary education. They have a son, Andy, who is a sophomore at the College of Wooster in Ohio. They are adjusting to the empty nest, although they still don't have as much "free time" as they had anticipated. When she isn't driving down to watch her son swim in Ohio, she likes to garden, cook, and read.

When she was asked last year to be on the Chemical Engineering Alumni Advisory Board, she thought it was a good way to give back to the program that afforded her such a great career. She brings to the board insight on how the engineering theory our students learn as undergraduates applies to engineering in industry. She also brings perspective on being a woman engineer in what's still a largely male environment.

Alumni Events

Friday, October 4, 2013

12:00-1:30 p.m.

Lunch with the Department

Johnson Rooms

3rd Floor, Lurie Engineering Center

1221 Beal Avenue

Please join us on October 4 for our annual alumni lunch in the department during Michigan Alumni Homecoming Weekend at noon. Rosemarie Wesson (PhD '88), our Alumni Society Award Winner, will be our guest of honor at the lunch. Shawn Hunter (BSE '00, MS '03, PhD '05), who is receiving the 2013 Alumni Recent Engineering Graduate Award from the College that weekend, will also join us. Students and faculty will be at the lunch to answer your questions about our program.

If you would like to join us, please contact Sandy Swisher, 734-764-7413 or at sandys@umich.edu.



Monday, November 4, 2013

7:00 p.m.-9:00 p.m.

2013 Annual AIChE Meeting Open House

Hilton San Francisco Union Square

San Francisco, CA

We invite you to join us for our annual open house in San Francisco. If you are attending the AIChE meeting, or if you live nearby, please stop by and visit faculty, students, and fellow alumni. If you have any questions, please contact Pamela Bogdanski at 734-764-7368 or pbog@umich.edu.

Leidy, Alumni Award Winner

Mark Leidy (BSE '79) was the 2012 ChE Alumni Society Merit Award recipient. He spoke at the ChE homecoming luncheon on October 12, 2012, where he was the guest of honor.



Mark Leidy was the Executive Vice President, Global Manufacturing at Monsanto between 2003 and 2009, and a C Level Officer since 2001. While in this position, Mark dramatically advanced operational efficiencies and cost savings. Mark also focused on continuous improvement of safety on a global scale. Previous to the position as Executive Vice President, Global Manufacturing, Mark served as the Vice President of Global Seed Supply. In this role Mark is credited with the successful integration of 10 seed companies with operations spanning 26 countries.

Mark also served as Director of Global Agriculture Chemical Manufacturing at Monsanto, where he championed expansion efforts to meet rapid sales growth of Roundup™. Mark's leadership has earned Monsanto Global Manufacturing several awards, including recognition as one of the safest companies in America by *Occupational Hazards* magazine. Under his leadership Global Manufacturing was also recognized for both its industry-leading work in human rights in communities where Monsanto operates as well as its world-class vehicle safety program. After leaving Monsanto, Mark has been doing executive consulting work.

Mark also earned an Executive MBA from the University of Iowa. For seven years, Mark has served on the Boards of Directors for the American Chemical Council and for Juvenile Diabetes Research Foundations. Mark presently resides in St. Louis, Missouri with his wife, Diane, and their two children, Katelyn and David.

Tailgating With Your Friends?



Members of the Class of 1994 were in town for the opening day game against Central Michigan on August 31, 2013. Front Row (L/R): Brad Martin, Dave Hagen, Renee Savera, Kristin Gross, Kim Wicklund, Jennifer Casteel, Diana Santiago. Back Row (L/R): Vinny Gauri, Casey Logan, Jeremy Bjork, Brian Balchunas, Chad Allen.

Do you tailgate with your ChE classmates before Michigan football games? Send a photo of your group to Sandy Swisher at sandys@umich.edu (please identify everyone) to display on the ChE alumni website.

News from Alumni

William M. Saltman (BSE '38, BS (Math) '38, MS '39) has now been retired for 30 years and doesn't give much thought to chemistry, much less chemical engineering. He is curious to learn if any of his classmates still flourish or even just survive. He says that he and his wife moved from Akron, OH to San Diego in 1989 and never regretted it.

After nearly 70 years at the University of Texas at Austin, **John J. McKetta, Jr.** (BSE '43, MS '44, PhD '46), was honored by the University when his department was renamed the John J. McKetta Jr. Department of Chemical Engineering. At 98-years-old, McKetta says he feels extremely fortunate



to have had an exciting and wonderful personal and professional life. His wife, Pinky, who he met in 1943 while in Ann Arbor, made a fantastic 69-year marriage for him until she passed away in February 2011 (with John in the photo above). The American Institute of Chemical Engineers honored him in May 2013 for his "lifelong achievements and contributions." Read more about McKetta on page 16.

Ralph E. Hillman (BSE '50, MS '53) and his wife continue to enjoy their retirement years at their summer cottage in Northern Michigan and on annual trips to visit relatives in Maine. With nine grandchildren and six great-grandchildren, they say they never lack for excitement. Ralph continues his pursuit of genealogy working on his third book, "A Hillman Family Genealogy."

Wayne Hamilton (BSE '51) retired from Lockheed in 1994, and is still enjoying retirement. Singing bass in a barbershop chorus is his favorite activity.

Manesh Shah (MS '57) keeps active in a local AIChE section and is an AIChE representative in Silicon Valley Engineering Council where he was a director last year. He retired from IBM after 32 years of service 21 years ago.

Leonard Bloomfield (BSE '60) retired on August 29, 2001 and was home recovering from a heart attack when the dramatic events of September 11 occurred. The following spring he got a job at the Chicago Botanic Garden as a Tour Tram guide and narrator, and continues such to this date. He says it is one of the most beautiful places on earth and certainly recommends any tourist visit it when in the Chicagoland area.

Douglas VanDerVoort (BSE '64) opted for the food industry after graduation. It not only smelled better than petrochemicals, it tasted better. He retired from GELITA, a worldwide manufacturer of gelatin, in 2010. He was asked to stay on part time to set up an LLC to assist in process troubleshooting. He specializes in evaporators as well as oven, kiln, spray, and batch dryers. He says his U-M degree allowed him to enjoy a career without spending a single day looking forward to retirement, and there is nothing better than that!



After a 40-year interlude, **Peter Parker** (MSE '68, PhD '74), on the left above, and **Dennis Stover** (BSE '67, MSE '68, PhD '75), on the right, got together in Oklahoma to recall their days in East Engineering under the respective guidance of Bob Kadlec and Frank Donahue.

Thomas L. Gould (PhD '72) was inducted into the Oregon State University Academy of Distinguished Engineers in February 2013. Gould has been recognized by the Society of Petroleum Engineers with the Ferguson



Medal 1975, Distinguished Member 1983, Distinguished Lecturer 1988, Distinguished Author 1989, Forum Chair 1994, and Editorial Technical Review. Gould is currently a senior partner with an international petroleum reservoir consulting firm. OSU Dean of Engineering, Sandra Woods, presents the award to Tom in above photo.

Bruce Banyai (BSE '74) embarked on a new career on July 1, 2012. He is now consulting in the areas of cellulose, cellulose derivatives, guar, water-soluble polymers and biotech business development. He still enjoys traveling with his expanding family, which now includes five grandchildren!

David Brossard (MSE '80) retired from Chevron Corporation earlier this year after 33 years.

The year is off to a great start for **Gary Graves** (BSE '81). His 5+ year reign as the non-executive chairman of Caribou Coffee ended when they sold the company to the Joh. A. Benckiser Group in January. In March, he was able to catch the Wolverines in action at the Big 10 Tournament, where the stands were filled with U-M alumni. Finally, in April he was in Boston while his wife completed the Boston Marathon. Fortunately, she finished well ahead of the bombs but it was still a scary time.

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Update your contact information with the University at www.engin.umich.edu/college/info/alumni

Alumni News

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Liz (Batesole) Hainey (MSE '85, PhD '93) was promoted to the lead systems engineer for her business unit, Tactical Information Systems, and she reports to the director. Her oldest son graduated from high school and is attending the Cockrell School of Engineering at the University of Texas in the fall. He was a four-time All-State Choir member, having served as First Chair the last two years, and is also a ranked tennis player.

Greg Poterala (BSE '86) joined Solvay Specialty Polymers in 2012 as a Sales Development Manager in the Automotive Market, based in the Detroit area. In his spare time the last several years he has played trombone with The Five Lakes Silver Band, a British-style all-brass band that won the First Section of the 2013 North American Brass Band Championships. The band performs throughout southeastern Michigan and has recorded 4 CDs. They even have videos on YouTube - check them out!

Tony Orlando (BSE '87) was appointed chair of the Chemical Engineering Advisory Alumni Board last year. He and his wife just had a new baby, Ella Caroline, on June 5!

David Goldblum (PhD '88) recently retired from the Air Force Reserves as a bird colonel, with 25 years of service.

Randy Stier (BSE '88), is Valero's director of Refinery Heater Best Practices, serving as chairman of the API/CRE/Subcommittee on Heat Transfer Equipment (SCHTE), for a three-year term effective January 1, 2013. Randy has been an active participant in SCHTE activities as an "operator-user" since he joined Valero in 2008 and was a "general interest" user of the SCHTE standards for 14 of his 19 years at UOP.

Margaret Gilligan (BSE '89), in the photo below, has been working at Coca-Cola Refreshments since September 2012. She is a principal engineer in the Network Optimiza-



tion Group, executing large capital projects. Her main focus right now is integrating fairlife, a dairy business, into Coca-Cola. She lives in Glenview, just north of Chicago.

Cynthia (Robertson) Essenmacher (BSE '90) achieved ASQ (American Society for Quality) Certified Manager of Quality/Organizational Excellence recognition in 2011. This certification recognizes her ability to "motivate and evaluate staff, manage projects, analyze financial information, identify and evaluate risk and use knowledge of quality management tools and techniques." Cynthia is employed as a lab quality manager by DuPont Performance Polymers in Washington, WV. She and her husband and children are very active in elementary and middle school activities, and in sports in Vienna.

Brad Foerster (BSE '92) has been appointed a Taubman Emerging Scholar at the University of Michigan and will receive a 3-year grant from the Taubman Institute. Foerster, an assistant professor of radiology at the medical school, is working to develop a more definitive imaging test for ALS in the hopes that earlier diagnosis will lead to more effective intervention. He also has a clinical practice and evaluates patients with aneurysms, strokes, multiple sclerosis and other neurodegenerative diseases. The award will allow him to study inflammatory changes in the brains of ALS patients and has the potential to reveal new opportunities for effective treatments.

Ken Benjamin (BSE '95, PhD '04) has been promoted to associate professor in the Department of Chemical and Biological Engineering at the South Dakota School of Mines and Technology.

Christopher W. Jones (BSE '95), the New-Vision Professor of Chemical & Biomolecular Engineering at Georgia Tech, was recognized with the 2013 Paul H. Emmett Award in Fundamental Catalysis from the North American Catalysis Society. This award recognizes a scientist or engineer under age 46 who has made significant contributions to catalysis.

Kevin Fok (BSE '96, MBA '02) is sales manager at LG Chem. He has over 17 years of business and engineering experience in renewable and alternative energy. Kevin is responsible for energy storage solutions for electric grid applications, ranging from residential systems up through utility-scale systems. He led the efforts to secure the Tehachapi Wind Energy Storage Project with Southern California Edison (SCE) for North America's largest battery energy storage system. He is currently the local project manager. Kevin also secured a project with Southern California Edison for its Irvine Smart Grid Demonstration project and successfully led a team in delivering residential energy storage units to SCE.

Tanya (Manson) Sullivan (BSE '96) and her husband welcomed their second daughter, Alexandra Eileen Sullivan, into their family on July 10, 2012.

In early 2012, **Anish Goel** (BSE '97) and his wife left Washington, DC and moved out to "bonny" Seattle, where he now works for the Boeing Company. They both love the Pacific Northwest, and say it's been great to meet so many other Michigan alums at Boeing.

Daniel Merenda (BSE '00) works for Alliant Techsystems (ATK) and recently became the Safety & Mission Assurance Chief Engineer for the Space Launch System's (SLS) Solid Rocket Boosters. The SLS is a new vehicle that NASA is developing to replace the Space Shuttle.

Carly Bosco (BSE '01) and her husband, Jacob, welcomed a baby daughter, Celia Jean, on March 29, 2013.

Send your news updates to Sandy Swisher at cheme@umich.edu

Brandon "BT" Cesul (BSE '01, MEng SpSys '02) completed a term as adjunct faculty at Ohio State University's Department of Mechanical & Aerospace Engineering this past school year where he was responsible for teaching the senior capstone design class in space systems engineering. He has resumed his full-time position with the USAF as a space systems engineer at Wright Patterson AFB in Dayton OH. He and his wife, Karen, had their second child, Casimir Lucas, on June 13. Both son and mom are doing well and looking forward to visiting Ann Arbor for ChE alumni weekend!

Michelle Wu (BSE '01) and her husband, Dan Hodge, welcomed their second child, a son on Christmas 2012. Michelle continues to work at Ximedica, a medical device design, development, and manufacturing service provider as the head of quality. They live in Providence, RI.

In January 2013, **Tracy (Matson) Brusewitz** (BSE '02) and her husband Andy welcomed their first child, Natalie Grace Brusewitz! Tracy says that Natalie, who had just turned 6-months-old when the photo below was taken, has been a blessing! Tracy was also



recently promoted to the Category Operations Leader for Materials Supply Management for the Paper sector of Procter & Gamble. Tracy, Andy and Natalie are still located in the Cincinnati, OH area.

Aaron Napier (BSE '02) started a new job as a measurement engineer with Chesapeake Energy (Oklahoma City) in October 2012. He and his wife, Cheryl, are expecting their 4th child in mid-October. Their other children are: Olivia (5), Emma (4), and Aubrey (1).

Doug Urquhart (BSE '03, MSE '04) and his wife had a baby in February, Wesley James Urquhart, who is growing up fast in Blacksburg, Virginia. Doug is working at CHA Consulting as a project engineer in the water/wastewater group.

Mike Doornbos (BSE '04, MSE '05) just completed his eighth year at Dow Corning in Midland, MI. His current role is manufacturing team leader, supervising a team of engineers and operators at the Midland



plant. He recently graduated from the MBA program at Central Michigan University. Mike has been married to his wife, Amy, for six years. They have 18-month-old twin boys, Andrew and Myles, who are with Mike in the photo above.

Jessica Mattis (BSE '04) received a Society of Women Engineers' (SWE) Distinguished New Engineer Award. She will be recognized at the Awards Banquet at the WE13 National Conference for Women Engineers in October in Baltimore, Maryland. She was selected based on her technical achievements, SWE participation, and her community involvement over the past nine years for SWE.

Ali Mohraz (PhD '04) was recently promoted to associate professor with tenure in the Department of Chemical Engineering and Materials Science at University of California, Irvine. He started his position there in 2006.

André Taylor (PhD '05) has been promoted to Associate Professor of Chemical & Environmental Engineering at Yale University.

In June of this year, **Corey Grice** (BSE '05) will be completing a master's of physics degree at the University of Toledo, specializing in photovoltaics. He will begin a PhD program in the same field in August. He was married in June to Ms. Catherine Elizabeth Lea of Owosso, MI.

Chereese Foster (BSE '06) recently completed an MS in chemical engineering from the University of Rochester.

After 6 years working for Dow Chemical, **Bobby Glied** (BSE '06, MSE '07) left at the end of July and relocated to Chicago, IL to take a position with McKinsey & Co. in September.

After 3 years in consulting, **Andrew Wang** (BSE '06) moved to Hong Kong to do two years in investment banking at Morgan Stanley and has recently been working in private equity in Asia focusing on the China market. He's still utilizing the toolset he learned at Michigan and, more often than expected, he fields questions about chemistry and chemical engineering.

Navin Raj Bora (BSE '07) is an intellectual property (IP) attorney currently working on a freelance/as-needed basis with several Chicago and Los Angeles area patent/IP law firms. He is licensed to practice law in Illinois and is in the process of waiving into several other jurisdictions. He is also preparing for the United States Patent and Trademark Office patent bar.

Joshua Lumley (BSE '12) is in his second year in Teach For America, teaching and coaching cross country and track at IDEA Frontier College Prep, located two miles from the southern tip of Texas. He is teaching chemistry, advanced chemistry, computer programming and problem-solving this year.

IN MEMORIAM

Dr. Richard "Dick" Balzhiser
(BSE '55, MSE '56, PhD '61)
December 23, 2012

Dr. Gus L. Constan (BSE '50, MSE '51)
January 2, 2013

Roger M. Garzel (BSE '67)
February 2013

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UNDERGRADUATE OFFICE HAS MOVED! Dr. Susan Montgomery and the undergraduate office staff, Laurel Neff and Christine Moellering, in the new undergraduate office. They moved into the space, formally occupied by Jim Wilkes and Brice Carnahan, last summer.

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The Faculty of the Department of Chemical Engineering

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Omolola Eniola-Adefeso • Cell Adhesion and Migration

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