

MichiganTech

MSE Annual Report

Materials Science and Engineering • Michigan Technological University

Fall 2013



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Greetings from the Copper Country, Michigan Tech, and the MSE Department!

It is my pleasure to again share with you a summary of the past year's highlights in MSE. We have had a good year, and I am proud of the accomplishments of our students, faculty, staff, and alumni.

Prominent among the good news is a dramatic one-year increase in our undergraduate student enrollment. As shown later in this report, total enrollment has increased approximately 50 percent over the previous year, approaching an 18-year high. The increase is a combination of a healthy (though not unusual) influx of transfers into

the department from within Michigan Tech, and from an unusually large incoming first-year class—up 135 percent over last year's enrollment. While many MSE departments nationally are likewise experiencing enrollment increases, I attribute our own baby boom to the enthusiasm created by the combined efforts of a very engaged collection of MSE-affiliated student groups. Also, a variety of outreach programs conducted by the national chapters of our professional societies have been influential. In particular, I would like to acknowledge the ASM's Materials Camp program, whose impact manifested in relatively large numbers of students basing their university of choice on an interest in our profession.

Included in this report are summaries of the outstanding efforts of three of our faculty; each have been a big part of understanding why our students are so enthusiastic and excited about their future careers in MSE. Assistant Professor Paul Sanders advises the multidisciplinary but MSE-centric Advanced Metalworking Enterprise (AME), and has led that group into one of the largest Enterprise activities on campus. Associate Professor Joshua Pearce's interest and development of 3D printing and open-source manufacturing methodologies has created international interest and notoriety for Michigan Tech. Professor Jarek Drelich's innovative use of copper nanoparticles as an antimicrobial agent is creating a variety of opportunities for not only his research group, but for the Houghton business community through a plethora of commercialization opportunities. A common thread among each of these faculty members is the prominent presence and support of undergraduates in all aspects of their activities—from Enterprise leaders to innovators to active participants in graduate research programs.

Finally, I am pleased to announce inaugural awards from new endowed scholarships established by contributions in memory of two influential faculty members; many of you will recognize their names. Thomas H. Courtney Memorial Scholarship awards were presented to seniors Alexandra Glover and Kelsey Whalen this past fall in appreciation of their service to the department as the presidents of Materials United and Alpha Sigma Mu, respectively. Fundraising for the Richard W. Heckel Memorial Scholarship is underway (see page 3), with an early award to be presented at the MS&T conference in October to a Michigan Tech student and in conjunction with the national chapter of Alpha Sigma Mu.

As always, I appreciate all of the support we receive from alumni and friends of the department. Your partnerships are very important to us, and are a critical means by which we pursue our goal: to ensure a top-quality education for our students.

Until next time,

Stephen L. Kampe

Franklin St. John Professor and Chair



Our sincere thanks to ArcelorMittal for their generous \$60,000 gift to the MSE department. The donation was used to support activities within the Advanced Metalworks Enterprise (AME) and for equipment upgrades in the undergraduate metallographic preparation lab. ArcelorMittal is a valued partner to MSE for their many years of support, including sponsorship of capstone senior design and AME projects, student internships, and permanent hires.

Student Scholarships

Pave the Way

With the generosity of our benefactors, we are able to help support the work of our students as they invent the materials of tomorrow. Here are some of this year's awards.

Endowed Scholarship Fund	MSE Student Recipient
Corbin T. Eddy Endowed Scholarship	Shane Anderson
John Biffl Endowed Scholarship	James Ebben
Mr. and Mrs. James C. Clark Memorial Endowed Scholarship	James Ebben, Eli Gooding, Tyler Gould
Thomas H. Courtney Endowed Scholarship	Alexandra Glover, Kelsey Whalen
Gilbert W. Boyd Endowed Scholarship	Eli Gooding
Edwin B. and Lois M. Johnson Endowed Scholarship	Tyler Gould
John Deere Scholarship—EMSE	Stephanie Haselhuhn
Moses and Mary Levinstein Endowed Scholarship	Emily Hayes
Ernest and Miriam Nikkila Material Science and Engineering Endowment	Christopher Heiting
Dennis and Barbara Staley Endowed Scholarship Fund	Michel Knudsen
Arnold E. Nilsen Memorial Annual Scholarship	Rachel McCollough
Thomas P. Posten Endowed Scholarship	Taylor Michels
James N. Wessel Metal Endowed Scholarship	Austin O'Connor
Elmer W. Cress Endowed Scholarship	Collin Tether
Harry Suprinick Memorial Scholarship	Matthew Tianen
George A. and Nancy E. Borgeson Memorial Endowed Scholarship	Matthew Tianen
Gary Shannette Memorial Endowed Scholarship	Matthew Tianen



The Thomas H. Courtney Memorial Scholarship made its inaugural distributions this summer to Allie Glover and Kelsey Whalen in recognition of their outstanding efforts as the presidents of the Materials United and Alpha Sigma Mu student chapters, respectively. The Courtney Endowment was created from gifts of MSE alumni to honor Professor Tom Courtney, an influential faculty member and department chair during the late 1970s through the 1990s.

More Than a Professor



It is hard to explain to your colleagues and friends who attended other universities how one could develop personal relationships with your professors. Many of my peers from Michigan Tech know the same feeling. I believe it was fate, not luck, that attracted me to the beauty of Tech in the fall of 1977.

I can still remember studying thermodynamics one evening with our normal study group and we were stuck on the problems assigned. Someone challenged me to call Dr. Heckel at home to get us past our unknown position.

That one phone call led to a personal relationship with the entire Heckel family and Dick becoming a dear personal friend and mentor through his battle with cancer, which ended in May, 2010.

Please join me and others from the classes of 1981 and 1982 in the establishment of the Richard W. Heckel Memorial Scholarship Fund. Contributions can be made using the enclosed envelope and pledge form.

—Dave Gelwicks, Class of 1982

Paul Sanders

Project-Oriented Learning

“We can do that.”



Paul Sanders, assistant professor of materials science and engineering, didn't quite realize what he was getting into when a pair of delegates from the Undergraduate Student Government (USG) approached him a couple of years ago. They asked if he and the Advanced Metalworks Enterprise (AME) might want to take on the project of crafting three red brass University seals for the kiosk outside the Memorial Union and one additional seal for the Alumni House.

“They said, ‘Hey, we have this idea. We’d like to cast the University seal and put it in the MUB kiosk,’” Sanders remembers. “We thought, ‘This is a great idea, we can do that.’”

Michigan Tech’s Department of Materials Science and Engineering has one of the few university-based foundries in the country, which is why Sanders, a metallurgist and advisor to AME, was in a position to say yes.

Casting the university seal for USG was one of eight workplace-oriented projects that the AME team took on in 2012–13. Other AME project sponsors included ArcelorMittal, Eastern Alloys, GE Aviation, Kennametal, Magliner, and Meritor.

Something unique about the Enterprise option is that most of the projects have unknown end-points, unlike most traditional academic lab exercises. In Enterprise, teams are coached to develop hypotheses and approach solutions through application of accepted principles and theories, but there is never any guarantee that the expected result will prevail, and rarely are the methods straightforward and provided ahead of time. For the seal project, this was evident when the team realized there was no existing mold pattern for the seal, nor were there any engineering drawings for fabricating a pattern. Just getting started became an exercise in problem solving and collaboration.

Beginning with only an EPS illustration, the team recruited Matt Monte of Monte Consulting in Houghton to develop a preliminary CAD model. From there, students and staff in the School of Technology’s machine shop refined Monte’s code, from which they developed patterns in plastic, and ultimately in aluminum, that delivered the desired result.

The seals are impressive—a deep bronze color, finely detailed and very heavy—but they are not quite finished yet. They need to be polished to bring out the design, and since that’s an irreversible



action, Sanders and the Enterprise will be taking their time. When they are done, Facilities Management will mount the seals in the kiosk.

“I think the University community will be very pleased,” Sanders said. “It wouldn’t have happened without the many people who stepped up to help.”

Sanders also coordinates the senior capstone design projects in MSE, blending a variety of industry-relevant skills into all student projects in the department. Students are required to incorporate strong statistical methods in their projects, including introductory principles of Six Sigma, something that Sanders used effectively as a researcher at Ford. Many of the projects also incorporate Integrated Computation Materials Engineering (ICME) principles, where robust fundamental modeling is used to define and design an efficient experimental plan.

“I’m an industry guy,” Sanders says, referring to his time with Ford. “Most activities in industry are complex and project-based. We need a variety of tools to assist us in defining and obtaining the most value from the experiments that we perform. It is all about the efficient use of resources and time.”



Sanders Honored with Peaslee Award

Paul Sanders has been honored as the inaugural grant recipient for the Kent D. Peaslee Junior Faculty Award from the Association for Iron and Steel Technology (AIST). The award is \$35,000 annually for three years.

Ron Ashborn, executive director of AIST said, “overall, the committee felt [his] proposal was well rounded and quite impressive, with strong letters of endorsement and a demonstrated track record of achievement relative to steel.”

“Paul has done a tremendous job coordinating our project activities,” said Department Chair Stephen Kampe. “These have included our industrial-sponsored senior projects and advising the Advanced Metalworks Enterprise. He submitted an outstanding proposal to AIST that will formalize the strong historical partnership Michigan Tech has with the ferrous materials industry.”

Kampe says that he could not be more humbled by this honor coming to Michigan Tech. “Professor Peaslee was an accomplished professor and valued colleague at Missouri S&T who died at a very young age, unexpectedly, in May of this year.”

A New Way to Prevent Deadly Infections

Jaroslav Drelich

*“When you make a discovery like this,
it’s hard to envision all the potential applications.”*



A sample of Drelich's copper-vermiculite material. It represents a tremendous opportunity to battle bacteria and prevent infections. Early tests look to be extremely promising.

Every year, thousands of people sicken from *E. coli* infections and hundreds die in the US alone. Jaroslaw (Jarek) Drelich, professor in the Department of Materials Science and Engineering, has found a new way to prevent these potentially deadly infections.

His innovation relies on copper, an element valued for centuries for its antibiotic properties and an important part of the story of Michigan Tech. Drelich has discovered how to embed nanoparticles of the red metal into vermiculite, an inexpensive, inert compound sometimes used in potting soil. This brings together two of the biggest mining legacies in the United States for an innovative solution to a 21st Century problem.

In preliminary tests on local lake water, Drelich's creation killed 100 percent of *E. coli* bacteria in the sample. Drelich also found that it was effective in killing *Staphylococcus aureus*, the common staph bacteria. Other studies have shown that copper is toxic to *Listeria*, *Salmonella*, and even the antibiotic-resistant bacteria MRSA.

Bacteria aren't the only microorganisms that copper can kill. It is also toxic to viruses and fungi. "If it were incorporated into food packaging materials, it could help prevent a variety of foodborne diseases," Drelich says.

This copper-vermiculite material mixes well with many other materials, like cardboard and plastic, so it could be used in packing beads, boxes, even cellulose-based egg cartons. But food storage and transportation are not the only potential uses. It could be used to treat drinking water, industrial effluent, even sewage. "I've had inquiries from companies interested in purifying water," Drelich says.

And it could be embedded in products used in public places where disease transmission is a concern: toilet seats, showerheads, even paper toweling.

"When you make a discovery like this, it's hard to envision all the potential applications," he says. It could even be mixed into that wad of dollar bills in your wallet. "Money is the most contaminated product on the market."

Drelich's initial research on the copper-vermiculite materials is described in the article "Vermiculite Decorated with Copper Nanoparticles: Novel Antibacterial Hybrid Material," published in 2011 in *Applied Surface Science*. The coauthors are Bowen Li, Patrick Bowen, Jiann-Yang Hwang, Owen Mills, and Daniel Hoffman.



3D Printers for Peace and Progress

Joshua Pearce



3D printers are already changing the way we live, and one researcher in materials science wants to see the benefits and potential good of this technology take center stage. “Our aim is to raise awareness of the power of 3D printing to change the world for the better,” says Joshua Pearce, associate professor of materials science and engineering and electrical and computer engineering.

Pearce’s lab has introduced a library of open-source, 3D-printable optics components; Pearce is also the organizer of the 3D Printers for Peace competition. The idea is not only to promote the many benefits of 3D printers, but also to get the public thinking about how to use these tools.

“We want to encourage people to think about ways 3D printing can be used for the benefit of humanity,” says Pearce. “3D printers have been getting a lot of bad press because people are using them to make guns, which is unfortunate, because many designers are making wonderful things.”

The goal is to get the tools in front of as many minds as possible, taking advantage of the possibilities of the open-source concept. Pearce’s lab used OpenSCAD, an open-source computer-aided design software tool, to make the designs in the open-source library customizable. They can be printed on open-source RepRap 3D printers, and the electronics and controls are based on the open-source Arduino microcontroller environment.

Michigan Tech has already saved tens of thousands of dollars using 3D printable scientific and engineering equipment. Plus, University researchers have developed 3D printable tools to test water quality and recycle waste plastic. “Their studies have shown that 3D printing consumer goods is better for the environment than shipping those items from China,” said Pearce.

“Saving money is nice, particularly for cash-strapped schools, but the real advantage of this approach is it enables researchers to fabricate custom optics equipment in house,” says Pearce. “You get exactly what you need for your experiments, even if they are not commercially available. This is the future of scientific equipment; we have only just started.”

As for the contest, a variety of designs could meet the requirements. For example, they might address scarcity of food and water in the developing world, enhance sustainable economic development, or provide free, clean energy.

“We’d like people to think about what designs could help reduce military spending and conflict while making us all safer and more secure,” Pearce said.

Faculty and Staff News



Calvin White

Professor **Calvin White** received the Alpha Sigma Mu Distinguished Life Membership Award at ceremonies conducted during the 2013 Materials Science and Technology Conference in Montreal. White was inducted as a Fellow of ASMU last year.



Jerry Anzalone

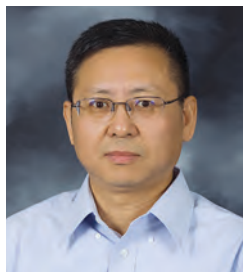
Gerald (Jerry) Anzalone has joined the department as a staff member and supervisor of the Nonconductive Nonvolatile Phase Materials Characterization Laboratory. He formerly managed the Michigan Tech Transportation Institute's (MTTI) environmental scanning electron microscope facility.



Yun Hang Hu

Professor **Yun Hang Hu** has been named the Charles and Carroll McArthur Professor in the MSE department. Hu is the author or coauthor of more than 100 journal publications. His research focuses on the use of graphene in photovoltaic systems, the synthesis of useful materials from carbon dioxide, and the development of hydrogen storage materials and catalysts for clean fuel production.

Hu was also elected chair of the energy and fuels division of the American Chemical Society, the largest scientific body in the world. He will serve as chair-elect in 2014 and chair in 2015. In July, Hu was also named a Fellow of the Royal Society of Chemistry.



Xiaodi Huang

MSE researcher **Xiaodi Huang** received the 2012 SEMA Global Media Award for a steel-clad aluminum brake rotor that he is developing within his company, LiteBrake Tech. SEMA, the Specialty Equipment Market Association, represents the aftermarket auto parts industry.



Larry Sutter

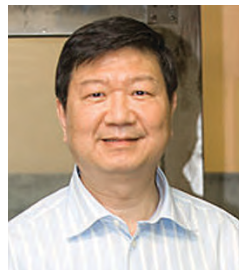
Professor **Larry Sutter** has joined the faculty of MSE, following six years serving as the director of MTTI. Many alumni will remember Sutter as the staff engineer who managed the electron optics facility for the metallurgical engineering department in the early 1990s. Sutter brings substantial expertise in cementitious materials and microstructural characterization to the department.



Stephen Mashl

Research professor **Stephen Mashl** was named a Fellow of ASM International. Mashl was cited for his industrial and academic contributions and leadership in the fields of heat treatment, powder metallurgy processing, and hot isostatic pressing technologies.

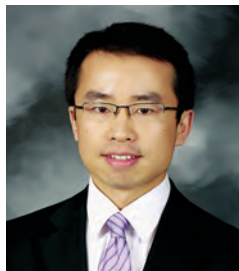
Mashl has also been elected to a three-year term as a member of the board of the ASM Heat Treating Society. He began his term in September, 2013.



Jim Hwang

Professor **Jiann-Yang "Jim" Hwang** and 2012 PhD graduate **Zhiwei Peng** received the 2013 Bhakta Rath Research Award for their studies on the use of microwaves in steelmaking.

The award, endowed by Michigan Tech alumnus Bhakta Rath and his wife, Shushama, recognizes a doctoral student at Michigan Tech and his/her faculty advisor for "exceptional research of particular value that anticipates the future needs of the nation while supporting advances in emerging technology." Hwang and Peng, now a research assistant professor, will share a \$2,000 prize.



Zhiwei Peng

Graduate Student Update

Several of our graduate students have been making their marks over the last year; here are a few updates.



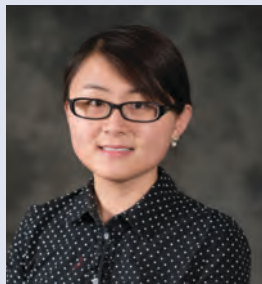
PhD candidate Amberlee Haselhuhn (advisor: Paul Sanders) participated in Graduate Education Week in February 2013 at the Capitol Building in Lansing. While there, she met with state senators and representatives to

discuss her research on metallic foams that could be used for bioactive bone implants. Haselhuhn has also been elected president of Tech's Graduate Student Government for a one-year term.



PhD candidate Patrick Bowen (advisor: Jarek Drelich) was awarded a fellowship from the American Heart Association for his research on bio-absorbable, zinc-based stents. Typically made from corrosion-resistant materials,

stents are used to restore blood flow in blocked arteries. They can cause long-term side effects, and research into alternate absorbable materials is underway.



PhD candidate Hui Wang (advisor: Yun Hang Hu) is the first student at Tech to receive the highly prestigious China National Award for Outstanding Graduate Students Abroad. The award honors outstanding academic

achievement and is extremely competitive.

Wang also served as an organizer for the International Graduate Symposium on Energy Research at the 246th American Chemical Society National Meeting in Indianapolis in September of 2013.

For her exemplary achievements, she was a recipient of a Michigan Tech Outstanding Scholarship Award and a Doctoral Finishing Fellowship from the Michigan Tech Graduate School.

Outreach



High school teachers from across the Midwest participated in the ASM International Teachers Materials Camp held at Michigan Tech in June. Teachers learned about materials engineering and conducted experiments to take back to their classrooms. The camp is held on campus each summer and is sponsored by ASM International, NACE, and the Department of Materials Science and Engineering.



MSE has a large presence in Tech's Summer Youth Programs (SYP), participating in both Women in Engineering and the Engineering Scholars Program—with 300 students visiting the department. Projects included blacksmithing, casting, and making patterns with 3D printers. MSE also participates in two Explorations in Engineering programs. About 20 students from grades 6–12 developed a process to create Dippin Dots ice cream. They used a 3D printer to create the processing apparatus, while taking advantage of surface energy of an ice cream solution dripped in liquid nitrogen to create the Dots.



2013 Undergraduate Expo Image Contest—Second Place
Advanced Metalworks Enterprise: Pouring molten iron
from induction furnace into crucible for filling sand mold

Undergraduate Student News

Awards

Zachary Morgan was named the 2013 MSE Departmental Scholar. Morgan maintains a 4.0 GPA and majors in MSE and ME-EM. He received a Charles and Carroll McArthur Research Internship for 2012–13 and worked under Professor Yongmei Jin on research involving the modeling of ferroelectric ceramic-reinforced composites. Morgan is active in Materials United, currently as secretary and previously as president.

Alexandra Glover was the recipient of a George A. Roberts Scholarship through the ASM Materials Education Foundation. The scholarship provides \$6,000 toward educational expenses for one year. It is awarded to an outstanding junior or senior who demonstrates exemplary academic and personal achievements, as well as an interest in metallurgy or the materials fields.

Collin Tether was the recipient of a \$3,000 Willy Korf Memorial Scholarship through the Association for Iron and Steel (AIST). Tether also received a \$6,000 William and Mary Dyrkacz Scholarship through the ASM Materials Education Foundation. He is actively involved in the Advanced Metalworks Enterprise and was a summer intern at Nucor Steel.

Research

In 2012–13, more than thirty MSE undergraduate students received grants for research under the guidance of MSE faculty. Receiving Charles and Carroll McArthur Undergraduate Research Internships were MSE seniors **Joseph Eckstein** and **Evan Schaefer**; juniors **Alexandra Glover**, **Greg Holl**, **Zachary Morgan**, **Collin Tether**, and **Matt Tianin**; second-year students **Adam Pringle** and **Brad Villeneuve**; and first-year student **Tyler Gould**. Senior **Meredith Mulder** received the inaugural Barbara Stoyack-Link GE Research Internship. Receiving NASA Michigan Space Grant Consortium Grants for undergraduate research were second-year student **Jacob Braykovich** and junior **Michael Warhus**. Also conducting research internships were: **Daniel Freiberg** (Ford), **Brittany Hoffman** (NASA), **John Laureto** (Michigan Initiative for Innovation and Entrepreneurship–MIIE), **Ben Wittbrodt** (MIIE), **Andrew Lewis** (Ford), **Rachel McCollough** (NURail), **Brian Milligan** (ONR and Ford), **Brad Pasioneck** (Mosaic Crystals), **Jordan Pontoni** (WI Chapter of AFS), and **Ben Schultz** (ONR and NASA).

Houghton High School junior **Phoebe Hu** and Calumet High School senior **Savannah Feely** were awarded US Army Research and Engineering Apprenticeship Program (REAP) scholarships for research under the direction of MSE staff member Edward Laitila. Houghton High School students **Nick Anzalone**, **Adam Drelich**, and **Michael Poszywak** were awarded research internships during summer 2013, conducted under the guidance of MSE faculty and staff.

Travel

Thirteen MSE students attended the MS&T Conference in Pittsburgh in October, 2012. Students participated in events organized by Materials Advantage and attended the Michigan Tech Alumni reception. At the reception, Tech hosted the 50th Anniversary celebration of **Alpha Sigma Mu (ASMu)**, the materials honor society. Tech is alpha chapter of ASMu.

Nine MSE students attended the College Industry Conference, sponsored by the Foundry Educational Foundation (FEF), in Chicago last November. Four students received FEF scholarships at the conference: **Andrew Miko**, **Austin DePottay**, **Melissa Wright**, and **Alicia Steele**.

In May, four MSE students attended the AISTech Conference in Pittsburgh. They had all worked on steel-related projects and were sponsored by ArcelorMittal. Three students presented in the Undergraduate Student Presentation Competition: **Daniel Freiberg** on Characterization of the Ductility Trough in Continuously Cast Steel Slabs; and **Gregory Holl** and **Benjamin Holtz** on Design, Fabrication, and Testing of an Improved Blast Furnace Tap Bit. On the trip back, they stopped in northwest Indiana and toured Number 3 Steel Producing and West Finishing at ArcelorMittal's Indiana Harbor plant in East Chicago.

Other News

Spring 2013 graduate **Evan Schaefer** worked with Delphi Automotive to file a patent for a glass ceramic to metal hermetic seal, applied in oxygen sensor packaging.

MSE student **Stephanie Haselhuhn** submitted the winning entry for the fall 2013 Parade of Nations theme, "Global Variation in One Location." Parade of Nations is a community-wide celebration of international diversity at Michigan Tech and in the Copper Country.

Materials United



Hi, I'm Eli Gooding, president of Materials United (MU). We are an organization that exposes students to all aspects of materials science and engineering by providing opportunities to meet with fellow students, learn about industry, and introduce students to the major materials professional societies.

Last year, MU members attended the Materials Science and Technology Conference and Exhibition (MS&T) in Pittsburgh. We

attended networking receptions and lectures while enjoying the beautiful city. Later in the year, we hosted several guest lectures and coordinated outreach programs for local high school science classes. During those visits, students were introduced to MSE through the making of liquid nitrogen ice cream and

demonstrations of aluminum casting. A similar outreach event for first-year students, the MSE Open House, had many of the same demonstrations and generated a lot of interest in the department.

This year we are excited to travel to Montreal for MS&T and to again coordinate the MSE Open House and high school outreach programs. We also plan to make MU more accessible to students, alumni, and those in industry through a new website. It will feature current projects, an events calendar, and a scholarship database. MU is always looking for support from alumni and industry; to get involved, please feel free to contact me at ejgoodin@mtu.edu.

If you would like to provide financial support to help us further our mission, please visit www.mtu.edu/mu-giving. From all of us in Materials United, thank you for your support!



MSE Open House

More than 200 first-year engineering students attended the MSE Engineering Explorations open house in November 2012. Organized and delivered entirely by the Materials United student society, the event has become one of the largest-attended and most popular Explorations open houses in the college. After a brief welcome by MSE Chair Steve Kampe, students were released to tour departmental facilities to watch student-run laboratory demonstrations and learn more about career opportunities in MSE. Popular demos included solidification science via the production of ice cream using liquid nitrogen, Charpy impact testing, composite materials and shape memory wire demonstrations, scanning electron microscopy, and the always-exciting activities in the MSE foundry. Engineering Explorations are part of the Introduction to Engineering course work, and are provided as a means to expose engineering students, particularly those undecided on a specific department, to the breadth of the engineering profession.



Michigan Tech Materials United Leaders Experience Congressional Visits Day

Materials United officers Alexandra Glover, Danielle Williamson, and Alicia Steele were selected to participate in Materials Advantage's Congressional Visits Day (CVD) April 9–11, 2013. CVD is an opportunity to advocate to legislators for the benefits of STEM-based education and research. Materials Advantage sponsors the event on behalf of its member societies (ASM, ACerS, AIST, and TMS), recognizing student advocacy as they become leaders. Shown with Congressman Dan Benishek (back row, second from right) is the State of Michigan CVD delegation: (from left) Associate Professor Pete Moran; MSE students Danielle Williamson, Alexandra Glover, and Alicia Steele; MSE Chair Stephen Kampe; and Michigan State University graduate student Qing Yang. In addition to Congressman Benishek, the delegation visited the offices of Senators Carl Levin and Debbie Stabenow, and Representatives Justin Amash and John Dingell.

MSE student teams work with industry to solve real-life problems or explore new opportunities afforded by an application of the principles and tools of materials science and engineering.



Design of an Eta Phase Strengthened Nickel-Base Alloy*

Peter Enz, Bryan Turner, Ben Wittbrodt, and Matt Wong

Faculty Advisor: C. L. White

Sponsor: EPRI

Honorable Mention—2013 Michigan Tech Undergraduate Expo



Sickle Section Materials and Heat Treatments Investigation

Kelsey Michael, Luke Operhall, Brad Pasionek, and Anne Wiese

Faculty Advisor: M. R. Plichta

Sponsor: Kondex Corporation

Second Place—2013 Michigan Tech Undergraduate Expo



Optimizing Rare Earth Usage in Ductile Iron Castings

Monica Dolby, Chase Everett, John Laureto, and Evan Schaefer

Faculty Advisor: D. J. Swenson

Sponsor: Waupaca Foundry, Inc.

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Microstructural Contributions to Thermal-Mechanical Fatigue Properties of Gray Iron Brake Rotors

Alex McQuarter, Matt Smith, Collin Tether, and Thad Waterman

Advisor: D. K. Dewald

Sponsor: Meritor, Inc.



An Evaluation of Stainless-Steel-Bonded Titanium Carbide as a Potential Substitute for Cobalt-Bonded Tungsten Carbide

Michael Buhr, Carolyn Lahti, Andrew Miko, and Max Rebottaro

Faculty Advisors: S. J. Mashl, S. L. Kampe

Sponsor: Kennametal

Honorable Mention—2013 Michigan Tech Undergraduate Expo



Transmission Bracket for Improved Mileage

Joe Eckstein

Advisor: R. J. Berkey

Sponsor: Supermileage Systems Enterprise

*Once again, an MSE Senior Design team has made waves on the national stage by being awarded second place in ASM's annual Undergraduate Design Competition. Congratulations to the entire MSE team!

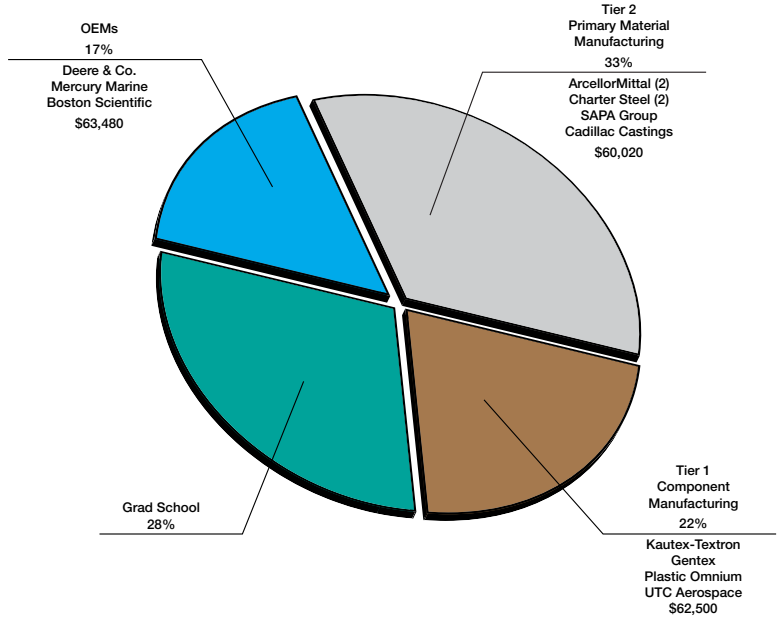
Our Graduates—A Profile



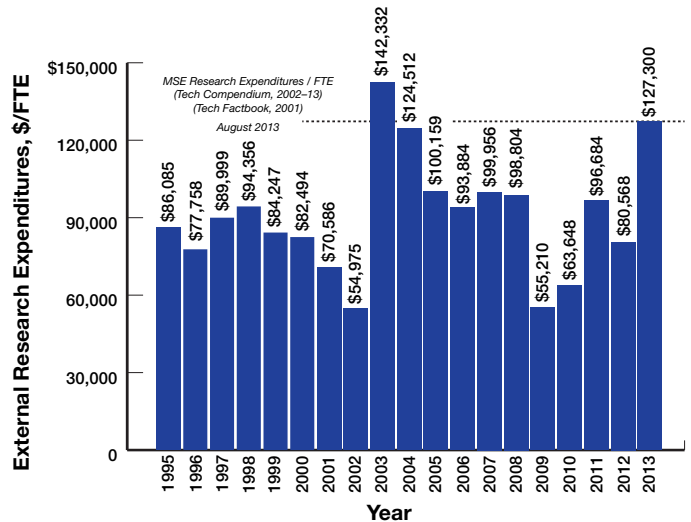
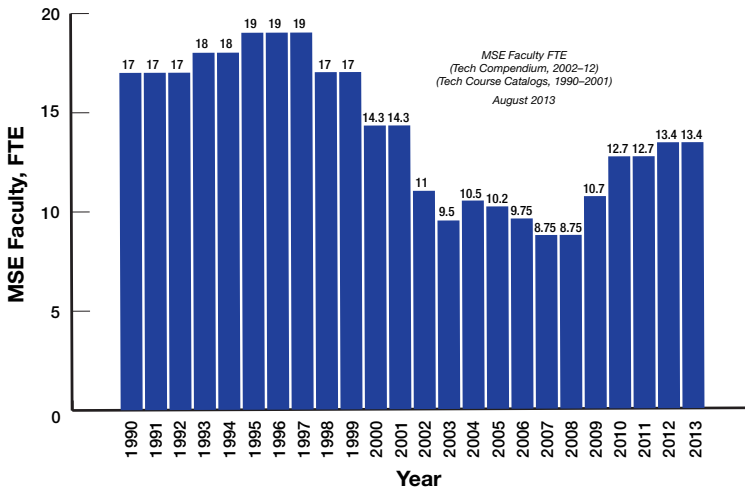
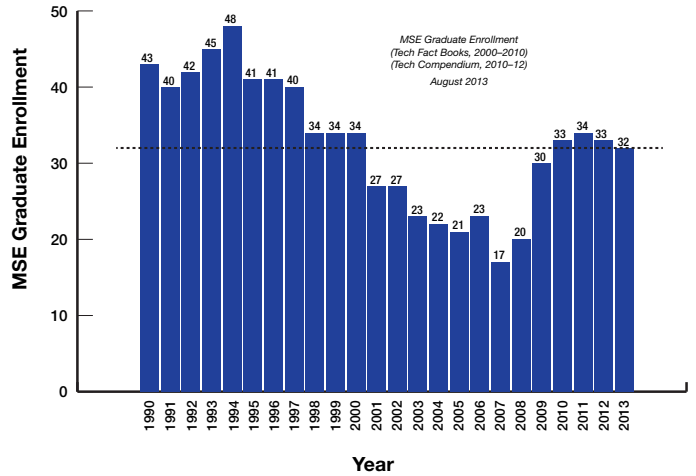
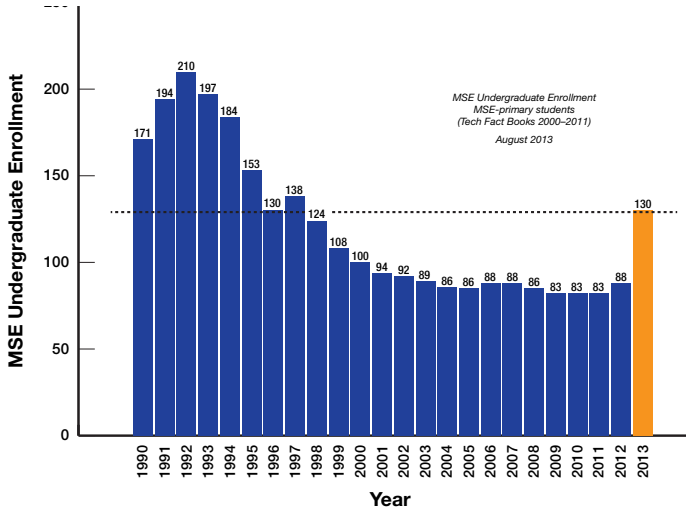
New Alumni Class of 2013

Back row, l to r: Thad Waterman, Matt Smith, Andrew Miko, Peter Enz, Ben Wittbrodt, Chase Everett, John Laureto, MSE Chair Stephen Kampe

Front row, l to r: Kelsey Michael, Anne Wiese, Monica Dolby, Alyssa Sahr, Evan Schaefer, Meredith Mulder, Carolyn Lahti, Luke Operhall, Matt Wong



Some Twenty-Year Trends



Alumni at a Glance

- Amy (Streicher) Clarke '00 (pictured below) is the 2013 recipient of Michigan Tech's Outstanding Young Alumni Award, presented by the Alumni Association in August as part of Alumni Week. Clark is a research and development scientist at Los Alamos National Lab. In July, Clarke was presented with a Presidential Early Career Award for Scientists and Engineers (PECASE) by President Obama at a White House ceremony.
- Richard Wright '82 was selected as an Idaho National Laboratory Fellow.
- Karen (Mikkola) Swager '94 was named vice president of mining operations for the Mosaic Company, a phosphate-based fertilizer company in Tampa, Florida.
- Bhakta Rath '58 spoke before the National Federation of Indian American Associations on women in STEM fields. Rath is the associate director of the Materials Science and Component Technology Directorate at the Naval Research Laboratory, and also sponsors the Bhakta Rath award (see page 10).



Amy Clarke with MSE Research Professor
and mentor Don Mikkola

- Lei Zhang '11 has joined the University of Alaska at Fairbanks as an assistant professor. Zhang previously held a postdoc position at the University of Pennsylvania in the Department of Chemical and Biomolecular Engineering.
- Lori Forbes '81 has been appointed to the Michigan Board of Professional Engineers by Governor Rick Snyder. Forbes has worked for Consumers Energy, headquartered in Jackson, Michigan, for 27 years.
- Melissa J. Baumann '83 recently became assistant provost for undergraduate studies at Auburn University and director of the Auburn University Honors College. She will also be a full professor in the Department of Mechanical Engineering.

On August 1, the alumni from our department held a mixer at The Library Restaurant in downtown Houghton, where they shared memories of their times at Tech and working in engineering. The group met for famous pizza and craft-brew, only to find that The Library doesn't serve pizza anymore! To their surprise, The Library's current menu has many creative and delicious dishes to complement their fine beer—brewed on site. The group made plans to gather again in 2014 and will work hard over the next year to get additional alumni to attend. 2013 attendees included: Steve and Jean Kampe; Frederick Carus; James (Dick) Douglas; Amy and Kester Clarke; Andrew Baker; John and Dawny Knott; and Michael, Marta, and Joseph Agin.

—Mike Agin '84

MSE now includes job postings on its website. Prospective employers can post positions by emailing beth@mtu.edu or sehill@mtu.edu. The site also gives alumni a resource for changing jobs. Visit www.mtu.edu/materials/department/employment to view current postings.