

MSE ANNUAL REPORT

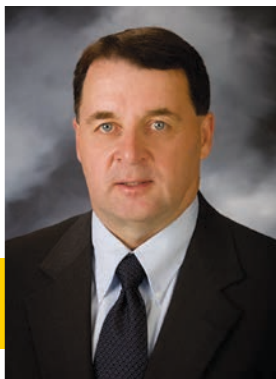
Materials Science and Engineering • Michigan Technological University

2018–19 Academic Year



Michigan
Technological
University

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FROM THE CHAIR

Stephen L. Kampe
Franklin St. John Professor and
Department Chair

Greetings from the Copper Country, Michigan Tech, and
the Materials Science and Engineering Department

It is my pleasure to share a summary of the past year's highlights. It's been another good year, and I continue to be proud of the accomplishments of our students, faculty, staff, and alumni.

In the last report, I shared the significant changes in campus leadership, introducing our new University President Richard Koubek and new College of Engineering Dean Janet Callahan. Bold changes on campus have continued. In July, Michigan Tech officially established the College of Computing, recognizing the importance and pervasiveness of computing, software development, artificial intelligence, machine learning, and data analysis to the STEM fields for which Michigan Tech is well known.

By its nature, MSE will participate in this campus-wide initiative through collaboration and research that exploits computing as a means to create and optimize materials, and to harvest and organize the large sets of data that we are able to generate through our advanced characterization and processing facilities. The heightened visibility and prominence of computing across campus reflects Michigan Tech's aggressive posturing for what some refer to as the fourth industrial revolution, or Industry 4.0, to describe how product development and advanced manufacturing will be driven into the future by incorporation of a suite of digital technologies.

This year, MSE graduated 28 baccalaureate students (winter and spring), down about five students from our recent average. As is typical for our program, nearly all of our students received employment offers by commencement. Ten graduate students also completed their studies and enjoyed outstanding job placement opportunities.

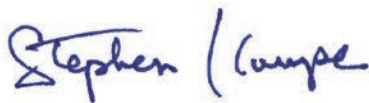
In this annual report, we feature research contributions from Assistant Professor Erik Herbert. Since joining Michigan Tech, Erik has continued his central international role in the emerging area of nanoscale mechanical characterization of materials. Recently, he joined forces with MSE Professor Steve Hackney to apply his expertise to the durability of lithium-ion batteries. In particular, Erik and Steve are investigating and reporting new mechanisms by which these materials can fail—often with dire consequences. I also take this opportunity to ask you to assist us in establishing corporate support for the outreach activities we've outlined on the back cover of this report. Michigan Tech's Summer Youth Programs (SYP) explorations are incredibly effective at providing middle and high school students with a sneak peek at career options in the STEM fields. Summer Youth Programs has been particularly effective for MSE—many of our students first learned about the profession by way of an SYP experience at Michigan Tech. Exploration tracks that specifically target engineering-bound students and



underrepresented groups have produced excellent results. MSE also hosts a section of ASM International's Materials Camp for Teachers, which has been highly effective at generating an awareness of materials science and engineering as a chemistry-oriented engineering career destination in high schools across the nation. This past summer, MSE received much-appreciated support from both Ford and the Lightweight Innovations for Tomorrow (LIFT) manufacturing institute of Detroit, which helped offset the considerable subsidy that MSE provides for these activities and the cost of the programs to students. Please consider championing these programs to your companies as an effective and valued means to increase the pipeline of talent into STEM careers via Michigan Tech and elsewhere.

As always, I appreciate the support we receive from alumni and friends of the department. Your partnerships are important to us, and a critical means by which we pursue our goals to ensure a top-quality educational experience for our students. We want to stay in touch. Please help us keep our alumni records up-to-date by checking your address and current affiliation on file with Alumni Relations at mymichigantech.mtu.edu/web/home-community/alumni.

With sincere regards and until next time,



Stephen Kampe
Franklin St. John Professor and Department Chair
Materials Science and Engineering at Michigan Tech



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▶ CAMPUS NEWS

College of Computing



Learn more about the College at mtu.edu/news, including the story “The Future is Here: College of Computing Welcomes First Students.”

In July, the University officially established the College of Computing. Departments and programs including computer science, electrical engineering technology, computer network and system administration, software engineering, and cybersecurity now fall within the College, which is the first and only of its kind in the state. The College was established to respond to the demand for talent in artificial intelligence (AI), machine learning, software engineering, data science, and cybersecurity. Former Associate Dean of Engineering Adrienne Minnerick was named founding Dean of the College.

“Launching the new College of Computing represents an inflection point in our trajectory as a premier technological institution, committed to preparing students to thrive in the fourth industrial revolution.”

–Dr. Richard J. Koubek
Michigan Tech President

School of Technology

Also in July, the units formerly comprising the School of Technology were reassigned to other colleges within the University. Mechanical engineering technology and surveying engineering are now part of the College of Engineering. Electrical engineering technology is in the College of Computing, and the construction management program is now jointly administered by the College of Business and the College of Engineering’s Department of Civil Engineering.



FACULTY & STAFF NEWS



Professor Larry Sutter was named Assistant Dean of Research and External Relations in the College of Engineering. Larry was also recognized in 2019 with the American Society for Testing and Standard Award of Merit, ASTM's top annual award, and was an ASTM Fellow for his contributions to establishing standards in the concrete engineering field. In addition, Larry received the Delmar L. Bloem Distinguished Service Award from the American Concrete Institute (ACI) for his leadership in concrete materials education and research.



Professor Erik Herbert received the inaugural Early Career Research Excellence Award presented by the College of Engineering in 2019.



Professor Walter Milligan was named Interim Chair of the rebranded Department of Manufacturing and Mechanical Engineering Technology (MMET), following the reassignment of the MET program to the College of Engineering in July (see accompanying story). Also in 2019, Walt was named a fellow of ASM International and received recognition as a Distinguished Life Member of Alpha Sigma Mu. He received both awards at the Materials Science & Technology annual meeting in October.



Research Engineer and Scientist Allison Hein was recognized at the 2019 Make-a-Difference Staff Awards Ceremony with the Above-and-Beyond Award, recognizing her exemplary efforts in assisting faculty with proposal development and budgeting.



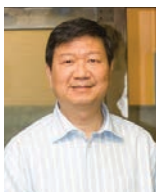
Paul Sanders was promoted from associate to full professor, and is the inaugural recipient of the Patrick Horvath Endowed Professorship of Materials Science and Engineering established by alumnus Patrick Horvath '60.



Rachel Griffin has joined the MSE Department as an Office Assistant, replacing Celine Grace who retired in November 2018. Rachel lives in Lake Linden with her husband and four children. She is currently pursuing an associate's degree in business.



Professor Joshua Pearce was named inaugural recipient of the Richard Witte Endowed Professorship, established by metallurgical engineering alumnus Richard Witte '50.



Professor Jim Hwang received two awards at the TMS Annual meeting in February—the 2019 AIME James Douglas Gold Medal Award for achievement in nonferrous metallurgy and the 2019 Extraction & Processing Division Distinguished Service Award.



In Memoriam

Margaret Rothenberger, long-time MSE staff member, passed away on July 17, 2019. Maggie, as she was affectionately known, was an invaluable asset to MSE, serving all our faculty, staff, and students. She began her career at Michigan Tech in the mid-1970s through a co-op program



offered by Chassell High School. She later moved away from the area to work at Marquette General Hospital, and raise her growing family. In 1986, she returned to the Houghton area and took a secretarial position in the ME-EM Department. Maggie joined MSE in 1994 and remained there until her retirement in 2014. She is sincerely and greatly missed.

BETTER, FASTER, STRONGER:

Building Batteries That Don't Go Boom

Understanding how lithium reacts to pressure developed from charging and discharging a battery could mean safer, better batteries.

There's an old saying: "You must learn to walk before you learn to run." Despite such wisdom, numerous industries skip the basics and sign up for marathons instead, including the battery industry.

Lithium ion batteries hold incredible promise for improved storage capacity, but they are volatile. We've all heard the news about lithium ion batteries in phones—most notably the Samsung Galaxy 7—causing phones to catch fire.

Much of the problem arises from the use of flammable liquid electrolyte inside the battery. One approach is to use a non-flammable solid electrolyte together with a lithium metal electrode. This would increase the energy of the battery while at the same time decreasing the possibility of a fire.

Essentially, the destination is building next generation solid-state batteries that don't go boom. The journey is to fundamentally understand lithium.

"Everybody is just looking at the energy storage components of the battery," says Erik Herbert, assistant professor of materials science and engineering at Michigan Technological University. "Very few research groups are interested in understanding the mechanical elements. But low and behold, we're discovering that the mechanical properties of lithium itself may be the key piece of the puzzle."

Michigan Tech researchers contribute significantly to gaining a fundamental understanding of lithium with

results published in an invited three-paper series in the *Journal of Materials Research*, published jointly by the Materials Research Society and Cambridge University Press. The team includes Herbert and Stephen Hackney, professor of materials science and engineering, along with Violet Thole, a graduate student at Michigan Tech, Nancy Dudney at Oak Ridge National Laboratory and Sudharshan Phani at the International Advanced Research Centre for Powder Metallurgy and New Materials. They share results that underscore the significance of lithium's mechanical





behavior in controlling the performance and safety of next generation batteries.

Like a freeze-thaw cycle damaging concrete, lithium dendrites damage batteries.

Lithium is an extremely reactive metal, which makes it prone to misbehavior. But it is also very good at storing energy. We want our phones (and computers, tablets and other electronic devices) to charge as quickly as possible, and so battery manufacturers face twin pressures: Make batteries that charge very quickly, passing a charge between the cathode and anode as fast as possible, and make the batteries reliable despite being charged repeatedly.

Lithium is a very soft metal, but it doesn't behave as expected during battery operation. Mounting pressure that inextricably occurs during charging and discharging a battery results in microscopic fingers of lithium called dendrites

to fill pre-existing and unavoidable microscopic flaws—grooves, pores and scratches—at the interface between the lithium anode and the solid electrolyte separator.

During continued cycling, these dendrites can force their way into, and eventually through, the solid electrolyte layer that physically separates the anode and cathode. Once a dendrite reaches the cathode, the device short circuits and fails, often catastrophically. Herbert and Hackney's research focuses on how lithium mitigates the pressure that naturally develops during charging and discharging a solid-state battery.

Their work documents the remarkable behavior of lithium at submicron length scales—drilling down into the lithium's smallest and arguably most befuddling attributes. By indenting lithium films with a diamond-tipped probe to deform the metal, the researchers explore how the metal reacts to pressure. Their results confirm the unexpectedly high strength of lithium at small-length scales reported in 2018 by researchers at Cal Tech.

Herbert and Hackney build on that research by providing the inaugural, mechanical explanation of lithium's surprisingly high strength.

Lithium's ability to diffuse or rearrange its own atoms or ions in an attempt to alleviate the pressure imposed by the indenter tip, showed researchers the importance of the speed at which lithium is deformed (which is related to how fast batteries are charged and discharged), as well as the effects of defects and deviations in the arrangement of lithium ions that comprise the anode.

DRILLING DOWN TO UNDERSTAND THE BEHAVIOR OF LITHIUM



In the article "Nanoindentation of high-purity vapor deposited lithium films: The elastic modulus," the researchers measure the elastic properties of lithium to reflect changes in the physical orientation of lithium ions. These results emphasize the necessity of incorporating lithium's orientation-dependent elastic properties into all future simulation work. Herbert and Hackney also provide experimental evidence that indicates lithium may have an enhanced ability to transform mechanical energy into heat at length scales less than 500 nanometers.

In the article that follows, "Nanoindentation of high-purity vapor deposited lithium films: A mechanistic rationalization of diffusion-mediated flow," Herbert and Hackney document lithium's remarkably high strength at length scales less than 500 nanometers, and they provide their original framework, which aims to explain how lithium's ability to manage pressure is controlled by diffusion and the rate at which the material is deformed.

Finally, in "Nanoindentation of high-purity vapor deposited lithium films: A mechanistic rationalization of the transition from diffusion to dislocation-mediated flow," the authors provide a statistical model that explains the conditions under which lithium undergoes an abrupt transition that further facilitates its ability to alleviate pressure. They also provide a model that directly links the mechanical behavior of lithium to the performance of the battery.

"We're trying to understand the mechanisms by which lithium alleviates pressure at length scales that are commensurate with interfacial defects," Herbert says. Improving our understanding of this fundamental issue will directly enable the development of a stable interface that promotes safe, long-term and high-rate cycling performance.

Says Herbert: "I hope our work has a significant impact on the direction people take trying to develop next-gen storage devices."



► SENIOR DESIGN Teams and Sponsors

Aluminum Scandium Wire Arc Additive Manufacturing



Team:
Sam Byrne, Craig Ekstrum,
Alex Malliett, Chelsey Rock,
Joseph Vermeylen

Sponsor:
Clean TeQ Holdings Limited,
Dr. Tim Langan, liaison



Cobalt Reduction in Tribaloy 400



Team:
Kyle Hrubecky, Lucas Itchue,
Jacob Thompson, Erin
VanDusen

Sponsor:
Winsert, Inc.,
Jason Sallgren (MSE '08), liaison



Model And Validation of Steel Castability Windows to Reduce Inclusions



Team:
Katherine Amar-Fox, Yani
Beeker, John Falecki, Claudia
Smale

Sponsor:
Gerdau Steel,
Dr. Denise Correa de Oliveira,
liaison



Nodule Reduction on Steel Reheat Furnace Refractory



Team:
Eric Olson, Patrick Ricchi,
Matthew Thomas, Casey
Vadnais

Sponsor:
ArcelorMittal,
Dr. Yong Lee, liaison

Scandium Effects on Cast Iron Microstructure and Properties



Team:
Mason Coy, Erin Heidelberger,
Katherine Russell

Sponsor:
Clean TeQ Holdings Limited,
Dr. Tim Langan, liaison

Trip Steel Wire Arc Additive Manufacturing



Team:
Jacob Coulson, Mackenzie
Keefer, Nate Stancroff, Rene
Teufack

Sponsor:
ArcelorMittal,
Dr. Johan Shamsuzzoha, liaison



Department Scholar

Emily Tom was named the 2019 Departmental Scholar by Michigan Tech Provost Jacqueline Huntoon, for her academic accomplishments, leadership, service, and participation in undergraduate research. Emily has conducted research as a member of Professor Jarek Drelich's research team and has interned at Argonne National Labs. She has been an active and effective MSE Learning Center Coach, and is active in Materials United, Michigan Tech's student materials professional society. She is a member of Tau Beta Pi, and Alpha Sigma Mu—the engineering and materials honor societies, respectively. She is also a member of the Michigan Tech Ridge Roamers Club, and Mont Ripley ski patrol—where she is also a ski instructor.

STUDENT NEWS

Richard Sharrow and Academic Achievement Awards



MSE senior **Erin VanDusen** was the 2019 recipient of the Richard Sharrow Award, presented at the annual senior banquet in April. The award recognizes the graduating senior with the greatest improvement in grade point average during the course of their studies in MSE at Michigan Tech. Erin is now a graduate student in MSE at Michigan Tech.



Also at the senior banquet, MSE senior **Jacob Thompson** received the 2019 Alpha Sigma Mu Academic Achievement Award for the highest GPA among graduating seniors.

MSE senior **Daniel LaCroix** is a coauthor on TMS' Light Metals Division 2019 Magnesium Best Paper Award, recognizing individual excellence of a paper published in the preceding year's volume of Magnesium Technology on a topic of application of magnesium. The paper is entitled, "Development of BioMg® 250 Bioabsorbable Implant Alloy," authored by **John Allison, Raymond Decker, Daniel LaCroix, Stephen LeBeau,** and appears in Magnesium Technology 2019. The work presented was conducted during Dan's internship interned with Thixomat, Inc. of Ann Arbor.



2019 Chapter of Excellence Award



The 2018-19 Michigan Tech Materials Advantage student chapter was awarded a 2019 Chapter of Excellence Award at ceremonies at the Materials Science & Technology Conference in Portland, Oregon in September. Accepting the award are 2019-20 Materials United members (from left) **Emily Tom, Katie Kiser, Oliver Schihl, Brendan Treanore, and John Jay.**

Several students were presented scholarship awards from the Foundry Education Foundation (FEF) and the American Foundry Society (AFS) at the 2019 senior banquet. MSE senior **Katie Amar-Fox** and MSE graduate student **Ale Almanza** received the Detroit-Windsor AFS Chapter's 2019 Past Chairman Award. **Katherine Russell, Riley Simpson, Katie Kiser, Olivia Clancey, Lucas Icthue, and Erin Heidelberg** received AFS-Wisconsin chapter Past Presidents Scholarships for their participation in the Wisconsin Regional Casting Competition. **Sidney Schroeder, Laura Bushong, Erin Heidelberg, and Oliver Schihl** received FEF Internship Scholarships, recognizing the completion of an internship in the metalcasting industry.



MSE seniors **Yani Beeker, Erin Heidelberg, and Katherine Russell** each received competitive scholarships at the Foundry Education Foundation's (FEF) College Industry Conference (CIC) held in Chicago in November. Yani received the AFS Saginaw Chapter Scholarship, Erin the Keith Dwight Mills Scholarship awarded to students with interest in ductile iron, and Katherine the Gary Gigante Scholarship.

MSE seniors **Matthew Thomas** and **Mackenzie Keefer** were awarded 2018-19 TMS Materials Processing and Manufacturing Division (MPMD) student scholarships.

STUDENT NEWS

Advanced Metalworks Enterprise



Hello alumni and friends of MSE, I'm **Oliver Schihl**, incoming president of Advanced Metalworks Enterprise (AME) at Michigan Tech. Advanced Metalworks Enterprise adds value to the Michigan Tech experience by providing students with opportunities for real industry problem solving. AME offers a variety of metallurgical manufacturing projects

that teams of three to five students take ownership of, from alloy design, automated test fixtures, and optimized foundry degassers to alloy characterization, metal 3D printing and cutting-edge casting method development. Being on a team helps students build a résumé, develop teamwork skills, form professional relationships with faculty and company representatives, and learn what to expect in the workforce.

Over the past five years, ArcelorMittal, Mercury Marine, Eck, General Motors, Ford, Waupaca, Neenah, Gerdau, Clean TeQ and AIST have sponsored multiple projects for students to get involved in. We're grateful for their help in offering students an opportunity to take textbook skills from the classroom and apply them in practical ways, to experiment, and get results.

New projects are started every year; more complex projects get carried over from the previous year. Either way, we are always working toward bolstering our skills as engineers and teammates. I look forward to seeing the new advancements in metallurgy made possible by student involvement in AME.

Thanks for your support,
Oliver Schihl, AME President



2019 Inductees into the Order of the Engineer and Alpha Sigma Mu



Katherine Amar-Fox
Andrew Baker
Yani Beeker
Samuel Byrne
Mason Coy
Craig Ekstrum
John Falecki

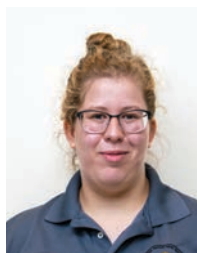
Kathy Hayrynen
Erin Heidelberger
Lucas Itchue
Mackenzie Keefer
Edward Laitila
Colleen Lehrer
Stuart Liburd

Alex Malliet
Walter Milligan
Eric Olson
Elizabeth Pilibosian
Chelsey Rock
Katherine Russell
Daniel Seguin

Claudia Smale
Rene Teufack
Matthew Thomas
Erin VanDusen
Joseph Vermeulen

Jake Beavers
James Bonar
Lauren Bowling
Kiaya Caspers
Michael Gazdecki
Alex Malliet
Brock Rudlaff
Katherine Russell

Materials United



Greetings, I'm **Katie Kiser**, incoming president of Materials United (MU). Materials United is a student organization dedicated to providing students with exposure to all aspects of Materials Science and Engineering. This includes offering opportunities to learn about industry, share research, develop personal skills, and participate in

professional societies. Materials United is a joint chapter of many major materials professional societies, including the American Foundry Society (AFS); American Ceramic Society (ACerS); American Society for Materials (ASM International); The Materials Society (TMS); and the Association for Iron and Steel Technology (AIST).

Last year, Materials United attended the Materials Science and Technology (MS&T) Conference and Exhibition in Columbus, Ohio, as well as AISTech in Pittsburgh, Pennsylvania. These events give students a chance to engage with professionals in world-class settings. MU student members participated in several casting

competitions, entering a variety of metal castings. MU also organized the departmental engineering exploration open house, giving new students a taste of what Materials Science and Engineering is about through hands-on laboratory experiments and tours. Every year MU hosts professional events supporting the fall and spring career fairs, including a meet and greet with company representatives and prep sessions with Gerdau recruiters.

This coming year we look forward to traveling to MS&T in October and AISTech in May. MU is excited to coordinate the annual departmental open house, participate in outreach events, and participate in new competitions. Materials United is always looking for support from alumni and industry. To get involved, send me an email at kekiser@mtu.edu.

Thank you from all of us for your continued interest and support,

Katie Kiser, Materials United President

STUDENT NEWS



The "LoCo" team at Michigan Tech received first place in the 2019 ASM International Undergraduate Design Competition for their project "Cobalt Reductions in Tribaloy 400." Accepting the award from ASM President William Mahoney (center) are former MSE seniors

Kyle Hruby (front, left) Erin VanDusen (front, right). Also participating are MSE faculty project advisors Walt Milligan (left) and Paul Sanders (right).

Thomas Courtney and Richard Heckel Memorial Scholarships

In recognition of their leadership and service to the department, MSE seniors **Katie Kiser** and **Brendan Treanore** and MMET senior **Oliver Schihl** were joint recipients of the 2019 Thomas Courtney MSE Leadership Scholarship. Kiser will serve as the 2019-20 Materials United President, while Treanore and Schihl will serve as the Presidents of the student chapters of the American Foundry Society (AFS) and Materials Advantage, respectively.

MSE senior **Michael Kallenbach** has been awarded the 2019-20 Richard Heckel Memorial Scholarship, in recognition of the perseverance he has applied towards the completion of his MSE degree.



2019 Congressional Visits Day

Four MSE students participated in Materials Advantage Congressional Visits Day (CVD) in Washington, D.C., in April. Students from chapters across the country gather for the purpose of advocating federal support for higher education and research in the physical sciences. Representing the State of Michigan at this year's CVD were MSE seniors **Erin VanDusen**, **Craig Ekstrum**, **John Falecki**, and **Jonah Jarczewski**. The Michigan Tech delegation held meetings in the offices of Michigan Senators Gary Peters and Debbie Stabenow, U.S. Representatives Jack Bergman (Michigan's first Congressional district), and John Moolenaar (Michigan's fourth Congressional district), and Wisconsin Congressman Glenn Grothman.

2019-20 Graduate Degrees

Student	Degree	Faculty Advisor	Dissertation / Thesis (defense)	Employment
Jeff Brookins	MS-T	Jarek Drelich	Development and Characterization of Biodegradable Zinc Vascular Ligation Clips (7/30/18)	PhD program, U of Tennessee- Knoxville
Georgia Hurchalla	MS-T	Jarek Drelich	Effect of Hierarchical Structure and Orientation on Water-Repellant Legs of Water-Walking Insects (7/31/2018)	OrthoMicroport, Arlington, TN
Apoorv Sandeep Kulkarni	MS-NT	Steve Hackney	Non-thesis	PhD. program, MTU / Univ Trento (Italy)
Peter Hokemeir-Seim	MS-T	Yun Hang Hu	Effects of Heat Treatment Conditions on Morphology, Optical Properties, and Performance of TiO ₂ in Dye-sensitized Solar Cells (12/6/2018)	Abbott U.S. Minneapolis, MN
Julia Scruton	MS-T	Paul Sanders	Effects and Limitations of Residual Alloying Elements in Silicon Solid Solution Strengthened Ferritic Ductile Iron (12/7/2018)	Baker Manufacturing Evansville, WI
Deji Fadayomi	Ph.D.	Greg Odegard	ICME Investigation of Electrical Conductivity and Thermodynamic Stability for Precipitation Strengthened Al-Zn-Zr and Al-Zn-Ni Ternary Alloys (12/17/2018)	INTEL Austin, TX
Sasank Potluri	MS-NT	Steve Hackney	Non-thesis	
Archit Kavishwar	MS-NT	Steve Hackney	Non-thesis	
Jiawen Liu	MS-NT	Steve Hackney	Non-thesis	
Akash Manojkumar Desai	MS-NT	Steve Hackney	Non-thesis	

▶ ALUMNI NEWS

The Metallurgical and Materials Engineering Academy at Michigan Tech

The Metallurgical and Materials Engineering Academy honors outstanding alumni and friends of the Materials Science and Engineering department at Michigan Tech. Election to the Academy recognizes excellence and leadership in the materials science and engineering discipline, and a continuing commitment of support and service to the department and its students.



Iver E. Anderson (MY '75) is a Senior Metallurgist at Ames Laboratory (USDOE) and Adjunct Professor in the Materials Science and Engineering department at Iowa State University. He is a Fellow of the American Powder Metallurgy Institute, ASM International, TMS, and

the National Academy of Inventors, as well as a member of the National Inventors Hall of Fame. He earned his BS in Metallurgical Engineering in 1975 from Michigan Tech, and his MS and PhD in Metallurgical Engineering from University of Wisconsin-Madison in 1982. Iver, who took a position at Ames Laboratory in 1987, spent the balance of his research career at Ames Lab and Iowa State University. His contributions and innovations resulted in more than 265 publications and 45 patents. Iver and his wife, Nancy, continue to support Michigan Tech and its students in a variety of ways both in his role as an alumnus and as an active advocate for Materials Advantage, the combined student professional society of ASM, TMS, ACerS, and AIST.



David H. Gelwicks (MY '82) began his career with North Star Steel Iowa. In 1993, Dave returned to Michigan, accepting a position with Hickman, Williams & Company in Monroe, where, in 2013, he was elected President and Chief Executive Officer. Dave has long been a generous

supporter of Michigan Tech and its students, assisting with the department's casting program and establishing a scholarship honoring former Professor Richard Heckel. Dave serves on the National Board of the Foundry Educational Foundation (FEF), and leads FEF's Advisory Board for Michigan Tech's metal-casting program and its accreditation activities. He previously served on MSE's Industrial Advisory Board. Dave and his wife Carrie '82 have been married 36 years. They have a daughter, Sarah; she and her husband Cory have three children.



Susan (Brechting) Kiehl (MY '83) recently retired as Vice President of the F-16/F-22 Integrated Fighter Group Product Development for Lockheed Martin Aeronautics, based in Fort Worth, Texas. She previously served in several leadership roles within

Lockheed Martin, including as Vice President of Program

Management, Director of the F-35 Joint Strike Fighter International Business Development, Director of Business Development Operations, and Team Leader for the F-16 Airframe Integration. Susan, who has distinguished herself as a generous advocate for the University, has strong family ties to Michigan Tech. Her grandfather, Gilly Boyd, taught metallurgy at the University for many years. In addition to her BS from Michigan Tech, Susan holds an MBA in Engineering Management from the University of Dallas. She has three children, a daughter-in-law, and a son-in-law (Sam and Robin, Lilli and Josh, and Isabelle), and resides in Grand Haven, Michigan.



Ruth I. (Schultz) Kramer first attended Michigan Tech from 1966-1968, but received her BS from the University of Oregon in 1979. She returned to Michigan Tech for graduate work and earned an MS in Geology in 1987, subsequently joining Michigan Tech's Institute of

Materials Processing as a research scientist. She moved to MSE as a technical staff member in 1995. In 2004, Ruth became the department's undergraduate academic advisor, a position that she recalls as her most important and rewarding work. She retired from the University in 2014 after 27 years of service to the University—19 of those with MSE. In 2012, students honored Ruth with Blue Key Honor Society's Clair M. Donovan Award for her outstanding service, and especially for her generous dedication to and impact on their academic success. Ruth continues to reside in the area, living near Chassell with Byrd, her husband of 46 years.



Dennis J. Moore received an Associate in Engineering degree in Metals Engineering Technology with a foundry option in 1962 from Wentworth Institute in Boston, Massachusetts. In 1966, he joined McDonnell-Douglas Aircraft Corporation in St. Louis, Missouri, where he earned

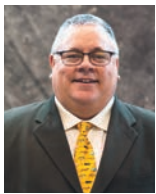
a BS in Applied Physics from University of Missouri-St. Louis. He came to Houghton in 1973 as staff manager of the Metallurgical Engineering Department's then-new foundry in the Chem-Met Building. For the next 29 years he and Professor Karl Rundman built a metal-casting program that has educated hundreds of students and has launched successful careers for Michigan Tech alumni throughout this industry. Now retired, Dennis and wife Pauline have three children: Kathleen, Matthew, and Christopher.



Boyd A. Mueller (MY '83) received MS and PhD degrees in Metallurgical Engineering from the University of Wisconsin-Madison in 1983 and 1986, respectively. Currently Vice President of Technology and Alloy for Arconic Engines—formerly Alcoa Howmet—Boyd



holds four patents, has authored more than 25 technical papers, is a Fellow of the American Society of Metals, has received the UW Madison Distinguished Achievement Award, and has served on the National Academy of Science-NIST Review Panel. Arconic currently employs dozens of MSE alumni of the department and Michigan Tech, and regularly hires our students as summer interns. Boyd and his wife Brenda continue to support the department in a variety of ways.



Joseph (Joe) M. Nowosad (MY '87) has spent 32 years with ArcelorMittal, the world's largest steel manufacturer. Since 2006, Joe has been lead recruiter for ArcelorMittal's Talent Acquisition at Michigan Tech, and has hired approximately 70 engineers—and more than 200 interns. Currently, he is Manager of Customer Technical Service for ArcelorMittal's largest customer, General Motors NAFTA.

A strong supporter of the department and University at many levels, ArcelorMittal has been a prominent booster for the Huskies Hockey Team. Joe, who also received an MBA from Indiana University in 2000, was honored with the Michigan Tech Distinguished Alumni Award in 2015.

He is married to **Brenda (Stinson) Nowosad**, who holds a BS in mathematics from Michigan Tech. They have three children, all Michigan Tech Huskies majoring in electrical engineering: Kate earned her BS in 2017; John and Sam's graduations are slated for 2020.



Bruce J. Pletka graduated with a bachelor's degree in Metallurgical Engineering from Cleveland State University in 1970 and an MS and PhD in Ceramic Engineering from Case Western Reserve University in 1973 and 1975, respectively. He then spent time as a National Research Council Post-Doctoral Research Fellow

at the National Bureau of Standards (now the National Institute for Science and Technology) until the fall of 1977, when he joined the Metallurgical Engineering Department at Michigan Tech. Bruce retired from MSE in 2016 after 39 years of service to the University and department. In addition to all he has done for MSE, Bruce served as an advisor and coach for Michigan Tech students competing in Division II mountain bike races in

the National Collegiate Cycling Association. He has personally participated in more than 125 mountain, road, gravel, and cyclocross bike races in Wisconsin, Minnesota, and Michigan.



Peter E. Sohlden (MY '65) Peter received his Metallurgical Engineering Bachelor of Science degree from Michigan Tech in 1965, and an MS in Metallurgical Engineering from the University of Wisconsin in 1968. He spent almost his entire career with Grede Foundries, Inc. in their Milwaukee facilities, retiring as Executive Vice

President and Chief Operating Officer after 34 years with the company. Peter was active in several professional and trade organizations and served two terms on MSE's External Advisory Board (2002–08). A member of the legacy-establishing McNair Society at Michigan Tech, he has shown his gratitude for the financial support that the University provided to him for his education. Peter spends his free time fishing, hunting, traveling, boating, and doing volunteer work. He has been married to his wife Jackie for 48 years and they have one daughter, Sonja.



Calvin L. White (MY '74) was born in Chico, California and raised in the small mountain town of Portola, about 60 miles Northwest of Lake Tahoe. He attended the University of California at Davis, where he majored in Mechanical Engineering; and where he met and married Elsie Jean Mertens, his wife of 50 years. When he graduated from

UC Davis in 1969, Calvin majored in Metallurgy and Materials Science at the University of Minnesota, where he met Dale Stein (who would one day be University president). When Dale accepted an opportunity to head the Metallurgical Engineering Department at Michigan Tech, Calvin and Elsie moved to Houghton so that Calvin could pursue his PhD under Dale's direction. After completing his dissertation Calvin joined the Metals and Ceramics Division at Oak Ridge National Laboratory in Tennessee. Calvin, Elsie, and their son Calvin Frederick moved to the Copper Country in 1986 when Calvin became a professor in the Michigan Tech Metallurgical Engineering Department. Calvin served as Chair of MSE from 1996-2002, and retired from teaching in 2014.

▶ ALUMNI NEWS

Amy Clarke (MME '00) and **Dale Gerard** (MY '82) were inducted as Fellows of ASM International at award ceremonies at the Materials Science & Technology Conference in October 2018 in Pittsburgh, Pennsylvania.

Pat Olesak (MY '80) has established the Patricia J. Olesak scholarship to assist female students studying MSE at Michigan Tech.

Rory Montgomery (MY '78) former quality assurance manager with Revere Copper Products, was awarded ASTM Copper and Copper Alloys International Committee Copper Club Award. He was recognized for his service to the committee, standardization of chemical analysis methods, and technical and editorial standards review and development. He was previously honored with the committee's Award of Appreciation.

George Durfee (MY '52) received the Lifetime Achievement Award from the International Titanium Association's 35th Annual TITANIUM USA 2019 conference

in September. George was honored for his pioneering contributions to forged and flow processed Ti-6Al-4V during his career at Wyman-Gordon from 1953 through his retirement in 1998.

Ben Almquist (MSE '04) was one of five featured guests and speakers at the Five Under 35 series of campus visits and programs pairing successful early career alumni with current students in November 2018.

Eric Lass (MSE '01) joined the faculty at the University of Tennessee-Knoxville following 10 years at the National Institute of Standards in Gaithersburg, Maryland.

Iver Anderson (MY '75) was awarded the Michigan Tech Distinguished Alumni Award during 2019 Alumni Reunion on campus in August. **Amberlee Haselhuhn** (BS BME MSE '10, PhD MSE '14) was co-recipient of the 2019 Outstanding Young Alumni Award along with **Andrew Baker** (MS MSE '11, PhD MSE '14).



Congratulations Class of 2019

A portion of MSE's newest alumni, pictured following spring commencement activities in May.

EAB and FEF Boards



MSE's External Advisory Board (EAB) and Foundry Educational Foundation (FEF) Board met in April to review department activities, attend the capstone Senior Design presentations, and to participate in the annual Michigan

Tech Design Expo, a showcase competition featuring Senior Design and undergraduate Enterprise projects across the University.

Members of the combined boards attending are, from left, back row: MSE Associate Professor **Paul Sanders**, **Chris Pflug** (MSE '18), Neenah Foundry; **Mike Klecka** (MY '05), United Technologies Research Lab; **Alex Thiel** (MSE '14), OshKosh Corporation; **Daniel Freiberg** (MSE '14), Ford; **Brian Munn** (MY '85), ZF-TRW; **Danielle Rickert** (MSE '04), Carpenter Tech; **Kathy Hayrynen** (MY '86 '89 '93), Applied Process, Inc.; **Elizabeth Pilibosian**, General Motors; **Joe Keske** (MME '97), Waupaca Foundry.

Front row: **Andrew Baker** (MSE '11, '14), Boeing; **Rick May** (MY '95), Cadillac Castings; MSE Chair **Stephen Kampe**; **Kevin Baker** (MSE '04), Beaumont Health Systems; **David Gelwicks** (MY '82), Hickman, Williams & Company, Inc.; Professor **David Bahr**, Purdue University; **Shannon Larkey** (MME '99), ArcelorMittal; **Matt Meyer** (MME '98), Kohler.



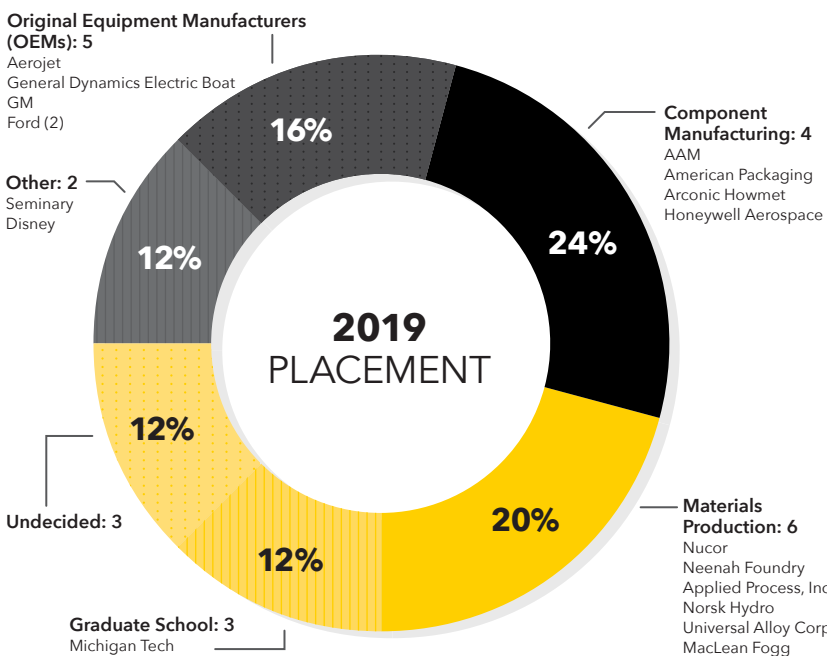
BY THE NUMBERS

▶ UNDERGRADUATE SCHOLARSHIPS

Undergraduate MSE students received \$581,382 in institutional and MSE-designated scholarships during the 2018–19 academic year from Michigan Tech’s Financial Aid Office and the MSE Department.

\$581,382

▶ CLASS OF 2019 PLACEMENTS



▶ FACULTY/STAFF

- ▶ 16 Tenure/tenure-track faculty
- ▶ 16 Affiliated and Adjunct faculty
- ▶ 5 Research faculty
- ▶ 9 Technical staff
- ▶ 2 Administrative staff

▶ 2018-19 GRADUATES

- ▶ 28 BS Graduates
- ▶ 8 MS Graduates
- ▶ 2 PhD Graduates

▶ 2018-19 ENROLLMENT

- ▶ 138 BS Graduates
- ▶ 42 MS Graduates

▶ EXTERNAL RESEARCH EXPENDITURES

\$1,778,198

▶ 2018-19 RANKINGS *U.S. News & World Report ranks the MSE graduate program 46th nationally*



**Michigan
Technological
University**

Materials Science and Engineering
Minerals and Materials Engineering Building
1400 Townsend Drive
Houghton, MI 49931-1295

Reaching Out to the Community and Educators

In June, the Materials Science and Engineering Department hosted high school teachers from around the state to participate in the Michigan Tech section of ASM International's Materials Camp for Teachers. Teachers learn about materials and participate in a variety of hands-on student laboratory exercises designed to introduce materials science and engineering through chemistry courses. We're grateful that Ford provided on-site support for the camp through a Ford STEAM (Science, Technology, Engineering, Arts, and Math) grant.



SYP lets students in grades 6–11 explore careers.
Learn more at mtu.edu/syp

Summer Youth Programs Get a LIFT

Lightweight Innovations For Tomorrow (LIFT), a national manufacturing innovation institute operated by the American Lightweight Materials Innovation Institute of Detroit, provided the MSE department with much appreciated financial sponsorship for four Summer Youth Programs (SYP) workshops over the summer. The workshops included two, week-long explorations that provided an overview of materials science and engineering, a Women in Engineering program, and the Engineering Scholars Program for academically gifted students.

Please consider encouraging your employer to champion MSE's outreach activities through full or partial sponsorship—an effective and proven means to increase the pipeline of talent into STEM careers. For more information, please contact MSE Chair Steve Kampe at kampe@mtu.edu or Michigan Tech's Center for Pre-College Outreach at cpco@mtu.edu

For more information about giving to MSE and Michigan Tech, contact MSE Chair Stephen L. Kampe at kampe@mtu.edu or Eric Halonen in the Office of Advancement at ehalonen@mtu.edu

Michigan Technological University is an equal opportunity educational institution/equal opportunity employer, which includes providing equal opportunity for protected veterans and individuals with disabilities. 352141219