



MSE Annual Report

Materials Science and Engineering • Michigan Technological University



2016-17 Academic Year



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Greetings from the Keweenaw, 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. It's been another good year, and I continue to be proud of the

accomplishments of our students, faculty, staff, and alumni.

This year, MSE graduated 26 baccalaureate students, down slightly from last year's 33. Nonetheless, overall undergraduate enrollment in the department continues to trend slightly upward. The 2016-17 school year was also a good one for graduate degrees with 13 master's and seven doctoral completions.

Professor Yung Hang Hu's receipt of both of Michigan Tech's major research awards serves as one of the highlights of the academic year for the department. The Michigan Tech Research Award recognizes Professor Hu's cumulative contributions in the area of synthesis of materials for energy-related applications. Additionally, Professor Hu and

his doctoral student, Wei Wei, jointly received the Bhakta Rath Research Award for contributions related to Wei's dissertation on new materials for photovoltaic applications. Many of you will recognize the creator and namesake of the award, Bhakta Rath, who was a 1958 MS graduate of Metallurgical Engineering.

We are also excited about the certification of a new, state-of-the-art scanning transmission electron microscope (STEM) at Michigan Tech. The installation of an FEI aberration-corrected STEM is being completed in a stand-alone, ultra-stable facility adjacent to the Advanced Technology Development Complex on Sharon Avenue. We will feature the microscope and its unique capabilities in a future annual report.

In this annual report, we feature Professor Jiann-Yang "Jim" Hwang's new association as a technical consultant and advisor to Evergreen Technologies, a technology harvesting and development company located in Hancock, Michigan. Evergreen was established by Futianbao Environmental Protection, Ltd., whose business plan includes responding to the significant investments occurring in China and elsewhere, seeking solutions to both legacy and ongoing environmental issues associated with past and ongoing manufacturing activities. Evergreen represents an interesting model by which university research and expertise



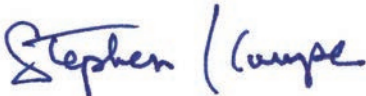
can be efficiently applied to solve problems of a global nature.

We send our best wishes to Beth Sickler, who retired in August after 33 years with Michigan Tech, 22 with MSE. We are grateful for her many years of service, and wish her well in her new projects and adventures. We are pleased to welcome Valentina O’Kane as her replacement, who has recently moved to Houghton from Stuttgart, Germany.

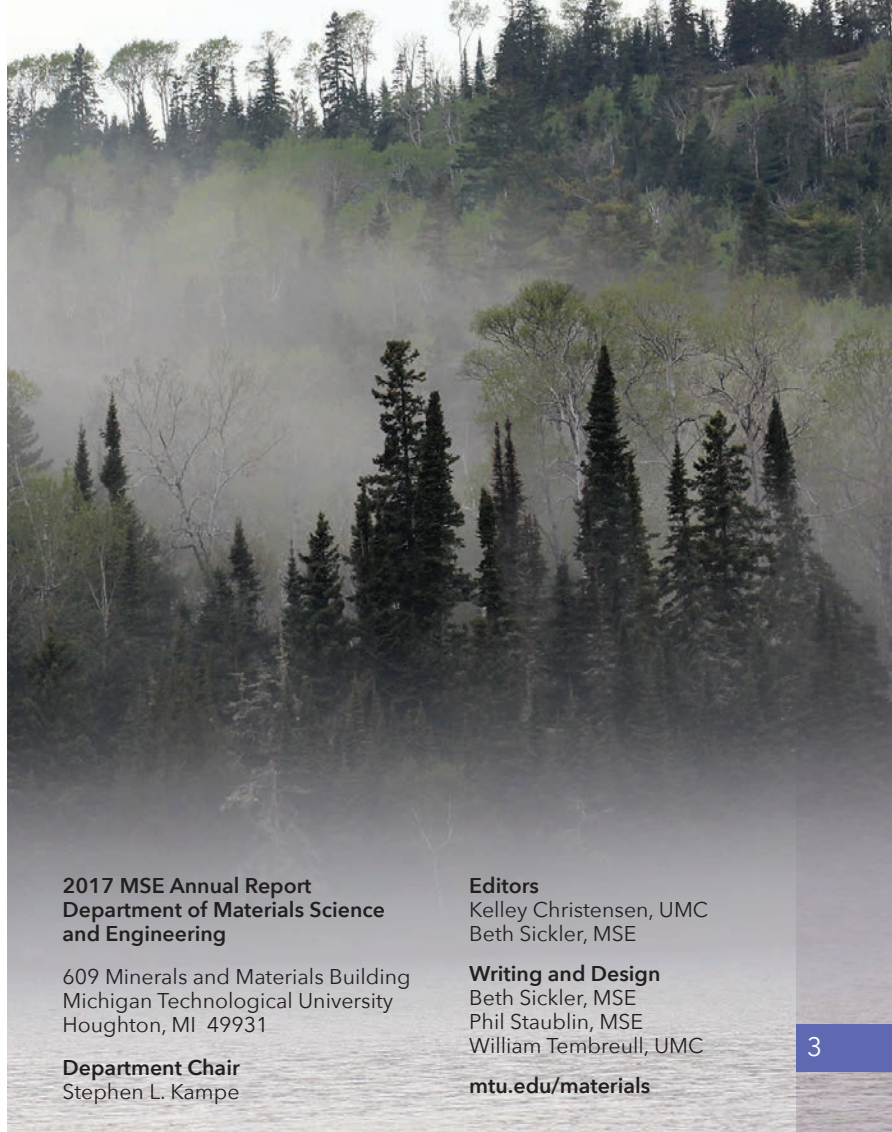
As always, I very much appreciate the support we receive from alumni and friends of the department. Your partnerships are very important to us, and have become a critical means by which we pursue our goals to ensure a top-quality educational experience for our students. Please help us keep our alumni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

mtu.edu/alumni/mymichigantech

Until next time and with sincere regards,



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



2017 MSE Annual Report
Department of Materials Science
and Engineering

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Table of Contents

4 Faculty and Staff News	13 Outreach
6 Faculty Research	14 Alumni News
8 Student News	15 By the Numbers
10 Senior Design Teams	16 Scholarships
12 Graduate Student News	



Quincy Smelter Works (pictured left; photo credit Hayden Henderson) was recently designated a Historic Landmark by ASM International. The Quincy Smelter, operated by the Quincy Mining Co. until 1972, processed native copper ore into ingots. Iver Anderson (MY '75), representing ASM International, performed the dedication.

MSE RETIREE

Department Coordinator Retires



Longtime MSE Department Coordinator **Beth Sickler** retired August 18 after 33 years at Michigan Tech, 22 with MSE.

Beth began her career at Michigan Tech in 1984 as the transcript clerk in the Registrar's Office.

"Those were the days when card-stock transcripts were kept alphabetically in file cabinets in a locked vault," she says. "My office was literally a 'hole in the

wall' where students could order transcripts.

I quickly became very familiar with a Xerox copy machine, especially trouble-shooting paper jams!"

Her eventual move to the coordinator position in MSE

proved to be beneficial for her career.

"I truly loved my job, working with the students and the ever-changing academic world," she says. "Our department is a close-knit group, just like a second family."

MSE Chair Steve Kampe says, "Beth's 22 years of service and dedication to MSE have been wonderful. Beth has been the person in our organization who one could count on to know what needs to be done and how to do it. We all would have been in big trouble without Beth to look after us."

Beth plans to eventually pursue a second career as a massage therapist, something she's always been interested in.

"But first," she says, "I'd like to enjoy a few months of retirement!"

FACULTY AND STAFF BRIEFS



Professor **Yun Hang Hu** was the 2017 recipient and co-recipient, respectively, of the Michigan Tech Research Award and the Bhakta Rath Research Award. See accompanying article on page 5.



Professor **Larry Sutter** was inducted as a Fellow of the American Concrete Institute (ACI).



Congratulations to MSE/ECE faculty member **Joshua Pearce**, who was promoted to full professor in August 2017.



Professor **Bruce Pletka** was named professor emeritus by the University's Board of Trustees at their March 2017 meeting. The emeritus title recognizes Pletka's career contributions to the University following his retirement from the MSE faculty.



Associate Professor **Jean Kampe** was appointed associate provost by Provost Jacqueline Huntoon in January 2017.



An international team led by MSE Affiliated Professor **John Jaszczak** (Physics) and Professor **Stephen Hackney** (MSE), have published the findings of their discovery of a new mineral, which they named merelaniite, in the June 2017 edition of the journal *Minerals*. Merelaniite is named for the Merelani mining district in Tanzania, a well-known locale for prized tanzanite and tsavorite minerals used in jewelry. Recently, merelaniite was named mineral of the year by the International Mineralogical Association.



Staff member **Allison Hein** and Professor **Stephen Hackney** (pictured at right) have been recognized for 25 and 30 years of service, respectively, to Michigan Tech.



Staff engineer **Tom Wood** (MY '92) was named to the 2016 class of the Michigan Tech Sports Hall of Fame. From 1989 to 1992, while a student at Michigan Tech, Tom was a four-time All American and a three-time Academic All American in nordic skiing.

See mtu.news/2sZWHiO

FACULTY AND STAFF NEWS

Department Welcomes New Supervisor for Metal Processing Labs



The MSE staff, faculty, and students extend a warm welcome to **Matt Otte**, who has joined as a staff member in MSE. Matt will supervise operations in the MSE metal processing labs—including the foundry, deformation processing lab, pattern shop, and other supporting labs. Matt replaces longtime staff member Pat Quimby, who has returned to his geographical roots in Washington state.

Matt graduated from Michigan Tech with a bachelor's degree in metallurgical engineering in 1996. He went on to complete a PhD in metallurgical engineering in 2001 at the University of Queensland in Brisbane, Australia. Most recently, he was a lead engineer for castings and enclosures for Eaton Corporation in Galesburg, Michigan. He brings more than 15 years of global industry experience to the MSE department and to Michigan Tech.

Matt is excited to promote hands-on lab work for students.

"Michigan Tech really helped change my life," he says. "Faculty and staff were really interested in mentoring me and seeing my potential even when I couldn't. If I could make a positive difference to students, that would be really rewarding."

MSE Chair Steve Kampe says, "We are very privileged to have someone as experienced and worldly as Matt to lead activities in our metal processing labs. Matt will continue a tradition of outstanding staff who serve as excellent role models and mentors to our students."

Matt plans to enjoy the natural beauty of the Houghton area, and looks forward to being outdoors, camping, biking, and being out on the water.

"There's a friendliness and a closeness in the Houghton and campus community," he says. "This was always a place that I felt I could call home."

Department Welcomes New Coordinator



Valentina O'Kane, who replaces Beth Sickler as department coordinator, was most recently a management assistant for the Defense Information Systems Agency (DISA) at the US Africa Command Headquarters in Stuttgart, Germany. She relocated to Houghton

with her husband, Lieutenant Colonel John O'Kane, who has been assigned to Michigan Tech as professor of aerospace studies and commander of the Air Force ROTC detachment. Valentina has an MA in international relations and a BS in hospitality management.

Yun Hang Hu Wins Research Award and Bhakta Rath Research Award



Yun Hang Hu won the 2017 Michigan Tech Research Award. He was also selected for the Bhakta Rath Research Award with his PhD student, **Wei Wei**.

Hu, the Charles and Carroll McArthur Professor of Materials Science and Engineering received the awards for his outstanding research achievements in advanced materials and clean energy.

The Michigan Tech Research Award, the highest research honor given at the University, commends Hu's internationally recognized work. He is well known for his contributions to nanostructured materials, memristive materials, catalysis, clean energy technology, and quantum chemistry calculations.

Hu has published more than 160 papers in journals including *Journal of the American Chemical Society*,

Angewandte Chemie International Edition, *Advanced Materials*, *Nano Letters*, *Energy and Environment Science*, and *Accounts of Chemical Research*. He has been honored by professional societies, such as the American Association for the Advancement of Science, American Chemical Society, American Institute of Chemical Engineers, UK Royal Society of Chemistry, and Materials Research Society.

The Bhakta Rath Research Award is a team effort, given annually to a PhD student-advisor duo based on the quality and significance of their work together. Wei Wei, a PhD materials science student, and her adviser, Hu, set a high bar in earning the 2017 award.

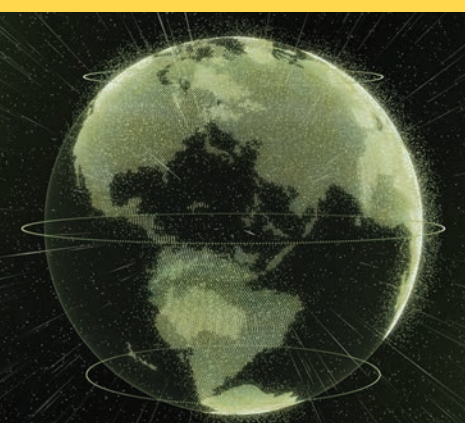
After joining Michigan Tech in 2007, Hu has supervised 26 graduate students and postdoctoral fellows, including 10 PhD students. All of his former PhD students obtained highly competitive positions, including 30 percent as faculty members at research universities around the country. Last year, his mentorship was also recognized by the Graduate Student Government's Exceptional Faculty Mentor Award.

EVERGREEN TECHNOLOGY REFORMS INDUSTRY

6



**PROFESSOR
JIANN-YANG "JIM" HWANG**



This decade, approximately \$1 trillion will be spent on environmental reforms to industry in China according to the nation's Five Year Plan released in March 2016. Roughly \$300 billion of that will be used to mitigate and remediate polluted water through 2020.

Michigan Tech MSE Professor **Jiann-Yang "Jim" Hwang** has brought some of that business to the Copper Country with the formation of Evergreen Technology in Hancock. In addition to his professorial duties, Jim serves as an advisor to the newly formed company, which seeks to partner with Michigan Tech to sponsor research and evaluate technologies for pollution mitigation.

"We have the potential to become an environmental Silicon Valley," Hwang said at the ribbon-cutting ceremony for the new research lab in

downtown Hancock. "We're changing the concept from just trying to meet regulations to engineering everything to a zero-discharge standard."

Recently China recognized Hwang as a "National Distinguished Expert" through their 1,000 Talents Award, which is meant to attract scientists and innovators who may make breakthroughs in key technologies or may enhance China's high-tech industries.

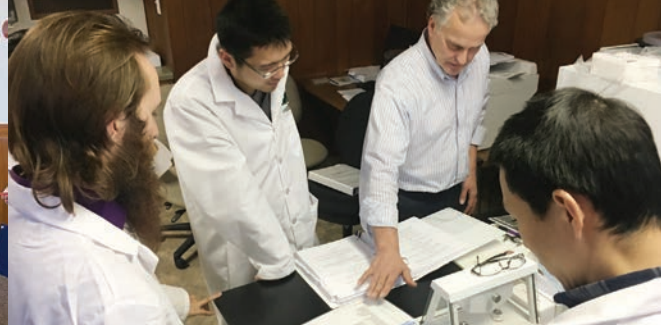
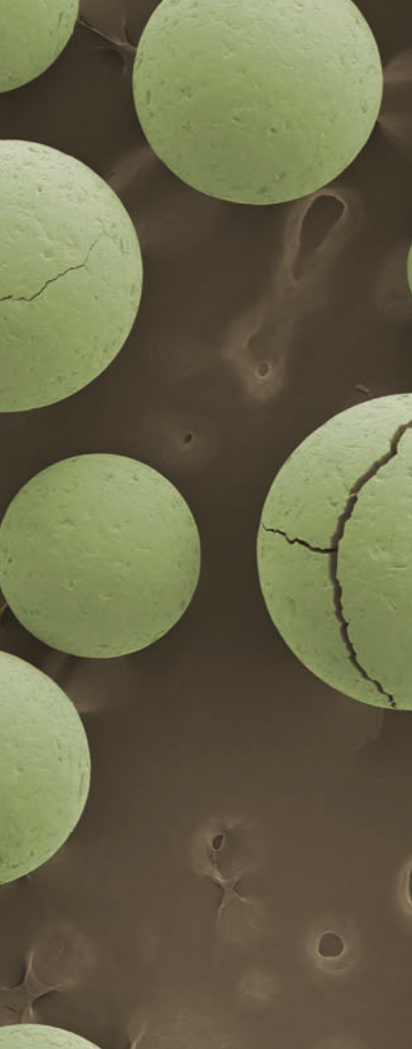
Through this program, Hwang was introduced to Futianbao Environmental Protection, Ltd., a company focused on removing heavy metal pollutants from their clients' industrial wastewater. Futianbao CEO Cuiping Huang traveled to Houghton from Xi'an, China, and was told about the region's history of addressing the environmental concerns

from its mineral and mining legacy under the leadership of Michigan Tech engineers.

"I am deeply gratified that Futianbao and Evergreen were both established with the goal of caring for our earth's water," Hwang said. "We have a vision of America and China coming together to improve the environmental conditions of both countries and to manufacture products and provide services that can have a global impact."

Hwang began consulting with Futianbao in 2000, which led to the creation of a materials research team in Hancock.

"I've been advising their researchers and engineers who are building advanced treatment facilities in China," Hwang said. "Right now we're looking at the fundamental problems related to pollution created by the electroplating industry."



RIBBON-CUTTING CEREMONY FOR NEW RESEARCH LAB.

acceptable clean production standards: coking, fertilizer and pesticide manufacturing, leather tanning, textile dyeing and finishing, electroplating, non-ferrous metal mining and processing, the paper and pulp industry, as well as food production and processing.

While strict regulations are used to reduce excessive pollution by industry in the near term, Lei said the long-term focus is to invest more in research and development to allow the economy to grow while also improving the environment.

"In pursuing the innovation-driven development strategy, China has developed and launched a plan for major science and technology programs by 2030, supported Beijing and Shanghai in building themselves into global R&D centers, and established another six national innovation demonstration zones," Lei said. "Our total trade volume exceeds \$12 billion dollars. Chinese companies have invested \$4 billion dollars and created nearly 9,000 jobs in the state of Michigan, making important contributions to local economy and employment."

Hwang believes Michigan Tech, and in particular the Department of Materials Science and Engineering, can play a major role in this emerging environmental market. Evergreen currently employs students as interns and sponsors graduate research projects.

"Many of the environmental issues that accompany manufacturing can be addressed through processing science, much of which has roots in the study of metallurgy," Hwang said. "The MSE department at Michigan Tech traces its origins to the mining and metallurgy industries and was responsible for a wealth of research that was conducted dating back to the copper era. The problem might be environmentally motivated, but the solution will be metallurgically inspired. Michigan Tech will be instrumental as one of the top metallurgical programs in the US and the world."

Jim Baker, executive director of Michigan Tech's Office of Innovation and Industry Engagement added, "Partnerships with industrial partners such as this are central to Michigan Tech's strategic goals of growth in research, scholarship, and creativity, as well as economic and social development and innovation. In the short term, students benefit from hands-on education working on projects like these with Evergreen and from learning from faculty with applied experience. Long-term societal and economic benefits also accrue from translation of the expertise into products and services available through the market to end users."

In 2015, China's new Environmental Protection Law went into effect with an emphasis on pollution control and reducing water consumption demands. Industries need to develop effective and efficient reforms to meet these goals in exchange for tax breaks, loans, and grants, or they face strict penalties for polluting.

"China stays committed to its fundamental policy of conserving resources and protecting the environment," said Consul General Hong Lei at a recent Michigan-China Forum in Ann Arbor. "President Xi Jinping has said many times that green mountains and clear water are as good as mountains of gold and silver."

The new law targets China's 10 major polluting industries for technological upgrades and emission reductions with the goal of meeting

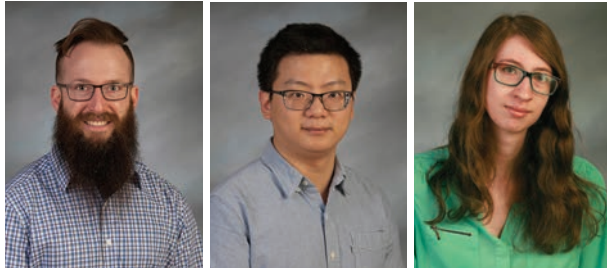


STUDENTS BENEFIT FROM WORKING ON PROJECTS LIKE THESE WITH EVERGREEN AND LEARNING FROM FACULTY WITH APPLIED EXPERIENCE.



STUDENT NEWS

Richard Shorraw Memorial and Academic Achievement Awards



At the 2017 senior banquet, **Jeffrey Brookins** and **Hao Qin** were announced as co-recipients of the 2017 Richard Shorraw Memorial Award, given for showing the greatest improvement in grade point average during their course of studies in MSE at Michigan Tech.

Also at the senior banquet, **Catherine Galligan** was presented with the 2017 Alpha Sigma Mu Academic Achievement Award for the highest GPA among graduating seniors.

Departmental Scholar



Philip D. Staublin was named the 2017-18 MSE Departmental Scholar by Provost Jacqueline Huntoon for his academic accomplishments, departmental leadership and service, and participation in undergraduate research. Recently, Philip received a McArthur Research Internship, working with Professor Jaroslav

Drelich on analyzing the corrosion behavior of bioabsorbable zinc heart stents. Philip also participates as a coach in the newly founded MSE Learning Center, supporting students in learning MSE fundamentals.

Student Awards



Kristen Bull received the prestigious Marion Semchyshen Scholarship from the Detroit Chapter of ASM International. Kristen was presented the award during a visit from MSE alumnus Eric McCarty (MY '90), the chair of the ASM International Detroit Chapter.



Four students received Detroit-Windsor AFS Chapter Scholarships. Pictured left to right: Josh Dorn (Bronze award), Jeff Brookins (Bronze award), Mackenzie Keefer (Silver award), and Julia Scruton (Gold award). The scholarships were presented by Kathy Hayrynen (MY '86 '89 '93), vice president for research and development at Applied Processes, Inc. and education co-chair and director of the Detroit-Windsor AFS chapter.

Seniors **Josh Dorn** and **Julia Scruton** were each recipients of H.H. Harris Foundation Scholarship awards in recognition of their scholastic records and involvement in the metallurgical and metal castings area of MSE.

The MSE Senior Design Team—**Georgia Hurchalla, Evan Olson, Hao Qin, and John Smith**—received third place in the 2017 Undergraduate Design Competition sponsored by the ASM Education Foundation. The team received their award at the 2017 Materials Science and Technology Conference in Pittsburgh, Pennsylvania.



The department inducted the following new members to the student chapter of Alpha Sigma Mu, the national honor society for materials engineers, at the annual banquet on April 13, 2017:

Graduate Students:

Xiaoxu Guo
Zachary Morgan
Wei Wei
Shan Zhao
Alex Poznak

Undergraduate Students:

Kristen Bull
Danielle Jencks
Daniel LaCroix
Ryan Lester
Karry Modolo
Chelsey Rock
Jacob Thompson
Joseph Vermeylen



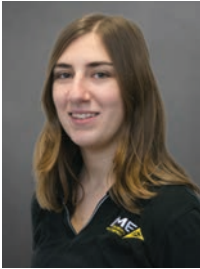
During the annual banquet on April 13, 2017, the following graduates were inducted into the Order of the Engineer:

Philip Bednarczyk
Jeffrey Brookins
Joshua Cicotte
Dylan Cromell
Janine Erickson
Catherine Galligan
Benjamin Gruber
Peter Hokemeir-Seim
Emily Hunt
Wyatt Hurst
Victoria Keerl

Kylie Lettow
Erin Neil
Evan Olson
Anna Polk
Hao Qin
Julia Scruton
Cameron Smith
John Smith
Violet Thole
Jonathan Vajko
Zachary Verran

STUDENT NEWS

Advanced Metalworks Enterprise Update



Enterprise at Michigan Tech adds value to the student experience by providing exposure to real industry problem solving. The Advanced Metalworks Enterprise (AME) offers a variety of metallurgical manufacturing projects for teams of three to five students. Membership on an AME team helps students build a resume, develop teamwork skills, form professional

relationships with faculty and company representatives, and gain a general sense of what to expect in the workforce.

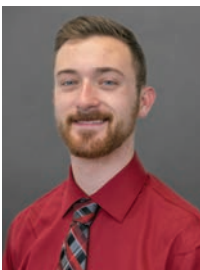
During the 2016-17 school year, General Motors, ArcelorMittal, Eck Industries, Mercury Marine, Steel Market Development Institute, and Lightweight Innovations for

Tomorrow sponsored projects. Some examples of these projects include optimizing hot-stamp processing of ultra-high strength steel, understanding effects of grain refinement and silicon modification on feeding efficiency of 3xx series aluminum alloys, investigating inconsistencies in mechanical bending properties of chassis components, and innovating a method of rapidly prototyping expendable patterns that can be integrated into the current lost foam casting process.

Some of these projects were completed, while others will continue in the 2017-18 school year. I look forward to seeing the new advancements in metallurgy made possible by student involvement in AME.

—**Mackenzie Keefer**, AME President

Materials United Update



Greetings! My name is **Josh Dorn**, and I am the 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 Salt Lake City, Utah, as well as AISTech in Nashville, Tennessee.

These events give students a chance to engage with professionals in world-class settings. MU student members participated in several AFS-sponsored casting competitions. MU also organized the departmental engineering exploration open house, giving new students a look at 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 Gerdauc recruiters.

This year we traveled to MS&T in October and look forward to traveling to 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 jjdorn@mtu.edu. Thank you from all of us in Materials United for your continued interest and support.



The Intersection of Art and Science

In short:
This is the hair of the tick that bit you.

Jeff Brookins, a MSE master's student advised by Professor Jaroslav Drelich, captured this image of a tick's leg hair during a departmental open house. In order to minimize the negative effects of electron beam charging on the sample, the tick was sputter-coated with a thin layer of Pt/Pd, allowing it to be imaged on ACMAL's JEOL JSM-6400 scanning electron microscope at 15kV. Afterward, post-processing was used to artistically add color.

This micrograph, titled "Standing Alone," placed as a runner-up in JEOL's 2016 SEM/TEM/EPMA Image Contest.

SENIOR DESIGN TEAMS AND SPONSORS



STEERING RACK RESIDUAL STRESSES

Team: John Gatewood, Anthony Orza, Matt Pscheid
Advisor: Ed Laitila
Sponsor: ZF TRW Automotive Holdings; Brian Munn, liaison



BASALT FIBER REBAR DURABILITY

Team: Daniel Casciani, Connor Knudson, Bryan Stout
Advisor: Paul Fraley
Sponsor: Neuvokas Corporation; Matt Kero, liaison



ALUMINUM EXTRUSION CORROSION

Team: Phil Bednarczyk, Josh Cicotte, Janine Erickson, Violet Thole
Advisor: Dan Seguin
Sponsor: Ford Motor Company; Daniel Freiberg, liaison



MODIFICATION & GRAIN REFINEMENT EFFECTS ON FEEDING CAST ALUMINUM

Team: Georgia Hurchalla, Evan Olson, Hao Qin, John Smith
Advisor: Tom Wood and Advanced Metalworks Enterprise (AME)
Sponsor: Eck Industries; David Weiss, liaison



GE
Aviation

MACHINING OF 3D-PRINTED COBALT-CHROMIUM ALLOY

Team: Jeff Brookins, Ben Gruber, Emily Hunt, Zachary Verran
Advisor: Walt Milligan
Sponsor: GE Aviation; Howard Weaver, liaison



HIGH PRESSURE DIE CASTING VENT CHANNEL OPTIMIZATION

Team: Stephen Hanley, Kassia Prystalski, Julia Scruton
Advisor: Russ Stein and AME
Sponsor: Mercury Marine; David Blondheim, liaison



ALUMINUM CONDUCTOR GALVANIC CORROSION

Team: George Castle, Catherine Galligan, Emily Petersen, Jonathan Vajko
Advisor: Doug Swenson
Sponsor: Yazaki N.A.; Ajay Singh, liaison



TIRE TREAD CRACKING

Team: Wyatt Hurst, Tori Keerl, Kylie Lettow, Peter Hokemeir-Seim
Advisor: Erik Herbert
Sponsor: Ford Motor Company; Janice Tardiff, liaison



PERFORMANCE SPEEDBOARD

Team: Trent Pietila, Tyler Rick
Advisor: Ibrahim Miskioglu (MEEM)
Sponsor: Boardsports Technology Enterprise

STUDENT NEWS

ASCE Concrete Canoe



Michigan Tech's Concrete Canoe team took first place in the American Society of Civil Engineers' 2016 North Central student competition at Michigan State University. Professor **Larry Sutter** serves as the advisor for the Concrete Canoe Team.

2017 Congressional Visits Day



Four undergraduate students from Michigan Tech and MSE Chair **Steve Kampe** visited Washington, DC, in April for the Material Advantage Congressional Visits Day (CVD). The purpose of CVD is to advocate federal support for the physical sciences, and to share personal stories illustrating the importance of the support. Representing the State of Michigan and shown (left to right) is Professor Kampe and students **Violet Thole**, **Emily Hunt**, **Jeff Brookins**, and **Philip Staublin**. The delegation attended meetings in the offices of Michigan Senators Gary Peters and Debbie Stabenow, and in the offices of Representatives Justin Amash, John Conyers, David Trott, and Jack Bergman. All four students are involved in undergraduate research programs in Materials Science and Engineering at Michigan Tech.



AFS Wisconsin Regional Invitational Casting Competition

A team from the Michigan Tech student chapter of the American Foundry Society (AFS) participated in the AFS Wisconsin Chapter Regional Casting Competition. The team, led by **Julia Scruton**, designed a process to cast the "three-ring circus" (three interlocking rings, each made from a different material). The investment-cast part was created by simultaneously pouring brass, aluminum, and gray iron. Students brought their casting to the AFS Wisconsin Chapter Regional Conference, where it took third place in the competition. Pictured above (left to right) above are team members **Julia Scruton**, **Chris Pflug**, **Ben Peterson**, and **Phil Bednarczyk**, along with advisor **Joe Licavoli**.

GRADUATE STUDENT NEWS

2016-17 Graduate Degrees

Name	Degree	Faculty Advisor	Thesis/Dissertation Title
Tai-Wei Chiu	MS	Stephen Hackney	Non thesis
Rachel Clark	MS	Paul Sanders	Heat Treatment of 4943 Aluminum produced by GTAW- and GMAW-based Additive Manufacturing
Kyle Deane	PhD	Paul Sanders	Investigation and Modeling of $Al_3(Sc, Zr)$ Precipitation Strengthening in the Presence of Enhanced Supersaturation and Within Al-Cu Binary Alloys
John Laureto	MS	Joshua Pearce	Utilizing Reprap Style 3D Printers for the Manufacturing of Composite Heat Exchangers
Mingyang Li	MS	Yu Wang	Nonlinear Dielectric Behavior of Field Induced Antiferroelectric/Paraelectric-to-Ferroelastic Phase Transition for High Energy Density Capacitor Application
Qianli Ma	MS	Yun Hang Hu	Ball-Milling Tuned Band Structures of ZnO Nanoparticles
Cameron McNamara	PhD	Stephen Kampe	Thermomechanical Processing of Aluminum Micro-Alloyed With Sc, Zr, Ti, B, and C
Alex Poznak	PhD	Paul Sanders	The Influence of Prior Natural Aging on Artificial Age Hardening in Al-Mg-Si Alloys
Shyam Sanjeevi	MS	Stephen Hackney	Non thesis
Avishan Shomali	MS	Jaroslav Drellich	Formulation and Testing of Biodegradable Polymeric Coating on Zinc Wires in Cardiovascular Stent Application
Kai Chun Tung	MS	Stephen Hackney	Non thesis
Dafu Wang	MS	Yun Hang Hu	Food Dyes Based Dye-Sensitized Solar Cells
Karl Warsinski	MS	Paul Sanders	Evaluation of Thermal Stability of Ausferrite in Austempered Ductile Iron using Differential Scanning Calorimetry
Wei Wei	PhD	Yun Hang Hu	Highly Efficient Electrode Materials and their Applications in Solar Cells
Xuechen Wu	MS	Yun Hang Hu	Beta-Cobalt Sulfide Flower-Like Microspheres Decorated Activated Carbon Composites for Capacitive Deionization
Yang Yang	MS	Stephen Hackney	Non thesis
Chenlong Zhang	PhD	Joshua Pearce	Nanosphere Lithography and its Application in Rapid and Economic Fabrication of Plasmonic Hydrogenated Amorphous Silicon Photovoltaic Devices
Yuhze Zhang	PhD	Jiann-Yang Hwang	Plating Wastewater Treatment
Shan Zhao	PhD	Jaroslav Drellich/ Jeremy Goldman	Structural Characteristics and Corrosion Behavior of Biodegradable Zn-Li Alloys in Stent Application
Shan Zhong	MS	Joshua Pearce	Tightening the Loop on the Circular Economy; Distributed Plastic Recycling with an Open Source Recyclebot

Graduate Student Recognitions

PhD student **Wei Wei** was recognized as a co-recipient, with her advisor Professor **Yun Hang Hu**, of the Bhakta Rath Research Award (see article on page five). Wei also received the Exceptional Graduate Student Scholar award at the 23rd annual University Student Awards ceremony in April.

Incoming PhD student **Violet Thole** (BS MSE '17) received an Honorable Mention Graduate Research Fellowship from the National Science Foundation.

Jephias Gwamuri and **Shan Zhao** were selected as the fall and spring semester recipients, respectively,

of the MSE Outstanding Graduate Scholarship Awards, sponsored by Graduate Student Government (GSG) council.

Prasad Soman was elected as MSE's representative on the GSG council for the 2017-18 academic year.

Incoming MS student **Jeff Brookins** received an Honorable Mention award in a micrograph competition sponsored by electron microscope manufacturer JEOL. See accompanying story on page 9.



MSE and Summer Youth Programs

The MSE department continues to be involved in the Michigan Tech Summer Youth Programs (SYP); this year MSE participated in Women in Engineering, the Engineering Scholars Program, and Explorations in Engineering. Middle and high school students from

across the country attended MSE activities as part of SYP this past summer. Students learned about materials science concepts through casting, blacksmithing, 3-D printing, forming shape memory materials, and making liquid nitrogen ice cream.



Materials United Volunteers at Western UP Science Fair

The Materials United student group participated in the 19th annual Western Upper Peninsula Science Fair on March 16, 2017. Materials United volunteers walked young students through the mold-making and tin-casting process using the Karl Rundman Foundry-in-a-Box demonstration kit.

In addition, the “bobby pins and blow torches” demonstration was used to show the effect of heat treatment on strength and ductility of steel. Pictured above is Materials United President **Josh Dorn** coaching middle school students in packing their green sand molds.

ALUMNI NEWS

Congratulations Class of 2017!

MSE's newest alumni, pictured here just before 2017 Spring Commencement: Front row (left to right): Josh Cicotte, Violet Thole, Hao Qin, Janine Erickson, Kylie Lettow, Georgia Hurchalla. Back row (left to right): Wyatt Hurst, Peter Hokemeir-Seim, Catherine Galligan, Emily Petersen, John Smith, Tyler Rick, Jeff Brookins, Dylan Cromell, Ben Gruber, Anna Polk, Tori Keerl. Not pictured are spring 2016 graduates Trent Pietila and Jonathan Vajko; and fall 2016 graduates Brian Brook, Tyler Brose, Dan Casciani, John Gatewood, Connor Knudson, Anthony Orza, Bryan Stout, and Nate Wickliff.



EAB and FEF Boards



MSE's External Advisory Board (EAB) and Foundry Education Board (FEF) met in April to review department activities, attend the capstone senior design presentations, and to participate in Design Expo. EAB members attending were (left to right) Brian Munn, ZF TRW (MY '85); Danielle Rickert, Carpenter Technology (MSE '04); Greg Ojard, Pratt & Whitney (MSE '86 '88); Elizabeth Pilibosian, GM; Daniel Freiberg, Ford (MSE '14); MSE Chair Steve Kampe; Professor David Bahr, Purdue University;



Robert Aikin, Los Alamos National Lab (MY '83 '87); Kevin Baker, Beaumont Health Systems (MSE '04); and Shannon Larkey, ArcelorMittal (MME '99).

Attending as Michigan Tech's FEF Board (right) were (pictured left to right) Matt Meyer, Kohler (MME '98); Kathy Hayrynen, Applied Processes Inc. (MY '86 '89 '93); special guest Stephen Pardus, MAGMA; Rick May, Cadillac Casting (MY '95); and Joe Keske, Waupaca Foundry (MME '97).



Alumni Association Awards

MSE alums **Kevin Baker** (left, MS MY '04), and **Paul Mikkola** (right, BS MY '66), were recipients of the 2017 Michigan Tech Outstanding Young Alumni and Outstanding Alumni Service awards, respectively, presented during Alumni Reunion in August 2017.

ALUMNI NEWS 2016-17

Raymond Smith, former Michigan Tech president and metallurgy department chair, celebrated his 100th birthday in January.

Bhakta Rath (MS MY '59) received the Medal for the Advancement of Research by the board of trustees of ASM International.

Melissa Baumann (MY '83) was named provost at Xavier University in Cincinnati.

Margaret (Bush) Flury (MSE '05) was featured in a Women in Engineering highlight in the May/June 2017 issue of *Advanced Materials & Processing*, published by ASM International.

See mio.asminternational.org/amp/201704/#72

Iver Anderson (MY '75) was inducted into the International Inventors Hall of Fame in Washington, DC, in April, in recognition of his role in the creation of a lead-free solder. Anderson was also a 2017 recipient of the Metal Powder Industry Foundation (MPIF) Service Award.

Wayne Heili (MY '88) has been appointed CEO and managing director at Peninsula Energy Limited, a world-wide uranium mining company.

Boyd Mueller (MY '82) was recognized with the Distinguished Achievement Award by the College of Engineering at the University of Wisconsin, where he received MS and PhD degrees.

Kathy Hayrynen (MY '86 '89 '93) was named vice president of research and development for Applied Process, Inc. in March. Applied Process is a world leader in austempering technology.

Beverly Aikin (MY '86 '88) was inducted as a Fellow of ASM at the ASM awards banquet at the Materials Science & Technology (MS&T) conference in October 2016.

Gary Shiflet (PhD '81) has been named program director for the Mathematical and Physical Sciences (MPS) and the Metals and Metallic Nanostructures (MMN) Program within the Directorate of Materials Research (DMR) at the National Science Foundation (NSF).



BY THE NUMBERS

Faculty Honors/Awards

- 7 professional society fellows
- 3 endowed professorships
- 1 faculty (emeritus), National Academy of Engineering
- 2017 Michigan Tech Research Award recipient
- 2017 Bhakta Rath Research Award recipient



FACULTY/STAFF

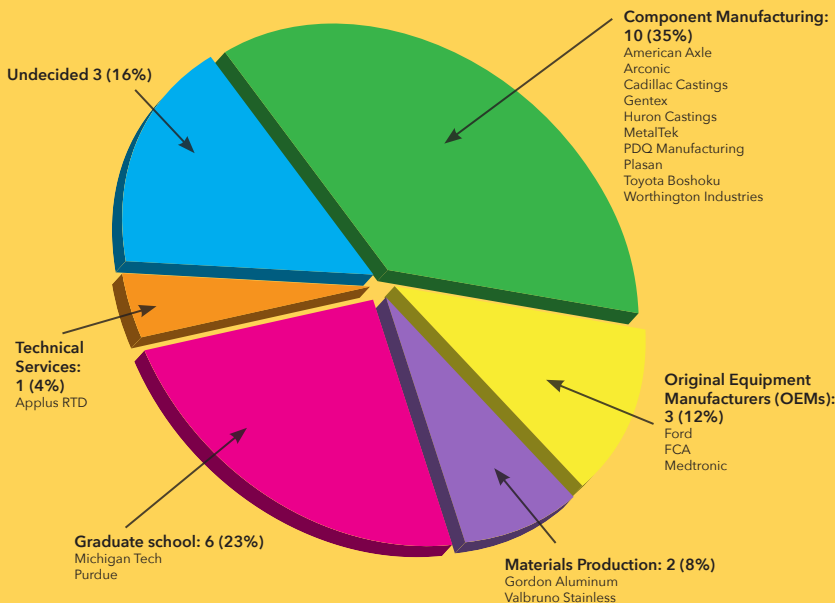
- 16 tenure/tenure-track faculty
- 7 research faculty
- 12 technical staff

15

2016-17 GRADUATES

BS graduates	26
MS graduates	13
PhD graduates	7

CLASS OF 2017 PLACEMENT



2016-17 ENROLLMENT

Undergraduates	146
Graduates	41
(22 MS, 19 PhD)	

RANKINGS:

US News and World Report (USNWR) ranked the PhD program 54th nationally in 2017

USNWR ranks MSE **273rd** in the world for global impact

External research expenditures in FY17 **\$2.9 MILLION**



**Michigan
Technological
University**

Materials Science and Engineering
Minerals and Materials Engineering Building, Room 512
1400 Townsend Drive
Houghton, MI 49931-1295

SCHOLARSHIPS

MSE Endowed Scholarships: Alumni Honors (Part II)



Endowed scholarships are a meaningful way to acknowledge the role Michigan Tech has played in one's career and quality of life by passing along financial assistance for future students and generations. Endowments can be established for many purposes, such as assisting students with their education or providing the department with funds for equipment, facilities,

or infrastructure. The following scholarships have been created explicitly for MSE students through endowments from department alumni and their families. The previous edition of this report featured six scholarships named in honor of the alumni benefactor.



**John Biffl Endowed
MSE Scholarship**
John Biffl (MY '58)

Dennis and Barbara Staley Endowed MSE Scholarship
Dennis Staley (MY '57)

Dr. Harry Suprinick Memorial Scholarship
Harry Suprinick (MY '51)

James N. Wessel Metallurgy Endowed Scholarship
James Wessel (MY '33)



**Moses and Mary Levinstein
Endowed MSE Scholarship**
Moses Levinstein (MY '40)

Thomas P. Posten Endowed MSE Scholarship
Thomas P. Posten (MY '75)

Kenneth and Mary Brickner Endowed MSE Scholarship
Kenneth Brickner (MY '56)

William and Sharon Duca Annual Fund Scholarship
William (MY '60) and Sharon Duca (Eng Phys '62)

(yearbook photos unavailable)

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

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