

# ME Bulletin

News for  
Mechanical  
Engineering Majors

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LINDSAY NIESEN

*New ME chairperson, Dr. James Klausner, receives a big MSU welcome when he finds his office filled with green and white balloons, compliments of the ME staff! Read about Dr. Klausner on page 3.*

Smell the Barn! by Professor Ron Averill, ME Associate Chair



When farm animals return home after a long day of grazing or working in the fields, there is a sense of heightened anticipation as they get close enough to smell

the barn. Perhaps it is the aroma of fresh hay or the warm feeling of a familiar place. Whatever the reason, most animals pick up speed as they approach the barn. They have a renewed energy.

As we approach the end of another semester and another academic year, are you picking up speed? Perhaps you are graduating soon. How's your energy?

It is not unusual to start feeling overloaded at this point and to think to yourself, "I hope I can just get through this semester!" Getting through may seem like a good option; it is probably better than not getting through. But in the long run, just getting through is definitely not in your best interest.

You see, getting a diploma is not the goal. The goal is to acquire the knowledge and skills upon which you can build a successful career. Getting through usually means shortchanging this goal.

The trajectory of your engineering career will depend on how much value you provide to your company, and how much value you are able to contribute depends on what you know (not who you know).

So take a deep breath, and then develop a plan to accelerate your career by mastering the fundamentals of engineering this semester. Be sure to include some sleep and exercise in that plan, and maybe even a little bit of fun.

Finish strong. Smell the barn!

Department News



•**Dr. John Foss** retired last May after more than 50 years on the ME faculty. Dr. Foss joined the ME faculty in 1964 and received his Ph.D. from Purdue University

in 1965. He has taught and conducted research in fluid mechanics, turbulent shear flows, vorticity measurements, and fluids engineering. Dr. Foss was the Director of the Study Abroad Program in Aachen, Germany for many years.

•**Dr. Alex Diaz** has rejoined the ranks of the regular ME faculty after more than 6 years as ME chairperson. Dr. Diaz is currently on sabbatical at the



Technical University of Denmark (DTU) where he is he pursuing research in the areas of additive manufacturing and nonlinear vibrations and energy man-

agement with applications in sensors and MEMS.



•**Dr. Farhang Pourbogrart** has left MSU and joined the Ohio State University faculty as a professor with a joint appointment in the Integrated Systems Engineering Department

and the Department of Mechanical and Aerospace Engineering, working closely with the Center for Design and Manufacturing Excellence (CDME).



•**Dr. William Resh** has joined the ME department as a professor. This semester he is teaching a senior elective, ME 491/603-Automotive Noise and

Vibration and ME371- Mechanical Design 1. He received his Ph.D. from MSU in 1984, and worked at Chrysler (currently Fiat Chrysler Automobiles) for 31 years until his retirement in 2015. While at Chrysler, Dr. Resh held a number of positions in test laboratories, computer aided engineering

ME Bulletin

The ME Bulletin is published twice a year (fall & spring) for sophomores, juniors, seniors, faculty, and staff of the Department of Mechanical Engineering. Photographs were taken by Craig Gunn unless noted otherwise.

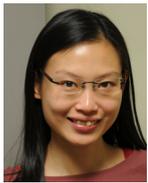
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## ME Department Welcomes New Chairperson!

(CAE), and design release organizations. Most recently he was senior manager of Powertrain Virtual Analysis. His interests include dynamic systems, noise and vibration, engines and propulsion systems, and integrated systems design and development. Dr. Resh is a licensed professional engineer who has four patents and numerous publications. He has received many awards including the 2014 MSU ME Distinguished Alumni Award. In his spare time, Dr. Resh enjoys the application of physics and design to music and cycling.



•**Dr. Junlin Yuan** has joined the ME department as an assistant professor. She received her Ph.D. from Queen's University in Canada in 2015. Her research interests include turbulence simulations and modeling, transition and separation control, and fluid-structure interaction. Flow physics interpreted from large-scale simulations are used to develop and improve turbulence models in realistic scenarios in engineering, environmental and biological flows. In her spare time, she enjoys traveling, pencil sketching, and singing alto in a choir.



•**Dr. Tamara Reid Bush's** ME 497 students were featured in the *Smithsonian* magazine. The team, consisting of **Sean Hughes, Stephanie Jones, Krista Oldham, Davis Trapp and Zachary Tuller**, went door-to-door to discover products their community wanted, then together designed and built a prototype. The Go Ramp is a wheelchair that carries its own ramp for traversing small obstacles. Harnessed to the rear of the chair, the ramp can be lifted up and over the user's head, then positioned against a curb or stair to be mounted. After going over the ramp, the ramp can then be hooked back into its start position on the back of the chair. The team hopes a future design will have a self-reloading



**Dr. James Klausner** joined the ME department in January as our new chairperson. He comes to us from the University of Florida where he was an Ebaugh Endowed Professor. He was a Program Director at the U.S. Department of Energy, ARPA-E for three years. He is a past chair of the ASME Heat Transfer Division and is currently serving on the ASME Technology Advisory Panel.

Dr. Klausner received his Ph.D. from the University of Illinois Urbana-Champaign in 1989. His research interests focus on thermal, chemical, and fluid transport in a variety of applications including, energy, processing, thermal management, desalination, powder flow, cryogenics, and bioengineering. He has done extensive fundamental work on the dynamics of phase change phenomena, including nucleation and bubble dynamics. He is very interested in sustainable

ramp, as well as be built with lighter composite materials. ME 497- Biomechanical Design is taught each spring semester along with with MKT 420- New Product Design & Development (Instructor: **Dr. Hang Nguyen**). The marketing and engineering students work in teams to develop marketable products. ME 497 is a design intensive senior elective.



PHOTO PROVIDED BY DR. REID BUSH

engineering processes and is currently working on using sunlight, water, recycled CO<sub>2</sub>, and biomass as possible inputs to thermochemical reactors for synthetic fuel production, such as hydrogen and higher order hydrocarbons as the output. Highly concentrated solar radiation is used to drive high temperature thermo-chemical conversion processes. He is also working on using low grade waste heat and un-concentrated solar energy for low temperature desalination. He has developed a number of phase-change thermal management processes that operate at unprecedented heat fluxes. He has a strong interest in light metals processing and energy efficient advanced manufacturing. He has nine patents and copyrights that resulted from his research work.

Dr. Klausner enjoys sports, and indeed his first purchase after arriving in Michigan was a pair of skis! He also loves music, mostly rock, and he plays both acoustic and electric guitar.



### IAH/ISS Diversity Requirement

Each IAH and ISS course emphasizes a form of diversity: national diversity (designated "N" at the end of the course title), international and multicultural diversity (designated "I" at the end of the course title), or both (designated "D" at the end of the course title). *Students must include at least one "N" course and one "I" course in their Integrative Studies programs. A "D" course may meet either an "N" or an "I" requirement, but not both.*

## 140 Seniors to Graduate in May and August!

Congratulations and best wishes to all ME graduates! On behalf of the faculty, I wish you the greatest happiness and success in your careers, graduate studies, and personal lives. The following students had applied for graduation by March 3. If your name is missing, please contact me immediately at [griffore@egr.msu.edu](mailto:griffore@egr.msu.edu) (Tele: 517-355-3338). —Gaile

### May Graduates

Zachary Richard Abbott  
Nickolas Charles Aguayo  
Alexandria Marie Allman  
Bashaier Hussein Alsinan  
Katherine Perry Arends  
Jason Matthew Avedesian  
Eric Michael Bargiel  
Maxwell Rinehart Bennett  
David Richard Bernier  
Ryan Gary Blancke  
Julia Marie Briggs  
Eric Nicholas Buday  
Evan Noah Bushman  
Naomi Grace Carlisle  
Bingchen Chi  
Alvin Samuel Chiang  
Nick James Chocko  
Lindsay Marie Clark  
Brian Joseph Cobus  
Daniel James Cornelius  
Curtis Gerald Coscarelly  
James Charles Cuthbert  
John Thomas Danielson  
Stephanie Renee DeJong  
Lucia Teresa DelVillano  
Michael Joseph Doa  
Dominique Michele Dubay  
David Neil Dudley  
Max Joseph Dunigan  
Nathan Stanley Fedewa  
Taylor Renae Forbush  
Patrick Louis Frahm  
Brice Edward Furr  
Rachel Lynn Geary  
Elizabeth Gojcaj  
Junhun Gong  
Shannon Paul Grace  
Andrew Jacob Gregg

Chase N Gunderud  
Shaoyu Han  
Richard Allen Harrington  
Akiem Alexander Harshman  
Blake Steven Hatherley  
Reace Michael Head  
Zackary Thomas Hickman  
Rachel Marie Horstman  
Peter Noel Howes  
Dingyu Hu  
Matthew Stephen Igo  
William Ning Kang  
Yash Ajit Kankaria  
Tyler Aaron Karp  
Matthew James Klooster  
Matthew Edward Knudtson  
Anthony Paul Kobak  
Horitsu Bruno Junior Kubata  
Kathleen Marie Landwehr  
Qin Liu  
Steven Andrew Lund  
Vikram Abhay Mandelia  
Leo Thomas McLaughlin  
Evan Kristopher Meier  
Tim Mijsbergen  
Paul R Miller  
Hiroya Miyoshi  
Connor C P Montgomery  
Melanie Lynn Mullett  
Jessica Anne O'Brien  
Sarah Ecker Parsons  
Harsh C. Patel  
Sapan Ashokbhai Patel  
Gregory Ross Peterson  
Zhi Hong Phuah  
Steven Patrick Price  
Jacob William Pusheck  
Quinn Joel Putt

Charles Edward Pynnonen  
Jinyang Qiu  
Gerald Robert Rivkin  
Lance Alan Roth  
Benjamin Michael Rowley  
Stephen Jacob Saksa  
Joseph Peter Savage  
Nicholas Myrton Scibilia  
Abhimanyu Singh  
Philip Andrew Skinkle  
Andrew Keith Slatin  
Aaron Brodsky Smith  
Tim Richard James Smith  
Logan Mcclary Springgate  
Andrew Phillip Stanny  
Haocheng Sun  
Matthew Gilbert Sutter  
Alexander Robert Taylor  
Lee Alexander Teasley  
Cody Douglas Thon  
Davis William Trapp  
Zachary Louis Tuller  
Aleksandr G Vartanian  
Jason Henry Vismara  
Dominic Anthony Waldorf  
Eric J Waldron  
Hengyu Wan  
Haoyu Wang  
Robert Allen Warfield  
Elisabeth Rose Warner  
Ian Maitland Waugaman  
Michael Richard Wicker  
Kevin David Wilberding  
Renee Leigh Wirsing  
Benjamin M M Yancho  
Nicholas M Youngerman  
Tingyuan Zhang  
Robert Kyle Zuerlein

### August Graduates

Abdulrahman Alsuwaylim  
Nadia Amira  
Miriam Waithera Chege  
Yu Chen  
Andrew James Crechiolo  
Laura Gumpfer  
Zhanying Hu  
Jiwen Huang  
Axel David Ivers

Jennifer Elizabeth Jones  
Joseph Paul Latorre  
James Leung  
Haochen Li  
Ying-Hung Lou  
Matthew David Marchetti  
Hayden William May  
Natasha Naveen Mital

Robert Lee Morgan  
John Mccafferty Neidhart  
Casey John Palanca  
Prateek Prasad  
Sean Robert Raymor  
Michael Steven Schwartz  
Nicholas George Vukov  
Yucheng Wang  
Yifan Zhao

## Curriculum News

**Co-op Students:** Before you leave for your Summer or Fall 2016 co-op rotation, please be sure to discuss your schedule for next Fall 2016 / Spring 2017 with your academic advisor.

► **CSE 231—Intro to Programming I** is replacing EGR 102 in the ME program effective Fall 2016. However, current students who have taken, or are taking, EGR 102, may waive the new requirement. If you have a question about your situation, please consult your academic advisor.

► **ME 300—Professional Issues in Mechanical Engineering** is a new requirement for students admitted to ME for Fall 2016 and thereafter. Previously admitted ME students are strongly encouraged to take this 1 credit course.

► **ME 391—** Effective Fall 2016 the prerequisite for this course has been changed from (MTH 235) to (MTH 235 and CSE 231). Students who took EGR 102 prior to the prerequisite change are eligible for a prerequisite override. To request an override, submit the ME Override Request form: <http://www.egr.msu.edu/me/form/me-override-request>

► **ME 433—Intro to Computational Fluid Dynamics** (3 credits) is a new senior elective for spring, although it has previously been taught as ME 491. ME 433 will be offered every spring semester.

► **Biomedical Concentration—** Effective Fall 2016, the Biomechanical Concentration will be called the Biomedical Concentration.

► **New Concentrations—** Three new concentrations have been added to the ME program: 1) Automotive Powertrain, 2) Computational Design, and 3) Energy. A detailed handout for each new concentration can be found on the ME website and on the rack outside the ME Advising Office.

**ME 481—ME Design Projects** requires *department approval* before you

can enroll. If you have an accurate long-term schedule on file in the ME Advising Office, request approval by submitting the ME 481 Approval Form: <http://www.egr.msu.edu/me/form/me481-approval-form>. If you do not have an accurate long-term schedule on file, schedule an appointment with Gaile by calling 355-3338 or stopping by 2560 EB.

**ME 489–Technical Communications** (2 credits) is on the spring schedule. Instructor: **Craig Gunn**, ME Director of Communications. *This course is an Other Elective. It is not a Senior Elective.*

**ME 491/001–Humanitarian engineering** (3 credits) will be offered Fall 2016 as a design intensive Senior Elective. See page 14 for more information.

• **ME 491/602–Biomechanical Analysis of Human Movement** will be offered Fall 2016. It will count as a non-design intensive senior elective, and it will apply to the Biomechanical (Biomedical) Concentration. See page 14 for more information.

**ME 491/603–Automotive Noise & Vibration** (3 credits) will be offered Spring 2017 as a non-design intensive Senior Elective. For more information, see page 15.

**Class Standing.** ME juniors and seniors can obtain this information in 2560 EB. Sophomores should go to W-8 Wilson. Be prepared to show your MSU I.D.

**Job Search Advice:** The Center is available to answer questions about your job search. To ask a question or schedule an appointment, go to 1340 EB or call 517-355-5163. Or, you can email the office at: [careers@egr.msu.edu](mailto:careers@egr.msu.edu)

**Prerequisites:** The ME department expects all students, *including members of the Honors College*, to observe all course prerequisite requirements. If you have a question about prerequisites, contact the ME Advising Office.

## Did You Ever Think about Going to Graduate School?

By Dr. Tamara Reid Bush

There are several good reasons to consider earning an advanced degree:

- **Higher salary.** Engineers with advanced degrees earn more money than those with BS degrees only. According to the National Association of colleges and Employers (<http://www.naceweb.org/uploadedFiles/Content/static-assets/downloads/executive-summary/2016-january-salary-survey-executive-summary.pdf>) entry pay for an MS in engineering is about \$10,000 more than that of a BS. So an MS pays for itself in a few years. PhD entry salaries go up even further. Not only that, but you can get paid to attend grad school. That's right! Many of our PhD students qualify for teaching or research assistantships. An assistantship covers a student's tuition, health care, and a salary, which together can have a value of over \$35,000 per year.

- **You can enter the PhD program right after graduating with your BS degree.** This is called a direct admit program, and students can earn a PhD in 4-5 years. For a MS degree, students can dual-enroll during the last year of their undergraduate program, and complete a MS (coursework only version) with only 1-1.5 years after their BS.

- **Job Quality.** On the whole, the engineers with advanced degrees have more interesting and creative jobs. An advanced degree puts an engineer in positions of greater leadership, and therefore enables an engineer to have more say in his or her responsibilities. Thus, an advanced degree is an effective way to propel an engineer into a flourishing career. If a research oriented career sounds attractive, a PhD may be the way to go.

- **Grad school is fun.** The graduate school experience is a bit different from that of the BS degree. There is a little less emphasis on lectures and exams, although those are still a strong part of the program. But a graduate student also has a chance to do a great deal of research and a little teaching. Most MS students, and all PhD students, do a thesis, whereby the student is involved in a long term project to investigate and discover aspects of a problem associated with areas such as health, automotive, nano-device, manufacturing, composites, etc. Student researchers are members of teams in laboratories, building relationships with their fellow graduate students and their faculty advisors. It usually turns out to be a very meaningful time in a person's life.

- **Prepare now for graduate school.** Graduate school is a scholarly activity, and to get admitted and to earn an assistantship, it is important to show evidence of scholarly potential and a high level of motivation. So do your best with your coursework, and get good grades. Get connected. As you develop interest in certain technical areas, identify faculty who do research in those areas, and talk to them. Volunteer to help in their research group. Seek paid undergraduate research projects or stay for a summer and participate in the EnSure program (a summer internship program on campus). Applications for graduate school can be made at any time. Although there are stated deadlines, we do take last-minute applications from our MSU undergraduates. The sooner you apply, however, the better your chances of getting an assistantship. For more information, contact **Dr. Mukherjee** or **Dr. Bush**.

## Dean's List

Congratulations to these 426 ME majors who made the Dean's List after Fall 2015. To be on the Dean's List, you must have a semester GPA of 3.5 or better. This list is from January 27. For updates, go to: <https://reg.msu.edu/ROInfo/GradHonor/DeansList.aspx>.

**NOTE: The italicized names received high achieving student recognition at the recent Evening with Industry Awards Banquet.**

**Fall 2015:** Michael Accettura, *Rachael Acker*, Dontae Addison, Alec Adgate, *Mitchell Agrwal*, Nickolas Aguayo, Junyoung Ahn, Yamen Al Mahmoud, Abdulmajeed Al Otaibi, Shwan Al-Howrami, Ahmed Alblooshi, Bara Aldasouqi, Nassar Alhajri, Manea Alhammadi, Omar Alhammadi, Rayed Alharbi, Adnan Alhuwait, Mojtaba Almiskeen, Majed Almughair, Mohamed Alneyadi, Abdulrahman Alqarni, Bashaier Alsinan, Bridget Anderson, Jonathan Andrejczuk, Cameron Andrews, A Katherine rends, Mimi Asante, Sanders Aspelund, Matthew Auvenshine, Andrew Aziz, David Bang, Andrew Banitt, Eric Bargiel, Andrew Barnett, Tyler Bauder, Benjamin Beckas, Angel Begov, Megan Beisser, Matthew Belknap, Kyle Benedict, Maxwell Bennett, Michael Bigelow, Niklas Boisten, Ryan Boufford, Samuel Boyea, Andrew Boyer, Stephen Branch, James Breen, *Zachary Brei*, Julia Briggs, John Brinkley, Ryan Britain, Joseph Brooks, Evan Bushman, August Butzke, Caleb Calfa, Stephen Camilletti, Connor Campbell, Ziqing Cao, *Andrew Capaldi*, Samuel Case, Oscar Castro, Jillian Chandler, Pranay Chaturvedi, Anthony Cicala, Kane Clark, Lindsay Clark, Brian Cobus, Mark Cogo, Curtis Coscarelly, Stephen Covitz, Joshua Cresswell, Alec Czanderna, Drew Daily, Connor Daly, Sagar Dangal, Bryana Deleon, Lucia Delvillano, Jacob Depierre, Derek Dignan, Michael Doa, Angela Do-brzelewski, Xincheng Dong, Matthew Dorman, Weilin Du, Analeeza Dubay, Caitlynn Dubie, Emily Duddles, David Dudley, Carly Dugan, Garrett Dunn, Megan Ebejer, Derek Edwards, John Ellbogen, Benjamin Evans, Alayna Farrell, Katherine Filipovic, Tyler Finses, Bradley Fischer, Jacob Flight, Patrick Floyd, Patrick Frahm, Brice Furr, Michael Gaduski, Brittany Galliers, Xueran Gao, Jackson Garber, James Garrett, Victoria Giese, Taylor Gilliland, Nathanael Ginnodo, Reison Gjolaj, Kevin Glime, Branden Goebel, Nicholas Goguen, Shannon Grace, Zachary Graves, *Moritz Greiss*, Aimee Griffin, Riley Griffin, Thomas Griffith, Marissa Grobbel, Tianyuan Gu, Charles Guidarini, Laura Gumpfer, Chase Gunderud, Rishi Gupta, Nathaniel Hadobas, Tecumseh Hakenjos, Matthew Hamilton, Tal Hanani, Lance Haner, Jack Hanson, James Hargrove, Richard Harrington, Akiem Harshman, Syunsuke Hata, Blake Hatherley, Jessica Hauda, Kyle Hawkins, Paul Heeder, Ryan Heinze, Abigail Henning, Jordan Hermiz, Jeffrey Hilck, Alexander Hoover, *Colin Horton*, Nicholas Houghton, Jonathon Howard, Peter

Howes, Ely Hsu, Jillian Hubbard, Richard Hutchins, Holly Iglewski, Ivan Iovtchev, *Hana Irvine*, Rachael Jannette, *Alexander Jennings*, Hunter Jenuwine, Linghao Ji, Adri Johari, Christopher Johnson, Mark Johnson, Meredith Jonik, Jennifer Ju, Ryan Juntunen, Andrew Kalina, Thomas Karbon, *Cody Kelly*, Edward Kelly, Edward Kennedy, Nicholas Kerby, Hyang Kim, Kevin Kinsey, Andrew Kistler, Jean Klochko-Bull, Austin Klump, Jeffrey Knoblock, Matthew Knudston, Jason Koberstein, Genevieve Kobrossi, Suhas Kodali, Jennifer Kozlowski, Austin Krauss, *Jacob Krummrey*, Bradly Labaere, Tyler Lahusky, Anxhelo Lalaj, Kevin Lalko, Chase Lamere, Zachary Lapinski, George Lewis, Nathaniel Lewis, Quanjing Li, Matthew Libiran, Evan Lile, Peter Lillich, Eric Lindlbauer, Ian Lindsley, Jiajun Liu, Shuang Liu, Zhan Liu, Ryan Loveland, Marc Lowenfeld, Christian Luedtke, Shane Lusch, Edwin Luo, Megan Luzenski, Cody Lysher, Kaidi Ma, Mark Macharia, Sahem Marji, Erin Maroney, Matthew Marsh, *Maria Martinpereira*, Mackenzie Martin, Austin May, *Michael Mazza*, Brandi Mazzella, Dillon McClintock, Molly McCloy, Christopher McCloskey, Jessica McCoy, Mason McDiarmid, Daniel McGrail, Joseph McKinney, Leo McLaughlin, Trevor McSween, Mackenzie Meyers, *Zhaoqiang Mi*, Noah Milberger, Austin Miller, Katherine Miller, Spencer Miller, Patrick Miyamoto, Hiroya Miyoshi, Nor Mohdnoor, Leah Mondro, Connor Montgomery, *James Morey*, *Alexandra Morford*, Kanshu Mori, Mitchell Morin, Anthony Mulka, Ryan Mulka, Taylor Mullahy, Josephine Muscato, Alex Napolitan, Josue Natarenmoran, Shane Neal, Jacob Neubecker, Joshua Neubecker, Phuoc Ngo, Hai Nguyen, Hoa Nguyen, Ping Ni, Yuchen Ni, Tyler Nicolay, Allison Nielsen, Nathaniel Noel, Jessica O'Brien, Brandon Okray, Michael Okuniewicz, Eric Olsen, Virginia Olszewski, Ryan Oquinn, Mark Osgood, Maria Osinski, Zachery Osisek, Ana Otero, Jesse Ouellette, Casey Palanca, Andrew Palucki, Bram Parkinson, Owen Parmeter, Chelsea Parson, Harsh Patel, *Kelly Patterson*, Jeffrey Pattison, Evan Paupert, Kevin Payne, Michael Perrin, *Trey Pfeiffer*, Amanda Pfitzenreuter, Brian Pieciak, Michael Pinger, Brian Pinsky, Sarah Plant, Samantha Pohlen, Elizabeth Pollack, *Martinez Ponsmartinez*, Reed Potter, Sean Powers, Jalaj Prakash, Garrett Preston, Steven Price, Kevin Pugh, Warren Purvin, Jacob Pusheck, Matthew Pusheck, Taylor Quillan, Ryan Radawiec, Parwesh Rallapalli, Max Ralya, Tess Reed, *Vincent Rende*, Rebecca Reneker, Brooks Reno, *Matthew Rimanelli*, Matthew Rist, Gray Ritchey, *Vincent Rogers*, Winter Romeyn, Drew Roth, Lance Roth, Griffen Rourke, Benjamin Rowley, Joseph Russell, Zachary Sadler, Tomo Saito, Michelle Samalick, *Jason Sammut*, Michael Sanchez, Matthew Sarver, Evan Scaccia, Travis Schafer, Zachary Schafer, Oscar Scheier, Morgan Schliem, Jacob Schmitter, Paul Schulman, Michael Schultz, Joshua Sebastian, Joseph Senechal, Nicole Shaffer, Ameer Shariq, Zhongyu Shi, Andrew Shih, Benjamin Siller, Richard Simon, *Andrew Slatin*, Nicholas Sly, Tyler Smith, Anna Sommerfeld, Frank Spica, Logan Springgate, Andrew Stamm, Nicole Stanley, Conner Stevenson, Tyler

Stricker, Matthew Strzalkowski, Jeri Sutter, Matthew Sutter, Mark Taylor, Jonathan Theoret, Spencer Thompson, Basil Thurston, *Branton Tობack*, Diamant Topllari, Nicholas Tottis, Andrew Tran, Richard Tran, Zachary Tuller, Antonio Ulisse, Brian Valentine, Erik Vanlaeke, Nicholas Vanoost, Gabriel Vanhollenbeke, Mark Vanpop-pelen, Aleksandr Vartanian, Patrick Vaughan, Andrea Vedrody, Jessica Vedrody, *Marc Veihl*, Sivajyothi Vemulapalli, Cristhyan Villacisnero, Andrew Voyd, Jacob Vymazal, Brice Wade-Shaner, Julia Waelchli, *Philipp Waeltermann*, Amad Wahib, Eric Waldron, John Walters, Andrew Wandor, Philip Wandor, Jianming Wang, Ling-feng Wang, Robert Warfield, Andrew Webb, Robert Wei, Xiaohang Wei, Olivia Weprich, Eric West, Jonathan West, Sterling White, *Nicholas Wiggins*, Henry Wikol, Ashley Wilkey, Colby Williams, Michael Williams, Reed Williams, Troy Willmer, Jacob Wilson, Brian Wingate, Caleb Winner, *Jacob Wojnicki*, Penghao Wu, Zhiwei Wu, Robert Wygant, Yingde Xie, Lei Xu, Tianhang Xu, David York, Connor Zehr, Austin Zeitler, Zachary Zettle, Bowen Zhang, Chengming Zhang, Hansheng Zhang, Tingyuan Zhang, Xuehuo Zhang, Pengfei Zhao, Yifan Zhao, Haonan Zhou, Yi Zhou.

## Tutoring

- The ME Learning Center, located in 1239 EB, has mentors for ME 201, 222, and 361. The hours for Spring 2016 can be found here: <http://www.egr.msu.edu/me/mechanical-engineering-learning-center> [Click on drop-in hours]
- The Guided Learning Center (GLC), located in 1108 EB, offers free drop in tutoring for MTH 234 and 235 and many core engineering courses. To request assistance, go to: <http://www.egr.msu.edu/dpo/academics/guided-learning-center> [Scroll down to REQUEST ASSISTANCE]
- The Cornerstone & Residential Experience (CoRe) program provides tutoring in G24 Wonders Hall in courses required for admission to the College of Engineering. Their "drop-in" hours are Sunday through Thursday from 6 - 10 pm.
- ME graduate student and Pi Tau Sigma undergraduate tutors can be contacted through the ME Advising Office. These tutors charge a fee, which you can negotiate with them. If interested, email **Gaile Griffore** <[griffore@egr.msu.edu](mailto:griffore@egr.msu.edu)>

## MSU-RWTH-Aachen Program by Prof. Brian Feeny, Program Director

Now for something completely different — consider a study abroad program! If you are interested in a summer experience where you can work on an applied engineering project in an advanced facility, tour fascinating sites, savor European foods and beverages, soak in the ambiance of languages and culture, and meet new people, check out the exchange program with RWTH Aachen.

MSU ME students with a 3.0 GPA or higher have the extraordinary opportunity to (1) live in Aachen, Germany (mid-May to end of July 2017), (2) earn 5 credits independent study plus 4 credits German language and culture, and (3) travel in Europe with planned 3-day weekends.

Note: During Spring 2017, before you go to Aachen, you will need to take 4 credits of German (usually GRM 101) and 1 credit of ME 490-Independent Study.

The Aachen experience will involve interaction with fellow engineering students from around the world at RWTH-Aachen, a premier European technical university. Possible project topics include automotive engineering, plastics, composite materials and textiles, manufacturing technology and automation, bio and chemical processing, and aerodynamics.

The city center is a blend of an old, historic European city and a modern college town. A well maintained bike path allows easy intimate access to the nearby small towns and farmlands. An outstanding rail system provides our students easy access to Munich, Paris, Amsterdam, Zurich, Rome, and many more destinations on their 3-day weekends. *Scholarship funds are available through the North American Rockwell Endowment.*

A great way to get more information is to talk to former exchange students, who enjoy sharing their experiences with the program. Former Aachen exchange students can be reached through me at [feeny@egr.msu.edu](mailto:feeny@egr.msu.edu) or 353-9451. Please contact me if you would like to find out more.

Don't miss this opportunity!



PHOTO PROVIDED BY DR. FEENY

Figure 1. Frankenburg castle, Aachen, February 2016.

## Study Abroad in France (ECAM in Lyon) by Professor André Bénard

The Department of Mechanical Engineering offers a month-long study abroad program for junior-level students in Lyon, France each summer. The students stay at ECAM, a French engineering school located in the old part of Lyon, for the entire month of June.

Students can take the equivalent of ME 201 or ME 410, both taught in English. They also take a French language course (taught in French). If you are interested in this program, please contact: **Ms. Maggie Blair-Ramsey** ([blairram@egr.msu.edu](mailto:blairram@egr.msu.edu)) or **Professor André Bénard** ([benard@egr.msu.edu](mailto:benard@egr.msu.edu))

## Academic Advising

1) **ME Juniors and Seniors** are advised by **Gaile Griffore**. For an appointment, call 517-355-3338, or go to 2560 EB. *Note: There will be some walk-in hours this semester. Call for schedule information.*

2) **ME Sophomores with a 3.0 or higher GPA who will be juniors at the end of this semester** are advised by **Gaile Griffore**. For an appointment, call 517-355-3338, or go to 2560 EB.

3) **ME Sophomores** who do not fit the criteria in number 2 above are advised by **Elizabeth Clark**. Schedule an appointment online during fall and spring semesters: <https://www.egr.msu.edu/adcalendar/>

4) **ME Freshmen** are advised in W-8 Wilson Hall on a walk-in basis only.

# Fractional Modeling: A New Meta-Discipline by Dr. Mohsen Zayernouri

“People who wish to analyze nature without using mathematics must settle for a reduced understanding,”  
—Richard Feynman

**Dr. Mohsen Zayernouri** has a joint appointment between the Department of Mechanical Engineering (ME) and the Department of Computational Mathematics, Science, and Engineering (CMSE). Dr. Zayernouri is the director of the Fractional Mathematics for Anomalous Transport and Hydromechanics (FMATH) group, and he is currently working with three PhD candidates: **Anna Lischke** (co-advised), **Mehdi Samiee**, and **Ehsan Kharazmi**. The main focus of research in the FMATH group is to develop and analyze new data-driven methods and algorithms for interesting and challenging anomalous thermo-fluid problems.

**Anomalous Transport:** refers to non-equilibrium thermo-fluid processes that cannot be described and predicted by the old fashion methods of mathematical and statistical physics.

Non-local models and fractional PDEs (FPDEs) provide a proper modeling framework, in which interesting applications of anomalous transport are investigated. The area of FPDEs is a rapidly growing field at the interface between computational mechanics, differential equations, and probability.

## Go Fractional; It's Urgent!

FPDEs are emerging as a powerful tool for modeling multiscale phenomena including overlapping microscopic/macroscale scales, and long-range time memory or spatial interactions. Although anomalous, such problems are abundant in nature. There is now an extensive amount of experimental evidence indicating that such phenomena occur in reacting turbulent flows, rheology, anomalous transport

phenomena in porous/disordered materials, complex fluids, and multi-phase applications (see Figure 1).

**FMATH Group:** aims to formulate robust and efficient data-driven methods for deterministic and stochastic fractional PDEs (FPDEs). This is done through the development of a variety of numerical methods such as finite-difference methods, spectral methods, spectral element methods, and Discontinuous Galerkin (DG) methods. FMATH always welcomes self-motivated students who are passionate about science and engineering.

*Dr. Zayernouri obtained his first PhD in ME from the University of Utah in 2010 and his second PhD in applied mathematics from Brown University in 2014. He enjoys reading, watching movies, and traveling; moreover, he is passionate about music and calligraphy.*

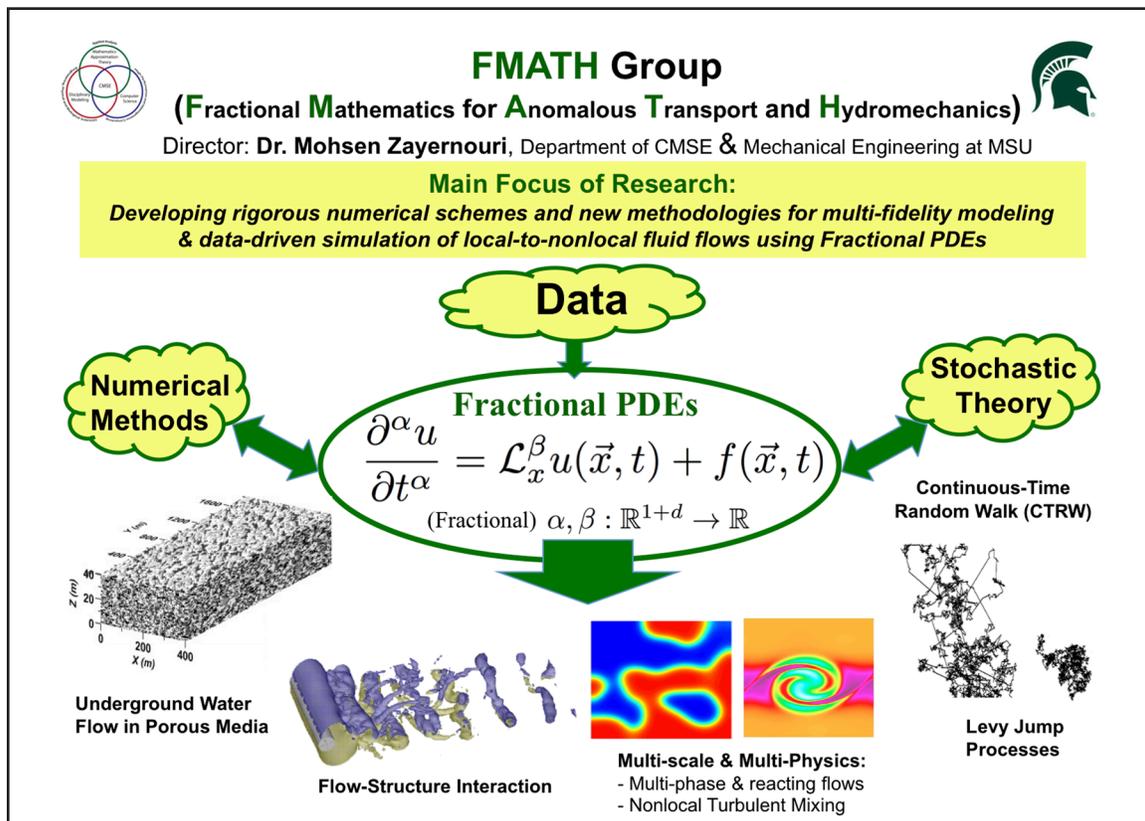


Figure 1: Main Focus of Research in FMATH Group

GRAPHIC PROVIDED BY DR. ZAYERNOURI

## Building a Science of Experimental Skull Fracture by Drs. Feng Wei and Roger Haut

Blunt force trauma is considered one of the most common forms of homicide worldwide. Blows to the head are often involved, and cranial fractures are a typical finding. In medicolegal death investigations, current techniques for interpreting cranial trauma are often brought into question, as there are limited experimental data that describe mechanisms of cranial fracture. Questions asked of forensic experts typically relate to: (1) the point(s) of impact; (2) the minimum number of blows; (3) the sequence of impacts; (4) the implement involved; and (5) the amount of force and energy used.

A significant amount of research has been conducted on the biomechanics of cranial fracture by the

automotive industry and their supported investigators, thus the current research in this area largely reflects industry needs. Cranial impact experiments have been conducted primarily to document impact force-deflection curves and acceleration-time histories to derive head injury criteria for automotive crash testing. Very few studies exist that describe the patterns of cranial fracture resulting from blunt force impacts, and the types of injury scenarios recreated in these studies typically do not account for scenarios of interpersonal violence often encountered in medicolegal death investigations.

At the Orthopaedic Biomechanics Laboratories (OBL) a newly funded research project is undergoing that

aims at developing mechanistic-based experimental data that begin to answer the above-mentioned questions using fresh, adult human cadaveric heads. In this effort, cadaver heads are subjected to blunt force trauma, causing cranial fractures that are recorded in time with high-speed photography. The locations of fracture initiation and propagation are documented in these experimental studies. The investigation seeks to show that patterns of fracture will depend on input energy, point of impact, number of blows, as well as implement used to impact. An earlier study by this group has demonstrated that a 3-inch flat impactor generated different fracture patterns (Figure 1, left) than those generated by a 1-inch flat impactor (Figure 1, right). Additionally, these patterns were in concert with the highest tensile stresses (shown in orange/red in Figure 2) predicted by finite element analyses (Figure 2, left is from 3-inch impactor and right is from 1-inch impactor).

The research project is in collaboration with the MSU Forensic Anthropology Laboratory (FAL), directed by **Dr. Todd Fenton**, and has been funded by the National Institute of Justice. Over more than 8 years the OBL and FAL have collaboratively made efforts in an attempt to understand forensic biomechanics of skull and long bone fractures for medicolegal death investigation experts to more accurately interpret trauma cases. **Patrick Vaughan**, a current OBL graduate student, has been assigned to the project. Vaughan was a recent senior ME student supported by the EnSURE program to work in the OBL. Recently, Vaughan presented a similar study on long bone fracture at the American Academy of Forensic Sciences 68th annual scientific meeting.



Figure 1

PHOTO PROVIDED BY DR. WEI

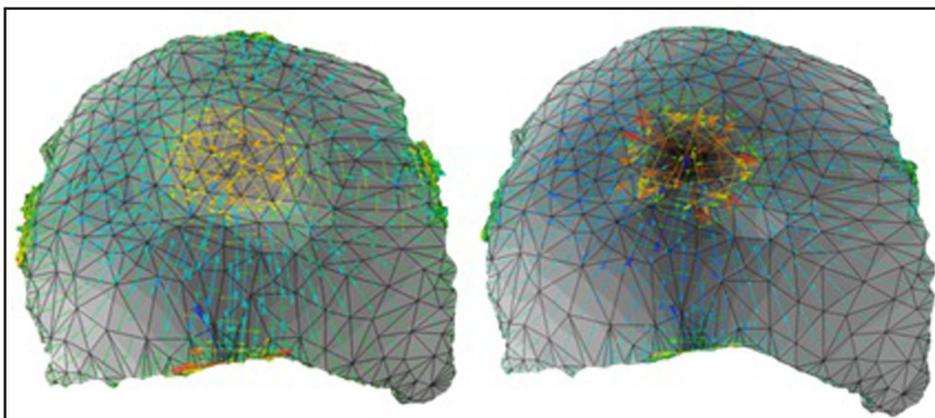


Figure 2

PHOTO PROVIDED BY DR. WEI

## Turbulence Ahead — “Please Fasten Your Seatbelts!” by Dr. Junlin Yuan

Turbulence is all around us. The air flowing in and out of our lungs, the flows around cars and planes that control the drag, the liquid core of the earth, even the Protoplanetary disk that forms planets, are all turbulent. Turbulence starts from instability in a shear flow, across which the flow velocity magnitude varies; one example is the turbulent boundary layer, where the shear layer is created by the presence of the wall.

The turbulence simulation and modeling group at MSU is studying the realistic turbulent boundary layers using large-scale parallel computing, with a focus on flow acceleration or deceleration, which happens around airfoils or in an atmospheric boundary. In the case of strong acceleration (Figure 1), the boundary layer undergoes a “relaminarization” process, opposite to the classical model prediction that an increase of mean-flow kinetic energy leads to higher turbulent kinetic energy (an assumption used in common turbulence models). High-resolution simulations help identify the underlying physics, and where the models go wrong.

Roughness is another important factor to model for a wide range of engineering and environmental boundary layers, such as wing icing analysis for airplanes, hydraulic turbine design, weather report over (urban) canopies, etc. The roughness models predict friction, so the roughness does not need to be resolved in industrial simulations. Such prediction is based solely on the statistics of the roughness geometry. We analyze its accuracy by resolving the complex rough surface and its effect directly in large-scale simulations (Figure 2a); results from a hydraulic-turbine flow show that the classical models produce up to 500% local errors in friction, due to the lack of model universality among different roughness

Cont'd on pg 11

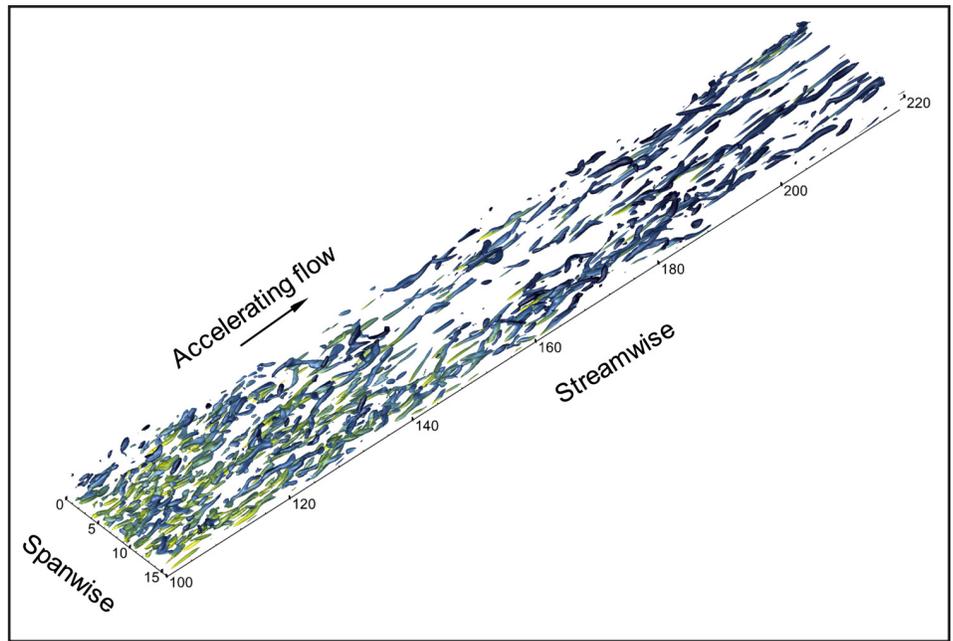


PHOTO PROVIDED BY DR. YUAN

Figure 1: Stabilization of near-wall turbulent vortices during acceleration of a flat-plate boundary layer.

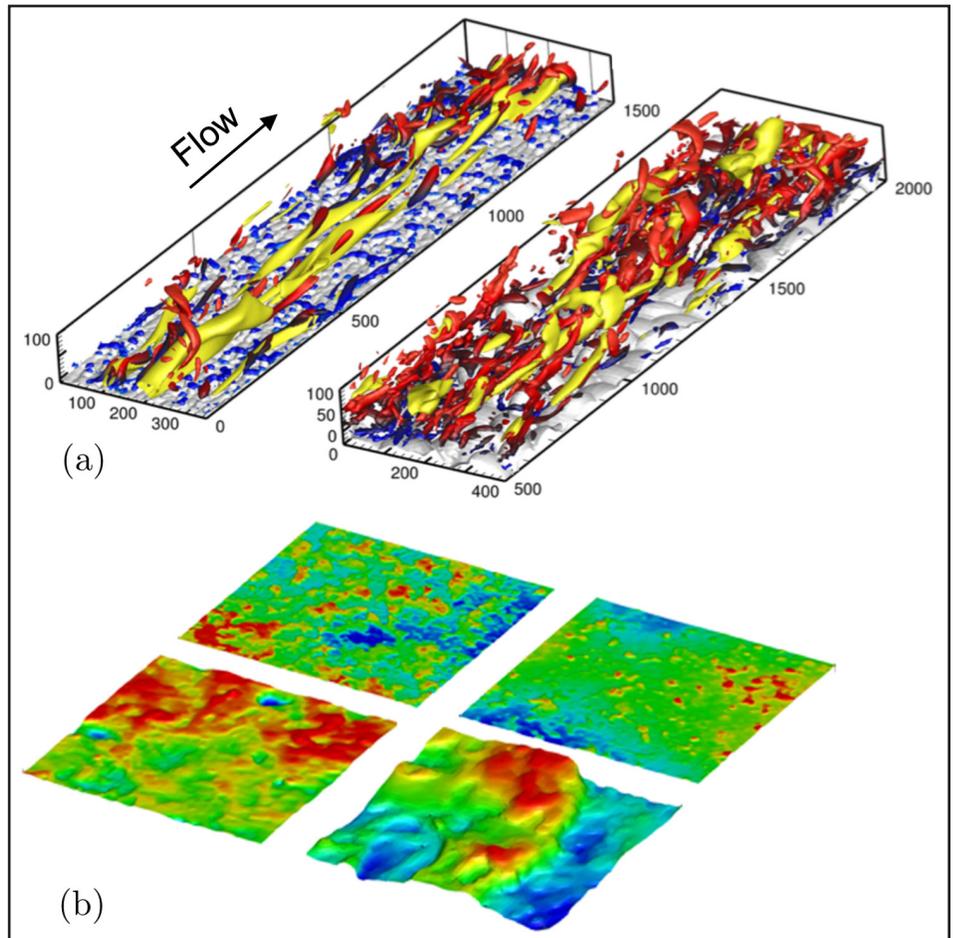


PHOTO PROVIDED BY DR. YUAN

Figure 2: (a) Turbulent eddies (dark) and low-speed streaks (light) demonstrating the effect of increasing roughness height on intensifying turbulence production. (b) Various rough surfaces duplicated from an existing hydraulic turbine in Québec, Canada.

## The Center for Spartan Engineering



Located in 1340 EB, across from Sparty's, The Center for Spartan Engineering is the ultimate resource for engineers seeking guidance on resumes, interviewing preparation, major career events, and experiential education opportunities. In addition to the everyday consultation activities that take place in The Center, the staff and career peers are active in hosting a variety of career preparation workshops and collaborating with employers for ASK Sessions, Career Fairs, and mock interviews throughout the school year.

At the Engineering Expo, held February 25th, the College of Engineering played host to over 100 companies and 1,000 students for the 4-hour career event! Engineering Expo has become a can't-miss event for engineering recruiters nationwide to attract top-talent as well as network and build relationships with students of all majors and years.

The Center wants to congratulate those graduating seniors who have already found and accepted a full-time position. Make sure that you apply for graduation and keep an eye out in your email for the Destination Survey to tell us about your upcoming plans! Our unofficial number for 2015 graduates is 96% placement.

For those students still looking for full-time positions, don't fret. There are still opportunities out there. Make sure that you engage in the following ways to assist in your job search.

- Update your resume and load it on MySpartanCareer.com- there are still employers posting jobs for graduating seniors. Stop into the Center to have your resume critiqued before posting.
- Check the calendar for upcoming events like Employer "ASK" sessions, workshops, and mock interviews

## ME Students Receive Awards

Congratulations to the following ME students who were honored at the annual Evening with Industry Awards Banquet on February 24! The names of those receiving high achieving student recognition are italicized on the Dean's List on page 6.

### Outstanding Women in Engineering Member Awards:

- *Brittany Galliers* (ME Senior), presented by Bosch.
- *Amanda Pfutzenreuter* (ME Junior), presented by C2AE.
- *Alexa Baylis* (ME Junior), presented by Fiat Chrysler Automobiles.
- *Lindsay Nault* (ME Junior), presented by Union Pacific Railroad.
- *Kelly Patterson* (ME Junior), presented by IBM.

### Outstanding Society of Women Engineers Award:

- *Carly Head* (ME Senior), presented by Kohl's Department Store.

### Frank J. Hatfield "Build it Better" Award:

- *Fred Anthony Smith* (ME Sophomore).

### Outstanding Diversity Programs Award:

- *Waithera Chege* (ME Senior), presented by Tenneco.
- *Chelsea Parson* (ME Freshman), presented by ArcelorMittal.
- *DeMarcus Gregory* (ME Freshman), presented by Ingersoll Rand.
- *Amanda Pfutzenreuter* (ME Junior), presented by Visteon.
- *Zirui Wang* (ME Junior), presented by Ford Motor Company.
- *Lauren Green* (ME Sophomore), presented by Mobis North America.
- *Andrew Voyd* (ME Sophomore), presented by FAAC.

### Exceptional and Distinguished Service Awards:

- *Cody Bradford* (ME Senior), nominated by Dr. Gary Cloud
- *Zac Sadler* (ME Junior), nominated by Dr. Tamara Reid Bush.
- *Kelly Patterson* (ME Junior), nominated by Dr. Tamara Reid Bush.



• Network! The U.S. Department of Labor estimates that up to 80% of positions are filled without employer advertising. Networking is important and many are unsure of how to create and use a network. There is a LinkedIn group just for you! Join "Michigan State University Engineering Connection" built to help support and network current and recent Spartan Engineering alumni.

- Join the MSU Alumni Association and start networking with a club in your current town/region or desired destination (i.e. The Chicago Spartans, West Michigan Spartans, Detroit Spartans). They host professional and networking events as well as fun social events.
- Stay persistent and continue to visit us in the Center and allow us to assist you in your search

The Center always has an open door to engineering students and would be happy to help you in any

way whether you are at the beginning of your career as a Spartan or preparing to depart the "Banks of the Red Cedar."

Email: [careers@egr.msu.edu](mailto:careers@egr.msu.edu)

Phone: 517.355.5163



*Cont'd from page 10*

topographies present in the turbine (Figure 2b). Currently, we are developing a novel roughness model that incorporates not only the topographical information, but also the input from the flow above; the adaptability of this new model to surface and flow state/direction translates to accurate prediction in transient and three-dimensional problems, such as weather and air-quality assessment, ocean-flow modeling, and studying moving structures such as bio-propulsion and fluid machinery.

# SAE International™

## Baja SAE



Michigan State's Baja SAE team has been hard at work designing, fabricating, and assembling for this year's upcoming race season. Lead by **Michael Holland, Thomas Sheldon, and Ray Renaud**. This year's car will be an improvement on last year's car, and potentially the lowest weight car in MSU Baja's history. With the generous donations by their various sponsors, the Baja team is planning on having their car completed and tested by the end of the school year.

While much of the car is already designed and fabricated, the design cycle still has to be com-

pleted through the use of data acquisition. With the help of returning members and new members, the Baja team will be preparing four cars from previous years to compete in a race held each year at Michigan Tech. This race, commonly known as Blizzard Baja, provides new members on the team with driving and competition experience before their SAE races in Tennessee, New York, and California this summer. The new car will be unveiled in early April, and then the team will be headed to Tennessee for our first SAE competition of the racing season. *Submitted by Michael Holland, Project Manager.*



PHOTO PROVIDED BY MICHAEL HOLLAND



PHOTO PROVIDED BY JONATHAN BIANCHI

## SAE Formula



Every year, students on the Formula SAE Racing team work hard to design, manufacture, and test a small open-wheel, racecar. Last year, the team took 11th

place out of 120 teams at the largest competition in the United States, Formula SAE Michigan.

Formula SAE is the world's largest engineering design competition with over 500 schools competing from around the globe. This year, the team will compete in two events: the first is in May at the Michigan International Speedway and the second is in August at the Hockenheimring in Germany. For the first time in team history, State Racing will be competing in Formula Student Germany. FS Germany will hold 75 of the best teams in the world, and we are one of seven from the United States!

Along with registering for Germany, State Racing has been working extremely hard to complete the car nearly two months ahead of the previous season. This extra time will allow for copious amounts of testing and tuning before the first competition in May.

If you would learn more about the team, please visit [www.msuformularacing.com](http://www.msuformularacing.com) or contact **Jonathan Bianchi** at [bianch19@msu.edu](mailto:bianch19@msu.edu). *Submitted by Jonathan Bianchi, Project Manager.*

## Have You Asked a Question Lately?

by Craig Gunn, Director of Communications



SEELEY

I could have sworn that at some point I wrote about the need to ask questions. Strangely enough I failed to ask anyone the pertinent question, "Have I ever

written an article for the *ME Bulletin* on the act of questioning?" By not asking, my mental processes simply stopped and I didn't move ahead on pursuing a very important subject. As I think about it, I realize that I had failed to do what I suggest that everyone does as a daily activity – Ask Questions.

When you were young, you probably didn't get an enormous amount of instruction, but you certainly spent a great deal of time asking questions. You badgered everyone around you to answer questions like, "What is the moon made of?" Those wonderful people were quick to provide the usual answer – green cheese. And with that, you continued to ask and ask and ask. But now you are an adult and those questions seem to have been relegated to a far back burner and that burner is turned off. You don't raise your hand and you shy away from asking for any form of help or answer.

I would ask that you return to that time long ago when you were young and innocent and willing to spend your waking hours asking about what you both wanted to know and needed to know. Those days were actually the Days of the Engineer. Days where you delved into the things you didn't know and with their discovery you became more and more the individual you are today. We learn by the questions that we ask of others and ourselves. We stagnate when we fail to mold those questions about our world that will make us better

## American Society of Mechanical Engineers



The MSU Student Chapter of the American Society of Mechanical

Engineers is a non-profit student organization. The main purpose of ASME is to introduce MSU students to the world of engineering. ASME provides an opportunity for students to meet representatives of leading industrial companies; this allows them to learn about these companies as well as possible internship/ employment opportunities.

ASME will be hosting a variety of events throughout the 2016-2017 school year: social events, company information sessions, community outreach, and design challenges. Events like these are a great way for ASME members to network with recruiters as well as their fellow classmates. Some of ASME's non-company partnered events include Junkyard Wars, Career Gallery How-to's, Impression Five exhibit, and a trip to the North American International Auto Show. Look for events like these and more this coming year!

To learn more about our upcoming events, please visit our Facebook page at <https://www.facebook.com/search/top/?q=asme%20michigan%20state%20university> and our website at <http://www.egr.msu.edu/asme/index.html> for more information. *Submitted by Kyle Hawkins, President.*



individuals and players in a global environment. Start this day anew and make a pledge with yourself that you will take the plunge and become young again and question everything you can.

## Pi Tau Sigma



The Tau Epsilon Chapter of Pi Tau Sigma, the International Mechanical Engineering Society, has had a very busy start to the semester. We held our informational meeting for interested initiates on Feb 23rd and had a great turn out! Also, we were pleased with how

many of our members took on the E-week blizzard to contribute their time as volunteers for the Engineering Expo Feb 25th. Our first social event, 'Wings Night' at Buffalo Wild Wings was on March 3rd. We enjoyed socializing with one another while enjoying some delicious wings.

We will be hosting a Mechanical Engineering Senior Elective presentation on Tuesday, March 29th at 7:00 pm. This event aims to inform students about their ME senior elective options and gives them a chance to ask questions from those who have already taken the courses. This will be both fun and informative and is open to members and non-members! Once a room location is set for this event, it will be posted on our website.

Later in the semester, we look forward to volunteering with Habitat for Humanity and playing some Euchre and other activities at our game night, one of our fun social traditions. Finally, we will hold initiation at the end of April to induct new members. For more information on Pi Tau Sigma or any of our events, please visit our website at <http://www.egr.msu.edu/pts/>. *Submitted by Abigail Henning, President.*

## ME Senior Electives for 2016-2017

- The following ME Senior Elective list was accurate as of March 4, but it is subject to change. Important changes will be emailed to you with “ME Bulletin Update” on the subject line.
- Design Intensive courses have an asterisk (\*) after the course number.
- Descriptions are provided for courses that are not in the catalog. All others can be found by going to <http://www.reg.msu.edu/Courses/Search.asp>
- The ME department cannot overfill a required course or section to solve a Senior Elective schedule conflict.
- Instructor assignments had not been finalized when the newsletter went to press. They will be posted later on the Schedule of Courses website.
- Course override instructions can be found in the shaded box on page 15.

### SUMMER SEMESTER

- ME 490 **Independent Study.** 1-4 credits. See Override Instruction #2 on page 15. You may reenroll for a maximum of 6 credits.
- ME 465\* **Computer Aided Optimal Design.** 3(3-0). Prereq: ME 222, and ME 280 plus ME 371 or concurrently.  
▶ Online Course.

### FALL SEMESTER

- ME 416\* **Computer Assisted Design of Thermal Systems.** 3(4-0). Prereq: ME 410 or concurrently.
- ME 422 **Introduction to Combustion.** 3(3-0). Prereq: ME 332 or concurrently.
- ME 423 **Intermediate Mechanics of Deformable Solids.** 3(3-0). Prereq: ME 222.
- ME 425 **Experimental Mechanics.** 3(2-3). Prereq: ME 222.
- ME 440 **Aerospace Engineering Fundamentals.** 3(3-0). Prereq: ME 332 or concurrently.
- ME 444 **Automotive Engines.** 3(3-0). Prereq: ME 410 or concurrently.
- ME 475\* **Computer Aided Design of Structures.** 3(3-0). Prereq: ME 471 or concurrently.
- ME 477 **Manufacturing Processes.** 3(3-0). Prereq: ME 222 and MSE 250.
- ME 490 **Independent Study.** 1-4 credits. See Override Instruction #2 on page 15. You may reenroll for a maximum of 6 credits.
- ME 491\* **Selected Topics in Mechanical Engineering.** Section 001: Humanitarian Engineering. See Override Instruction #1 on page 15. Course Description: Extensive class notes plus web-based material, and a major project requiring students to apply human-centered design methodologies to create and manufacture a sustainable solution to an authentic inter-disciplinary engineering problem in India, Guatemala, or Kenya, or elsewhere, involving people fending for themselves at the margins of life. Prereq: (ME 371) and (Senior-level standing).
- ME 491 **Selected Topics in Mechanical Engineering.** Section 602: Biomechanical Analysis of Human Movement. See Override Instruction #1 on page 15. Course Description: Experimental methods used in the biomechanics of human movement. Topics will include equipment used for capturing movement (e.g, motion capture, force plates, EMG), data analysis techniques, and reviews of important studies in the biomechanics literature. Emphasis will be on writing code in MATLAB for data analysis. Applications of these techniques to human movement from different contexts (e.g., gait, sports, ergonomics) will be discussed. Prereq: ME 371. **Biomechanical Concentration Course.**
- ME 494 **Biomechanics and Heat Transfer.** 3(3-0). Prereq: ME 410 or concurrently. **Biomechanical Concentration Course.**
- CHE 472 **Composite Materials Processing.** 3(2-3). Prereq: ME 332.
- ECE 415 **Computer Aided Manufacturing.** 3(2-3). Prereq: ME 451. See Override Instruction #3 on page 15.
- ECE 445 **Biomedical Instrumentation.** 3(2-3). Prereq: ECE 345. **Biomechanical Concentration Course.**
- ECE 491 **Special Topics.** Section 601: Acoustics. See Override Instruction #4 on page 15. Course Description: Review of Laplace and Fourier transforms, waves in one dimension, the acoustic wave equation, transmission and reflection, radiation and diffraction, absorption and attenuation, cavities and waveguides, resonators and filters. Prereq: (EGR 102 or CSE 131) and (ECE 345).
- MSE 476 **Physical Metallurgy of Ferrous & Aluminum Alloys.** 3(3-0). Prereq: MSE 250. Recommended background: MSE 310. For more info, see Override Instruction #5 on page 15.

- ME 810 **Advanced Classical Thermodynamics.** 3(3-0). *See Override Instruction #6 below.* Prereq: ME 412 plus GPA of 3.5+.
- ME 812 **Conductive Heat Transfer.** 3(3-0). *See Override Instruction #6 below.* Prereq: ME 412 plus GPA of 3.5+.
- ME 830 **Fluid Mechanics I.** 3(3-0). *See Override Instruction #6 below.* Prereq: ME 332 plus GPA of 3.5+.
- ME 860 **Theory of Vibrations.** 3(3-0). *See Override Instruction #6 below.* Prereq: ME 461 plus GPA of 3.5+.

## SPRING SEMESTER

- ME 417\* **Design of Alternative Energy Systems.** 3(3-0). Prereq: ME 410 or concurrently.
- ME 426 **Introduction to Composite Materials.** 3(3-0). Prereq: ME 222.
- ME 433 **Introduction to Computational Fluid Dynamics.** 3(3-0). Prereq: ME 410 or concurrently.
- ME 442\* **Turbomachinery.** 3(3-0). Prereq: ME 332.
- ME 445\* **Automotive Powertrain Design.** 3(3-0). Prereq: ME 444.
- ME 464 **Intermediate Dynamics.** 3(3-0). Prereq: ME 361.
- ME 465\* **Computer Aided Optimal Design.** 3(3-0). Prereq: ME 222 and ME 280, plus ME 371 or concurrently.
- ME 477 **Manufacturing Processes.** 3(3-0). Prereq: ME 222 and MSE 250.
- ME 478 **Product Development.** 3(3-0). Prereq: ME 477.
- ME 490 **Independent Study.** 1-4 credits. *See Override Instruction #2 below.* You may reenroll for a maximum of 6 credits.
- ME 491 **Selected Topics in Mechanical Engineering.** Section 603: Automotive Noise and Vibration. *See Override Instruction #1 Below.* Course Description: Automobiles are one of the most complex and expensive machines that an individual will purchase and use. Vibrations in a vehicle can affect vehicle durability, safety, performance, customer comfort, and even the decision of whether or not to purchase the vehicle. This course will focus on the engineering application of mechanical vibrations to vehicles including: different sources of vehicle vibrations, how these can affect different vehicle systems, driver perception of noise and vibration, and engineering approaches to control vehicle noise and vibration.. Prereq: (ME 461 or concurrently).
- ME 495 **Tissue Mechanics.** 3(3-0). Prereq: ME 222. *Biomechanical Concentration Course.*
- ME 497\* **Biomechanical Design in Product Development.** 3(3-0). Prereq: ME 371 or concurrently. *Biomechanical Concentration Course.*
- CHE 483 **Brewing and Distilled Beverage Technology.** *See Override Instruction #7 Below.* Location: 2000 Merritt Road, East Lansing. Prereq: (Age 21 or higher) and (Senior standing) and (ME 410-Heat Transfer or concurrently).
- BE 444 **Biosensors for Medical Diagnostics.** 3(3-0). (BS 161) and (CEM 141) and (ECE 345). *Biomechanical Concentration Course.*
- ENE 422 **Applied Hydraulics.** 3(2-2). Prereqs: ME 332.
- MSE 425 **Biomaterials & Biocompatibility.** 3(3-0) Prereq: MSE 250. Recommended Background: PSL 250. *Biomechanical Concentration Course.*
- MSE 465 **Design & Application of Engineering Materials.** 3(3-0). Prereq: MSE 250.
- Graduate Level Courses:** Honors College members and/or students with 3.5+ GPAs might consider taking a graduate course as a senior elective. Before enrolling, several signatures, including that of the instructor, are required. Possible choices for Spring 2017 include ME 814, 825, 861, 872, and 875. *See Override Instruction #6 below.*

## VERRIDE INSTRUCTIONS

- 1) Submit the ME Override Request Form: <http://www.egr.msu.edu/me/form/me-override-request>
- 2) ME 490–Independent Study Enrollment Procedure: Find a professor who is willing to supervise your independent study, and discuss your plans with him/her. Complete an *ME 490/490H Enrollment Contract* (independent study form), available in the ME Advising Office in 2560 EB. After you and your professor have completed and signed both sides, return the form to the ME Advising Office for the remaining signatures, override, and enrollment.
- 3) Six seats in ECE 415 have been allocated for MEs who are on record as Manufacturing Concentration students. To be “on record,” you must meet with Gaile to plan a long-term schedule. To request an override, email Gaile [griffore@egr.msu.edu](mailto:griffore@egr.msu.edu) and be sure to include your PID number with your request. NOTE: A prerequisite override will be given to students who will need to take ECE 415 & ME 451 concurrently.
- 4) Complete and submit the ECE Override Request Form: <http://www.egr.msu.edu/ece/undergraduate-override-form>
- 5) ME majors do not need to have taken the Recommended Background courses, but you will probably need to do some additional background reading. Contact the instructor for more information.
- 6) Complete the *Graduate Course Override* form, available in the ME Advising Office in 2560 EB. This is a paper form.
- 7) CHE 483–To request an override, submit the CHE Override Request form: <https://www.egr.msu.edu/chems/override/index.php>

**MICHIGAN STATE**  
UNIVERSITY

*ME Advising Office*

*Dept of Mechanical Engineering*

*Engineering Building*

*428 S. Shaw Lane, Rm 2560*

*East Lansing MI 48824-1226*

## Spring Semester Calendar

<b>March 14</b>	Scheduled appointments begin for enrollment for Summer 2016. Your enrollment access date is posted in StuInfo.
<b>March 28</b>	Senior Send-Off, 5-7 p.m. in the Varsity S Club Room in the Stadium Tower. Sponsored by the Center.
<b>March 29</b>	<b>Senior Elective Night, 7:00 p.m. Location TBA. Sponsored by Pi Tau Sigma.</b>
<b>April 1</b>	Computer enrollment begins for Fall 2016 / Spring 2017.
<b>April 29</b>	<b>Design Day in the EB. See you there!</b>
<b>May 2-6</b>	Final Exams.
<b>May 6</b>	University Undergraduate Student Convocation—1:00 p.m. in Breslin.
<b>May 8</b>	College of Engineering Undergraduate Commencement Ceremony, 12:30 p.m. in Breslin. Lasts about 2 hours.
<b>May 16-June 30</b>	<u>First</u> Summer Session.
<b>July 6-Aug 18</b>	<u>Second</u> Summer Session.
<b>May 16-Aug 18</b>	<u>Full</u> Summer Session.
<b>August 11</b>	Initial Fall 2016 Minimum Tuition & Fee payment due.
<b>August 31</b>	Fall Semester classes begin.

The MSU College of Engineering

# Design Day

Friday, April 29, 2016  
Engineering Bldg

Come and see our  
students lead, create,  
and innovate

- Competitions
- Demonstrations
- Presentations
- Awards



*MSU is an affirmative action, equal opportunity employer. MSU is committed to achieving excellence through cultural diversity. The university actively encourages applications and/or nominations of women, persons of color, veterans and persons with disabilities.*