IOWA STATE UNIVERSITY
Department of Mechanical Engineering

Annual Report
2016-2017

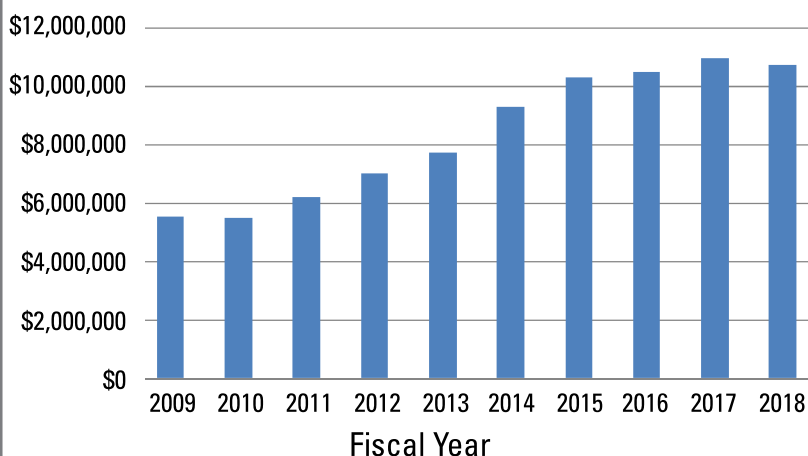**November 2017**

Contents

Cover Image: Team PrISUm traveled to Australia to compete in the Bridgestone World Solar Challenge in October 2017. Of the 15 students who traveled down under, seven were MEs. Photo by Nick Fetty.

Departmental General University Budget


Personnel (Full-Time Equivalent)

Tenure and Tenure-Track Faculty	42.86
Non-Tenure Eligible Lecturers	14.33
P&S and Merit Staff	26.80

Research Sponsors

American Chemical Society Petroleum Research Fund

American Society of Heating Refrigerating and Air Conditioning Engineering Inc.

Cornell University

Deere & Company

Department of Agriculture
    National Institute of Food & Agriculture

Department of Commerce
    National Institute of Standards & Technology

Department of Defense
    Air Force Office of Scientific Research
    Air Force Research Laboratory
    Army Materiel Command

Defense Threat Reduction Agency

Office of Naval Research

Department of Energy

Department of Justice
    National Institute of Justice

Iowa Energy Center

Medtronic Inc.

Molecular Express Inc. - DBA Aptalogic Inc.

NASA

National Science Foundation

Sabic Petrochemicals BV

Sandia Corporation-Sandia National Laboratories

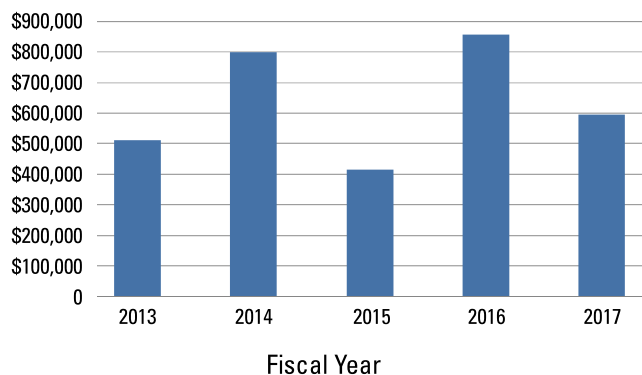University of California-San Diego

University of Texas-Austin
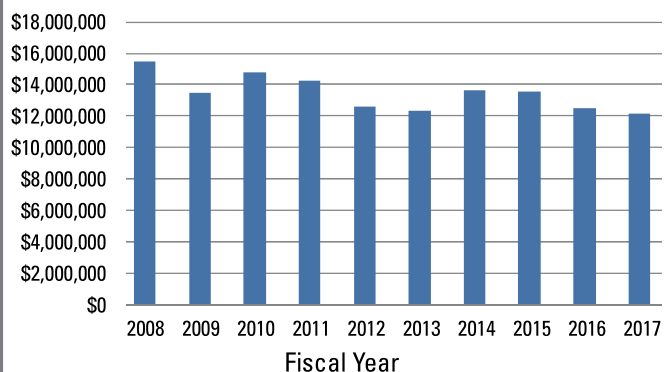
Private Giving: Black-Hilstrom Gift Production
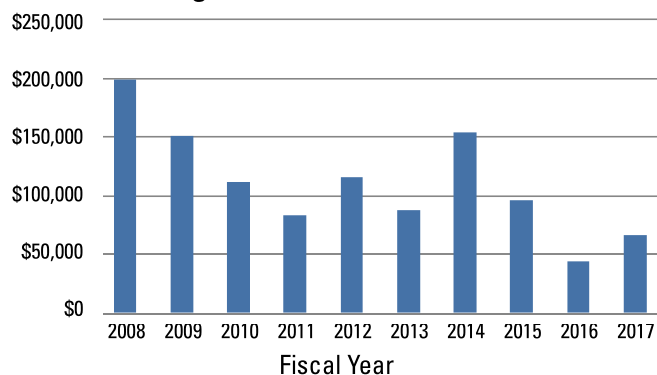
Sponsored Funding Awards Received
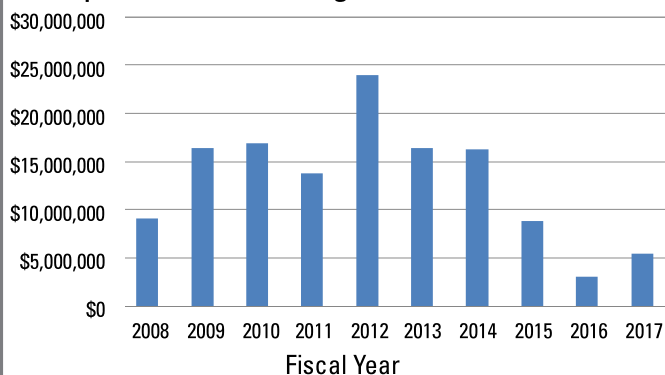
Private Giving: Total Gift Production

Research Expenditures

Named Faculty Positions

Anson Marston Distinguished Professor of Engineering
Robert Brown

Bergles Professor of Thermal Science
Ted Heindel

Gary and Donna Hoover Chair in Mechanical Engineering
Robert Brown

Joseph and Elizabeth Anderlik Professor in Engineering
Judy Vance

Larry and Pam Pithan Professor of Mechanical Engineering
Jim Oliver

Lynn Gleason Professor of Interdisciplinary Engineering
Caroline Hayes

Schafer 2050 Challenge Professor
Valery Levitas

William March Scholar in Mechanical Engineering
Sarah Bentil

Research

Journal Papers Published	216
Conference Papers Published	179
Sections/Chapters in Books	9
Patents	2
Doctoral Dissertations	19
Master's Theses/Projects	24

Professional Society Fellows

American Society of Mechanical Engineers

Daniel Attinger	Jim Oliver
Robert Brown	Sriram Sundararajan
Abhijit Chandra	Judy Vance
Caroline Hayes	Xinwei Wang
Ted Heindel	Jonathan Wickert
Atul Kelkar	

Degrees Awarded

Bachelor's Degrees Awarded

Master's Degrees Awarded

Doctoral Degrees Awarded

Undergraduate Enrollment

Undergraduate Enrollment

Undergraduate Female Enrollment

Undergraduate URM Enrollment
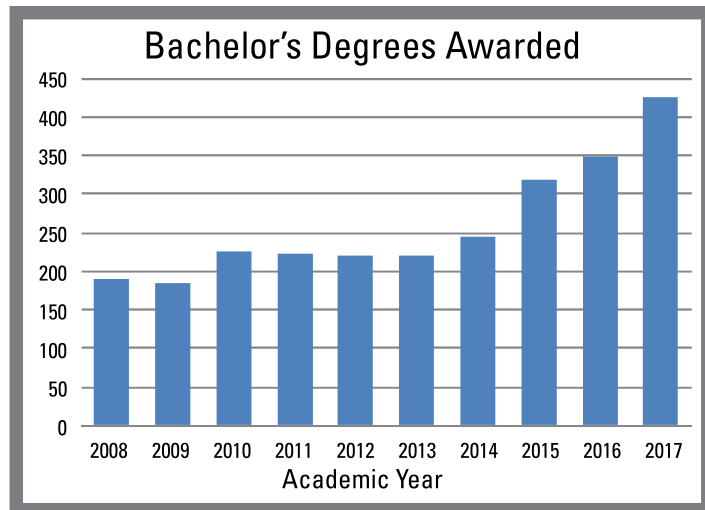
Graduate Enrollment

Graduate Enrollment

Fall 10-Day Number

Graduate Female Enrollment

Fall 10-Day Number

Graduate URM Enrollment

Fall 10-Day Number
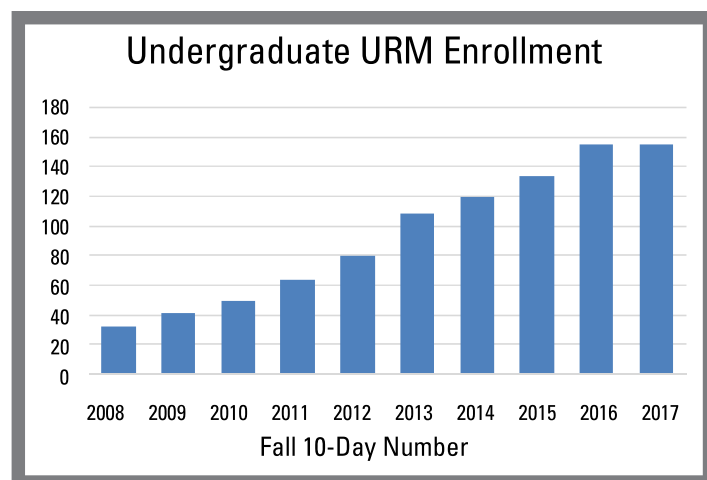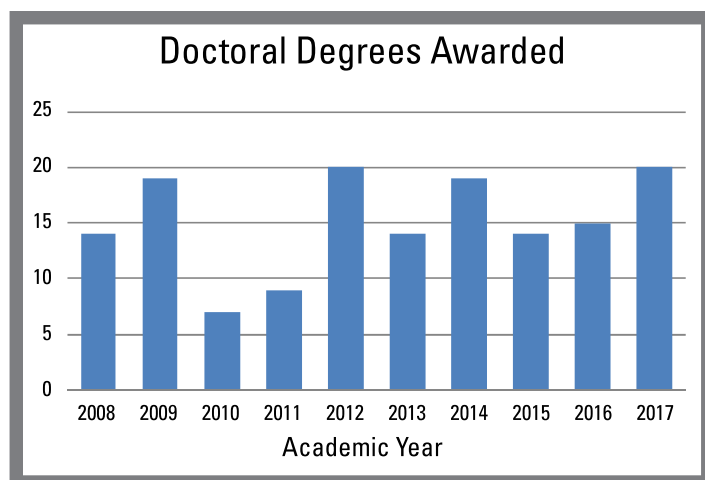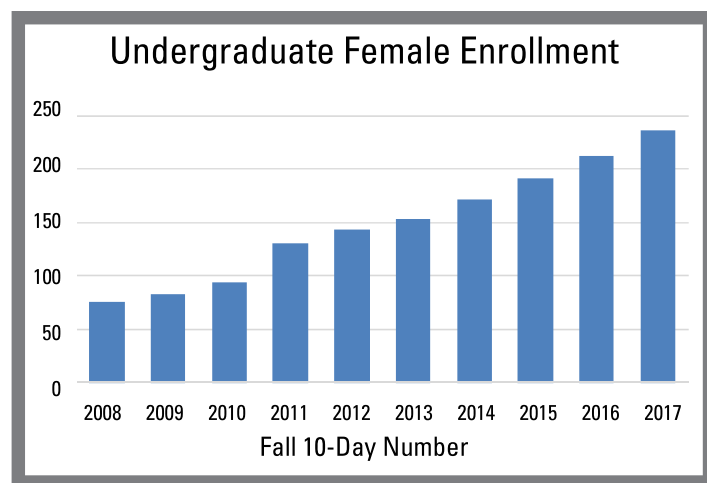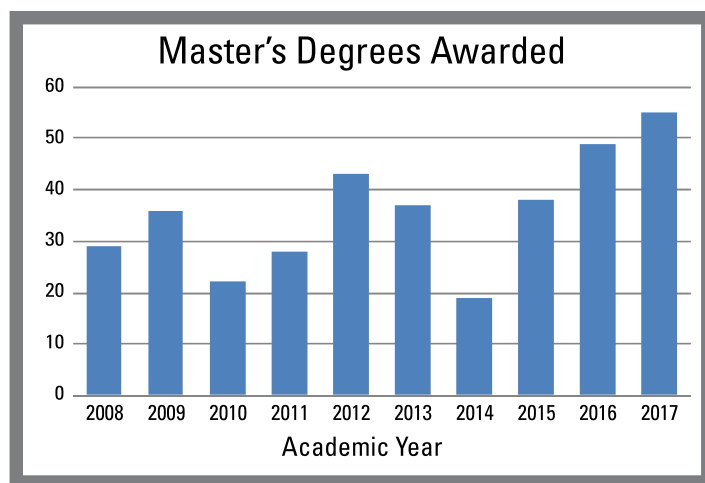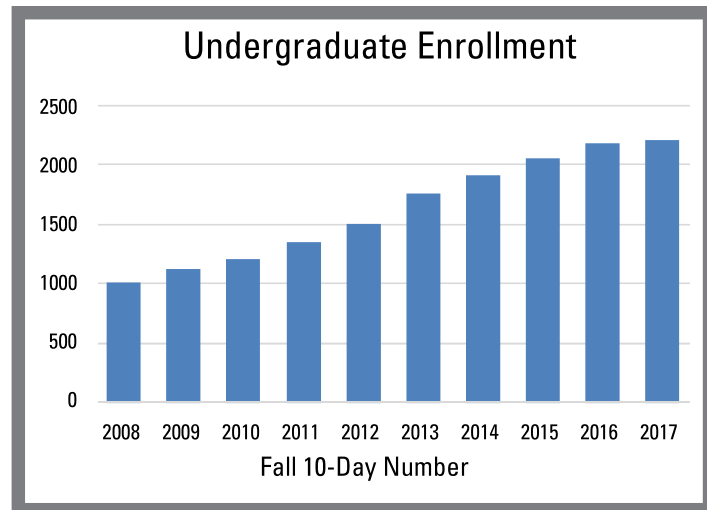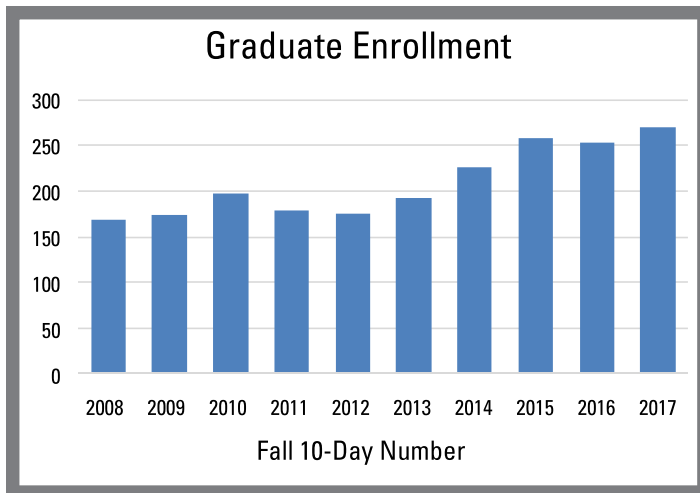
Graduate Program Recruitment

Complete Applications

Academic Year

Legend: Domestic, International

Selectivity: Ratio of Complete Graduate Applications to Admissions Offers

Calendar Year

Conversion: Graduate Admission Offers to Acceptance Ratio

Calendar Year
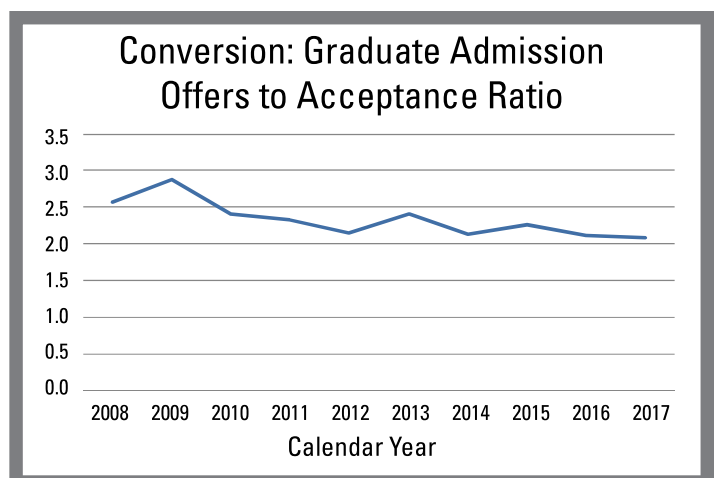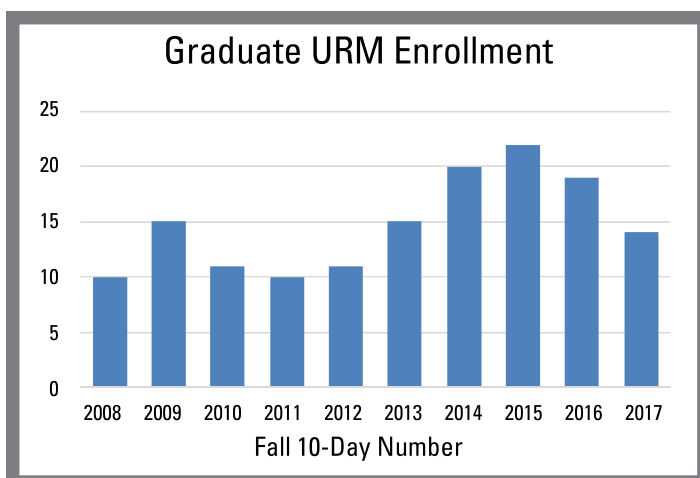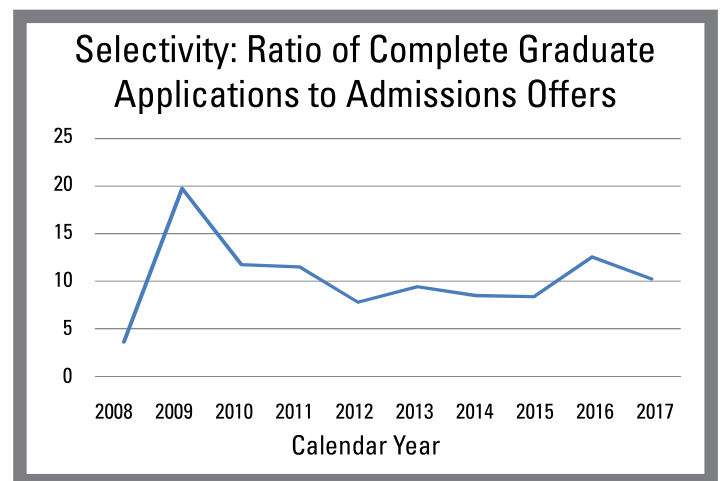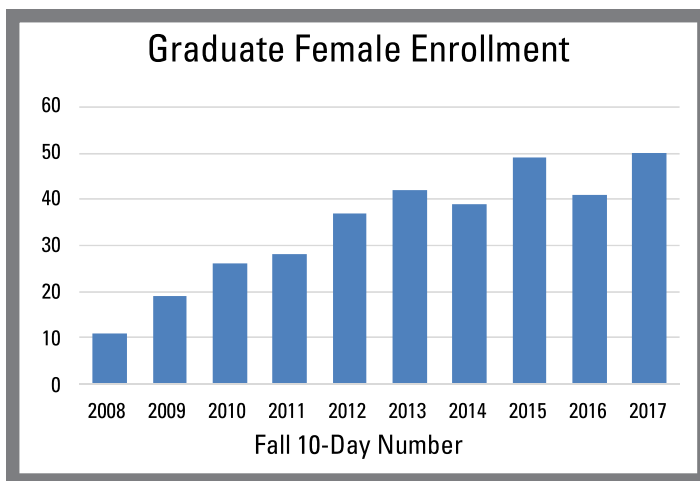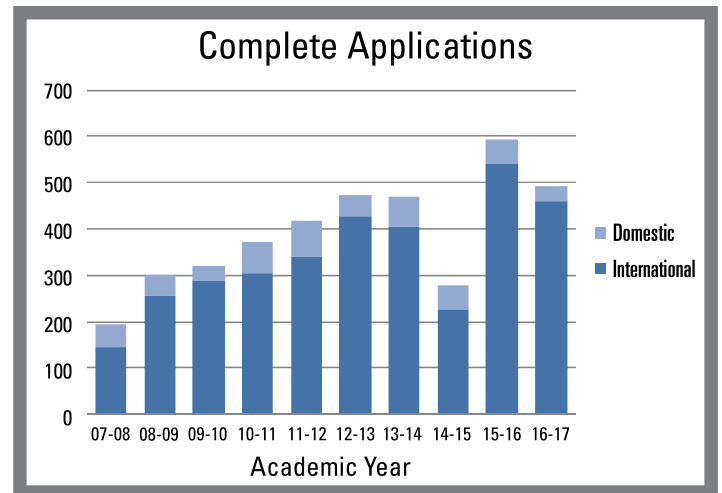
Program Updates

Mechanical Engineering continues to be the most popular major at ISU, and our program remains one of the very largest nationally with over 2200 students. This most recent academic year has been somewhat of a welcome change in pace, however, because enrollment growth slowed and allowed the faculty and staff to think about long-term strategy for the curriculum as well as prepare for the upcoming accreditation visit in 2018. The increases in program capacity achieved over the past several years, in terms of instructors, laboratory spaces and staff, have not positioned us to leverage the experience of our faculty in the classroom. One special point of pride has been the continued high placement rate of both summer internships and also post-graduation employment.

Cris Schwartz
Associate Chair
for Undergraduate
Studies

Recent Developments

The Department welcomed three new faculty members this fall, who have expertise in core ME areas and will contribute significantly to our curriculum in the areas of thermodynamics, manufacturing, and machine vision. Carmen Gomes, Jongyhun Lee, and Beiwen Li joined the faculty in fall 2017 and Paul Schafbuch will join us in spring 2018. Read more about these new faculty members on page 29. One point of pride this year has been the ability of our program to address the significant budget cuts and identify both efficiencies as well as challenges. This was accomplished in part by exploring more targeted use of the high-level expertise of graduate teaching assistants, complemented by a corps of highly-qualified undergraduate teaching assistants as a means of instructional support. We strive to learn from our experiences and our goal is to continuously improve our curriculum even through this – hopefully short-lived – period of financial challenges.

Senior Design Projects

ME 415 - Fall 2016

Small Industry Projects

ALMACO - *Plot Combine Narrow Drive*
- Trey Achterhoff, Megan Anderson, Tanner Boudreaux, Skyler Davis, Josh Essary, Andrew Meyer, Derek Nichols, Michael Orr, Tanner Wandersc

Boyt Harness - *D30 Recoil Lead Sled*
- Josef DeBower, Kevin Hyler, Patrick Gaffney, Ryan Jacobson, Sam Leskun, Lucas Nenne, Varandy Suisa, Jianning Zhu

Boyt Harness - *Kennel Door*
- Ahmed Aly, Matt Hullander, Joseph Johnson, Anne Leners, Tyler Lo, Joel Morton, Elizabeth Shroyer, John Sievert John Staley

Environmental Tillage Systems - *4500 Series Wing Whell Redesign*
- Jordan Jamison, Jared Jeffery, Dan Kaiser, Erika Meierotto, Michael Phillips, Jake Steinmetz, Bret Weaver

Link Mfg - *Fender Isolator to Extend Fender and Fender Bracket Life*
- Jacob Fincel, Ross Glanz, Tyler Jones, Kevin Kassel, William Kuehner, Bill Massner, Matt Orth, Andrew Pochettino

Paragon - *Shaved Ice Machine*
- Piotr Wozny, Dan Robinson, Ryan Gunderson, Eric Itokazu, Gehad Fadl, Kun Chang, Fang Cui

Pengo - *Auger Test Stand*
- Molli Butler, Matt Hirsch, Michael Manning, Jared Nelson, Patrick Mork, Andrew Paleczny, Camden Wallraff, Taylor Wisgerhof

Profol - *Centralized cooling for processing water systems*
- Ian Anderson, Jacob Hoogensen, Eric Lacey, Youssef El Masry, Shaun McCarthy, Duhyung Song, Nate Sunken, Brayden Weinschenk, Thomas Wilson

Rock Industries - *Part Feeder*
- Joshua Bicknese, Benjamin Felmlee, Jonathan Hamilton, Bradley Jackson, Jonathan Hamilton, S.M. Syed Putra, Navneet Singhal, David Wnek, Shenda Wu

Roeslein - *Nutrient Recover System*
- Zach Buscher, Joey Cataldo, Justin Christensen, Tanner Hill, Nathan Jameson, Brandon Theisen, Yangdong Wang

Stellar Industries - *Lift Boom Design*
- Jeremy Berg, Carter Gerdeman, Scott Kappel, Anna Kinzel, Xiaowei Li, Josh Ravestein, Alex Rover, Sean Wasion

Large Industry Projects

Caterpillar - *Clamp Device*
- Jun Ye Fong, Robert Heck, Colin Houlihan, Regan Mommer, Xian Yeow Lee, Riley Nicolay, Christina Prigge, Nick Rogers

John Deere Des Moines Works - *Wrap Feed Improvement*
- Alex Anderson, Xiaoming Chen, Nicholas Chua, Jacob Davis, Rong Gao, Brandon Loree Zach Maule, Nick Merical

Pella Corporation - *Ultimate Patio Door Handle*
- Kai Buhse, Madison Currie, Austin Rudolph, Tad Steinberger, Patrick Thull, Minh Vu, Brendan Yeah, Ryan Zielinski

Pella Corporation - *Patio Door Security*
- Austin McVey, Jack Miller, Keith Padgett, Mitchell Reecher, Pengming Sun, Sin Yong Tan, Benjamin Trebesch

Vermeer - *Bearing Wear Monitor System*
- Nick Collison, Nicholas Hasto, Brian Huk, Zhongtian Li, Charlie Nermyr, Robert Scanlon, Connor Szczepaniak, Jasmine Teague, Junkai Wang Jacob Wheeler

Department Projects
ISURF - *Continuous Variable Transmission Demonstrator*
- Robert Dunteman, Thomas Baldwin, Alexander Menke, Dustin Meyermann, Juho Lee
- Lucas Hahn, Garrett Beltz, Andrew Tasset, Jasmine Scholefield, Riley Gossling

ENGR 466 - Fall 2016

Small Industry
Artistic Manufacturing - *Small Volume Liquid Dispenser*
- Matthew Fuqua, Layne Goertz, Daniel Goldman, Alex Kouri, Kevin Hyler, Andrew Justin, Evan Miller, Sam McCarthy, Dan Robinson, Chin Kai Soon

Cross Over - *Safe Helmet Test and Development*
- Mitch Beattie, Chris Eggleston, Zamir Ghazli, Nick Herrera, Alfrado Real-Ibarra, Jovani Rubio, Zach Taalman, Tate Vangsgard

Department Projects
Agronomy - *MGV and Phenotyping Cart*
- Mahfouz Azzam, Jacob Benner, Ben Gifford, Jason Herzog, Grant Mommer, Elijah Koech, Austin Woods

Music - *Campanile/Carillon Model Mobile Platform*
- Mohamad Aqeellzani, Ryan Cazin, Ethan Henry, Patrick Keep, Muhammad Omar Raghib, Nor Alia Izwanis Roni, Nate Scheirer

ME 415 - Spring 2017

Small Industry
ALMACO - *Auto Cornstalk Counting System*
- Jonah Brink, Dustin Van Diepen, John Hageman, Richard Hess, Jonathan Mayer, Joshua Miller, Kyle Neher, Bryce Sanford, Sean Soupiset, Brett Wills, Brian Wood

Boyt Harness - *Dog Kennel Design for Manufacture*
- Tyler Bertoldi, Dallas Carter, Leah Fossum, Robert Hank, Matthew Hart, Andrew Hoefling, Maxwell Johnson, Kelsey Lisowski, Jeffrey Perkins, Jesse Rhodes, Jacob Swoyer

Dalton - *Snow/Ice Abatement Spreaders*
- Ryan Aske, Matthew Eng, Blacke Fitzel, Henry Friedrichs, Samuel Hardie, Tyler Hoth, Matthew Linebach, Seth Stoube, Joshua Wendell, Michael Woofter

Dalton - *Weld Fixture Design*
- Ian Baumgartner, Nicholas Begley, Caleb Coon, Sydney Good, Ryan Greenwood, Nathan Janssen, Connor Kocek, Mitchell McDonough, Ullas Prakasan, Luke Schneeman, Yanxi Wang

GOMACO - *Wear Pan Design*
- Justin Blanchett, Julia Eckhott, Daniel Hemken, Angela Hoogland, Ashley Johnson, Jakob Lindke, Estefania Rodriguez, Luke Soleim, Elizabeth Sweeney, Daniel Talbert

GOMACO - *AutoFloat System*
- Gabriel Baglan, Colin Boesch, Corbin Habel, Muhamad-Hadi-Afend Johari, Ryan Leo, Trung Lo, Joseph Mazzenga, Kevin McCabe, Gabriel Murray, Yuanhong Xu

HEM Paving - *Paver Guidance System*
- Ryan Beymer, Yiqun Chen, Xuanhua Duan, Brendan McAlister, Jonah Mueller, Zachary Olson, Garrett Rowe, Ryann Swansen, Matthew Szmurlo, Peng Xue

Mills County Choppers (JHS) - *Helicopter Fill Cap*
- Marcos Cortes-Medina, Tyler Klein, Eduardo Lorenzana, Franklin McCracken-Van Fleet, Derek Nalley, Nathan Peterson, Zachary Reusch, David Ristau, Pathik Rustagi, Michael Trimble

Molded Products Corp - *Landscape Block and Test Apparatus*
- Holly Baiotto, Kyle Birchmier, Michael Boysen, Casey Coyle, Craig Halicki, Ryan Hempel, Grant Lehmann, Daniel Mrla, Brett Paulsen, Timothy Sluik, Nicholas Smith

Monarch Materials Group - *Composite Window Frame Design and Manufacture*
- Jiawei Bao, Wyatt Burns, Connor Eberhardt, Chaoyue Huang, Pei Lun Lai, Ryan Nelson, Kirk Rudolph, Wen Shim, Jeremy Zeis, Yiyao Zhang

Power Engineering - *Black Box System for Life Monitoring*
- John Bavlsik, David Bonn, Trevor Brey, Ryan Cooksley, Connor Fabrycy, Joshua Higginbottom, Erin Kollar, Miguel Orihuela, Dustin Smith, Qianjun Ye

Power Engineering - *Remote Torque Sensor*
- Eric Lundeen, Brendon Kinney, Jackson Marko, Daniel McDonald, Kyle Mensen, Michael Panek, Jace Piercy, Ernest Staffensmeier, Andrew Tiedeman, Andrew Thompson

Sukup Manufacturing Company - *Fan Blade Design and Optimization*
- Alvina Aui, Austin Dzik, Logan Gesell, Walter Jankowski, Zhuan-Hao Koh, Daniel Konsor, Sam Loban, Omar Longou, Timothy Meschke, Scott Stephan, Brian Wandrei

UAVX - *Drone Structure Design*
- Jason Boblit, Justin Brown, Ian Dexter, Devin Hall, Isaac Harmelink, Hans Heindl, Ha-Lim Jeong, Quinton Quam, Kyle Speer, Van Stephan, William Woodcock

Large Industry
Caterpillar - *Drill Auto Multipass Project*
- Dylan Berg, Joseph Budden, Sylvia Farley, Jason Holesha, John Maxwell, Marcus Obren, Jacob Petersen, Justine Schmidt, Enrique Toscano, Tanner Watts

Curries - *Collaborative Robot on Hinge Tapping Station*
- Joshua Baedke, Shawn Castelino, Khai Chan, Bryan Deherder, Andrew Filipp, Alagendrah Gonasergar, Curtis Guzan, Ann McLoughlin, Kyle McNulty, Craig Stanley

Pella Corporation - *Vinyl Window Structure*
- Brian Becker, Thomas Gavin, Samuel Gaylord, Austin Gluesing, Jung Hyun Ha, John Heires, Chase Langreck, ChanGyu Park, Minhao Wang, Everett Wood

Senior Design Projects

Pella Corporation - *Ideal Casement Operator*
- Mark Cox, John Derango, Tyler Hardy, William Herzog, Andrew Hovenga, Dan Li, Elliot Lynch, Chris Mack, Jacob Robertson, Tianqi Wang

Department Projects

ISURF - Geared *Continuous Variable Transmission*
- Lydia Barrett, Jacob Dumler, Nichole Gottschalk, Robert Hanson, Cody Ledezma, Colin Lorenz, James Polacek, Koree Willer, Seth Woolston

Mechanical Engineering - *Autonomous Rover*
- Joseph Carpenter, Justin Hardenbrook, Luke Oberbroeckling, Erik Olsen, Phillip Rockwell

Music - *Campanile Model/Mobile Carillon System*
- German Barcenas, Michael Conroy, Jonathan Hermsen, Phillip Pakes, Jacob Vogts

Students from the Campanile-Carillon Moedel project explain their design to Dr. Tin-Shi Tam, the University Carillonneur and project collaborator, during the fall 2016 ME Design Expo held in the atrium of Howe Hall on Dec. 6.

ME 466 - Spring 2016

Small Industry
Artistic Manufacturing - *Small Volume Communion Cup Fillers*
- Jason Banker, Joseph Gettemy, Andrew Kollenkark, Winston Mulder, Stevanna Truso, Zhisheng Zhang

CyBIZ (Dr. Sahai) Manufacturing - *Double Stroller Prototype*
- Lauren Dohse, William Hendricks, Eric Jeffrey, Anthony Locurto, Hunter Oberbroeckling, Xingfang Tan

Cross Over - *Safe Helmet Shell Development*
- Kyle Hatton, James Conklin, Austin Cunningham, Andrew Peterson, Kirk Rudolph, Brendan Schuler, Angela Wagner, Wan-Afifuddin Wan-Jaffar

Department Projects
Agronomy - *Agronomy Phenotyping System*
- Aaron Carter, Timothy Dwyer, Gabriel Evans, Muhammad Mohammad-Nizam, Muhammad Raffiq Mohd Khalil, Christopher Moore, Terence Schafer, Alan Watts,

Senior Design Projects

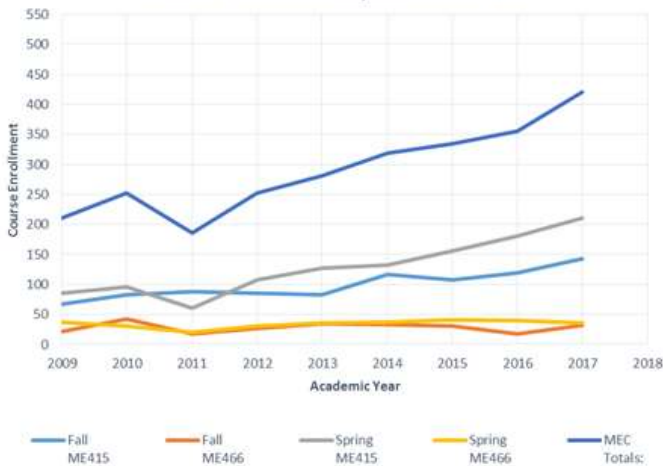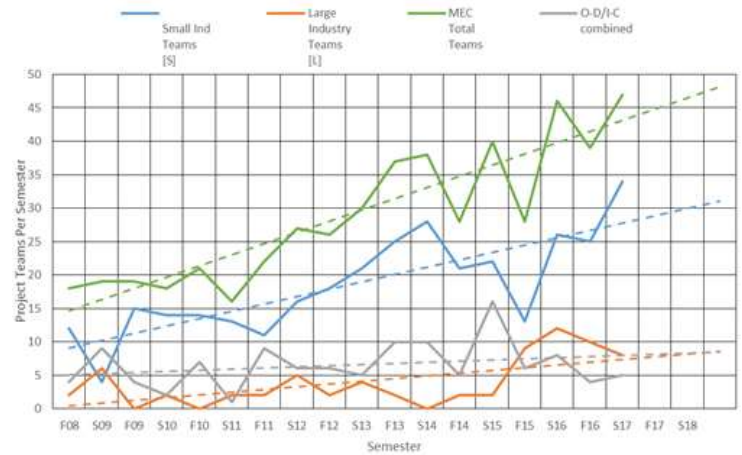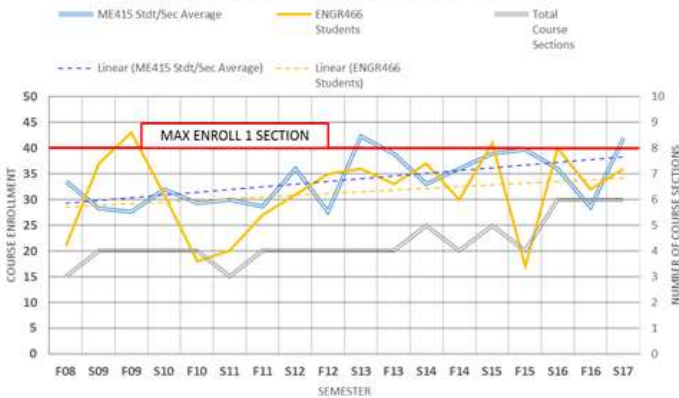### Course Enrollment by Academic Year

ME CAPSTONE TRENDS - PROJECT TEAMS

ME CAPSTONE TRENDS - ENROLLMENT

M E Capstone Program Sponsor Commitments

A shot of the spring 2017 ME Design Expo held in the atrium of Howe Hall on April 25.

Enrollment: At the start of the 2017-2018 academic year, Mechanical Engineering had 270 students enrolled.

Degrees: The department granted 21 Master's of Engineering (MEng) degrees, 33 Master's of Science (MS) degrees, and 20 Doctorate (PhD) degrees during the summer, fall and spring semesters of the 2016-17 academic year.

Recent developments

Dr. Abhijit Chandra, Professor, was appointed as Associate Chair for Graduate Studies and Director of Graduate Education in December 2015 and continues to serve in this role.

Abhijit Chandra
Associate Chair
for Graduate Studies
Director of Graduate Education

One MS and 5 PhD students were awarded Research Excellence Awards and 1 MS and 5 PhD students were awarded Teaching Excellence Awards from the Graduate College. One student was chosen as the recipient of the NSF Fellowship.

The ME Graduate Student Organization (MEGSO) is helping new graduate students adapt to life on campus through their learning community. MEGSO hosts workshops for the new graduate students on topics surrounding campus resources, setting up the program of study, qualifier and preliminary exams.

Doctoral Graduates

Summer 2016

Jeremy Scott Bennett *
Faculty Advisers: James Oliver and Joseph Zambreno

Geetha Pravallika Chimata
[dissertation title unavailable]
Faculty Adviser: Cris Schwartz

Longwen Ou
[dissertation title unavailable]
Faculty Advisers: Robert Brown and Mark Mba-Wright

Bo Sun
[dissertation title unavailable]
Faculty Adviser: Shankar Subramaniam

Chamila R. Thilakaratne
[dissertation title unavailable]
Faculty Adviser: Robert Brown

Jingnan Zhao
[dissertation title unavailable]
Faculty Adviser: Pranav Shrotriya

Fall 2016

Bhaskar Bhattacharya*
Automatic generation of augmented reality guided assembly instructions using expert demonstration
Faculty Adviser: Eliot Winer

Matthew Aguirre Darden
An investigation of skin tribology phenomena involved in tactile communication through braille and its associated psychophysical response during task-based discrimination
Faculty Adviser: Cris Schwartz

Peter Samuel Broen Finzell
A stigmergic algorithm for solving inverse thermal systems
Faculty Adviser: Kenneth Mark Bryden

Anthony David Fontanini
Analyzing the characteristics of contaminant transport using the Perron-Frobenius operator in indoor building environments
Faculty Advisers: Baskar Ganapathysubramanian and Michael Olsen

Martin Robert Haverly
Biorenewable Resources and Technology
An experimental study on solvent liquefaction
Faculty Adviser: Robert Brown

Wangyujue Hong
Ion transport in ionomeric polymers for ionic electroactive polymer devices
Faculty Adviser: Reza Montazami

Zhenping Liu
Mechanical Engineering and Chemical Engineering
A fundamental investigation of scaling up turbulent liquid-phase vortex reactor using experimentally validated CFD models
Faculty Advisers: Michael Olsen and Rodney Fox

Mahdi Ramezani
Experimental investigation of multiphase flow: Mass transfer and fluid flow in Taylor-Couette reactor and velocity field of train of particles in a square duct
Faculty Adviser: Michael Olsen

Farrokh Sharifi
Microfluidic fiber fabrication and its application in neural tissue engineering
Faculty Adviser: Nastaran Hashemi

Spring 2017

Mina Mikhail Henry Bastwros
Control and manipulation of nanoparticles for fabrication of metal matrix composites
Faculty Adviser: Gap-Yong Kim

Jing Liu
Energy transport at the micro-/nanoscale and structure discovery based on phonon scattering
Faculty Adviser: Xinwei Wang

Saeed Abdullah Mousa
Roll bonding of metal-polymer-metal sandwich composites-
Faculty Adviser: Gap-Yong Kim

Christopher Daniel Radke
Synchrotron x-ray radiography, fluorescence, and imaging of coaxial rocket injector sprays
Faculty Advisers: Terrence Meyer and Travis Sippel

Rui Zou
[dissertation title unavailable]
Faculty Adviser: Sourabh Bhattacharya

* Denotes graduate of Human Computer Interaction program

Masters Graduates

Summer 2016

Master of Science (MS)

Briana Christina Bettin*
Faculty Adviser: James Oliver

Allison Anne Cargill
[thesis title unavailable]
Faculty Adviser: Jonathan Claussen

Prachi Deepak Deshpande
[thesis title unavailable]
Faculty Adviser: Atul Kelkar

Nicholas John Haberl
[thesis title unavailable]
Faculty Adviser: Song-Charng Kong

Mark Jeffrey Johnson
[thesis title unavailable]
Faculty Advisers: Terrence Meyer and James Michael

Wenqi Li
[thesis title unavailable]
Faculty Adviser: Xianglan Bai

Daphne Mintz*
Faculty Adviser: James Oliver

Michelle C Munguia*
Faculty Adviser: James Oliver

Benjamin Jordan Reuter
[thesis title unavailable]
Faculty Advisers: Terrence Meyer and James Michael

Jason Ugie*
Faculty Adviser: James Oliver

Therin Jamal Young
[thesis title unavailable]
Faculty Advisers: Sriram Sundararajan and Halil Ceylan

Zhikun Zhong
[thesis title unavailable]
Faculty Adviser: Gregory Maxwell

Master of Engineering (MEng)

Kaustubh Dhananjay Gosavi
Faculty Advisers: Ted Heindel and Gregory Maxwell

Joshua Ryan Calvert
Faculty Adviser: Abhijit Chandra

Ye Cheng
Faculty Adviser: Abhijit Chandra

Danielle Marie Douskey
Faculty Adviser: Greg Luecke

Sayan Ghosh
Faculty Adviser: Abhijit Chandra

Wilson Onyino Mukabane
Faculty Adviser: Abhijit Chandra

Akil Utkarsh Patel
Faculty Adviser: Pranav Shrotriya

Kumar Rishi
Faculty Adviser: Abhijit Chandra

Can Zhu
Faculty Adviser: Gap-Yong Kim

Fall 2016

Master of Science (MS)

Hao Bai
Investigation of momentum exchange terms closures for the eulerianeulerian model applied to bubbly flows
Faculty Adviser: Alberto Passalacqua

Sean Patrick Durkin*
Faculty Adviser: Eliot Winer

Yuting Guo*
Faculty Adviser: Rafael Radkowski

Hiroyuki Iino*
Faculty Adviser: James Oliver

Nigel Lee
[thesis title unavailable]
Faculty Adviser: Baskar Ganapathysubramanian

Kin Gwn Lore
Deep learning for decision making and autonomous complex systems
Faculty Adviser: Soumik Sarkar

Mingchang Lu
Aligning carbon nanofibers in PCL microfibers using microfluidic method: An approach to efficiently improve electrical conductivity and mechanical strength
Faculty Advisers: Nastaran Hashemi and Reza Montazami

Hosein Monshat
[thesis title unavailable]
Faculty Adviser: Shan Hu

Hsiang Sing Naik
Image analysis and machine learning based methods for disease detection in soybeans
Faculty Adviser: Baskar Ganapathysubramanian

Ashlea Brooke Ann Reed*
Faculty Adviser: James Oliver

Nicholas Aaron Sturtz*
Faculty Adviser: James Oliver

Master of Engineering (MEng)

Brenda Marie Fischer
Faculty Adviser: Pranav Shrotriya

Steven Bennion Gardner
Faculty Adviser: Abhijit Chandra

Robert Owen Gowdy
Faculty Adviser: Abhijit Chandra

John William Harris
Faculty Adviser: Abhijit Chandra

Frederick C. J. Koke
Faculty Adviser: Abhijit Chandra

Hsin Miao Lee
Faculty Adviser: Abhijit Chandra

Christopher Ryan Sievers
Faculty Adviser: Abhijit Chandra

Spring 2017

Master of Science (MS)

Ashton Rose Archer
An experimental and statistical study of 2D hopper flow of binary mixtures
Faculty Adviser: Ted Heindel

Michael R. Huston
[thesis title unavailable]
Faculty Adviser: Travis Sippel

Alexander D. Jenson
The hardness evolution and tribofilm growth during running-in of case carburized steel under boundary lubrication
Faculty Adviser: Sriram Sundararajan

Kayla Elizabeth Johnson
Pretreatment optimization methods for increased sugar yields from biomass pyrolysis
Faculty Adviser: Robert Brown

Ross David Mazur
[thesis title unavailable]
Faculty Adviser: Robert Brown

Chloe Lindsay McPherson
Tangible augmented reality intervention for a product dissection task
Faculty Adviser: Rafael Radkowski

Yan Tian
Smart autonomous grain carts towards a solution to harvesting-on-demand
Faculty Adviser: Sourabh Bhattacharya

Hiep Hoang Tran
View factors for circular air ducts in attics: Fast and accurate approximations
Faculty Adviser: Baskar Ganapathysubramanian

Kwang Shiong Wong
[thesis title unavailable]
Faculty Adviser: Pranav Shrotriya

Gavin Ruey-Jer Young
[thesis title unavailable]
Faculty Adviser: Adarsh Krishnamurthy

Master of Engineering (MEng)

Drew Tyler De Ruiter
Faculty Adviser: Abhijit Chandra

Matthew Lawrence Gulleen
Faculty Adviser: Abhijit Chandra

Evan Nathaniel Lowther
Faculty Adviser: Pranav Shrotriya

Cody Raine Simpson
Faculty Adviser: Abhijit Chandra

Johnathon Stanny
Faculty Adviser: Pranav Shrotriya

11

* Denotes graduate of Human Computer Interaction program

Faculty

Emmanuel Agba
Senior Lecturer

PhD, Mechanical Engineering, Florida Atlantic University
M Eng, Mechanical Engineering, University of Benin, Nigeria
B Eng, Mechanical Engineering, University of Benin, Nigeria

Dr. Agba studies product realization, product lifecycle management, virtual manufacturing engineering, computer-aided engineering

Daniel Attinger
Associate Professor

Sc D, Technical Sciences, Eidgenoessische Technische Hochschule (ETH) Zurich, Switzerland, 2001
BE and MS, Mechanical Engineering, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, 1997

Dr. Attinger's research interests include micro and nanofluidics, convective heat transfer, single droplet/bubble dynamics, visualization, engineering and simulation of multiphase flow, and multiscale transport phenomena for energy and forensics applications.

Xianglan Bai
Assistant Professor

PhD, Mechanical Engineering, The University of Tokyo, Japan
MS, Aerospace Engineering, Beijing Univesity of Aero. & Astro., China
BS, Aerospace Engineering, Beijing Univesity of Aero. & Astro., China

Dr. Bai's research interests include bio-fuels and bio-based products, thermochemical conversion of biomass and other waste streams and fast pyrolysis and solvent liquefaction.

Jackie Baughman
Senior Lecturer

PhD, Industrial & Agricultural Technology and Biorenewable Resources & Technology, Iowa State University, 2012
MBA, Business Administration. Keller Graduate School of Management, 1997
BS, Metallurgical Engineering. Iowa State University, 1989

Dr. Baughman's research interests include student professional development; flipped classroom; dynamics of teamwork; and multidisciplinary teams.

Sarah Bentil
Assistant Professor

PhD, Mechanical Engineering, The Ohio State University, 2013
MS, Mechanical Engineering, University of Hawai'i at Manoa, 2006
BS, Mechanical Engineering, University of Vermont, 2003
BS, Mathematics, University of Vermont, 2003

Dr. Bentil studies soft tissue biomechanics, biomaterials, traumatic brain injuries, blast impact injury mechanisms, high-speed imaging, brain-machine interfaces, and blunt impact injury mechanism.

Sourabh Bhattacharya
Assistant Professor

PhD, Electrical and Computer Engineering, University of Illinois, Urbana-Champaign, 2010
MS, Applied Mathematics, University of Illinois, Urbana-Champaign, 2009
MSEE, University of Illinois, Urbana-Champaign, 2005
BTech, Indian Institute of Technology, Bombay, 2002

Dr. Bhattacharya's research interests include optimal control theory, game theory, robotics, compressed sensing, large data storage and inference, security for cyber-physical systems, networked control systems, and machine vision.

> *"Education is the mortar that has cemented together the whole structure of Western Civilization."*

~Henry Black
ME Department Chair (1946-72)

Timothy Bigelow
Associate Professor, Mechanical Engineering and Electrical and Computer Engineering

PhD, Electrical Engineering, University of Illinois at Urbana-Champaign, 2004
MS, Electrical Engineering, University of Illinois at Urbana-Champaign, 2001
BS, Electrical Engineering, Colorado State University, 1998

Dr. Bigelow researches systems that use ultrasound in treating cancer, quantifying physical properties of tissue using back-scattered ultrasound signals, applying ultrasound to treat infections, and exploring ultrasound-induced bioeffects for ultrasound safety and therapy applications.
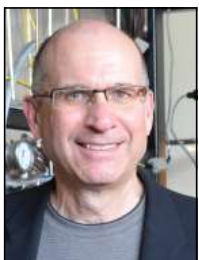
Robert Brown
Anson Marston Distinguished Professor
Gary and Donna Hoover Chair in Mechanical Engineering
Director, Bioeconomy Institute
Director, Center for Sustainable Environmental Technologies

PhD, Mechanical Engineering, Michigan State University, 1980
MS, Mechanical Engineering, Michigan State University, 1977
BS, Physics, University of Missouri, 1976
BA, Mathematics, University of Missouri, 1976

Dr. Brown studies the conversion of biorenewable resources into bioenergy and biobased products, combustion, gasification, fast pyrolysis, hydrogen energy, hydrodynamics, and heat transfer in fluidized beds.

Faculty Highlights

Emmanuel Agba: CIRAS/ME team completed 14 projects with Iowa based companies with ISU metal AM system. This included 40 builds to support the projects. The longest single project that was successful build was 125 hours, which according to the equipment manufacturer is nearly 4x the duration of a typical industry metal AM build. With our focus on building plastic injection molds, a typical build duration was 90 hours (nearly 3x duration of the industry average). The ISU metal AM system recorded over 3,000 hours of build time against a target of 1,000 hours.

Daniel Attinger became an ASME Fellow, and was invited to Japan as a JSPS Fellow. He also taught a forensic graduate class in Jamaica. His research has been featured on the front page of the leading European engineering school EPFL , and in a broad range of popular venues such as Maxim, Popular Science, FoodandWine, Gizmodo, and the New Scientist.

Xianglan Bai recieved two new research grants; published six journal papers and one book chapter; was invited to two talks; supervised six graduate students, one postdoc and three undergraduate students; and was a member of three departmental committees.

Jackie Baughman successfully led flipped classroom implementation in ME 270 for AY 2016, and co-led campus-wide Flipped Learning Community. Developed successful ME 270 logistics proposal to improve space utilization, and provide flexibility for students and instructional team, and reduce Boyd Lab resource needs (implemented spring 2017). Streamlined/improved capstone course logistics utilizing Blackboard Learn, and sourced diverse, industry-sponsored projects. Conducted research in the Scholarship of Teaching and Learning (SoTL). Continue to address diversity through hiring and mentoring URM students in ME.

Sarah Bentil and her newly recruited undergraduate and graduate students have begun developing experimental and computational methods to non-invasively characterize the response of soft tissues and biomaterials to blast and blunt impact. Her research group are also investigating design modifications for football helmets to reduce traumatic brain injury following blunt impact.

Timothy Bigelow: Overall, it was a very exciting year for my research lab. The best news was the funding of a new proposal on the treatment of infections on surgical mesh following hernia repair as an NIH R21. The funding will allow me to study the interaction of ultrasound histotripsy and bacteria biofilms on surgical mesh. Since the R21 is often the gateway to an NIH R01, receiving this award puts my lab on a very positive trajectory.

Prof. **Robert Brown** serves as director of the Bioeconomy Institute at ISU, which annually conducts $10 - 12 million in research. Prof. Brown is part of a national team that has been selected by the U.S. Department of Energy to establish a National Network in Manufacturing Innovation Institute in Modular Manufacturing and Process Intensification. Prof. Brown will lead the Distributed Biorefining program of the institute.

Mark Bryden
Professor

PhD, Mechanical Engineering, University of Wisconsin,
    Madison, 1998
MS, Mechanical Engineering, University of Wisconsin,
    Madison, 1993
BS, General Engineering, Idaho State University, 1977

Dr. Bryden researches the virtual engineering of
fluids and heat transfer systems within collaborative,
immersive, and synthetic environments.

Abhijit Chandra
Professor

PhD, Cornell University, 1983
MS, University of New Brunswick, Canada, 1980
BTech, IIT, Kharagpur, India, 1978

Dr. Chandra's research interests include mechanics of
manufacturing processes, nanoscale surface modification,
multiscale and multiphysics modeling, renewable energy,
and the boundary element method.

Jonathan Claussen
Assistant Professor

PhD, Biological Engineering, Purdue University, 2011
MS, Mechanical Engineering, Purdue University, 2008
BS, Mechanical Engineering, University of Minnesota, 2006
BA, Spanish and Portuguese Studies, University of Minnesota, 2006

Dr. Claussen's research interests include biosensors
(electrochemical and optical, bio-integrated electronics,
BioMEMS and BioNEMS, micro/nanoscale propulsion,
carbon nanomaterial growth)graphene and carbon
nanotubes, nanomanufacturing / materials printing,
quantum dots / carbon dots, and mass transport / fluid
dynamics.

Mirka Deza
Lecturer

PhD, Mechanical Engineering, Virginia Tech, 2012
MS, Mechanical Engineering and Bionewable Resources &
    Technology, Iowa State University, 2006
BS, Mechanical Engineering, Pontificia Universidad Catolica del Peru, 1997

Dr. Deza's research interests include computational fluid
dynamics and heat transfer, multiphase flow modeling,
natural ventilation simulation and modeling, energy
usage and energy efficiency as well as engineering
education.

Faculty Highlights

Professor **Mark Bryden** made significant progress towards the
mechanical engineering department's commitment to diversity. In 2016
all undergrad, grad, and predoctoral hires for his research group were
women or underrepresented minorities (or both). At the end of 2016
his research was comprised of 9 individuals (4 undergrad researchers,
3 graduate students, 1 predoctoral researcher, and 1 postdoctoral
researcher). Of these 5 were men (3 are white Americans, 1 is a Native
American, and 1 is an African American) and 4 are women (3 are
white Americans and one is an African American – the only African
American woman in our department).

Abhijit Chandra: Two papers on CMPG were published in international
journals. A paper on life expectancy of grinding wheels is also in
print. Objective ranking algorithm is applied to voting systems and a
publication is under review. Data Driven Prognosis algorithm is applied
to on-line monitoring and control of manufacturing systems and
machine tools. Continuing development of a plasma system facilitating
buffing of ultra-hard materials (e.g., sapphire).

Prof. **Claussen** obtained funding support from the USDA-NIFA, 360 Yield
Center (360 Yield Center), Alberta Livestock and Meat
Agency, Naval Surface Warfare Center, and the Gordon and Betty
Moore Foundation to develop an in-field pesticide biosensor, infield
fertilizer sensor, in-field cattle disease biosensor, and catalysts for
underwater vehicle propulsion all with nanomaterials in
2016. Prof. Claussen's research in 2016 was awarded a provisional
patent, highlighted in the front cover of the journal Nanoscale
and published in various news outlets including ISU, USDA/NIFA, and
the Southwest Farm Press.

Mirka Deza: I have taught six classes with high overall performance
and helped to update of the background content of the Heat transfer
Lab.

Sebastien Feve
Senior Lecturer

MS, Mechanical Engineering, Ecole Nationale d'Ingenieurs de Metz, France, 1998

Lecturer Feve's interests include tire research, fundamentals of thermodynamics, engineering education, international & study abroad.

Baskar Ganapathysubramanian
Associate Professor

PhD, Cornell University, Mechanical and Aerospace Engineering, 2008
MS, Cornell University, Mechanical and Aerospace Engineering, 2006
BTech, Indian Institute of Technology, Madras, Mechanical Engineering, 2003

Dr. Ganapathysubramanian researches computational physics, computational mechanics (fluid mechanics and heat transfer), stochastic analysis, uncertainty quantification and propagation, multiscale modeling, control and optimization of complex systems, materials-by-design, and parallel computing and inverse problems.

Matt Hagge
Senior Lecturer

PhD, Mechanical Engineering, Iowa State University, 2005
MS, Mechanical Engineering, Iowa State University, 2002
BS, Mechanical Engineering, Iowa State University, 1998

Dr. Hagge's research involves computational modeling, wood, combustion, pyrolysis, thermodynamics, and visualization of bloodstain pattern analysis.

Nicole N. Hashemi
Assistant Professor

PhD, Mechanical Engineering, Virginia Tech, 2008
MS, Mechanical Engineering, West Virginia University, 2004
BS, Mechanical Engineering, Tehran Polytechnic, 1999

Dr. Hashemi's research areas of interest include microfluidics, biosensors, optofluidics, Bio-N/MEMS: design, modeling, and fabrication, diagnostics and therapeutics, physics of micro/nanoscale phenomena, and nonlinear dynamics.

Sebastien Feve: (1) ME 170 students now have the chance to work (and learn first-hand) about 3D printing, 3D measuring, 3D scanning and 3D designing during class projects; (2) ME students can enroll in a summer intensive study abroad program in France and complete online their ME 231 course requirement. They can also study abroad for a semester or a year in Switzerland at EPFL (world's top15 engineering school), or enroll in ME 401x to learn about human centered design in Nicaragua, (3) New student club 'Solidworks CAD' – come learn with your peers and earn your Solidworks Associate Certification; (4) ME 170 'Solidworks Help Sessions' are offered every nights from 6-8pm and weekends 3-5pm on campus to all ME 170 students.

Baskar Ganapathysubramanian is leading an interdisclipinary team that uses engineering- and data- analytics principles for improving agriculture production (digital agriculture). This has resulted in several high impact publications as well as awards worth $2 million.

Dr **Hagge's** work continues to demonstrate that ME students appreciate instructors with high standards, instructors that attempt to prepare students for the real world, by teaching ME students to take responsibility for their own learning, and by teaching students how to work in a collaborative environment to turn in correct answers to their boss. Dr Hagge has developed an innovative teaching method called 'Decision Based Learning' where students learn to solve unfamiliar problems by connecting all their pieces of understanding through a set of instructor decisions. Dr Hagge has developed a tutor activity than has shown a statistically large amount of learning in every group of thermodynamic students ever tested, with more than 500 participants, through an NSF funded proposal with John Jackman, Stephen Gilbert, Gloria Starns, and LeAnn Faidley.

Nicole Nastaran Hashemi: This year, I have published 11 manuscripts in high impact factor journals, delivered an invited seminar internationally, and received major grants from ONR and LUSH. Three distinct research topics from my lab was highlighted by news agencies such as CNN, BBC, Forbes, ASME, IEEE, AIChE, among many in July, August, and October. I have graduated a PhD and three Master's students. Three graduate/undergrad students graduated from my lab secured PhD and research positions at MIT, Berkeley, and Penn State. My graduate students and I have received many fellowship and awards such as ISU Dean's Fellowship and University Award for Excellence in Honors Teaching and Mentoring.

Faculty Highlights

Ted Heindel leads the ISU portion of a newly-awarded five university team to study spray dispersion and control through an Office of Naval Research Multidisciplinary University Research Initiative (ONR MURI) grant. Ted's portion of this work will focus on characterizing sprays near the nozzle exit using X-ray imaging technology.

Jim Heise organized 46 sponsored projects for the ME Capstone Senior Design Program to support 86 teams; 35 of these projects were in direct support of Iowa manufacturers. These projects represent a 21% growth over a 2-year period matching our enrollment growth. Jim hosted a second crowd source design event in the fall with the College of Engineering and Caterpillar Corporation. Eleven student club teams participated with the Cyclone Space Mining Club receiving the $2000 award for having the best design solution. As faculty advisor for Cyclone Space Mining Club he accompanied the team had another successful year at NASA's 8th Annual Robotic Mining Competition at the Kennedy Space Center placing 2nd overall (out of 48 teams participating). The team took second place in Best Use of Social Media and second place in the Outreach Project Award, the sixth year in a row that ISU has placed in that category. Jim received the College of Engineering's 2017 Superior Extension Award for his work with Iowa companies as a part of the M E Capstone Senior Design Program.

Dr. **Hsu's** research group focuses on developing novel and transformative fluid–structure interaction simulation frameworks for engineering design, analysis, and optimization. The frameworks have been applied to applications such as artificial heart valves, wind turbines, gas turbines, hydraulic arresting gears, and turbulent flow over complex geometries. He has published nine journal papers (four are in print and five are in press) and gave seven invited lectures in 2016.

Professor **Chao Hu** co-authored a book entitled "Probabilistic Engineering Analysis and Design" to be published by Springer in 2017. Topics covered in the book include statistical data analysis, reliability analysis under time-independent and time dependent uncertainties, and system health diagnostics and prognostics.

In 2016, Dr. **Shan Hu** has received three research grants as PI and co-PI from Iowa Energy Center and National Science Foundation. She has presented research findings as invited speaker at the Innovations in Biomedical Materials and Technologies 2016 meeting and at Department of Industrial and Manufacturing Engineering, Kansas State University. Her research group expanded this year to one postdoctoral researcher, five PhD students, and two MS students.

Caroline Hayes
Department Chair
Lynn Gleason Professor of Interdisciplinary Engineering

PhD, Robotics, School of Computer Science, Carnegie Mellon University, 1990
MS, Knowledge-Based Systems, Mellon College of Science, Carnegie Mellon University. Interdisciplinary degree between Psychology, Computer Science and Mechanical Engineering, 1987
BS Computer Science, Carnegie Mellon University, 1983

Dr. Hayes's recent focus is on understanding the sociotechnical factors impacting collaboration in globally distributed design teams, and in developing processes and tools to make such teams more effective. Her research has crossed disciplinary boundaries between engineering, psychology, computer science and management.

Ted Heindel
Bergles Professor of Thermal Science

PhD, Mechanical Engineering, Purdue University, 1994
MS, Mechanical Engineering, Purdue University, 1990
BS, Mechanical Engineering, University of Wisconsin, Madison, 1988

Dr. Heindel works with x-ray flow visualization, fluid mechanics, multiphase flow hydrodynamics, and gas-liquid mass transfer.

"The ultimate goal of all education is the making of men and women of such intellectual fiber and moral worth as shall prepare them in training and purpose to perform aright all the duties that go with citizenship in a free industrial republic."

~Edgar W. Stanton
ME Class of 1872

Jim Heise
Senior Lecturer

MS, Mechanical Engineering, Iowa State University
BS, Mechanical Engineering, Iowa State University
AS, Mechanical Engineering Technology, Hawkeye Community
    College

Lecturer Heise's specialties include product design engineering, project management, design for Lean Sigma®/Six Sigma®

Ming-Chen Hsu
Assistant Professor

PhD, Structural Engineering, University of California, San Diego, 2012
MSE, Aerospace Engineering and Engineering Mechanics, The
    University of Texas at Austin, 2008
MS, Engineering Science and Ocean Engineering, National
    Taiwan University, 2005
BS, Engineering Science and Ocean Engineering, National
    Taiwan University, 2003

Dr. Hsu's research interests lie in the field of Computational Mechanics, Isogeometric Analysis and Fluid–Structure Interaction (FSI) with an emphasis on contemporary engineering problems such as wind energy and biomedical applications.

Chao Hu
Assistant Professor

PhD, Mechanical Engineering, University of Maryland-College
    Park, 2011
BE, Engineering Physics, Tsinghua University, China, 2007

The goal of Dr. Hu's research is to develop innovative engineering design and failure prognostics methodologies that lead to design of resilient and sustainable systems.
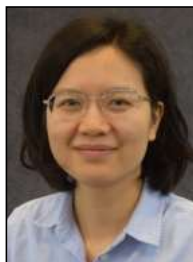
Shan Hu
Assistant Professor

PhD, University of Minnesota, Minneapolis, MN, 2014
MS, University of Minnesota, Duluth, MN, 2009
BS, Harbin Institute of Technology, Harbin, China, 2007

Dr. Hu's research interests include nanomaterials for energy storage and energy harvesting; scalable manufacturing of nanomaterials-based devices; sensors, actuators, and controls.

Jaime Juarez
Assistant Professor

PhD, Chemical and Biomolecular Engineering, Johns Hopkins
    University, 2011
MS, Mechanical Engineering, University of Texas at San
    Antonio, 2006
BS, Mechanical Engineering, Stanford University, 2004

Dr. Juarez's interests include microfabrication, microscopy, microfluidics, flow cytometry, soft matter physics, self assembly of materials, physics of micro- and nanoscale forces, simulation of colloidal materials.

Atul Kelkar
Professor

PhD, Mechanical Engineering, Old Dominion University, 1993
MS, Mechanical Engineering, Old Dominion University, 1990
BS Mechanical Engineering, University of Poona, Pune, India, 1984

Dr. Kelkar researches control theory, robust and nonlinear control, acoustic noise control, vibration control, flexible multibody dynamics, integrated design via multiobjective optimization, robotics, and neural networks.

Gap-Yong Kim
Associate Professor

PhD, Mechanical Engineering, University of Michigan, 2005
MS, Mechanical Engineering, University of Michigan, 2003
BS, Mechanical Engineering, Yonsei University, 1997

Dr. Kim works with manufacturing science at the microscale, microscale deformation processes, semisolid forming, modeling and fabricating microreactors, and energy conversion devices.

Song-Charng Kong
Professor

PhD, Mechanical Engineering, University of Wisconsin, Madison, 1994
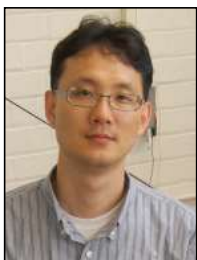MS, Mechanical Engineering, University of Wisconsin, Madison, 1992
BS, Power Mechanical Engineering, National Tsing-Hua University, Taiwan, 1987

Dr. Kong researches experimental engine combustion and emissions studies, biorenewable energy utilization in internal combustion engines, and numerical combustion study and model development using detailed chemical kinetics with computational fluid dynamics.

Owen Kolstad
Senior Lecturer

MS, Agricultural Engineering, University of Minnesota, 1981
MS, Mechanical Engineering, University of Minnesota, 1978
BS, Agricultural Engineering, North Dakota State University, 1991

Lecturer Kolstad's interest areas include product realization; design; product and process development; Six Sigma; quality; and project management.

Adarsh Krishnamurthy
Assistant Professor

PhD, Mechanical Engineering, University of California-Berkeley, 2010
MTech, Mechanical Engineering Indian Institute of Technology-Madras, 2005
BTech, Mechanical Engineering, Indian Institute of Technology-Madras, 2005

Dr. Krishnamurthy research involves Biomechanics, finite element analysis, patient-specific modeling, computational mechanics, geometric modeling, computer aided design and manufacturing, computer graphics.

Faculty Highlights

Owen Kolstad: Engineers Without Borders – ISU sent seven students to Ullo-Dantie, Ghana in late December 2016 to prepare for a large water system they are planning for the community. ME communications specialist Nick Fetty is working with the students to share more news of this activity.

Dr. **Kong** conducts innovative research in multiphase flows and renewable energy systems. His group has developed high-fidelity computational framework for simulating biomass thermochemical conversion for biofuel production. He has developed highly-efficient optimization algorithms for diesel engine performance optimization. He is an associate editor for ASME Journal of Engineering for Gas Turbine and Power, associate editor for Frontiers in Mechanical Engineering, and a member in the editorial board of Internal Journal of Engine Research. He is currently the Program Director of the Combustion and Fire Systems Program (ENG/CBET) at National Science Foundation.

Adarsh Krishnamurthy: Part of my research in 2016 focused on computational modeling of heart failure, where identifying patients who will best respond to a particular therapeutic intervention is difficult. Computational models, developed from patient-specific clinical data, can help refine the diagnosis and personalize heart failure intervention therapies. Our research has recently been used to ascertain a possible mechanism for improvement due to cardiac resynchronization therapy, which uses implantable pacemakers to synchronize ventricular function, for the first time. This preliminary investigation suggests the possibility of extracting important diagnostic information from clinical measurements using computational models.

Valery Levitas: (1) New phase field approaches are developed and corresponding problems solve numerically for: interaction of phase transformation and dislocation evolution at the nanoscale under compression and shear; solid-solid transformations via nanoscale

Valery I. Levitas
Schafer 2050 Challenge Professor
Department of Mechanical
Engineering and of Aerospace
Engineering

DrIng habil, Continuum Mechanics, University of Hannover, 1995
ScD, Continuum Mechanics, Institute of Electronic Machinebuilding
    (Moscow), 1988
PhD, Materials Science, Institute for Superhard Materials (Kiev), 1981
MS, Mechanical Engineering (Honors), Kiev Polytechnic Institute, 1978

Dr. Levitas's research includes stress- and strain-induced
phase transformations, high pressure mechanics and
mechanochemistry, structural changes in materials via
virtual melting, multiscale modeling, strain-induced chemical
reactions, and large inelastic deformation of solids.
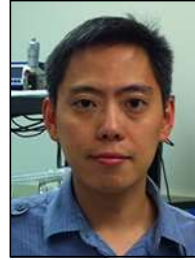
Barbara Lograsso
Senior Lecturer

PhD, Metallurgical and Materials Engineering, Michigan Technological Univ., 1991
MS, Metallurgical and Materials Engineering, Michigan Technological Univ., 1982
BS Metallurgical and Materials Engineering, Michigan Technological Univ., 1980

Dr. Lograsso's interest areas include analysis of fracture
orientation of metals; forming of materials; powder
processing including powder injection modling;
development of adaptive structures that will regulate their
mechanical properties under service conditions; and
magnetic materials.

Meng Lu
Assistant Professor

PhD, Electrical Engineering, University of Illinois, 2008
MS, Electrical Engineering, University of Illinois, 2006
BS, University of Science and Technology of China, 2002

Dr. Lu's research interests include optical sensors,
biomedical engineering, sensors for molecular
diagnostics and photonic devices.

Greg Luecke
Associate Professor

PhD, Mechanical Engineering, Pennsylvania State University, 1992
MS, Engineering and Applied Science, Yale University, 1987
BS, Mechanical Engineering, University of Missouri-Columbia, 1979

Dr. Luecke's research interests include robotics and
control, multibody dynamics and simulation, and
artificial neural networks for control.

intermediate interfacial phase with allowing for interfacial stresses;
nanoscale melting of aluminum nanoparticle covered by oxide shell
under high heating rates including mechanics effects, and phase
transformations with anisotropic interface energies and stresses, (2)
New model and FEM modeling of plasticity under extreme pressure up
to 300 GPa are developed and validated by experiments.

Barbara Lograsso: Collaborated as a Co-PI with A. Bastawros of
Aerospace Engineering, W. Meeker, and R. Maitra of Statistics along
with Indiana State Police Forensic Scientist, J. Vanderkolk to propose
a study selected for a two-year award by National Institutes of Justice.
The study is entitled "Development and Assessment of Analysis
Tools for Examination of Microscopic Fracture Surface Topology and
Degradation for Evidence Physical Match."

In 2017, **Meng Lu** recieved the NSF CAREER Award and the 3M Non-
Tenured Faculty Award, he published nine journal articles and was
awarded four grants. He also taught two courses (EE/BME 450X and EE

432/532) and advised four PhD students, five MS students, and seven
undergraduate students.

Greg Luecke: Instrumental in developing and commercializing new
technology related to visualization and controls. Supported Iowa based
companies, Deere and Co. and Winegard Company, and Vermeer
Corp. with research projects on new technology development. Based
on research with ISU, Deere and Co is now selling the S-Series
GoHarvest™Premium Combine Simulator. Using development work
from ISU, Winegard has multiple tracking antenna products available
for consumer purchase, including the Pathway X1. Vermeer Corporation
sold and showcased a new Horizontal Directional Drilling simulator
at the preeminent Jakarta Indonesia, infrastructure convention, IIICE,
in November, 2016. Continued funded collaboration with the College
of Veterinary Medicine at ISU and with researchers at the Texas
A&M College of Veterinary Medicine is aimed at bionic stimulation of
muscles to allow dogs with spinal cord injuries to walk normally.

Faculty Highlights

Margaret Mathison: I have remained active in the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), chairing a technical committee that supervises research, programs, standards and handbook chapters related to positive displacement compressors, and serving on several ASHRAE standard committees.

In 2016, **Mark Mba Wright** published eight peer-reviewed journal articles and received over $1,000,000 in new federal and state awards.

Scott Merkle is a Senior Lecturer in Mechanical Engineering, having joined ISU in 2015 with extensive industry experience in the leadership of interdisciplinary product development teams for global consumer products. Scott teaches several courses in the M.E. Design Series, and enjoys fostering relationships with major corporate sponsors; such as co-hosting and co-judging the Caterpillar Corporation Saturday Design Challenge Event where several student club teams competed in an eight hour blitz competition for a grand prize of $2,500. Scott recruits for strong and underrepresented youth for the M.E. program, for example, by representing ISU at both the annual Iowa High School Science Fair Finals Competition and the Iowa High School Tech Expo State Competition.

Michael Messman: I joined the ME faculty as a Senior Lecturer in August 2016 and taught two sections of ME 415, Mechanical Systems Design.

Dr. **Michael** and his graduate student Chloe Dedic have recently developed a nonlinear laser-based measurement technique that allows for detailed measurements of the energy transfer processes in highly excited atmospheric plasmas. Understanding the internal modes of energy are critical to optimizing the use of these types of nonequilibrium plasmas for applications ranging from combustion control to materials surface treatment, and the technique they have developed allows for highly detailed measurements of these quantities.

Montazami's group research was featured on the ISU News, and several other science news outlets including Scientific American, MRS, BBC, Forbes, NBC, and Materials Today. Professor Montazami appeared on the NPR's Science Friday and IPR's River to River radio programs to discuss his research on soft transient electronics. The innovative technology developed in his lab (patent pending) is to be utilized in the future soft transient electronic devices.

Professor **Oliver** leads ISU's Virtual Reality Applications Center and its graduate program in Human Computer Interaction. His research, teaching, and economic development activities focus on human computer interaction technologies, encompassing computer graphics, geometric modeling, virtual reality, and collaborative networks for applications in product development and complex system operation. His research is supported by a variety of industry partners and federal agencies, and the VRAC supports a broad interdisciplinary constituency that spans the entire university.

Michael Olson: I presented a Keynote Lecture at the International Symposium on Flow Visualization in Gatlinburg, TN in June. Although I only had one archival journal paper appear in 2016, I still had a productive research year. One paper that was submitted in 2016 has already been accepted for publication in 2017, and I also have two journal papers currently in review and four others to be submitted in early 2017.

Margaret Mathison
Lecturer
PhD, Mechanical Engineering, Purdue University, 2011
BS, Mechanical Engineering, Iowa State University, 2006

Dr. Mathison's research and teaching interests include positive displacement compressors, HVAC&R equipment, and modeling and analysis of thermal systems.

Greg Maxwell
Associate Professor
Director, Industrial Assessment Center

BS, Physics, Purdue University, 1973
MS, Nuclear Engineering, Purdue University, 1977
PhD, Mechanical Engineering, Purdue University, 1984

Dr. Maxwell's research interests include energy usage in buildings and HVAC systems, industrial energy efficiency, and nuclear energy.

Mark Mba Wright
Assistant Professor

PhD, Mechanical Engineering & Chemical Engineering, Iowa State University, 2010
MS, Biorenewable Resources & Technology, Iowa State University, 2008
BS, Mechanical Engineering, Iowa State University, 2007

Dr. Wright investigates the cost and performance of energy systems, researching techno-economics, process modeling, and energy conversion. Recent projects investigated the costs and emissions of biomass conversion to gasoline and diesel. He also researches novel ways of converting biomass into fuels. Current research includes low-temperature thermochemical conversion (torrefaction and pyrolysis) of lignocellulosic biomass into platform chemicals and fuels.

Scott Merkle
Senior Lecturer

MBA, University of Iowa, 2004
BS, Mechanical Engineering, Iowa State University, 1982

Lecturer Merkle worked in industry for more than 30 years before joining the faculty at Iowa State. He has six patents to his name and is licensed by the State of Iowa as a Certified Professional Engineer.

Michael Messman
Senior Lecturer

MS, Mechanical Engineering, University of Nebraska-Lincoln, 1986
BS, Mechanical Engineering, University of Nebraska-Lincoln, 1984

Lecturer Messman's teaching interests include Mechanics of materials, fatigue and durability Machine dynamics and vibrations Engineering measurements Digital data acquisition Multiaxial force transducer design Correlation of experimental measurements to computer simulation results

James Michael
Assistant Professor

PhD, Princeton University, Mechanical and Aerospace
  Engineering, 2012
MA, Mechanical and Aerospace Engineering, Princeton
  University, 2009
BS, Aerospace Engineering, University of Maryland-College
  Park, 2007

Dr. Michael's areas of interest include optical and spectroscopic diagnostics of reacting, multiphase, and non-equilibrium flows; plasma-assisted combustion; and combustion ignition and control.

Reza Montazami
Assistant Professor

PhD, Materials Science and Engineering, Virginia Tech, 2011
MS, Materials Science and Engineering, Virginia Tech, 2009
BS, Physics and Astronomy, Virginia Tech, 2007

Dr. Montazami's researches smart materials and structures, biomimetic materials and devices, nature-inspired soft microrobotics, mems and nems, functional thin-films, polymeric sensors and actuators, and biomaterials for biomedical applications and devices.

Jim Oliver
University Professor
Larry and Pam Pithan Professor of Mechanical Engineering
Director, CyberInnovation Institute
Director, Virtual Reality Application Center

PhD, Mechanical Engineering, Michigan State University, 1986
MS, Mechanical Engineering, Michigan State University, 1981
BS, Mechanical Engineering, Union College, 1979

Dr. Oliver's areas of interest include design and manufacturing process automation using geometric modeling, computer graphics, visualization, simulation, optimization, virtual reality, and human-computer interaction.

Michael Olsen
Professor

PhD, Mechanical Engineering, University of Illinois-Urbana-Champaign, 1999
MS, Mechanical Engineering, University of Illinois-Urbana-Champaign, 1995
BS, Mechanical Engineering, University of Illinois-Urbana-Champaign, 1992

Dr. Olsen is active in experimental fluid mechanics and microelectromechanical systems.

Sonal Padalkar
Assistant Professor

PhD, Materials Engineering, Purdue University,
MS, Physical Metallurgy, Government College of
Engineering, Pune University, India
BS, Metallurgy, Government College of Engineering, Pune
University, India

Dr. Padalkar's research areas include synthesis,
characterization and simulation of hybrid
nanostructures for energy related application,
synthesis and characterization of nanomaterials
for biosensing, utilizing advanced characterization
techniques like TEM, HRTEM, EELS, and Atom Probe
to obtain solutions for complex research problems.

Alberto Passalacqua
Assistant Professor

PhD, Chemical Engineering, Politecnico di Torino, 2008
MS, Chemical Engineering, Politecnico di Torino, 2004

Dr. Passalacqua's research interests include
multiphase fluid dynamics, fluid particle flows,
quadrature-based moment methods, uncertainty
quantification, computational fluid dynamics and
numerical methods for computational fluid dynamics,
open-source tools for computational fluid dynamics.

Paola Pittoni
Lecturer

PhD, Chemical Engineering, National Taiwan University of
Science and Technology, Taipei
BS, Energy Engineering, Politecnico di Milano

Dr. Pittoni's areas of interest include wettability, drop
triple line dynamics at low and high temperatures, drop
impact, drop evaporation, and multi-phase thermal-fluid
dynamics: heat transfer; pressure drop; and flow patterns.

Rafael Radkowski
Assistant Professor

Doctor in Engineering, product design with evolutionary
algorithm, Graduate School Automatic Configuration in Open
System, Heinz Nixdorf Institute, Paderborn, Germany, 2006
Dipl.-Ing. (equal to BS+MS degree), Mechanical Engineering,
University of Paderborn, 2003

Dr. Radkowski's research interests include Iterative
Closest Points for object identification and tracking;
view-dependent rendering and depth cue simulation
for CAD workstations; probabilistic search methods
for large-scale feature databases.

Juan Ren
Assistant Professor

PhD, Mechanical Engineering, Rutgers University, 2015
BS, Process Equipment and Control, Xi'an Jiaotong University
(China), 2009

Dr. Ren's research interests include nanoscale probe-
based broadband biomechanics characterization and
high-speed imaging and broad-band viscoelasticity

Soumik Sarkar
Assistant Professor

PhD, Mechanical Engineering, Penn State University, 2011
MS, Mechanical Engineering, Penn State University, 2009
MS, Mathematics, Penn State University, 2009
BE, Mechanical Engineering, Jadavpur University, 2006

Dr. Sarkar's research interests include diagnostics,
prognostics & supervisory control of complex cyber-
physical systems; multi-agent systems and analysis
of critical phenomena; human-machine interaction;
data mining and visualization, machine learning,
probabilistic graphical models; and stochastic time
series analysis.

Cris Schwartz
Associate Professor
Associate Chair for
Undergraduate Education

PhD, Mechanical Engineering, Iowa State University, 2006
MS, Mechanical Engineering, Iowa State University, 1998
BS, Mechanical Engineering, Iowa State University, 1996

Dr. Schwartz's research interests include biotribology, polymer tribology, wear of biomaterials and the effects of wear debris in vivo, biomedical implant design, and incorporating naturally derived and biodegradable polymers in design.

Howard Shapiro
Lecturer

PhD, Mechanical Engineering, The Ohio State University, 1975
MS, Mechanical Engineering, The Ohio State University, 1971
BS, Mathematics, The Ohio State University, 1969

Dr. Shapiro's research interests include energy efficiency, waste reductions, and productivity in industrial processes; thermodynamics and energy conversion; refrigeration; and heating, ventilating, and air conditioning.

Soumik Sarkar: We have developed hierarchical spatiotemporal feature extraction algorithms with an emphasis on Deep Learning tools for complex system modeling, understanding scientific patterns from data and design with significant success on various application areas including combustion processes, microfluidic channels, cybermanufacturing, traffic systems and plant disease detection. We have also developed Generalized Gossip based policies for distributed optimization with an application focus on agent-based supervisory control of building HVAC systems for energy efficiency. NSF, Iowa Soybean Association, Rockwell Collins and Iowa Energy Center have supported our research during 2016.

Cris Schwartz: 2016 allowed for me to be more focused on long-term strategy for the ME undergraduate program than in years past, because of the work that had already been done to build capacity. Now that the program is the largest ME undergrad program in the US, we serve as a model to other institutions. The development

Faculty Highlights

Sonal Padalkar had one research publication in print, four manuscripts under preparation, taught ME 231 successfully in 2016, and recruited and retained woman and underrepresented minority students in the lab.

Alberto Passalacqua received the Jean D'Alembert Scholarship for junior investigators at Université Paris-Saclay for Summer 2017 and 2018. He also published the second release of OpenQBMM, the first open-source implementation of quadrature-based moment methods to solve population balance equations for nucleation, aggregation, breakup, growth of nanoparticles.

Paola Pittoni taught three different courses taught, for a total of 258 students (119 freshmen and 139 seniors) and 6 sections, with a mean overall teaching effectiveness (just considering 2016) of 4.37 (average of 4.68 for ME 436). She also served as the "Women in Mechanical Engineering" faculty advisor which included coordination of 9 group meetings, creation of press and advertising material, person in charge of the social network activities/ PR of the group (Facebook, Instagram). ME 436 labs update: due to the improvement/ modernization of many experimental setups (Fall semester 2016), she coordinated the revision of most of the laboratory procedures and documentation, with the support of the laboratory team led by Mr. Howell.

Rafael Radkowski investigated wide-base statistical feature descriptor which allows to model and match objects in a large scene represented as 3D point cloud. The feature descriptor is statistically more robust than previously reported descriptors, which facilitate descriptor matching in large scene, where the high number of available descriptors increase the number of mismatches, thus, outliers. The application of this result yield a real-time object recognition and tracking method for augmented reality that works in large scenes.

Juan Ren set-up the Nano-/bio-mechanical study and control research lab, and recruited Ph.D. students for research projects focusing on biological and nanoscale sciences. Teaching lab development for course ME410. Funded NSF project on AFM-based nanomechanical mapping of biological materials.

of curriculum and continuous improvement committees will allow our program to sustain our quality while we continually search for efficiencies.

Howard Shapiro: My most notable contributions to the department are to provide leadership and impetus for faculty development in teaching and learning and to coordinate preparation for the ABET review and continuous improvement of learning. ME LEARNS! is bringing together new faculty and established faculty to learning and grow together and is stimulating curriculum discussion and enhancing interdepartmental communication about teaching and curriculum. I was appointed chair of the Edward F. Obert Award Committee. In this capacity I oversee the annual selection of the society-wide award for best paper in Thermodynamics. It is a great honor to have been selected for this important position, and I am proud to serve and honor the memory of Edward F. Obert, an icon the field of thermodynamics.

Faculty Highlights

Dr. **Shrotriya** received three new research grants , presented invited seminars at Oklahoma State University and Lund University, Sweden. He served as the Associate Chair for Graduate Studies and Research till Fall 2016 and worked with department faculty to: increase graduate enrollment to 256 students making ME the fourth largest graduate and PhD program in the university.

Travis Sippel: In 2016, my research group obtained research results demonstrating the electromagnetic control of the color and intensity of a pyrotechnic flame and we continued development of our microwave-plasma controllable solid rocket propellants as well as development of other high performance combustion compositions that will positively impact space transport and defense applications. We've used our research as a tool to excite a new generation of future engineers through involvement of high school and undergraduate students in research as well as development of research-centered lectures delivered at ISU.

Gloria Starns: The Human Centered Design course in Nicaragua was taught for the third consecutive year; students introduced three new sustainable technologies to rural areas of Nicaragua. A soil testing kit, a rice-husk cook stove, and a concrete form were fabricated by the students after interviewing and collaborating with Nicaraguan co-designers.

Shankar Subramaniam directs a strategic research thrust in multiphase flows through the Center for Multiphase Flow Research & Education (CoMFRE) through the College of Engineering's Accelerating Collaborative Research Initiative (ACRI) grant.He published five journal articles, continued ongoing international collaborations, and presented three invited talks at the University of Alberta in Canada,ETH Zurich in Switzerland and at the Institut Mecanique des Fluides in Toulouse, France.

Dr. **Vance** and her student, Leif Berg, published the results of an NSF-sponsored study of the use of virtual reality in industry. Together they visited 18 companies, spanning 7 industries, and interviewed 62 people. The results indicated that VR has become an engineering tool which is integrated into the design process. User viewability related to product design and ergonomics, both of the product and the manufacturing processes, were the two highest application areas.

Xinwei Wang: In 2016, I have received two new grants ($700 k) to support research related to building energy efficiency. I have published 9 papers in highly visible journals, including Advanced Materials, ACS Nano, and Nanoscale. My lab member: Shen Xu has received the prestigious Zaffarano Prize for excellent graduate research at Iowa State University.

Dr. **Winer**'s lab had some notable achievements this year in the areas of Augmented Reality for assistance in bench-top assembly and visualization of 4D medical data. The world's first system was developed that allows AR work instructions to be created through automated processing of an expert demonstration. In medical imaging, Dr. Winer's lab developed the capability to visualize 4D medical data on a computing systems including desktop, mobile, and immersive VR.

Pranav Shrotriya
Professor

PhD, Theoretical and Applied Mathematics, University of Illinois-Urbana-Champaign, 2001
MS, Theoretical and Applied Mathematics, University of Illinois-Urbana-Champaign, 1997
BT, Mechanical Engineering, Indian Institute of Technology, 1995

Dr. Shrotriya researches the mechanical response of micro- and nanoscale structures, experimental and computational mechanics at small-length scales, mechanics of surface stress sensors and molecular adsorption, stress-assisted dissolution and damage of biomedical implants, and mechanics of manufacturing processes.

Travis Sippel
Assistant Professor

PhD, Mechanical Engineering, Purdue University, 2013
MS, Mechanical Engineering, Purdue University, 2009
ME, Mechanical Engineering, Purdue University, 2009
BS, Mechanical Engineering, University of Kansas, 2006

Dr. Sippel's research areas of interest include multiphase combustion, paticularly of propellants, explosives, and pyrotechnics, nanostructured energetic materials and novel applications of

Gloria Starns
Senior Lecturer

PhD, Mechanical Engineering, Iowa State University
MS, Mechanical Engineering, Iowa State University
BS, Mechanical Engineering, University of Kentucky

Dr. Starns's past experience includes private consulting and serving as a project engineer for a commercial refrigeration manufacturer.

Shankar Subramaniam
Professor

PhD, Mechanical and Aerospace Engineering, Cornell University, 1997
MS, Aerospace Engineering, University of Notre Dame, 1990
BT, Aeronautical Engineering, Indian Institute of Technology, 1988

Dr. Subramaniam's research interests include spray modeling, modeling and simulation of gas-particle flows and granular flows, combustion, turbulent reactive flows, mixing, stochastic models, particle methods, and computational fluid dynamics.

Sriram Sundararajan
Associate Dean for Academic Affairs
Professor

PhD, Mechanical Engineering, The Ohio State University, 2001
MS, Mechanical Engineering, The Ohio State University, 1997
BE, Mechanical Engineering, Birla Institute of Technology and Science, 1995

Dr. Sundararajan's research areas of interest are surface engineering, micro- and nanoscale tribology, multiscale mechanical behavior of materials, scanning probe microscopy, and thin film characterization using three dimensional atom probe microscopy.

Judy Vance
Joseph and Elizabeth Anderlik
Professor of Engineering

PhD, Mechanical Engineering, Iowa State University, 1992
MS, Mechanical Engineering, Iowa State University, 1987
BS, Mechanical Engineering, Iowa State University, 1980

Dr. Vance works with virtual reality applications in mechanical engineering including virtual assembly, virtual manufacturing and mechanism synthesis, optimization, and the fundamentals of engineering design including ideation and concept generation.

Xinwei Wang
Professor

PhD, Mechanical Engineering, Purdue University, 2001
MS, Thermal Science and Energy Engineering, University of Science and Technology of China, 1996
BS, Thermal Science and Energy Engineering, University of Science and Technology of China, 1994

Dr. Wang's areas of interests include laser-assisted bio-imaging, thermal transport in nanoscale and nanostructured materials, novel technique developments for thermal conductivity measurement of films, coatings and micro- and nanoscale wires/rubes, and laser-assisted nanostructuring.

Jonathan Wickert
Senior Vice President and Provost, Iowa State University
Professor, Department of Mechanical Engineering

PhD, Mechanical Engineering, Univ. of California at Berkeley, 1989
MS, Mechanical Engineering, Univ. of California at Berkeley, 1987
BS, Mechanical Engineering, Univ. of California at Berkeley, 1985

Dr. Wickert's research interests include mechanical vibration and noise control, continuous and multibody systems dynamics, applied mechanics, and applications in computer data storage.

Eliot Winer
Professor

PhD, Mechanical Engineering, State Univ. of NY at Buffalo, 1999
MS, Mechanical Engineering, State Univ. of NY at Buffalo, 1994
BS, Aeronautical and Astronautical Engineering, The Ohio State Univ., 1992

Dr. Winer is active in internet technology for large-scale collaborative design; medical imaging, analysis and visualization, multidisciplinary design synthesis, computer aided design and graphics, application in optimal design, and scientific visualization and virtual reality for large-scale design.

Adjunct and Courtesy Appointments

Ashraf Bastawros
Adjunct Associate Professor
Aerospace Engineering

PhD, Engineering, Brown University, 1997
MS, Applied Mathematics, Brown University, 1995
MS, Mechanical Engineering, Cairo University, 1991
BS, Mechanical Engineering, Cairo University, 1988

Dr. Bastawros' research interests include micro and nano surface machining, experimental methods to study structure-property relationships, and thermo-mechanical characteristics of porous solids and biological materials.

Leonard Bond
Courtesy Professor
Aerospace Engineering

PhD, Physics, City University - London

Dr Bond's reserach focused on ultrasonics applied to nondestructive evaluation (NDE) as well as advanced diagnostics and prognostics, to estimate safe service life, applied to aerospace and energy systems.

Kristen Cetin
Courtesy Assistant Professor
Civil, Construction and
Environmental Engineering

PhD, Civil Engineering, University of Texas-Austin, 2015
MS, Civil Engineering, University of Maryland-College Park, 2010
BS, Civil Engineering, University of Maryland-College Park, 2009

Dr. Cetin's research interests include energy efficiency of residential and commercial buildings; smart grid-enabled technologies to improve building performance; HVAC performance and fault detection and diagnostics (FDD); big data analytics, data-driven modeling, and inverse modeling of buildings; energy modeling and simulation; peak load reduction and demand response; sustainable infrastructure; building envelope performance and systems.

Wei Hong
Courtesy Assistant Professor
Aerospace Engineering

PhD, Engineering Sciences, Harvard University, 2006
MS, Engineering Mechanics, Tsinghua University, Beijing, China, 2002
BS, Engineering Mechanics, Tsinghua University, Beijing, China, 2000

Dr. Hong's research interests include solid mechanics, soft materials, smart materials and structures, fracture and microstructure evolution, and multiphysics modeling and simulation.
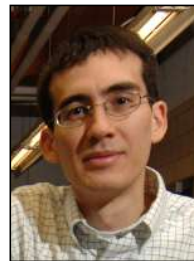
Terry Meyer
Collaborator Professor
Purdue University

PhD, Mechanical Engineering, University of Illinois-Urbana-Champaign, 2001
MS, Mechanical Engineering, University of Illinois-Urbana-Champaign, 1997
BS, Mechanical Engineering, University of Minnesota, 1993

Dr. Meyer's areas of interests are laser imaging and spectroscopy for reacting fluid flow and sprays, biorenewable fuels, combustion, power and propulsion, gas-turbines, scramjets, hypersonic vehicles, and internal combustion engines.

Richard T. Stone
Courtesy Assistant Professor
Industrial and Manufacturing

PhD, Industrial and Systems Engineering, The University of Buffalo, SUNY, 2008
MS, IT with concentration in Robotics and W/M programing, The Rochester Institute of Technology, 2001
Adv. Cert, Environmental Managment Science, 2002, Robotics and CAM, 2001, The Rochester Institute of Technology
BS, MIS, The Rochester Institiute of Technology, 1999

Dr. Stone's research interests include human performance enhancement in both physical and mental domains. He employs multiple approaches toward this goal, including cognitive and physiological engineering, classical and experimental ergonomics, augmented reality, and the incorporation and application of new technologies.

Emeritus Faculty

Shyam Bahadur	Bill Cook	Alexander Henkin	Ted Okiishi
Bill Bathie	Richard Danofsky	Alfred Joensen	Mike Pate
Joseph Baumgarten	Paul DeJong	George Junkhan	Howard Shapiro
Jim Bernard	Arvid Eide	Pat Kavanagh	
Jerry Colver	Jerry Hall	Ron Nelson	

Industry Advisory Council members pose in front of the new ME signage during their fall 2016 meeting. From left: Caroline Hayes, Joe Wright, Diane Fischer, Robin O'Callaghan, Cynthia Lord, Greg Garrison, Brett Anderson, David O'Brien, Jeremy Berg, Jason Olberding, and Mike Jensen.

Industry Advisory Council

Brett Anderson
Boeing
Brett is an Iowa State BSAE alum and has been with The Boeing Company since 1989. He coordinates with internal and external technology experts to identify short and long term roadmaps to match business unit needs with strategic direction for both technology development and business opportunities.

Jeremy Berg
Cargill
Jeremy is a BSCE alum of Iowa State and has been at Cargill since 2004. He provides Automation, Electrical and Instrumentation (AEI) support to more than 30 oilseeds (soybean, canola, flax, corn germ) processing plats and refineries across North America.

Diane Fischer
Black & Veatch
Diane is a BSME alum of Iowa State and has worked for Black & Veatch since 1992. She currently serves as the Associate Vice President and Regional Area Director - Central Region for Power Generation Services and is responsible for client satisfaction, project execution, and business capture for power generation services projects in the central region of the United States.

Mike Hilby
John Deere
An alum of the department, Mike leads the Operations organization at John Deere Product Engineering Center. He is responsible for the efficient planning and growth of all Global Tractor Platform PV&V facilities.

Greg Garrison
Union Pacific
Greg holds a BS in mechanical engineering from the University of Arkansas at Fayetteville and is also a graduate of the Advanced Management Program at the University of Chicago's Booth School of Business.

Mike Jensen
Caterpillar
Mike is a BSME graduate of Iowa State and serves as a Senior Engineering Tech Team Leader at Caterpillar. His activities encompass working enterprise-wide new product development program challenges related to updating the Caterpillar machine product line to meet upcoming diesel engine emissions regulations.

Cynthia Lord
Alliant Energy
Cynthia is a BSME alum of Iowa State and has spent over 27 years in the energy industry. She is a manager in the Generation Engineering department for Alliant Energy, and is responsible for supporting the engineering needs of 15 power plants across Iowa, Wisconsin, and Minnesota.

David O'Brien
Lyondellbasell
Dave is a BSME alum and started at Lyondellbasell as a co-op engineering in 1990. He is currently the Machinery Group Lead and helps perform troubleshooting, executes upgrades, and provides technical support for the operation and maintenance of rotating equipment such as steam turbines, centrifugal compressors, and pumps.

Robin O'Callaghan
Kiewit Power, Inc.
Robin graduated from the ISU ME program and is employed as an operational mechanical engineering at Kiewit Power in Lenexa, KS. Robin has been active in Iowa State recruitment and is a licensed engineer in three states.

Jason Olberding, IAC Vice Chair
Emerson Process Management
Jason is an ISU ME graduate and serves as the Special Products Group Manager at Emerson Process Management in Waterloo, Iowa.

Nancy Stewart
3M
Nancy graduated from ISU with a BS in mechanical engineering and joined 3M shortly afterwards. She has worked in a variety of positions at 3M and is currently serving on an assignment in the Lean Six Sigma Organization in the Skin & Wound Care Division.

Kyle Wehring
Rockwell Collins
Kyle is an ISU BSME graduate and serves as a design engineer at Rockwell Collins. He is responsible for mechanical design and packaging of electronics for fixed site, ground vehicle, and airborne applications.

Joe Wright
Sauer Danfoss
Joe is an Iowa State BSME alum and has been with Danfoss Power Solutions since 2004. He leads a team of engineers in Europe and North America focused on simulation, development, and testing of hydrostatic transmissions for off-highway equipment.

Staff

Kiewit Undergraduate Student Services Center

Matt Dikeman
Academic Adviser

Fred Lloyd
Academic Adviser

Aliza Mackenzie
Academic Adviser

Alyssa Mittleider
Academic Adviser

Jessica Van Winkle
Academic Adviser

Jessie Vosseller
Academic Adviser

John Wagner
Academic Adviser,
Advising Center
Coordinator

Johna Wolfe
Academic Adviser

Hazel Peterson
Advising Secretary

Laboratory and Information Technology

Sandy Bremer
Teaching Laboratory
Coordinator

Joel Buehler
Systems Support
Specialist
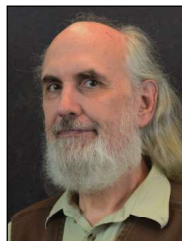
Jim Dautremont
Laboratory
Mechanical
Technologist

Josh DeLarm
Teaching
Laboratory
Coordinator

Derek Dickson
Systems Support
Specialist

John Howell
Teaching Laboratory
Coordinator

Nate Jensen
Systems Support
Specialist

Wyman Martinek
Teaching
Laboratory
Coordinator

Taylor Schweizer
Teaching
Laboratory
Coordinator

Craig Severson
Teaching Laboratory
Coordinator

Jim Shelledy
Teaching
Laboratory
Coordinator

Business Office

Cindy Bartleson
Assistant to the
Chair/HR Liaison

Kristin Clemens
Undergraduate
Program Assistant

Hallie Golay
Graduate Program
Assitant

Rachael Gross
Fiscal Officer

Neely Lehman
Administrative
Specialist

Katie Lott
Administrative
Specialist

Deb Schroeder
Clerk IV

Patti Thrasher
Grant Program
Coordinator

Carmen Gomes
Associate Professor

PhD, Biological and Agricultural Engineering, Texas A&M University, 2010
BS, Food Engineering, Federal University of Visoca, Brazil, 2003

Dr. Gomes's research interests include design of novel nanoscale materials using biopolymers; design of biosensors using nanotechnology approaches; stimuli-responsive nanostructures; delivery systems and sensing platforms; and food safety and shelf-life extension of food products.
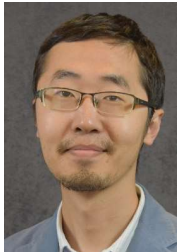
Beiwen Li
Assistant Professor

PhD, Mechanical Engineering, Purdue University, 2017
MS, Mechanical Engineering, Iowa State University, 2014
BS, Optoelectronics, Beijing Univ. of Aeronautrics and Astronautics, 2012

Dr. Li's research interests include superfast 3D optical sensing; multi-scale 3D optical metrology; machine/computer vision; differential geometry; in-situ inspection; and biophotonic imaging.

Jonhhyun Lee
Assistant Professor

PhD, Mechanical Engineering, University of Massachusetts-Amherst, 2007
MS, Mechanical Engineering, University of Massachusetts-Amherst, 2004
BS, Mechanical Engineering, Inha University, South Korea, 1999

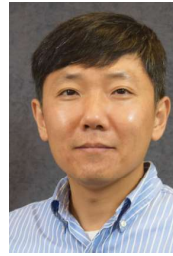Dr. Lee's research interests include additive manufacturing (Selective Laser Melting, Laser Engineered Net Shaping, Cold Spray); containerless processing (Electrostatic/Electromagnetic Levitation); high temperature materials, thermophysical properties of metals and ceramics; transport phenomena in molten metals and ceramics; musculoskeletal biomechanics; finite element analysis; computational Fluid Dynamics.

Paul Schafbuch
Senior Lecturer

PhD, Engineering Mechanics, Iowa State University
MS, Mechanical Engineering, Stanford University
BS, Engineering Science, Iowa State University

Dr. Schafbuch served as Associate Professor of Practice in the Department of Aerospace Engineering at Iowa State before joining the ME department. He has 31 years of experience in engineering and management, including serving as vice president of engineering and development at Emerson Process Management.

Research Portfolio
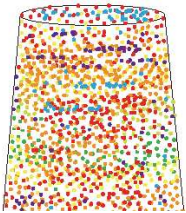
Bioengineering and Translational Health
Faculty researchers: Tim Bigelow, Carmen Gomes, Nastaran Hashemi, Ming-Chen Hsu, Jaime Juarez, Adarsh Krishnamurthy, Ming Lu, Juan Ren, Cris Schwartz, Pranav Shrotriya, and Eliot Winer.

Nanoscale Sciences
Faculty researchers: Ganesh Balsubramanian, Nastaran Hashemi, Shan Hu, Jaime Juarez, Ming Lu, Sonal Padalkar, Juan Ren, Pranav Shrotriya, Travis Sippel, and Sriram Sundararajan.

Energy Sciences and Sustainability
Faculty researchers: Xianglan Bai, Ganesh Balsubramanian, Robert Brown, Mark Bryden, Baskar Ganapathysubramanian, Ted Heindel, Shan Hu, Atul Kelkar, Song-Charn Kong, James Michael, Sonal Padalkar, Travis Sippel, and Mark Wright.

Multiphase Flow and Complex Fluids
Faculty researchers: Nastaran Hasemi, Ted Heindel, Jaime Juarez, Song-Charng Kong, Jonghyun Lee, James Michael, Alberto Passalacqua, and Travis Sippel.

Design and Manufacturing
Faculty researchers: Emmanuel Agba, Tim Bigelow, Caroline Hayes, Ming-Chen Hsu, Chao Hu, Gap-Yong Kim, Adarsh Krishnamurthy, Cris Schwartz, Pranav Shrotriya, Sriram Sundararajan, and Eliot Winer.

Dyanamic Systems, Sensors, and Controls
Faculty researchers: Sourabh Bhattacharya, Shan Hu, Atul Kelkar, Greg Lucke, Juan Ren and Soumik Sarkar.

Computational Sciences and Visualization
Faculty researchers: Sourabh Bhattacharya, Mark Bryden, Baskar Ganapathysubramanian, Ming-Chen Hsu, Chao Hu, Atul Kelkar, Song-Charng Kong, Adarsh Krishnamurthy, Soumik Sarkar, Cris Schwartz, and Eliot Winer.
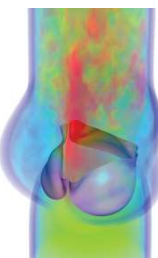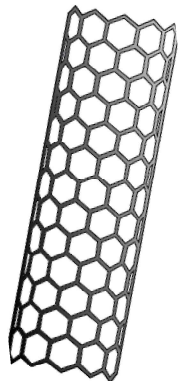
Publications

Peer-Reviewed Journal Publications

A. Kolbasov, P. Comiskey, R. P. Sahu, S. Sinha-Ray, A. L. Yarin, B. S. Sikarwar, S. Kim, T. Z. Jubery, and **D. Attinger**, "Blood Rheology in Shear and Uniaxial Elongation," *Rheological Acta*, vol. 55, pp. 901-908, 2016.

V. Lee and **D. Attinger**, "Thermodynamics and historical relevance of a jetting thermometer made of Chinese zisha ceramic," *Sci Rep*, vol. 6, p. 28609, 2016.

"Prediction of blood backspatter from a gunshot in bloodstain pattern analysis," P.M. Comiskey, A.L. Yarin, S. Kim and **D. Attinger**, *Physical Review Fluids*, vol. 1, p. 043201, 2016.

S. Kim, Y. Ma, P. Agrawal, and **D. Attinger**, "How important is it to consider target properties and hematocrit in bloodstain pattern analysis?," *Forensic Science International*, vol. 266, pp. 178-184, 2016 (10.1016/j.forsciint.2016.05.015).

C. Frankiewicz and **D. Attinger**, "Texture and wettability of metallic lotus leaves," *Nanoscale*, vol. 8, pp. 3982-3990, Feb 11 2016.

D. Attinger, Y. Takata, "Selected Papers from the 12th International Conference on Nanochannels, Microchannels, and Minichannels," *Heat Transfer Engineering*, vol. 37, pp. 901-902, 2016.

Xue, Y., Zhou, S., **Bai, X.** (2016), Role of hydrogen transfer during catalytic co-pyrolysis of lignin and tetralin over HZSM-5 and HY zeolite catalysts, *ACS Sustainable Chemical Engineering*, 4 (8), 4237-4250.

Davis, K. M., Rover, M., Brown, R. C., **Bai, X.**, Wen, Z., Jarboe, L. (2016) Recovery and Utilization of Lignin monomers as Part of the Biorefinery Approach, *Energies* 9 (10), 808.

Zhou, S., Xue, Y., Sharma, A., **Bai, X.**, (2016) Lignin Valorization through Thermochemical Conversion: Comparison of Hardwood, Softwood and Herbaceous Lignin, *ACS Sustainable Chemical Engineering*, 4 (12), 6608-6617.

Qu, W., Xue, Y., Gao, Y., Rover, M., **Bai, X.**, (2016) Repolymerization of pyrolytic lignin for producing carbon fiber with improved properties, *Biomass & Bioenergy*, 95, 19-26.

Xue, Y., Kelkar, A., **Bai, X.**, (2016), Catalytic co-pyrolysis of biomass and polyethylene in a tandem micropyrolyzer, *Fuel*, 166, 227-236.

Ghosh, A., Brown, R. C., **Bai, X.** (2016) Production of solubilized carbohydrate from cellulose using non-catalytic, supercritical depolymerization in polar aprotic solvents, *Green Chemistry*, 18, 1023-1031.

S. Bhattacharya, T. Basar, and N. Hovakimyan. "A Visibility-Based Pursuit-Evasion Game with a Circular Obstacle." *Journal of Optimization Theory and Applications* 171(3): 1071-1082, 2016.

R. Zou and **S. Bhattacharya**, Visibility-Based Finite Horizon Target-Tracking Game. *IEEE Robotics and Automation Letters*. 1 (1), 399-406, 2016.

Zhang, Mengzhe, and **Sourabh Bhattacharya**. "Multi-agent Visibility-Based Target Tracking Game." *Distributed Autonomous Robotic Systems*. 3(1), 271-284, 2016.

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A Kommajosula, S Xu, CY Wu, D Di Carlo, **B Ganapathysubramanian**, "A Quasi-Dynamic Approach to modelling Hydrodynam Focusing", American Physical Society Division of Fluid Dynamics Meeting, Portland, 2016

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N. Hashemi, "Polycaprolactone Fibrous Scaffolds to Navigate Neural

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C.N. Smyth+, A.J. Amos+, R.L. Pemathilaka+, and **N. Hashemi**, "Placenta on a Chip: Final Development Toward Model Human Testing", Honors Poster Presentation, Iowa State University, Ames, IA, April 27, 2016

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J.T. Feddersen+, P. Kalgren+, and **N. Hashemi**, "Using LabView for Signal Processing and Noise Reduction for Flow Cytometry", Honors Poster Presentation, Iowa State University, Ames, IA, April 27, 2016

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Heindel, T.J., "Recent Advanced in Spray Diagnostics using X-rays," ILASS – Americas 2017: 29th Annual Conference on Liquid Atomization and Spray Systems, May 15-18, 2017, Atlanta, GA, Submission ID: 6. (Invited paper and talk).

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V. I. Levitas. Optimization of Micron-Scale Aluminum Reactivity for Dynamic Loading. 2016 Triservice Energetic Materials Basic Science Review, Arlington, VA. 8/17/16 - 8/19/16 (invited talk)

V. I. Levitas. Interaction between Phase Transformation and Plasticity. International Conference on Emerging Trends In Applied Mathematics and Mechanics, Perpignan, France, May 28-June2, 2016, (Keynote lecture).

V. I. Levitas. Multiphase phase field theory for phase transformation. European Congress on Computational Methods in Applied Sciences and Engineering, Crete Island, Greece, 5/6/16-10/6/16.

B. Feng, V.I. Levitas. Large deformation model for coupled elastoplasticity and strain-induced phase transformations in diamond anvil cells. 53d Annual Meeting Society of Engineering Science, College Park, MD, 10/02/16-10/05/16.

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V.I. Levitas. Phase transformations under high pressure and large plastic deformations: multiscale theory and interpretation of experiments. International Conference on Martensitic Transformations "Materials by Design", Chicago, IL , 07/4-07/9 2017, Keynote lecture, accepted

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V.I. Levitas. Phase transformations at multiple scales. 45th APM International Summer School-Conference, June 22nd – 27th 2017, St. Petersburg, Russia, Plenary lecture, accepted.

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S. Tabassum, Y. Wang, J. Qu, Q. Wang, S. Oren, R. J. Weber, R. Kumar, M. Lu, and L. Dong, "Patterning of nanophotonic Structures at Optical Fiber Tip for Refractive Index Sensing," *IEEE Sensors Conference*, Orlando, FL, Oct. 2016.

L. Liu, H. Khan, J. Li, A. C. Hillier, and M. Lu, "Fabricating a linear variable filter using nanoreplica molding," *Conference on Lasers and Electro Optics (CLEO)*, San Jose, CA, June 2016

Y. Wang, L. Dong, and M. Lu, "Optical bound states of 2D high-contrast grating for refractometric sensing," *Conference on Lasers and Electro Optics (CLEO)*, San Jose, CA, June 2016

H.-Y. Wu, L. Liu, M. Lu, and B. T. Cunningham, "Lasing emission from plasmonic nano- dome arrays," *Conference on Lasers and Electro Optics (CLEO)*, San Jose, CA, June 2016.

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K. Zhu, S. Barkley, T.R. Sippel, and **J.B. Michael**, "Sodium laser-induced fluorescence and emission spectroscopy for characterization of alkali-doped composite propellant flames," *Central States Meeting of the Combustion Institute*, Knoxville, TN (May 2016).

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R. Montazami, D. Grewell, "Odor Control in Agave and Natural Fiber Composites", CB2 meeting, Iowa (2016)

M. M. Michel, D. Grewell, **R. Montazami**, "Functionalizing Interfaces of Bio-Renewable Fillers for Thermoplastics", CB2 meeting, Iowa (2016)

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R. Montazami, "Mechanics of Soft Transient Materials and Structures", MRS, Arizona (2016) Invited

M. M. Michel, D. Grewell, **R. Montazami**, "Functionalizing Interfaces of Bio-Renewable Fillers for Thermoplastics", CB2 meeting, 3M, Minnesota (2016)

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X. Gao, B. Kong, M. Ramezani, **M.G. Olsen**, R.D. Vigil, "Experimental measurement and CFD-PBM simulation of bubble size distribution in a gas-liquid Taylor Vortex reactor," *2016 Annual Meeting of the American Institute for Chemical Engineers*, San Francisco, CA, Nov. 13-18, 2016

M.G. Olsen, "Flow visualization and measurement in microscale and macroscale vortex nanoprecipitation reactors," *17th International Symposium on Flow Visualization*, Gatlinburg, TN, June 19-22, 2016 (keynote lecture)

Z. Liu, E. Hitimana, **M.G. Olsen**, R.O. Fox, J.C. Hill, "Turbulent Swirling flow and mixing in a macroscale multi-inlet vortex reactor," *10th International Symposium on Turbulence and shear flow phenomena*, Chicago, IL, July 6-9, 2017.

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M.Tran, **S. Padalkar**, "Synthesis of Density Controlled Gold Nanostructures via Limited Exposure to Hydrofluoric Acid for Sensing Applications," *MRS Fall Meeting 2016*, Boston, USA

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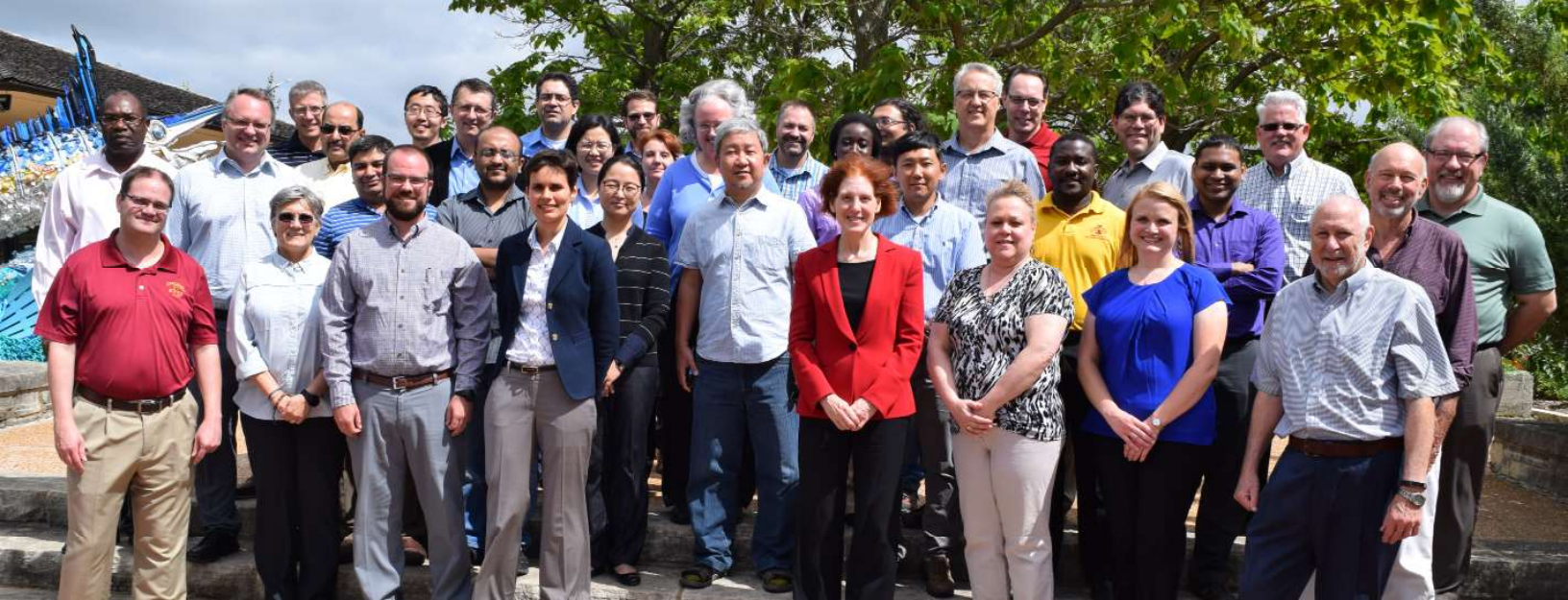
ME faculty pose at Rieman Gardens during the 2017-18 ME Faculty Retreat on Aug. 17.

Responsibilities

The Department of Mechanical Engineering at Iowa State University is a community of faculty, staff, students, and alumni—and industrial and governmental partners—working together to improve the state of Iowa and society in the broadest terms through mechanical engineering research, education, and service.

Vision

Through the excellence of its people, the Department of Mechanical Engineering will be recognized as a leader of its discipline in a manner that exemplifies the land-grant traditions of learning, discovery, and engagement. The department will be a desirable place to study and work, with its community comprising the best and brightest, and with research and educational programs grounded in the mechanical engineering sciences and set within the context of meeting important societal needs.

Mission

The mission of the Department of Mechanical Engineering has three tenets centered on the principle of improving lives and livelihoods: to create knowledge through research in the science and technology of mechanical engineering; to share knowledge through educational programs and the dissemination of new discoveries; and to develop the professional potential of faculty, staff, and students.

Priorities

We will pursue the following priorities to reinforce our recognized strengths and advance our vision for 2025.

- Extend our pillars of research excellence
- Strengthen our graduate program
- Enrich our undergraduate program
- Develop our people
- Build our community