

IOWA STATE UNIVERSITY
COLLEGE OF ENGINEERING

Mechanical Engineering



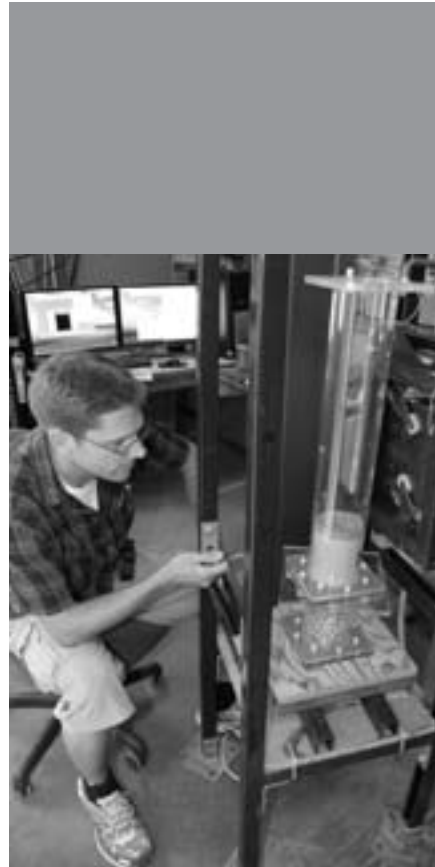
Knowledge. Innovation. Leadership.

September 2010

**Annual Report
2009-2010**

Contents

Year in Review.....	3
Performance Indicators	4
Undergraduate Program Highlights	8
Senior Design Projects.....	9
Graduate Program Highlights	10
Doctoral Dissertations	11
Research Portfolio	12
Department Organization	14
Journal Publications.....	25
Sections or Chapters in Books, Monographs, or Similar Volumes	30
Conference Proceedings	30
Patent Awarded	35



Year in Review

The 2009–2010 academic year was one of transition with several challenges and many significant achievements within the department. Despite a state-imposed 10 percent across-the-board budget reduction last fall, the Department of Mechanical Engineering remains strong and is still the most popular degree program on campus. We continue to focus on our land-grant missions of teaching, research, and service using our strategic plan as an outline. As we move forward, the search for a permanent chair will begin fall 2011 with the expectation of having this position filled by fall 2012.

We continue to add to the growing list of departmental “points of pride,” and the past academic year was no exception. Graduate applications increased by 75 percent and the undergraduate program saw record enrollment of more than 1,100 students. Several faculty members made headlines as well. Software developed by Jim Oliver and Eliot Winer was the basis for the company BodyViz; this software was used on the TV program *The Biggest Loser Couples* to show contestants their body scans in 3-D. Ross Morrow was interviewed on Bloomberg Television and quoted in the *The New York Times* Dot Earth blog for his work on assessing fuel taxes. Mark Bryden was a recipient of a 2009 R&D 100 Award for his software development work in virtual engineering. Additional faculty and staff highlights can be found throughout this report.



To look ahead to next year, we must recognize several people who have recently made a significant impact on the department. Sriram Sundararajan, who served as the Associate Chair for Graduate Studies and Research and Director of Graduate Education (DOGE), and Michael Olsen, who served as the Associate Chair for Undergraduate Studies helped maintain and implement new techniques and strategies to benefit both the graduate and undergraduate programs. We thank them for their service and leadership during the past academic year.

Pranav Shrotriya will be our new Associate Chair for Graduate Studies and Research and DOGE as Sriram takes over as the Associate Chair for Undergraduate Studies. Michael Olsen will lead our search to hire new faculty into our department. I look forward to working with them in these new and challenging roles.

We say goodbye and good luck to Sherrie Nystrom as she retired in July. Sherrie was a staff member in the department for five years and worked in a variety of positions such as secretary to the chair, advising center secretary, and departmental programs secretary. She has been at the university for nearly 40 years and will be missed.

Some of our immediate goals for the upcoming year are to continue involvement in note-worthy research, retain strong numbers for student admissions, and hire quality faculty members who excel in teaching and research. As a department, we look forward to growing our community of faculty, staff, students, and alumni, and to extending our service through educational, research, and service programs. We thank you for your interest in our department and truly look forward to what the 2010–2011 academic year will bring.

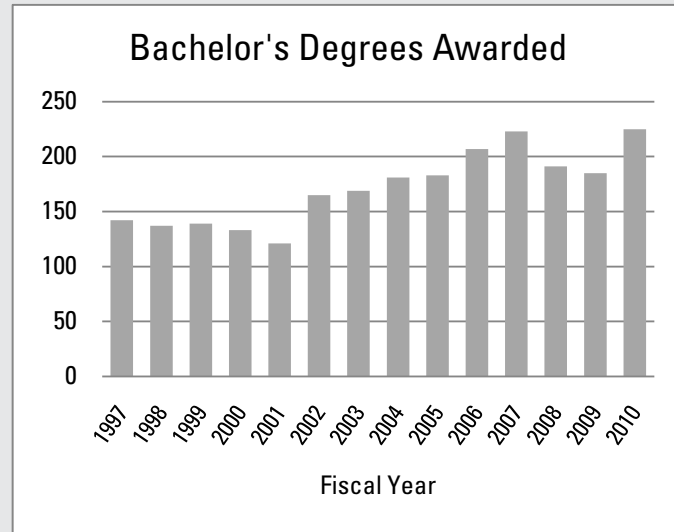


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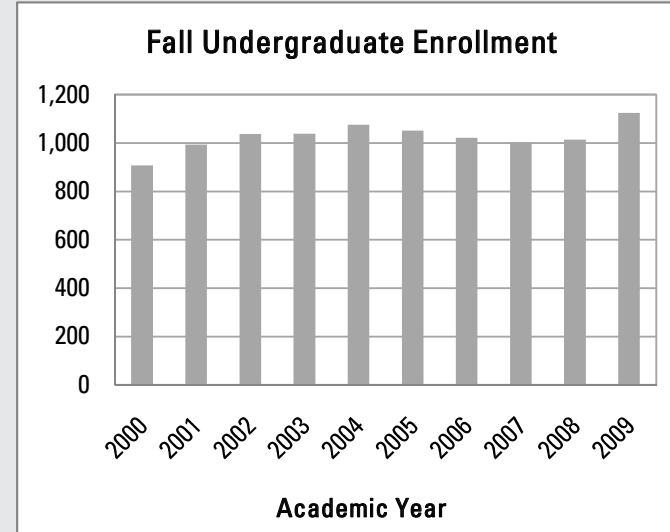
Interim Chair, Department of Mechanical Engineering
Bergles Professor of Thermal Science

Performance Indicators

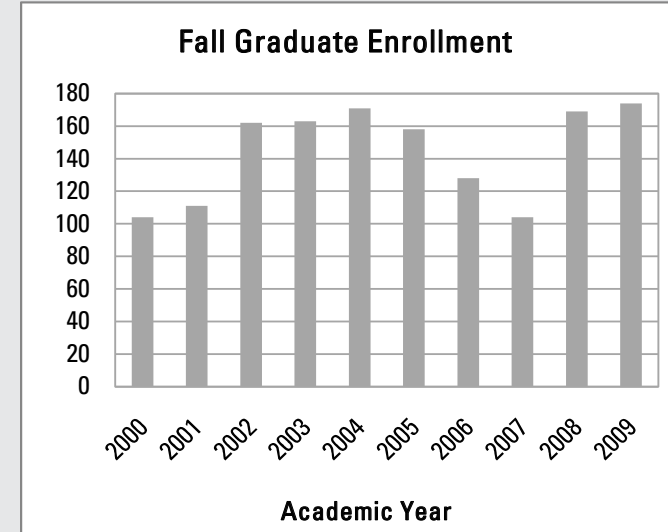
Degrees Awarded



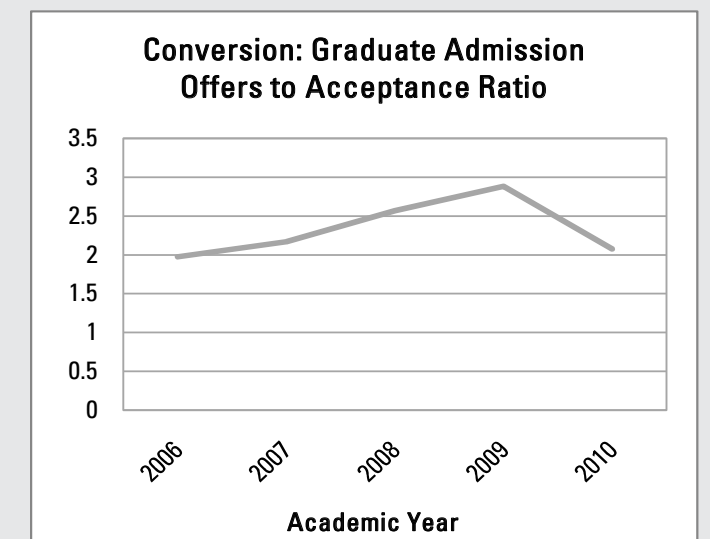
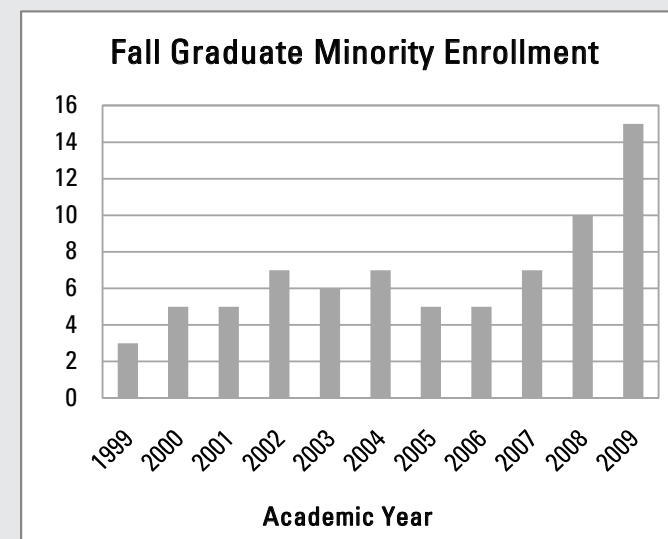
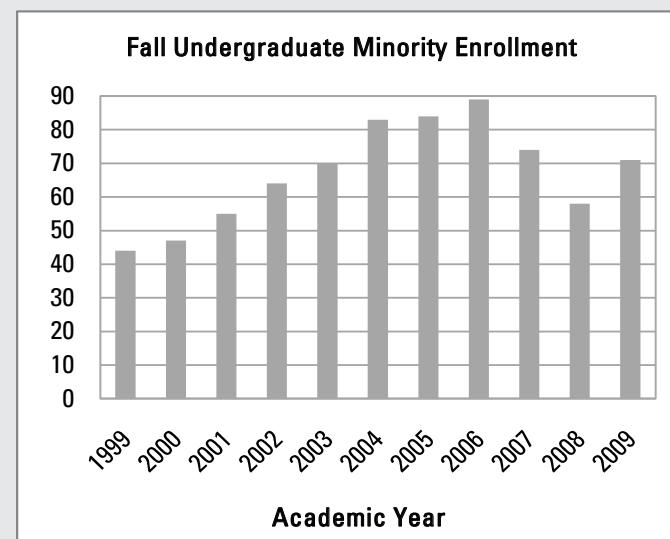
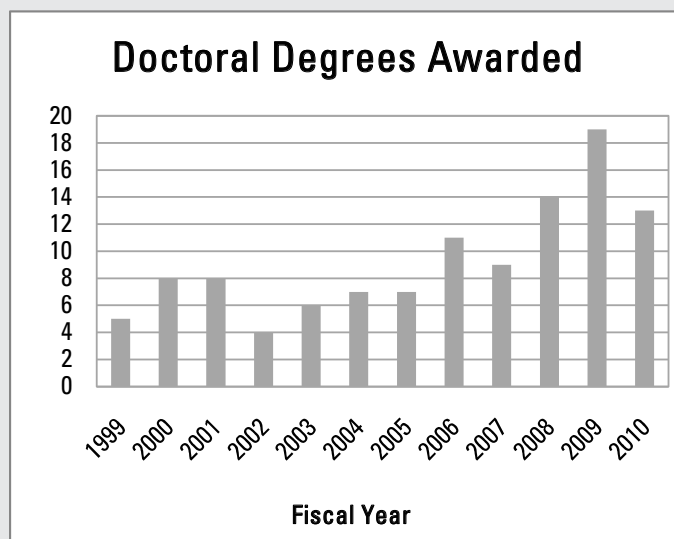
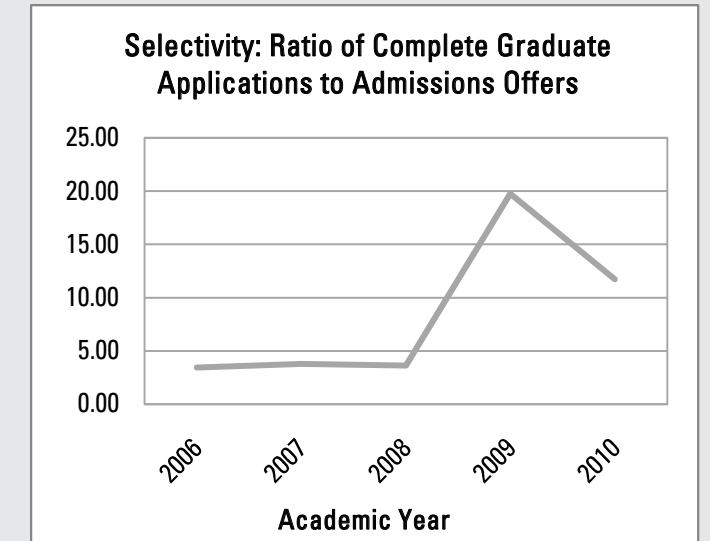
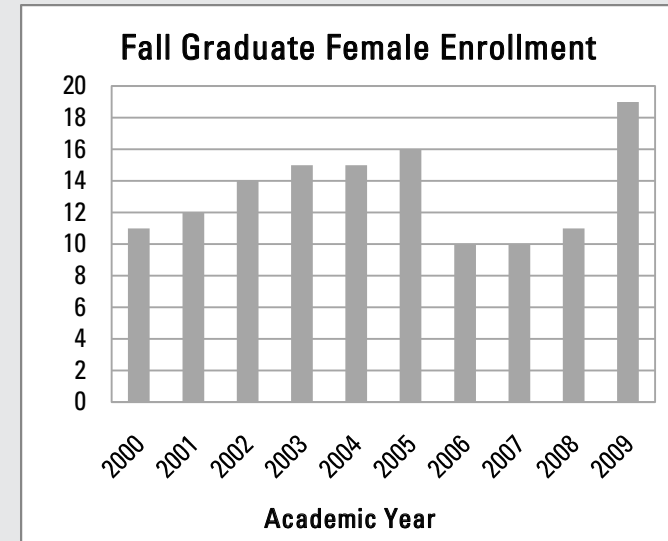
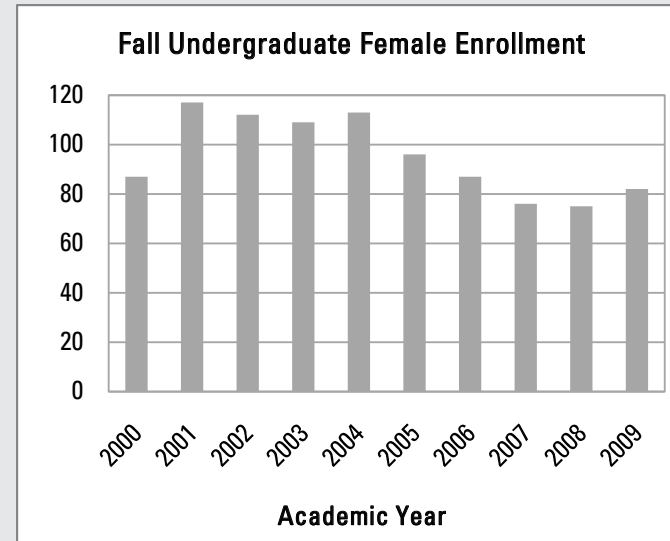
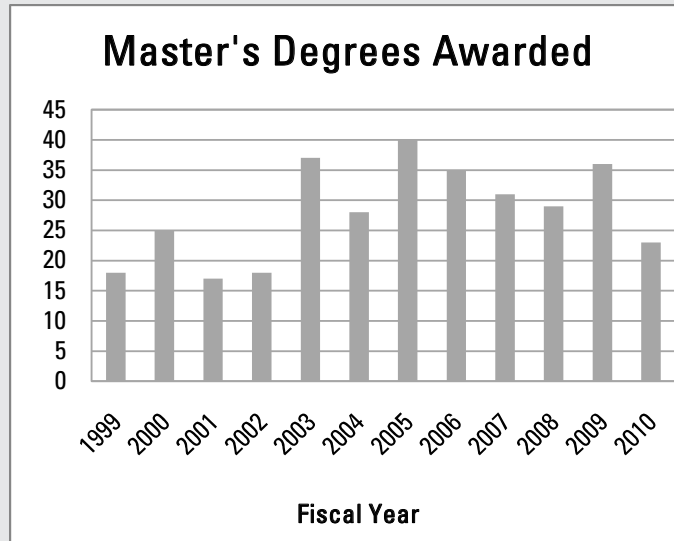
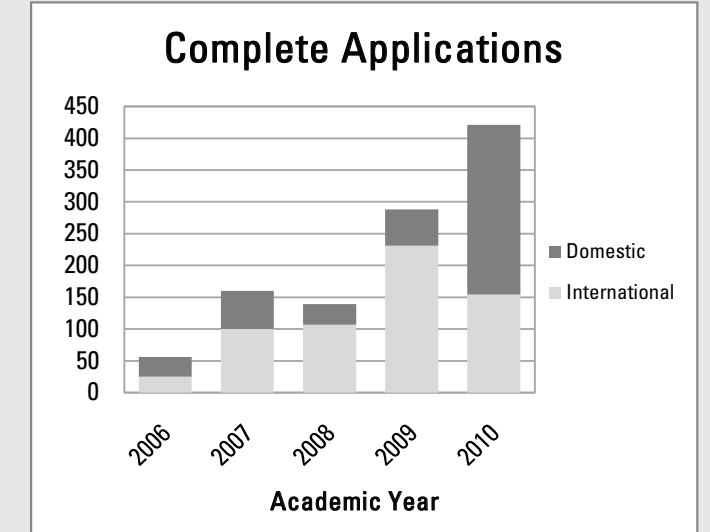
Undergraduate Enrollment



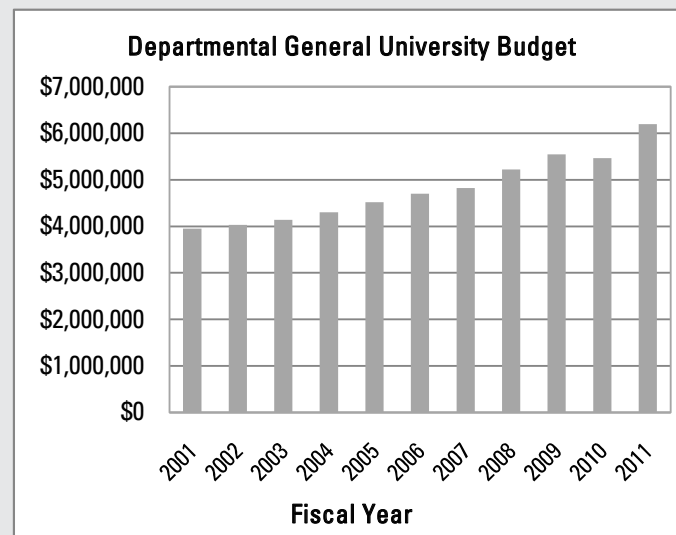
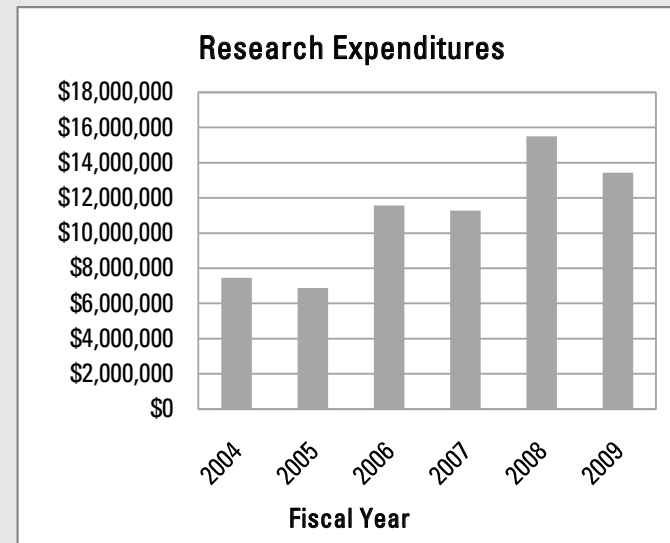
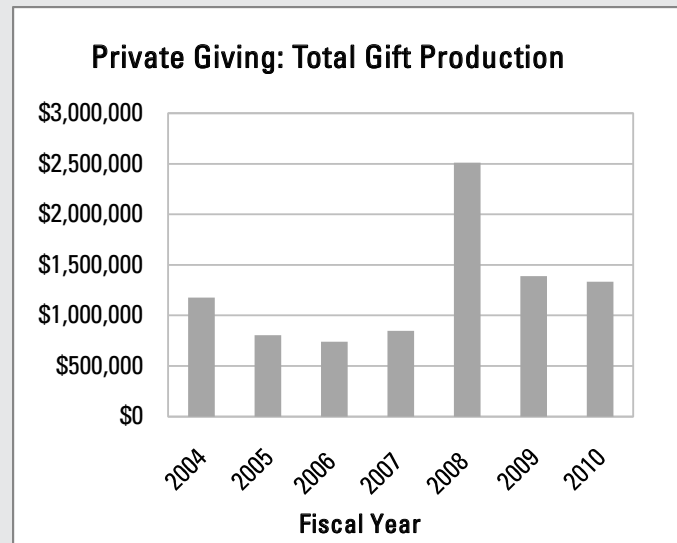
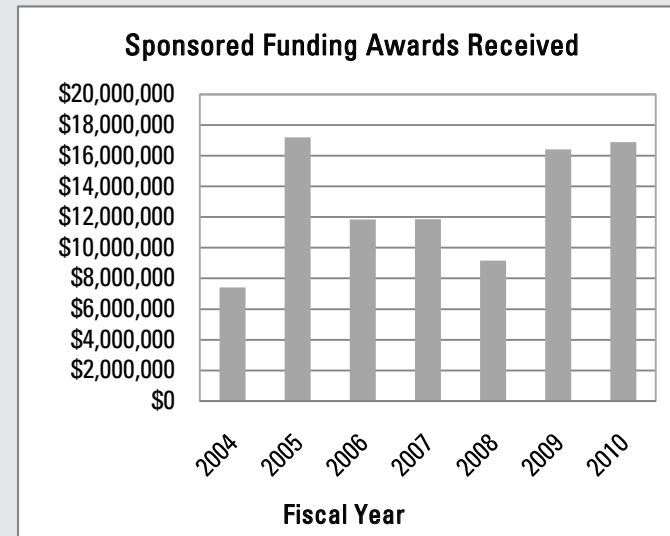
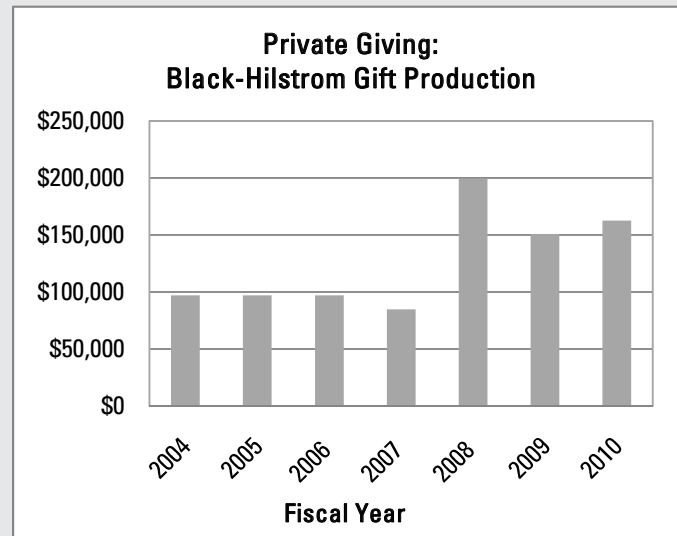
Graduate Enrollment



Graduate Program Recruitment



Department Operations



Personnel (FTE)

Tenure and tenure-track faculty: 25.8
 Non-tenure eligible lecturers: 5.0
 P&S and merit staff: 13

Research

Journal papers published: 76
 Conference papers published: 60
 Sections or chapters in books, monographs, or similar volumes: 5
 Patents awarded: 1
 Doctoral dissertations: 7
 Master's theses/projects: 23

Professional Society Fellows

American Society of Mechanical Engineers
 Robert Brown Jim Oliver
 Abhijit Chandra Judy Vance
 Atul Kelkar Jonathan Wickert

Named Faculty Positions

Anson Marston Distinguished Professor of Engineering
 James Bernard
 Robert Brown

Bergles Professor of Thermal Science
 Ted Heindel

Gary and Donna Hoover Chair in Mechanical Engineering
 Robert Brown

James and Katherine Melsa Professor in Engineering
 Jonathan Wickert

Joseph and Elizabeth Anderlik Professor in Engineering
 Judy Vance

Larry and Pam Pithan Professor of Mechanical Engineering
 Jim Oliver

Michael and Denise Mack 2050 Challenge Scholar
 Erin MacDonald

Schafer 2050 Challenge Professor
 Valery Levitas

William and Virginia Binger Assistant Professor of Mechanical Engineering
 Song-Charng Kong

William March Scholar in Mechanical Engineering
 Baskar Ganapathysubramanian



Undergraduate Program Highlights

Enrollment

Enrollment in the undergraduate program during the 2009–2010 academic year was 1,124 students. Of this number, 7 percent were women and 6 percent were minorities. During the 2009–2010 academic year, 225 bachelor's degrees were awarded. In addition to the traditional bachelor degree program, the mechanical engineering department also offers concurrent degree programs leading to a BS/MS in mechanical engineering or a BS in mechanical engineering and an MBA. The recently added minor in nuclear engineering graduated its first students in the 2009–2010 academic year, and enrollment in this program now stands at 24 students.



*Sriram Sundararajan
Associate Chair for
Undergraduate
Studies*

Industrial/Academic Partnership in Design

Design courses throughout the curriculum continue to emphasize student interaction with industrial partners and charitable organizations. Recent design projects have involved collaboration with companies such as John Deere, Bell Water Systems, and TPI composites; work with non-profit organizations including Camp Courageous and Harmony House; and entrance in national design competitions such as the NASA Lunar Mining Competition.

International Study and Travel Opportunities

The undergraduate program offers opportunities for students to study abroad in Wales, Australia, Germany, Spain, and Mexico. Courses are also offered in sustainable engineering that culminate in class trips to underdeveloped countries such as Mali and Nicaragua to directly apply the technologies taught in the classroom. Students can also participate in student exchange with universities within the U.S. Twenty percent of spring 2010 graduates had international educational or work experience.

Mechanical Engineering Beyond the Classroom

The ME program provides many opportunities for students to apply their knowledge and skills beyond the classroom. These include national design competitions such as Mini Baja, Formula SAE, the team PriSUM solar car, and the Interlock House, Iowa State's entry in the U.S. Department of Energy's Solar Decathlon. Students are also able to gain work experience through internships and co-ops with both Iowa and national industries. Eighty-five percent of spring 2010 ME graduates had co-op, internship, or summer work experience.

Women in Mechanical Engineering (WiME) Program

The goal of the Women in Mechanical Engineering program is to provide resources to recruit and retain women in the mechanical engineering field. To accomplish this, the WiME program provides scholarship opportunities, social events, networking opportunities with faculty and industry, and mentoring by women engineers in industry.

Senior Design Projects

For more information or if you have questions about our senior design projects, contact Jim Heise at jheise@iastate.edu or 515 294-3857.

Fall 2009

CIRAS Sponsored Projects

Armstrong Machine Company, Pocahontas, IA: Grout pump hydraulic control design

- John Crossett, Brandon Grimm, Chan "Stan" Lee, Andrew Vos*, David Wu
- Kyle Hrodey*, Eric Murphy, Michael Rau, Justin Tivers, Derek Tramp

Dobson Pipe Organ Builders Ltd, Lake City, IA: CNC router process design

- Lucinda Freneau, Jacob Hetzel, Zach Klenske*, Emily Leafstadt, David Smit
- Ahmad Baharuden, Brandon Foster, Kevin O'Connell*, Dan Schrader

Double HH Manufacturing, Rock City, IA: Hitch pin plastisol process design

- Mark Brayton*, Brett Cooper, Philippe Hevesy, Christopher Iacono, Sean Sturm
- Nathan Anderson*, Jason Banwart, Jeremy Hilsabeck, Orrin Lanz

Industrial Design Fabrication and Installation Inc., Merville, IA: Greaseless conveyor chain design

- Richard Blair, Ilya Ellern*, Will Frisbey, Andres Park, Dain Spurgeon
- Justin Augustyn, Tyler Fast, Jordan Lee, Peter Martinson*, Robert Peck

Power Engineering and Manufacturing, Ltd., Waterloo, IA: Transmission test stand design

- Brandon Hawver, Luke Jensen, Nathan Manor*
- Kyle Fichtner, Nathan Gibilisco, Eric Marasco*, James Michelson, Joseph Mistretta

Power Engineering and Manufacturing, Ltd., Waterloo, IA: Transmission black box monitoring design

- Michael Bridwell*, Kwan Choong Chin, Jacob Pratt
- Isaac Garlinton*, Kevin Gehrke, Don Kieu, Nathaniel Renner, Timothy Schrad

Van Gorp Corporation, Pella, IA: Conveyor roller spiral wrap process design

- Kristofer Anderson*, Matthew Britten, Jon Debower, Austin Tech, Robbie Tharp

Waters Hot, Inc., Orange City, IA: 4-way control valve design

- Mitch Damgaard*, Katie Kolega, Nicholas Lucas, David Prater, Joseph Retek
- Jason Boggess*, Diana Gylling, Lee Harris, Theodore Hotvet, Laurel McDonough

Service Project

Camp Courageous of Iowa, Monticello, IA: Solar water heating system

- Randy Cullison, Jasmine Draper, Zach Kuecker*, Andrew Theobald, Woodrow Witherow

Student Projects

Feuerhelm Construction, St. Charles, MN: Freight elevator design

- Dan Apperson, Jeff Feuerhelm*, Jonathan Hershberger, Jakob Wunn

Iowa State-SAE Student Branch: Baja vehicle suspension design

- Alex Brimeyer, Joshua Klocke*, Shane Pearson, Andrew Smidt, Skyler Teachout

Spring 2010

CIRAS Sponsored Projects

Creative Composites, Ankeny, IA: Lubricant testing machine design

- Carl Friedmann, David Gustafson, Tom Meade, Steven Nelson, Eric Nichols*
- Tyler Dorin*, Zebulon Fisher, Robert Jaeger, John O'Brien, Ali Surel, Brent Teske

Cycle Country Accessories, Spencer, IA: ATV snow blade skid design

- Brian Baird, Jeff Cook, Benjamin Dunnigan, Matthew Fisher, Joe Goering*
- Adam Bernard, Joshua Cronbaugh*, Gary Mraz, Jacob Schrader, Andy Warden

ESCP, Inc., Davenport, IA: Concrete industry power tool design

- Tayte Askelsen, Zach Halbur, Ryan Olson, Derek Steelman*, Kai Tanaka, Aaron Wenthold
- John Fenske, Kristin Foy*, Eric Shannon, Charles Weldon, Matt Zeman

Jancy Engineering, Inc., Davenport, IA: Pipe bender portable base design

- Adam Harmon*, Dylan Jans, Chichu Liang, Joshua Ritchie
- Seth Babcock, Kyle Engel, John Gardener*, Elliot Hoff, Tim Klinge, Anthony Sikora

Jancy Engineering, Inc., Davenport, IA: Magnetic base drill power feed accessory design

- Joe Briggie, Joshua Jensen*, Tevor McCoy, Benjamin Peterson, Bob Scharfenkamp
- Brian Conley*, Michael Dunlay, Greg Langenfeld, Matthew Martin, Evan Rickels, Ryan Tweeten

TFI Lighting Products, Inc., Carroll, IA: Electric car charging station

- Marcus Jacobson, Jeremy Keiser, Eric Matuska, Justin Voss*, Jonathan Wyman
- Jonathan Determan, Kaitlin Faulds, Tyler Gibney, Sergio Pinon, Ryan Spindler*, Jeff Turner

Thombert Manufacturing, Newton, IA: Pallet handler redesign

- Chad Anderson, Thomas Cooper, Samuel Huffman*, Bryan Lemke, Jerry Lynch, Clint Weinberg
- Sim Chew, Pierre Gilles*, Eric Lo, Tim Marquardt, Hao Tran, Troy Zimmerman

Corporate Sponsored Projects

Whirlpool Corporation, Benton Harbor, MI: Blender drive redesign

- Steve Coon, Ryan Hinrichsen, Amada Newendorp, Kyle Parks, Alden Peterson*, Aaron Weinschen
- Dan Chandler, Enrique Osuna, Logan Schultz, Grant Ubben, Ryan Wacker, Heather Wilson*

Service Project

Iowa State FPM-EHS Department: Fire extinguisher status check system design

- Jaime Benitez, Dan Galuszka, Ryan Lefevre*, Allison Vigoya

*Team leader

Graduate Program Highlights

Enrollment

In the 2009–2010 academic year, the mechanical engineering department had 174 graduate students enrolled. These consisted of 86 master's students and 88 PhD students. Nineteen students were women and 15 were minority students. The enrollment numbers include 44 students pursuing their master's degrees via distance education.

Degrees

The department granted 23 master's degrees and 7 doctoral degrees in 2009–2010. Upon graduation, one MS and two PhD student received graduate research excellence awards and two of our PhD students received graduate teaching excellence awards.

Recruitment and Support

We had 213 students apply to our graduate program for admission in fall 2009. Of these applicants, 52 students were admitted and 46 students enrolled. Overall the department supported 25 students through teaching assistantships and 82 students through research assistantships. In addition, seven students were awarded fellowships including one winner of the prestigious National Science Foundation Graduate Fellowship.

BS/MS Program

The concurrent BS/MS program continues to provide students with the opportunity to earn both a BSME and an MSME following five years of study as well as exposure to research as early as their junior year. In 2009–2010, the department enrolled 10 new students to the program.

Career Paths

Our graduates enjoy tremendous visibility among industry and academia. A large fraction of our graduates pursue positions in industry with such renowned companies as John Deere, Caterpillar, 3M, Intel, and Garmin. Recent graduates have also found faculty and post-doctoral opportunities with institutions such as Massachusetts Institute of Technology, Australian National University, Oak Ridge National Laboratory, and Trine University.

Recent Developments

The department launched its new coursework-only professional master's degree program (master of engineering) in fall 2009 with 19 students enrolled. Two of these students completed the degree in two semesters and graduated in spring 2010. Working with Engineering Distance Education, we anticipate strong growth in this program in upcoming years with the development of graduate minors in strategic areas of interest to our industrial stakeholders.

Our aggressive recruiting continues to yield rich dividends. Our application count is the highest it has been in the last five years, including a marked increase in the number of domestic applicants. Our efforts of increasing student diversity have also resulted in the program enrolling the highest level of women and minority students in the last decade. Graduate program staff members have successfully pursued university grants to enhance regional recruitment efforts and increase fellowship monies to attract the best prospects for our program. Finally, the department has established new graduate course requirements to enable students to achieve the appropriate depth in mechanical engineering as well as the necessary breadth to excel in interdisciplinary research.



Pranav Shrotriya
Associate Chair for
Graduate Studies
and Research

Doctoral Dissertations

Daniela Faas

Dissertation: A Hybrid Method for Haptic Feedback to Support Manual Virtual Product Assembly
Major Professor: Judy Vance

*Sergei Markutsya**

Dissertation: Modeling and Simulation of Nanoparticle Aggregation in Colloidal Systems
Major Professor: Shankar Subramaniam

Kumar Karra

Dissertation: Parametric Study and Optimization of Diesel Engine Operation for Low Emissions Using Different Injectors
Major Professor: Song-Chang Kong

Derek Wissmiller

Dissertation: Pyrolysis Oil Combustion Characteristics and Exhaust Emissions in a Swirl-stabilized Combustor
Major Professor: Terry Meyer

*Ying Wu**

Dissertation: Inversion-based Feedforward-feedback Control: Theory and Implementation to High-Speed Atomic Force Microscope Imaging
Major Professor: Qingze Zou

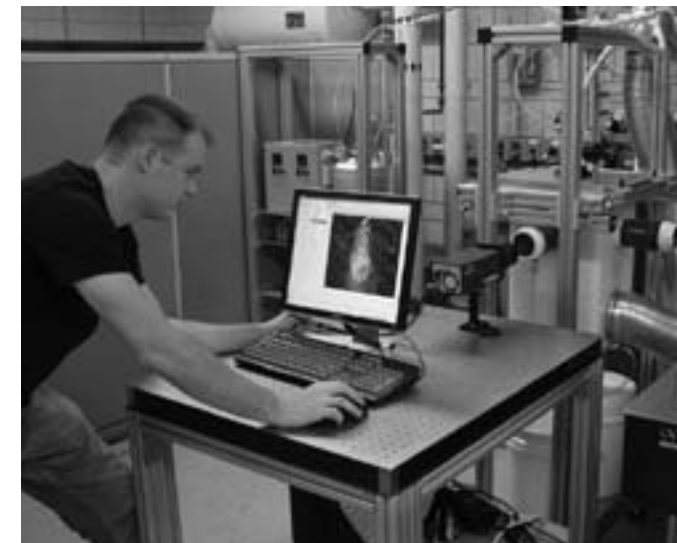
Ronald Bremner

Dissertation: Rapid Optimization of Interior Permanent Magnet (IPM) Machines Using the Response Surface Method and Dimensionless Parameters
Major Professor: Ron Nelson

Xiaohui Zhou

Dissertation: A Plug and Play Framework for an HVAC Air Handling Unit and Temperature Sensor Auto-recognition Technique
Major Professor: Ron Nelson

*Research Excellence Award



Research Portfolio

Biological and Nanoscale Sciences

Pranav Shrotriya, Program Director

The biological and nanoscale sciences program investigates problems at the interface of engineering, biology, and nanotechnology, enabling us to apply the fundamental principles of mechanical engineering to expand opportunities for new science and engineering breakthroughs. Faculty members in the program have received funding from the National Science Foundation to host a summer Research Experience for Undergraduate (REU) site on microscale sensing, actuation, and imaging (MoSAIc). The MoSAIc REU site provides research experiences that address fundamental issues concerning design and manufacture of sensors, actuators, and smart materials, as well as state-of-art imaging and diagnostic systems. The research activities address fundamental issues in mechanical engineering at several scales ranging from the molecular to the mesoscale.



Clean Energy Technologies

Terry Meyer, Program Director

The clean energy technologies program investigates alternative energy and energy efficiency methods that have a positive effect on the environment. The course Applications of Sustainable Engineering in Development, in conjunction with an Engineers Without Borders site visit, gave students the opportunity to build battery charging stations and lighting in three villages that had no electricity or lighting, design a human power grain grinder for use by village women, and build and test enhanced cookstove designs to improve women's health. The undergraduate senior design program was also involved with several sustainable energy projects during the school year. Faculty members have been busy with many areas of research such as waste-to-energy technologies, wind speed energy conversion, and new burner technologies for ethanol processing.

Complex Fluid Systems

Shankar Subramaniam, Program Director

Shankar Subramaniam, together with several other faculty members (LeAnn Faidley, Baskar Ganapathysubramanian, Gap-Yong Kim, Song-Charng Kong, Terry Meyer, and Michael Olsen) organized a one-day workshop on complex fluid systems at Iowa State. The conference brought together leading university experts to foster interactions and promote future collaboration in the field, as well as help pursue large collaborative research funding opportunities. During the workshop, five technical track presentations and a graduate student poster session were held, along with afternoon breakout sessions that allowed participants to discuss key areas of interest. A summary of the presentations concluded the workshop.

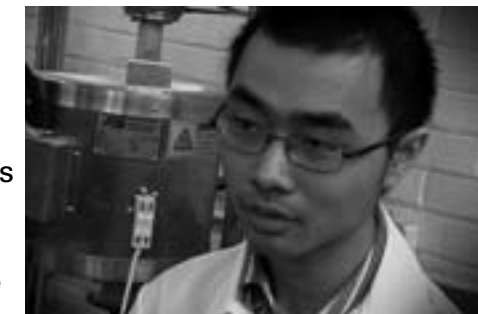


Design and Manufacturing Innovation

Abhijit Chandra, Program Co-Director

Gap-Yong Kim, Program Co-Director

The design and manufacturing innovations (DMI) program centers on transforming resources into useful and desirable products cutting across all phases of the design and manufacturing cycle. Novel experimental, computational, and analytical techniques are developed to advance our understanding of these transformation processes, as well as to study practical applications, which include chemical mechanical planarization, laser processing, tribology at the micro/nanoscale, surface engineering, and characterization for biomedical applications.



In 2009, the DMI program sponsored the 2nd Annual Excellence of Graduate Research Conference where six awards were granted. Next year, the group would like to expand the event to include the biological and nanoscale sciences program to promote graduate research and provide opportunities for collaboration in interdisciplinary areas. The program also offered compensation for student conference travels to enrich graduate study experience within the program. Additionally, the group partially supported the acquisition of a high-end profiler (Zygo) for undergraduate laboratories and graduate research. The equipment will enable high quality, hands-on lab experience for undergraduate students and enable synergistic research opportunities.



Simulation and Visualization

Song-Charng Kong, Program Director

Faculty members of the simulation and visualization program develop advanced computational and experimental techniques to understand and predict physical phenomena. We also create unique image rendering methods to enhance the interpretation of complex systems. For example, James Oliver and Eliot Winer developed a technology to convert flat images from medical

scans into 3-D images. Their technology was used in NBC's *The Biggest Loser Couples* to show contestants' MRI scans in 3-D. Another technology that received Hollywood attention is the high-speed, high-resolution 3-D imaging technique developed by Song Zhang. Shown in the figure, the 3-D image mimic movement in real time. This innovative technology, developed under the support of the Department of Justice, has tremendous potential in numerous applications.

Another highlight is the simulation tool developed by Baskar Ganapathysubramanian on accelerating the development of organic solar cells (OSCs) for harnessing solar energy more efficiently. This multi-scale computational framework is being used to investigate the property-structure and process-structure relations in OSCs. This simulation technology will subsequently be used to computationally optimize processing conditions to tailor the morphology to achieve high-efficiency OSCs.

The faculty will continue to develop innovative simulation and visualization technologies that can be used to explore various science frontiers as well as use in daily life. One goal is to enable scenarios for products or processes to be altered and tested in a virtual environment before any prototypes are created. Such capability in virtual engineering will significantly reduce the time and cost associated with product development and process optimization.

Department Organization

Industrial Advisory Council (IAC)

Brett L. 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 road maps to match business unit needs with strategic direction for both technology development and business opportunities.

Scott Bowman, IAC Chair
KJWW

Scott is an alum of the ME department and has worked at KJWW Engineering in Des Moines since 1989. His specialties include project delivery, project management, contracts, direct digital controls, energy efficiency, sustainable design, LEED, and commissioning.

Craig Connell
Black & Veatch

Craig is a BSME graduate of Iowa State. Upon graduation, he joined the global engineering and construction company Black & Veatch. He is currently a Vice President and the Director of the Corporate Project Management Office, responsible for establishing policies, practices, systems, and tools for management and project controls globally.

Mike Hilby
John Deere

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

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.

Dave O'Brien
Lyondellbasell

Cynthia Lord, IAC Vice Chair
Alliant Energy

Cynthia is a BSME alum of Iowa State and has spent more than 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.

Jason Olberding
Emerson Process Management

Staff

Kiewit Undergraduate Student Services Center



Denise Birney
Secretary



Kevin Osgerby
Academic Advisor



John Wagner
Academic Advisor,
Lead Advisor



Johna Wolfe
Academic Advisor

Business Office



Mary Bilstad
Program Coordinator



Amy Carver
Program Assistant for
Graduate Education



Carol Knutson
Account Clerk



Janelle Miranda
Program Assistant for
Undergraduate Education



Deb Schroeder
Department Secretary



Denise Wright
Administrative Specialist,
Assistant to the Chair

Laboratory and Information Technology



Larry Couture
Teaching Laboratory
Coordinator



Jim Dautremont
Laboratory Mechanical
Technologist



Nate Jensen
System Support
Specialist



David Lennon
Teaching Laboratory
Coordinator



Hap Steed
Manager, Technical
Services

Staff Highlights

Denise Birney graduated with a BA in Human Resource Management from Briar Cliff University.

Johna Wolfe earned a Master of Education in Higher Education with an emphasis on student affairs. It is her second master's degree from Iowa State.

Professors

James Bernard Anson Marston Distinguished Professor



BS, Engineering Mechanics,
University of Michigan, 1965
MS, Engineering Mechanics,
University of Michigan, 1967
PhD, Engineering Mechanics,
University of Michigan, 1971

Professor Bernard works with real-time applications of computer modeling and simulation, particularly vehicle dynamics applications, and interactions between technology and globalization.

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



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

Professor Bigelow researches systems to use ultrasound to treat 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.

Faculty Highlights

Emmanuel Agba led the effort to obtain a gift-in-kind for 10 seats of MAGMASOFT® metal casting simulation software with a list price of more than \$650K if purchased.

Robert Brown was selected to lead Iowa's submission of a \$20 million research proposal to the National Science Foundation's Experimental Program to Stimulate Competitive Research program. This proposal, a collaboration among Iowa's Regent Universities, its community and private colleges, and Iowa state agencies, has a goal of developing a comprehensive research program in renewable energy.

Robert Brown Anson Marston Distinguished Professor Gary and Donna Hoover Chair in Mechanical Engineering Director, Bioeconomy Institute Director, Center for Sustainable Environmental Technologies



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

Professor 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.

Mark Bryden Associate Professor



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

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

Abhijit Chandra Professor



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

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

LeAnn Faidley Assistant Professor



BS, Physics, Iowa State University, 1999
BS, Engineering Science,
Iowa State University, 1999
MS, Engineering Mechanics,
Iowa State University, 2001
MS, Mechanical Engineering,
The Ohio State University, 2005
PhD, Mechanical Engineering,
The Ohio State University, 2006

Professor Faidley studies active/smart materials, structures and systems, the characterization, modeling, application, and control of magnetically activated materials, magnetorheological elastomers, and smart materials for medical devices.

Baskar Ganapathysubramanian William March Scholar in Mechanical Engineering Assistant Professor



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

Professor 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.

Ted Heindel Interim Chair Bergles Professor of Thermal Science



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

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

Faculty Highlights

In 2009, **Mark Bryden** and his research team won an R&D 100 award for his work in developing the software package Virtual Engineering—Process Simulator Interface (VE-PSI). VE-PSI provides engineers with a tool to design and optimize power plants within a virtual engineering environment. Referred to as the “Oscars of Invention” the R&D 100 awards recognize the 100 most technologically significant products introduced into the marketplace over the past year.

Abhijit Chandra developed a multi-physics and multi-scale analysis methodology to predict defectivity in polishing processes. A sensitivity analysis based on this methodology can be used to develop defect avoidance strategies. The group developed life prediction protocol for hip implants that was recently adopted by German industry.

Atul Kelkar Professor



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

Professor 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 Assistant Professor



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

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

Song-Chang Kong
William and Virginia Binger
Assistant Professor of Mechanical
Engineering



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

Professor Kong researches experimental engine
combustion and emissions studies, biorenewable
energy utilization in internal combustion engines,
numerical combustion study and model development
using detailed chemical kinetics with computational
fluid dynamics, and optimization of engine
performance via experiments and numerical models.

Valery I. Levitas
Schafer 2050 Challenge Professor
Department of Mechanical
Engineering and of Aerospace
Engineering
Courtesy appointment with
Department of Materials Science
and Engineering



Kiev Polytechnic Institute, Kiev, USSR, MS (Honors) in
Mechanical Engineering, 1978
Institute for Superhard Materials, Kiev, USSR,
Candidate of Sciences in Materials Science, 1981
Institute of Electronic Machinebuilding, Moscow,
USSR, Dr. of Sciences in Continuum Mechanics, 1988
University of Hannover, Germany, Doctor-Engineer
habil. in Continuum Mechanics, 1995

Professor Levitas studies stress- and strain-induced
phase transformations, high pressure mechanics
and mechanochemistry, structural changes in
materials via virtual melting, multiscale modeling,
strain-induced chemical reactions, large inelastic
deformation of solids, continuum thermodynamics
and kinetics, instabilities in materials and structures,
micromechanics and nanomechanics, energetic and
nanoenergetic materials, superhard materials, and
smart materials.

Greg Luecke
Associate Professor



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

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

Erin MacDonald
Assistant Professor of Mechanical
Engineering and of Art & Design
Michael and Denise Mack 2050
Challenge Scholar



BS, Materials Science and Engineering,
Brown University, 1998
MS Mechanical Engineering, University of Michigan,
2004
PhD, Mechanical Engineering, University of Michigan,
2008

Professor MacDonald researches product design;
sustainable design; design optimization; behavioral
psychology; construction of consumer preferences;
judgment and decision-making regarding products;
and cognitive and learning styles.

Faculty Highlights

LeAnn Faidley's research program
continued to expand into characterization
of soft-magnetically activated smart
materials and other applications of smart
materials. Additionally she completed the
development and implementation of brand
new labs for ME 421, System Dynamics
and Controls, based on a scenario
approach. She was also active in diversity
efforts within the department.

Sebastien Feve published two co-written
reports with the National Highway
Transportation Safety Administration
based on his earlier work with tire research
from 2006.

Faculty Highlights

Baskar Ganapathysubramanian developed a mathematical framework for interrogating and designing photovoltaic devices. He also developed SETDiR (Scalable Extensible Toolkit for Dimensionality Reduction), a computational framework for non-linear dimensionality and model reduction, which is funded by a prestigious grant from the National Science Foundation.

Matthew Hagge developed concept based learning in thermodynamics.

Ted Heindel and **Greg Maxwell** were selected as the ME Teachers of the Year by graduating seniors. Heindel was also named the Bergles Professor of Thermal Science, and he completed the Iowa State Emerging Leaders Academy program.

Jim Heise arranged for the sponsorship of 16 industrial projects for ME 415 students as the design project coordinator. Of these 16 projects, 10 were co-sponsored by Iowa State Extension CIRAS and provided service outreach to Iowa industry.

Atul Kelkar has been working with an Ames, Iowa, startup to develop new processes and equipment that can be used to recover energy from waste streams such as waste plastics, used oil, and used tires in the form of useful fuels.

Gap-Yong Kim is developing a laboratory to conduct research on solid oxide fuel cell (SOFC) modeling and fabrication. The goal of the research is to improve SOFC performance by understanding the impact of cell microstructure on its reaction mechanism. Collaborative work on measurement of the SOFC performance is underway for various types of fuel gases.

Adin Mann
Associate Professor
Assistant Dean, Graduate College



BS, Engineering Science, Iowa State
University, 1984
PhD, Acoustics, Pennsylvania State
University, 1998

Professor Mann works with acoustics, noise control,
and design optimization.

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

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

Terry Meyer
Assistant Professor



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

Professor 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.

Pal Molian
Professor



BE, Indian Institute of Science, 1975
ME, Indian Institute of Science, 1977
PhD, Oregon Graduate Institute of
Science and Technology, 1982

Professor Molian works with materials and
manufacturing with a focus on laser processing,
nanotechnology, microelectromechanical systems,
and solid freeform fabrication.

W. Ross Morrow
Assistant Professor of Mechanical Engineering, with a Courtesy Appointment in the Department of Economics



BS, Mechanical Engineering, University of Michigan Ann Arbor, 2001
 MS, Applied Interdisciplinary Mathematics, University of Michigan Ann Arbor, 2008
 MS, Mechanical Engineering, University of Michigan Ann Arbor, 2008
 PhD, Mechanical Engineering, University of Michigan Ann Arbor, 2008

Professor Morrow works with engineering design; environmentally benign engineering; environmental regulatory policy and engineering design; numerical methods for nonlinear problems; optimization and equilibrium problems; and models of consumer choice.

Ron Nelson
Professor



BS, Mechanical Engineering, Iowa State University, 1970
 MS, Mechanical Engineering, Iowa State University, 1972
 PhD, Mechanical Engineering, Stanford University, 1981

Professor Nelson's interests include energy conversion and utilization, environmental control, thermal system optimization, and applied artificial intelligence.

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



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

Professor 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.

Mike Olsen
Associate Professor



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

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

Pranav Shrotriya
Associate Professor
Associate Chair for Graduate Studies and Research
Director of Graduate Education



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

Professor 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.

Shankar Subramaniam
Associate Professor



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

Professor 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 Professor
Associate Chair for Undergraduate Studies



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

Professor 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.

Faculty Highlights

Adin Mann continued to work on building a national network of engineering faculty who share the same vision of broadening the participation of underrepresented minorities working in industry, government, and the professoriate in the engineering field. He also has continued his efforts on developing tools and models to assess the strength of maize hybrids to withstand weather, develop sound in a virtual environment to control actions, and improve modeling of flow induced pipe vibration.

Greg Maxwell continues to be involved with Iowa State's Industrial Assessment Center, working with industries to improve efficiency and reduce energy costs.

Terry Meyer's work in laser diagnostics for combustion and alternative fuels has received new funding support from the Department of Energy, Air Force Office of Scientific Research, and Iowa Energy Center. Dr. Meyer serves as Director of the Clean Energy Technologies Program in the Department of Mechanical Engineering, serves as co-chair for two major research conferences, and was recently given the Young Researcher Award in Advanced Optical Technologies by a major research institute in Erlangen-Nuremberg, Germany, with a 4-year position as a visiting professor.

Pal Molian has had high quality journal publications with a high reputation as a reviewer of numerous journals and National Science Foundation panels in the area of materials and manufacturing.

W. Ross Morrow started his academic career at Iowa State in the fall of 2009 after completing a post-doctoral research fellowship in the Harvard Kennedy School's Energy Technology Innovation Policy group. He recently published an analysis of transportation energy policy options in the journal *Energy Policy*. He gave several seminars in 2009 concerning transportation policy, equilibrium pricing, and numerical methods for large-scale nonlinear systems.

Faculty Highlights

Song-Chang Kong explored alternative engine fuels such as mixtures of biodiesel and waste plastics as well as pyrolysis oil and ethanol. His research also included the combustion of synthesis gas produced from biomass gasification. He was named the William and Virginia Binger Assistant Professor of Mechanical Engineering in recognition of his excellence in research and education. On May 4, 2010, *The Des Moines Register* featured his engine research program, which explores the use ammonia as a fuel that does not produce carbon dioxide emissions in an effort to alleviate greenhouse gas emissions.

Valery Levitas developed the first theory for sublimation via virtual melting inside elastoplastic materials, and the first fully physically and geometrically nonlinear phase field theory for martensitic transformations and corresponding finite element approach and simulations. He also obtained new experimental and theoretical results on melting of Al nanoparticles encapsulated in oxide shells.

Erin MacDonald revamped ME 423, Creativity and Imagination in Engineering Design, including a new team project designing Rube Goldberg Machines. She has been working to develop a new interdisciplinary master's degree in product design and innovation. She has been completing her research on cognitive styles and website advertisements from her Postdoctoral Appointment at MIT and will begin a new initiative in Wind Farm optimization for homeowner preferences, for which she recently received a SEED grant from Ames National Laboratory.

Faculty Highlights

Ron Nelson has been on phased retirement and taught two courses in the fall. He also continued to work with five graduate students and was the mechanical engineering faculty member on the U.S. DOE Solar Decathlon competition. He did the energy modeling for the SolarD net-zero energy building and his graduate student helped design all the energy systems; they took 5th place in engineering for the world-wide competition.

Jim Oliver continued to lead Iowa State's Virtual Reality Applications Center and the Human Computer Interaction graduate program. His research is supported by a variety of industry partners and federal agencies, and VRAC supports a broad interdisciplinary constituency that spans the entire university.

Pranav Shrotriya was promoted to Associate Professor with tenure in July 2009. Over the last year, research results from his group were reported in three journal publications, three invited lectures, and four peer-reviewed conference proceedings.

Gloria Starns continued to lead collaborations across multiple colleges to understand and apply techniques that will improve the ability of students to solve complex problems. Her work led to experimentally implementing ThinkSpace, a tool that helps researchers understand where in the process of problem solving, complexity begins to thwart students in their efforts to find solutions to complex problems, in some mechanical engineering courses.

Shankar Subramaniam, who directs the ME department's research program on complex fluid systems, organized a one-day workshop on Complex Fluid Systems at Iowa State that brought together researchers from all departments and colleges at the university to establish collaborations and pursue large collaborative research funding opportunities in the area of complex fluid systems. He is part of team proposal to study the rheology of cement using numerical simulation and experiments with Professor Kejin Wang (CCEE) and Professor Sriram Sundararajan (ME) that was funded by the National Science Foundation.

Sriram Sundararajan has helped advance the graduate program by deploying a new coursework-only professional master's degree, streamlining coursework requirements for graduate degrees, and increasing involvement of women in graduate programs. He was also elected to the steering committee of the International Conference on Wear of Materials.

Judy Vance **Joseph and Elizabeth Anderlik** **Professor of Engineering**



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

Professor 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 **Associate Professor**



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

Professor Wang's areas of interests are 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 **Dean, College of Engineering** **James and Katherine Melsa** **Professor in Engineering** **Professor, Department of** **Mechanical Engineering**



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

Professor Wickert's research interests include mechanical vibration and noise control, continuous and multibody systems dynamics, applied mechanics, applications in computer data storage, flexible web material manufacturing, and friction-vibration interaction.

Eliot Winer **Associate Professor**



BS, Aeronautical and Astronautical Engineering, The Ohio State University, 1992
MS, Mechanical Engineering, State University of New York at Buffalo, 1994
PhD, Mechanical Engineering, State University of New York at Buffalo, 1999

Professor 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.

Song Zhang **Assistant Professor**



BS, Precision Machinery & Precision Instrumentations, University of Science & Technology of China, China, 2000
MS, Mechanical Engineering, Stony Brook University, 2003
PhD, Mechanical Engineering, Stony Brook University, 2005

Professor Zhang researches three-dimensional optical metrology, machine and computer vision, virtual reality, human-computer interaction, nondestructive evaluation, and biometrics.

Faculty Highlights

Judy Vance, along with several co-authors, received a best paper award from the American Society of Mechanical Engineers (ASME) Design Engineering Division Mechanisms and Robotics Committee at the International Design Engineering Conferences held in San Diego. Her research using haptics, or force feedback, to enhance virtual reality to produce realistic virtual assembly simulations continues to be supported with funding from the National Science Foundation. She remains active in supporting women engineering faculty as they explore academic leadership opportunities as evidenced by her activities as a member of the ASME Broadening Participation Committee.

Xinwei Wang's Micro/Nanoscale Thermal Science Laboratory has been developing high-efficiency and cost-effective micro wind turbines. The project is funded by the California Energy Commission and it aims to develop micro wind turbine arrays based on the revolutionary technology Wind Annulus Nozzle Distributor (WAND). The proposed WAND-based micro wind turbine array technology will benefit the public significantly in terms of reducing CO₂ emission, reducing the dependence on coal and oil for electricity generation, and reducing family electrical bills.

Research in **Eliot Winer's** lab focusing on allowing enhanced exploration of digital medical data has been transitioned into a commercial product. It is currently being used at a major U.S. hospital for planning radiation oncology treatments and organ transplant procedures. Dr. Winer was on research teams that attracted more than \$1.5M in new funding to Iowa State.

Song Zhang received research grants with a total of \$414,000, delivered three invited talks in university and conferences, published/accepted 15 papers including one invited journal article and one invited book chapter. His research was highlighted by the College of Engineering "Two Minutes With" video and VRAC's *VRTech Spring News*.

Senior Lecturers



Emmanuel
Agba



Gloria
Starns

Emeritus Faculty

- Shyam Bahadur
- William Bathie
- Joseph R. Baumgarten
- Gerald Colver
- William Cook
- Richard Danofsky
- Paul DeJong
- Arvid Eide
- Max Gassman
- Jerry L. Hall
- Alexander Henkin
- Alfred Joensen
- George Junkhan

Adjunct and Courtesy Appointments

- Ashraf Bastawros, Adjunct Associate Professor (Aerospace Engineering)
- Joseph N. Gray, Adjunct Associate Professor (Physicist, Center for Nondestructive Evaluation)
- John McClelland, Adjunct Associate Professor (Senior Physicist, Ames Laboratory)
- Richard Stone, Courtesy Assistant Professor (Industrial and Manufacturing Systems Engineering)

Research Sponsors

- Aesculap
- Air Force Office of Scientific Research
- Ames Lab
- Battelle Infrastructure and Platform Grants Program
- California Energy Commission
- Conoco-Phillips
- Defense Threat Reduction Agency
- Department of Energy
- Department of Homeland Security
- DuctSox Corporation
- Fisher Control
- Grow Iowa Values Fund
- Iowa Energy Center
- Iowa Power Fund
- Institute for Physical Research and Technology, Iowa State
- John Deere
- Midwest Forensics Resources Center
- NASA
- National Institute of Health
- National Institute of Justice
- National Research Council
- National Science Foundation
- NineSigma
- Omaha Public Power District
- Office of Naval Research
- Pioneer
- Provost Office, Iowa State
- Rockwell-Collins
- Sokang University, South Korea
- US Army
- Winegard Company

Lecturers



Sebastien
Feve



Matt
Hagge



Jim
Heise

- Patrick Kavanagh
- Charles Mischke
- Ted Okiishi
- Mike Pate
- Leo Peters
- Richard H. Pletcher
- Donald Roberts
- George Serovy
- Howard Shapiro
- Bernard Spinrad

Journal Publications

Patwardhan, P. R., J.A. Satrio, **R. C. Brown**, and B. H. Shanks, "Product Distribution from Fast Pyrolysis of Glucose-based Carbohydrates", *Journal of Analytical and Applied Pyrolysis*, 86(2): 323–330, 2009.

Brewer, C. E., K. Schmidt-Rohr, J. A. Satrio, and **R. C. Brown**, "Characterization of Biochar from Fast Pyrolysis and Gasification Systems", *Environmental Progress & Sustainable Energy* 28(3): 386–396, 2009.

Choi, D., D. Chipman, S. Bents, and **R. Brown**, "A Techno-economic Analysis of Poly-hydroxyalkanoates and Hydrogen Production from Syngas Fermentation of Gasified Biomass", *Applied Biochemistry and Biotechnology*, 160(4): 1032–1046, February 7, 2009.

Laird, D.A., **R.C. Brown**, J.E. Amonette, and J. Lehmann, "Review of the Pyrolysis Platform for Producing Bio-oil and Biochar: Technology, Logistics and Potential Impacts on Greenhouse Gas Emissions, Water Quality, Soil Quality and Agricultural Productivity", *Biofuels, Bioproducts, and Biorefining*, 3: 547–562, 2009.

Ganapathysubramanian, B., and N. Zabaras, "A Stochastic Multiscale Framework for Modeling Flow Through Heterogeneous Porous Media", *Journal of Computational Physics*, 228(2): 591–618, 2009.

Ganapathysubramanian, B., "Using Data to Account for Lack of Data: Linking Material Informatics with Stochastic Analysis", *Journal of Metals*, 61(1): 54–59, 2009.

Deza, M., N.P. Franka, F. Battaglia, and **T.J. Heindel**, "CFD Modeling and X-ray Imaging of Biomass in a Fluidized Bed", *Journal of Fluids Engineering*, 131(11): 111303–111314, 2009.

Franka, N.P., and **T.J. Heindel**, "Local Time-Averaged Gas Holdup in a Fluidized Bed with Side Air Injection using X-ray Computed Tomography", *Powder Technology*, 193(1): 69–78, 2009.

Zhu, H., B.H. Shanks, and **T.J. Heindel**, "Effect of Electrolytes on CO-Water Mass Transfer", *Industrial & Engineering Chemistry Research*, 48(6): 3206–3210, 2009.

Karkee, Majoj, Brian L. Steward, **Atul G. Kelkar**, and Zachary T. Kemp II, "Modeling and Real-time Simulation Architectures for Virtual Prototyping of Off-Road Vehicles", *Virtual Reality*, DOI 10.1007/s10055-009-0150-1, Springer Verlag, London, December 2009.

Kuzhiyil, N., and **S.-C. Kong**, "Energy Recovery from Waste Plastics by Using Blends of Biodiesel and Polystyrene in Diesel Engines", *Energy and Fuels*, 23(6): 3246–3253, 2009.

Xue, Q., and **S.-C. Kong**, "Development of Adaptive Mesh Refinement Scheme for Engine Spray Simulations", *Computers & Fluids*, 38(4): 939–949, 2009.

Li, Y.H., and **S.-C. Kong**, "Integration of Parallel Computation and Dynamic Mesh Refinement for Transient Spray Simulation", *Computer Methods in Applied Mechanics and Engineering*, 198(17–20): 1596–1608, April 15, 2009.

Karra, P.K., and **S.-C. Kong**, "Experimental Study on Effects of Nozzle Hole Geometry on Achieving Low Diesel Engine Emissions", *ASME Journal of Engineering Gas Turbines and Power*, 132(2): 022802–022812, 2009.

- Xue, Q., and **S.-C. Kong**, "Multi-Level Dynamic Mesh Refinement for Modeling Transient Spray and Mixture Formation", *Atomization and Sprays*, 19(8): 755–769, 2009.
- Zhang, L., and **S.-C. Kong**, "Modeling of Multi-Component Fuel Vaporization and Combustion for Gasoline and Diesel Spray", *Chemical Engineering Science*, 64(16): 3688–3696, 2009.
- Li, Y.H., and **S.-C. Kong**, "Mesh Refinement Algorithms in an Unstructured Solver for Multiphase Flow Simulation Using Discrete Particles", *Journal of Computational Physics*, 228(17): 6349–6360, 2009.
- Levitas, V.I.**, L.B. Smilowitz, B.F. Henson, and B.W. Asay, "HMX Polymorphism: Virtual Melting Growth Mechanism, Cluster-to-cluster Nucleation Mechanism and Physically Based Kinetics", *International Journal of Energetic Materials and Chemical Propulsion*, 8(6): 571–593, 2009.
- Levitas, V.I.**, and O.M. Zarechnyy, "Modeling and Simulation of Mechanochemical Processes in Rotational Diamond Anvil Cell", *Europhysics Letters*, 88(1): 1–6, 2009.
- Levitas, V.I.**, D.-W. Lee and D.L. Preston, "Interface Propagation and Microstructure Evolution in Phase Field Models of Stress-induced Martensitic Phase Transformations", *International Journal of Plasticity*, 26(3): 395–422, 2009.
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- Levitas, V.I.**, "Burn Time of Aluminum Nanoparticles: Strong Effect of the Heating Rate and Melt Dispersion Mechanism", *Combustion and Flame*, 156(2): 543–546, 2009.
- Levitas, V.I.**, and I.B. Ozsoy, "Micromechanical Modeling of Stress-induced Phase Transformations. Part 1. Thermodynamics and Kinetics of Coupled Interface Propagation and Reorientation", *International Journal of Plasticity*, 25(2): 239–280, 2009.
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- Levitas, V. I.**, and M.L. Pantoya, "Mechanochemical Mechanism for Fast Reaction of Metastable Intermolecular Composites Based on Dispersion of Liquid Metal", *International Journal of Energetic Materials and Chemical Propulsion*, 7(1): 17–38, 2009.
- MacDonald, E.**, R. Gonzalez, and P. Papalambros, "Preference Inconsistency in Multidisciplinary Design Decision Making", *Journal of Mechanical Design*, 131(3): 031009–031022, 2009.
- MacDonald, E.**, A. Lubensky, B. Sohns, and P. Papalambros, "Product Semantics and Wine Portfolio Optimization", *International Journal of Product Development*, 7(1/2): 73–98, 2009.
- Shrestha, S.S., and **G.M. Maxwell**, "An Experimental Evaluation of HVAC-grade Carbon-dioxide Sensors: Part 1, Test and Evaluation Procedure", *ASHRAE Transactions*, 115(2): 471–484, 2009.
- Schmidt, J.B., Z.D. Schaefer, **T.R. Meyer**, S. Roy, S.A. Danczyk, and J.R. Gord, "Ultrafast Time-Gated Ballistic-Photon Imaging and Shadowgraphy in Optically Dense Rocket Sprays", *Applied Optics*, 48(4): B137–B144, 2009.
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- Kostka, S., S. Roy, P.J. Lakusta, **T.R. Meyer**, M.W. Renfro, J.R. Gord, and R. Branam, "Comparison of Line-Center and Line-Scanning Excitation in Two-Color Laser-Induced Fluorescence Thermometry of OH", *Applied Optics*, 48 (32): 6332–6343, 2009.
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* Best Paper Award

Patent Awarded

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US Patent Publication No. US2009/0010447
Issued November 24, 2009
Active Noise Control System

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

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