ME-EM

MECHANICAL ENGINEERING

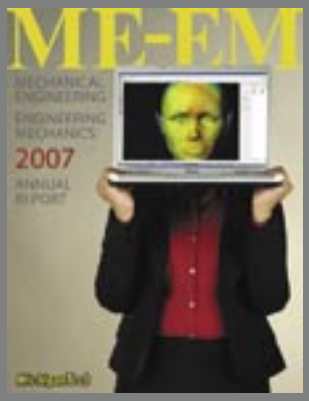
ENGINEERING MECHANICS

2007

ANNUAL REPORT

MichiganTech

CONTENTS



ON THE COVER:
ME-EM Graduate student Kari Brown demonstrates groundbreaking technology in human thermal comfort analysis developed at ThermoAnalytics, Inc., a Michigan Tech spin-off company.

Message From the Chair

The last year has been one of growth and progress for the Department of Mechanical Engineering-Engineering Mechanics, with many exciting developments. It is an honor to lead a department of such great promise, and as I survey the accomplishments presented in this annual report, I am optimistic about the future of the ME-EM department in our rapidly changing engineering community.

With the globalization of the engineering discipline, international connections are paramount. Early in 2007, I gave a presentation about our Senior Design and Enterprise programs to faculty at the Seoul National University of Technology in Seoul, South Korea. Based on the strong reputation of the MTU programs and the influence of the ME-EM community, the university has decided to adopt the Senior Design program into their own curriculum. In an increasingly interconnected global community, ME-EM faculty, students, and alumni maintain a strong presence in engineering education and industry worldwide.

The ME-EM department continues to appear on lists of top-ranked mechanical engineering departments, and credit is due to the people behind the rankings. Our faculty members are recognized nationally and internationally for their innovative approach to research and teaching. Our students, with open minds and ambitious endeavors, are prepared to create change and impact the technology of tomorrow. And our alumni, who hold prominent positions in industry and academia, continue to spread the ME-EM spirit of innovation throughout the global engineering community.

This year, we are beginning to see the results of our new research structure as faculty across the department discover complementary interests and surprising topical intersections that open new and exciting possibilities. We are pleased to welcome five new tenure-track faculty and two lecturers. I am confident they will contribute to the ME-EM department's innovative, enterprising research program.

It is with great professional pride that I present to you the accomplishments of our faculty, students, and alumni. I invite you to become a part of our innovative ME-EM community, joining with us as we forge new paths into the future of engineering. As always, we look forward to your feedback, comments, and support.

William W. Predebon
Professor and Department Chair

Pursuing Continued Success

RESEARCH EXPENDITURES SOAR

This year, as the ME-EM department adjusted to the new research group structure (please see following page for more information), research expenditures continued to grow. I am pleased to report that the National Science Foundation (NSF) ranked the ME-EM department 21st in research expenditures among all mechanical engineering departments in the U.S. in FY2006 with $10.238 million. The ME-EM faculty has embraced the structural reorganization, exploring new, interdisciplinary possibilities as they pursue ongoing major projects funded by sources including the NSF, NASA, DOD, DARPA, DOE, AFOSR, and the U.S. Navy.

EDUCATION RANKINGS RISE

As our research programs expand, engineering education continues to be a top priority for the ME-EM department. This year, our *undergraduate* program was ranked 22nd nationally among doctoral granting mechanical engineering departments in the U.S. by the *2008 U.S. News & World Report: America's Best Colleges*, up from the last published ranking of 25th. Our *graduate* program is ranked 54th nationally among doctoral granting mechanical engineering departments in the U.S. by the *2008 U.S. News & World Report: America's Best Graduate Schools*.

Our students continue to be a source of inspiration and a credit to the department, earning national and international acclaim for their engineering efforts. In 2007, for the third consecutive year, NASA selected the MTU Aerospace Enterprise Team's proposal to include an experiment on the agency's zero gravity airplane. The SAE Aero Design Team took first place in the SAE Aero East National Competition in 2006 among teams from universities worldwide, and the ME-EM Capstone Design project, "Automatically Indexing Insert Toolholder," earned first place at the 2007 ASME International Manufacturing Science and Engineering Conference Student Manufacturing Design Competition. The SAE Formula Car Enterprise Team and the Challenge X Enterprise Team also placed high in national competitions. In both their academic and extracurricular activities, ME-EM student engineers display admirable dedication to education and innovation.

MISSION
Prepare engineering students for successful careers

VISION
Be a nationally recognized mechanical engineering department that attracts, rewards, and retains the very best students, faculty and staff—be a department of choice nationally

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RESEARCH GROUP DIRECTORS

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Michele H. Miller, Associate Professor
Engineering Education Innovation Group
PhD: North Carolina State University

Tammy Haut Donahue, Associate Professor
Mechanics of Multiscale Materials Group
PhD: University of California at Davis

Mohan D. Rao, Professor
Multidisciplinary Engineered Dynamic Systems Group
NVH Enterprise Faculty Advisor
PhD: Auburn University

Craig R. Friedrich, Professor
Multiscale Sensors & Systems Group
Integrated Microsystems Enterprise Co-advisor
PhD: Oklahoma State University

Lyon B. King, Associate Professor
Space Systems Group
Aerospace Enterprise Faculty Advisor
PhD: University of Michigan

Innovating the Culture of Research

RESEARCH GROUPS

In 2006, ME-EM faculty voted to restructure the department's research program to better prepare the ME-EM department to respond to large, collaborative interdisciplinary research requests for proposals in order to achieve our strategic goal of being a top-ranked research program.

Research today occurs at the interfaces of different fields of engineering and science. To stay at the forefront of technology, our new structure centers around six research groups that are designed to encourage intra-ME-EM department technical area, inter-department, inter-college/school, and inter-university collaboration. Our long-term goal is for each group to become university centers or institutes, and eventually, national centers:

Advanced Power Systems (APS)
Engineering Education Innovation
Mechanics of Multiscale Materials
Multidisciplinary Engineered Dynamic Systems (MEDS)
Multiscale Sensors and Systems
Space Systems

With limitless possibilities for interdisciplinary investigation, the research groups will engage more faculty members in research activities and foster synergy across the department and the university. As an organized, collaborative research enterprise, we are truly greater than the sum of our parts.

EVALUATION OF RESEARCH GROUPS

The research group structure was planned as a three-year trial, with fluid groups designed to respond to emerging research possibilities. Each group will be evaluated yearly by three major criteria: the number of faculty on interdisciplinary research proposals; the number of faculty involved in the research enterprise; and the size of proposals. We have entered the second half of the experiment, and are beginning to see the impact of the new structure as research expenditures rise and interdisciplinary discussion produces exciting possibilities. This new configuration, while it broadens the range of research, will inherently and structurally provide for continuous improvement of undergraduate education. In the spring of 2009, the department will vote to adopt or modify the structure based on the progress of the previous three years.

Expanding Research Capacity

In recent years, the ME-EM department has seen unprecedented growth in research expenditures. In 2006, as part of the new research group structure, the department appointed Dr. Gordon Parker, at left, as the Director of Research. In this capacity, Parker will oversee ME-EM research activities and foster the creation of an infrastructure that will allow future expansion.

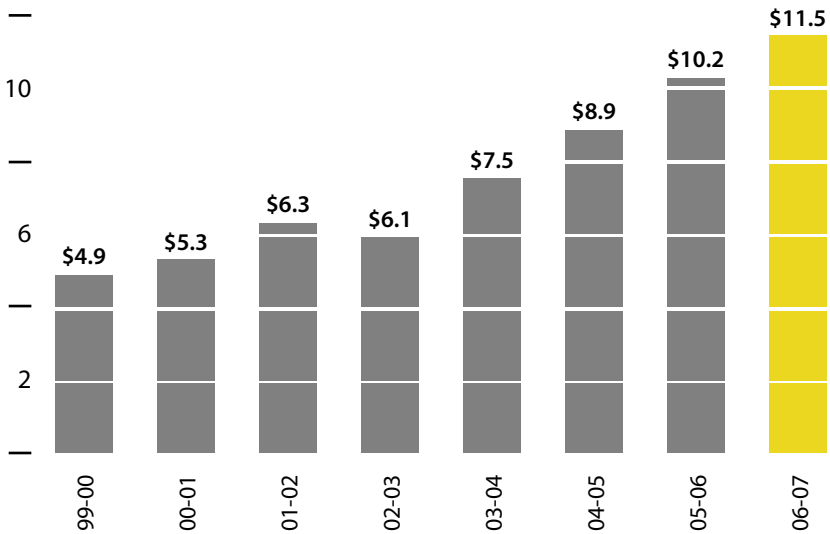
Parker's approach to the support of research growth is simple: "My goal is to ensure that ME-EM faculty members have the support and resources they need throughout the entire research process, from the initial proposal stage to the final technology transfer." Now in his second year as the Director of Research and his 11th year at Michigan Tech, Parker is creating a tighter, more coordinated organizational structure to improve research success and streamline the funding process. To respond to an increase in large research opportunities, his immediate concern is the formalization of the departmental support process for research proposals.

The driving force behind a thriving research program, according to Parker, is the enthusiasm of faculty and students. "Our faculty is performing cutting-edge research," he says, "and their excitement for the work is reflected in their students' performance. Departmental morale is a huge factor in success."

While it focuses on increasing research expenditures, the department will continue to maintain and improve the quality of undergraduate and graduate education. "Underlying the research reorganization and our efforts to increase research expenditures," says Parker, "is the drive to continue our tradition of innovation in our nationally recognized undergraduate program."

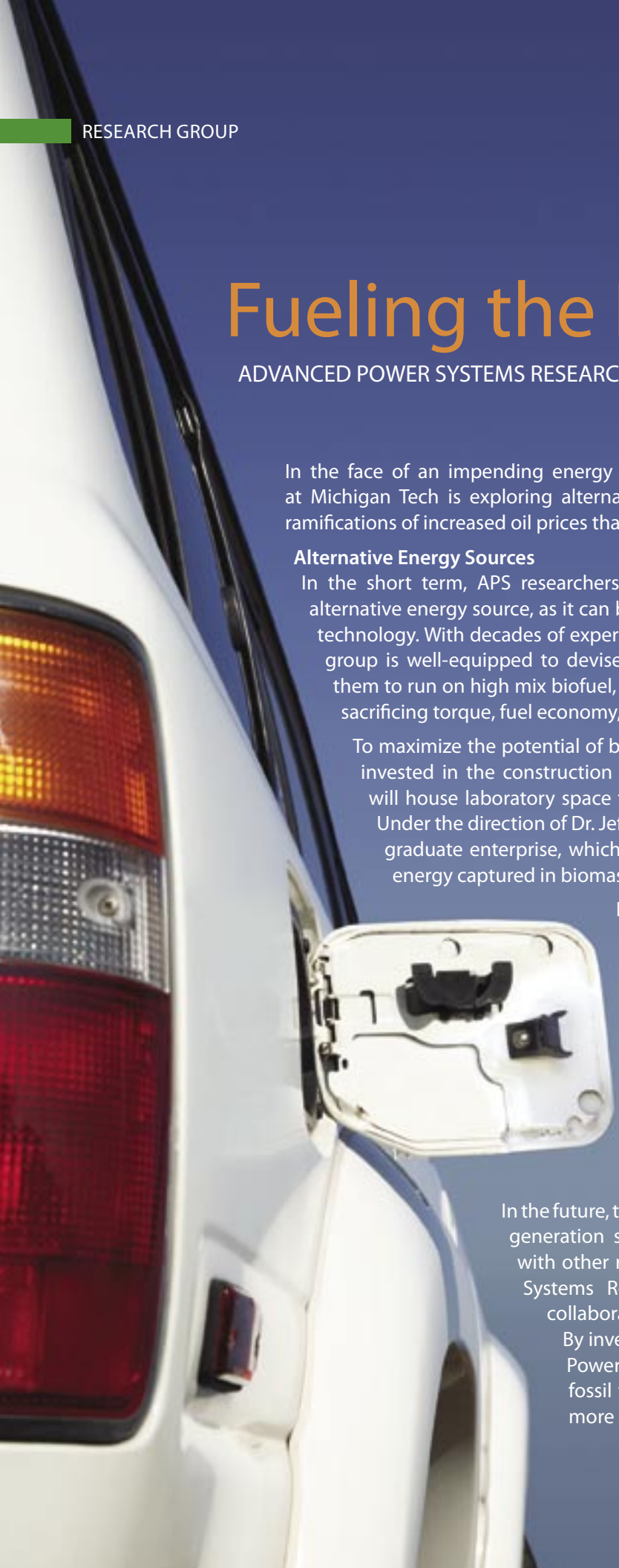
In coming years, he says, the interface with technology will become increasingly important, as will the globalization of the research process. To make ME-EM research activities and findings more accessible to the public and other researchers worldwide, the department has restructured its research website. The new website can be accessed at http://www.me.mtu.edu/research.

Research Expenditures (in millions)



Fueling the Future

ADVANCED POWER SYSTEMS RESEARCH GROUP



In the face of an impending energy crisis, the Advanced Power Systems (APS) research group at Michigan Tech is exploring alternative energy sources that will help mitigate the economic ramifications of increased oil prices that are expected in coming years.

Alternative Energy Sources

In the short term, APS researchers have targeted biofuel as the most immediately feasible alternative energy source, as it can be used in concert with existing internal combustion engine technology. With decades of expertise and numerous innovative engine research labs, the APS group is well-equipped to devise the necessary modifications to IC engines that will allow them to run on high mix biofuel, which will improve efficiency and reduce emissions without sacrificing torque, fuel economy, or smooth vehicle operation.

To maximize the potential of biofuel use in transportation applications, the APS group has invested in the construction of the Alternative Energy Research Building (AERB), which will house laboratory space for research into fuel injection, combustion, and emissions. Under the direction of Dr. Jeff Naber, the AERB is a part of Michigan Tech's *Wood to Wheels* graduate enterprise, which seeks to increase the overall efficiency of converting solar energy captured in biomass resources.

Energy System Optimization

To ensure efficient use of future fuel supplies, the APS group is working to optimize each stage of fuel use. APS thermal-fluid experts are working to characterize two-phase flows in heat exchangers, enhance flows in fuel cells, and develop methods and technologies that will allow the utilization of gasified natural material in power generation systems. APS researchers are also investigating ways to optimize the flow of air across wind turbines in order to increase productivity.

In the future, the group plans to expand its current research into solar power generation systems, energy storage, and distribution, in collaboration with other research centers at the university. In their Advanced Power Systems Research Energy Center, APS will promote campus-wide collaborative inquiry into sustainable, efficient power systems. By investigating current and emerging technologies, the Advanced Power Systems research group is bridging the gap between today's fossil fuel economy and a multi-source economy that promises a more stable and sustainable future.

WITH OIL PRICES APPROACHING THE SYMBOLIC THRESHOLD OF $100 A BARREL, THE WORLD IS HEADED TOWARD ITS THIRD ENERGY SHOCK IN A GENERATION.
— NEW YORK TIMES

JEFFERY NABER, PhD

Dr. Naber's research interests are in internal combustion engines, after-treatment, and the development and application of advanced experimental techniques, signal processing technologies, theoretical models, and embedded control to characterize the thermo-physical processes. Current areas of research include biofuels, including ethanol, with production from sources including forest products and application in advanced combustion engines.

NANOSCALE SCIENCE, ENGINEERING, AND TECHNOLOGY ARE ENABLING PROMISING NEW MATERIALS AND APPLICATIONS ACROSS MANY FIELDS INCLUDING HEALTHCARE, ELECTRONICS, AERONAUTICS, AND ENERGY. REALIZING THESE POSSIBILITIES REQUIRES CONTINUED RESEARCH AND ACCELERATED INNOVATION.

— NATIONAL NANOTECHNOLOGY INITIATIVE

Beauty on a Grand Scale

MECHANICS OF MULTISCALE MATERIALS RESEARCH GROUP

The Mechanics of Multiscale Materials (MMM) research group uncovers the relationships of structures across the full range of engineering scales, from the molecular to the macro. In addition to established practices of nano-scale modeling and large-scale structural mechanics, the MMM group is bridging the gap between these scales by developing accurate constitutive modeling and characterization at each intermediate level.

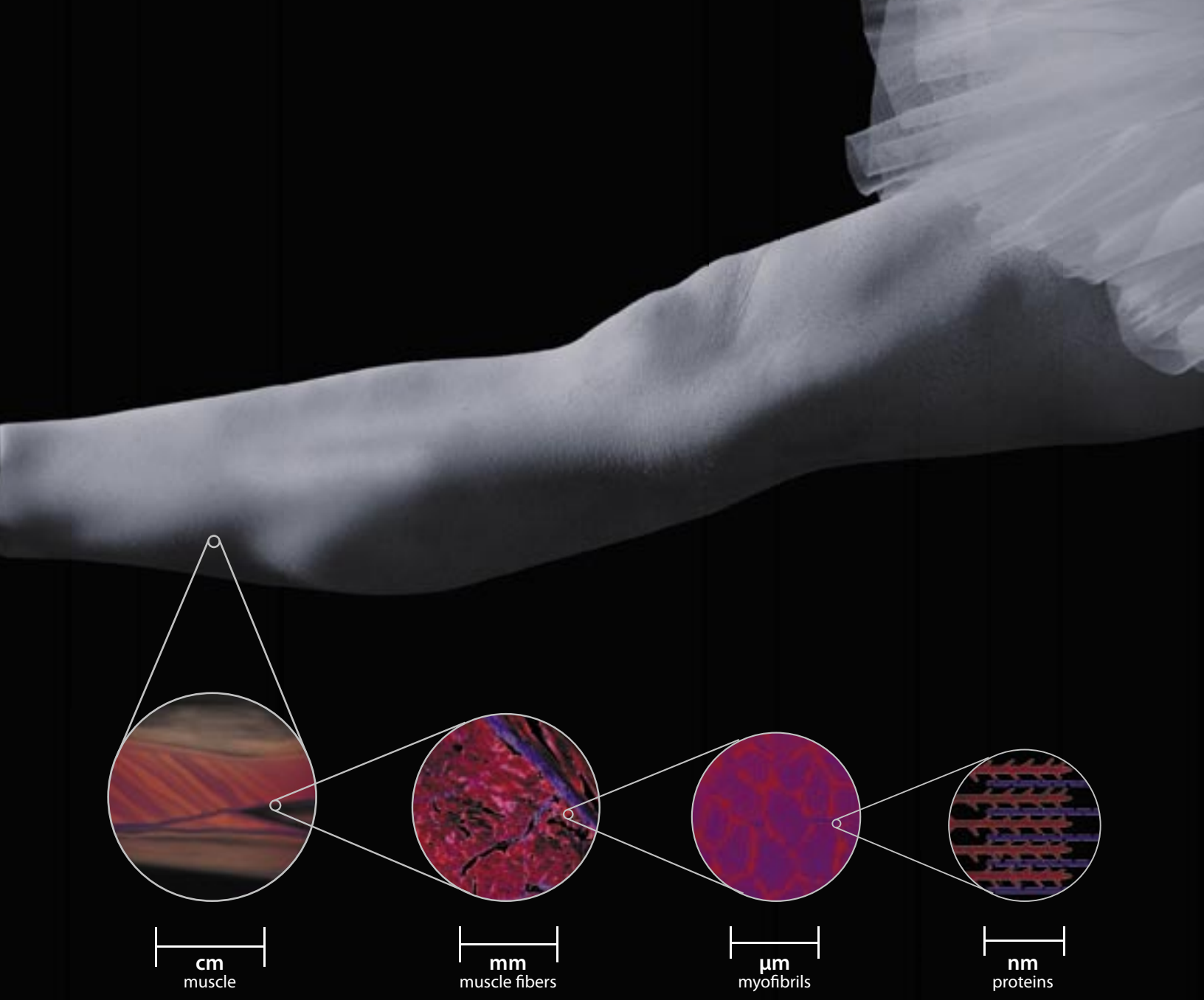
Mid-level Mechanics

The MMM group identifies the critical parameters that lead to success or failure of material for a particular application. For example, to better understand how the material properties of polymer-based structural composites affect airfoil performance, MMM researchers are using advanced modeling and experimental methods to pattern the relevant material mechanics operating at each scale. Others are working to model structural foam designs for aerospace and automotive products, with the goal of improving thermal insulation, impact absorption, and moment of inertia. Uncovering how the nano- and micro-level mechanics play into the millimeter- and meter-level structures enables advanced composite materials to be optimized for structural performance.

Developing New Methods

Through advanced multiscale modeling, simulation, and experimentation, the MMM group is developing methods that will inform emerging technologies including nano-, micro-, and biomedical engineering and science. They are simulating muscle tissue by modeling structures from individual proteins at the molecular level to individual muscle fibers. To understand how osteoporosis weakens bone, MMM researchers are examining the correlation of porosity at the nano-level with reduced shear strength on 1cm tissue samples from moose tibias.

With 12 labs and ongoing projects sponsored by NASA, the National Institutes of Health (NIH), and Mayo Clinic, the Mechanics of Multiscale Materials research group is well-positioned to advance the state-of-the-art in this rapidly emerging field. The MMM group characterizes the functions of intermediate scales between the nano and the macro, novel materials and composites can be created and optimized. MMM researchers are working on novel experiments, MEMS/NEMS, atomistic and continuum modeling, multifunction materials and devices, microfluidics, tissue engineering, nanostructured materials, material characterization, biological transport, cell mechanics, and physics-based modeling.



SPANDAN MAITI, PhD

Dr. Maiti's research objective is to provide quantitative descriptions of the relationships between the measurable features of the micro- and nano-structures of materials and their macroscopic mechanical behavior. His research interests include predictive modeling and large scale simulation of deformation and failure of advanced materials, multiscale modeling to investigate the effect of microstructure on the macroscopic behavior of materials, and the design and analysis of biologically-inspired materials.

The Sound of Silence

MULTIDISCIPLINARY ENGINEERED DYNAMIC SYSTEMS RESEARCH GROUP

A key aspect of successful product design is to understand and influence consumer perception. Yet perception is a whole-body experience: having produced visually appealing products, many engineering teams are stumped by the challenge of controlling the sound and feel of their systems.

Noise and Vibration Solutions

When faced with complaints about noise or unpleasant vibration, many global manufacturers turn to the Multidisciplinary Engineered Dynamic Systems (MEDS) research group to investigate and improve their systems' behavior. With industry customers like Caterpillar, GM, and Whirlpool, MEDS employs experimental and simulation-based methods to turn a grating whine into a gentle hum that exists below the realm of human perception. In the world of noise, vibration, and harshness, success means going unnoticed.

Often, systems have more severe issues with vibration and motion control than noise. The MEDS team has solved major challenges of controlling cranes, optimizing robots, and managing vibrations that deform surfaces and lead to failure by fatigue. As sensors and microprocessors become increasingly sensitive and powerful, MEDS has developed feedback controls to produce smart structures that respond to harmonic disturbance and consequently cancel out unwanted motion or vibration. When faced with the challenge of transferring cargo between ships at sea, the Naval Research Lab contracted researchers in the MEDS group to develop a crane control system that could sense the pitch, roll, and yaw of two vessels and cancel their relative motion through a mechanism in the boom crane. A prototype of the system was put to sea in 2006 and is now used on many vessels.

NVH Research

With modern lab facilities that include anechoic and reverberation chambers, the MEDS team is well-equipped to undertake studies of components and systems in full-scale operation. Current projects include noise pollution control of running automobiles in the Advanced Technology Development Center's Chassis Dyno lab and field studies of excavator cab noise for Volvo Construction Equipment Company. In coming years, the Multidisciplinary Engineered Dynamic Systems team plans to expand its expertise by hiring additional faculty and establishing an industry consortium to bring together the organizations that will shape the future of dynamic systems research.

MOHAN D. RAO, PhD

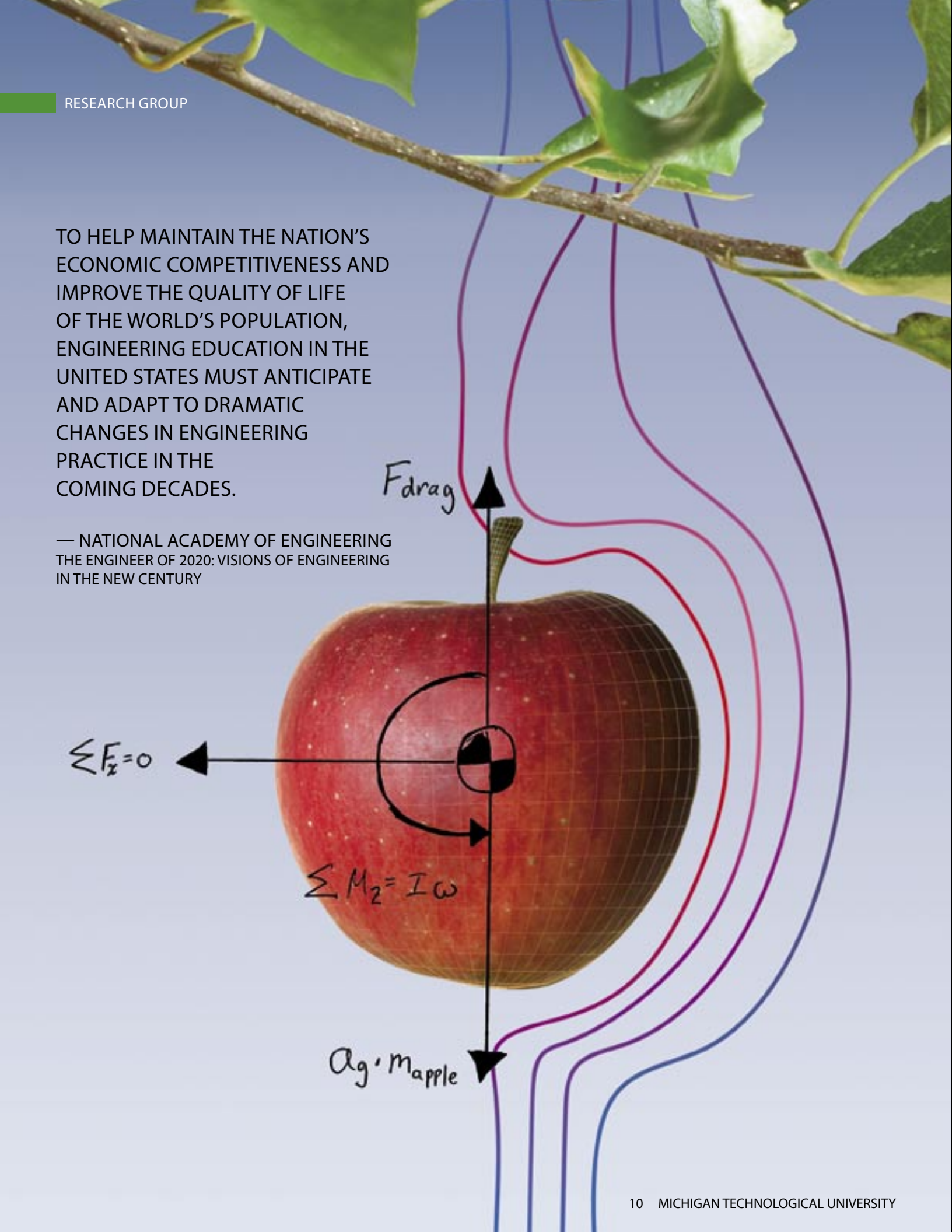
Dr. Rao, the director of the Multidisciplinary Engineered Dynamic Systems research group, is a Fellow of the ASME and SAE, an associate editor of the *International Journal of Vehicle Noise and Vibration*, and works as a consultant for industry partners worldwide. His research interests include damping, acoustics, vibration and noise control with particular applications to automotive, aerospace, construction equipment, and snowmobile and appliance industries.

NETWORKS OF SMALL, PERMANENTLY MOUNTED SENSORS COULD SOON CHECK CONTINUOUSLY FOR THE FORMATION OF STRUCTURAL DEFECTS IN I-BEAMS AND OTHER CRITICAL STRUCTURAL SUPPORTS OF BRIDGES AND HIGHWAY OVERPASSES, GIVING STRUCTURAL ENGINEERS A BETTER CHANCE OF HEADING OFF CATASTROPHIC FAILURES.

— Science*Daily*

TO HELP MAINTAIN THE NATION'S ECONOMIC COMPETITIVENESS AND IMPROVE THE QUALITY OF LIFE OF THE WORLD'S POPULATION, ENGINEERING EDUCATION IN THE UNITED STATES MUST ANTICIPATE AND ADAPT TO DRAMATIC CHANGES IN ENGINEERING PRACTICE IN THE COMING DECADES.

— NATIONAL ACADEMY OF ENGINEERING
THE ENGINEER OF 2020: VISIONS OF ENGINEERING IN THE NEW CENTURY



WILLIAM J. ENDRES, PhD

Dr. Endres' expertise is in manufacturing and design, and his research interests include machining dynamics, cutting mechanics, and mechanistic process modeling techniques. Most recently, Dr. Endres has engaged in efforts to commercialize research knowledge in his field through his spin-off R&D company, Endres Machining Innovations, LLC, located in the Michigan Tech SmartZone. This entrepreneurial effort has allowed Dr. Endres to bring to the classroom and Capstone Design practical examples of working with technology end-users, joint development partners, prospective investors, IP attorneys, vendors, and the real challenges of getting a functioning product into production and to the marketplace.

From Observation to Simulation

ENGINEERING EDUCATION INNOVATION RESEARCH GROUP

As global and technological factors increase the complexity of the engineering discipline, the Engineering Education Innovation (EEI) research group seeks to understand and improve the total educational experience in order to prepare engineering students for the demands of a changing workplace.

Improving Engineering Education

The EEI group seeks to analyze student motivation and gain insight into their emotional states as a means to assess the effectiveness of current educational practices. In the process, the group is required to shift methodology from familiar, numerical experiments to more nuanced measurements often employed by social scientists.

"We are seeking to understand how engineering concepts are acquired through the myriad experiences of student engineers," states Dr. Michele Miller, director of the EEI group. "The worldwide marketplace is dynamic and the demands on our graduates will require both social and cognitive agility."

With their findings, the group will develop curriculum improvements designed to increase students' global competency and lifelong learning skills to better prepare graduates for academic and professional work.

Restructuring the Curriculum

As they work to improve current educational practices, the EEI group will provide innovative recommendations to restructure the engineering curriculum. For example, the group is considering the feasibility of a radical departure from the established "tools-first, challenge later" approach. A modified program would prepare students for changing tools and problems by teaching three explicit processes crucial to the agile engineer: to identify problems worth solving; figure out what tools are needed to solve the problem; and finally, to figure out the best way to learn the tools they don't yet know.

By challenging first and second year students with advanced engineering problems, the group will seek to engender a practical understanding of fundamentals earlier in the educational experience. "When a student learns to use tools that apply directly to a project, they gain a comprehensive appreciation for the engineering process," says Miller, "Emphasizing real problems will then serve as a motivating factor throughout their undergraduate and graduate studies."

Preparing Future Engineers

The EEI group also addresses the challenges facing future generations. In anticipation of the social and technological demands on a globally-competent engineer working in the year 2020, the group is planning outreach to students at the primary and secondary school levels. They will present engineering as a highly relevant field that will appeal to students outside of the traditional demographics through projects like 'field engineering' kits and partnerships with undergraduate design teams. Says Dr. Miller, "We are researching concrete actions that can be taken now to encourage students and improve engineering education to ensure a capable, enthusiastic generation of future engineers."

NANOTECHNOLOGY IS AT AN EXPLORATORY STAGE. LONG-TERM, FUNDAMENTAL RESEARCH IS NEEDED TO DISCOVER NEW PHENOMENA, UNDERSTAND THE BASIC BUILDING BLOCKS, DEVELOP PROCESSES AND TOOLS AT THE NANOSCALE, CREATE INNOVATIVE TECHNOLOGIES, AND EDUCATE AND TRAIN A NEW WORKFORCE.

— NATIONAL SCIENCE FOUNDATION

A Sense of Possibilities

MULTISCALE SENSORS & SYSTEMS RESEARCH GROUP

The Multiscale Sensors and Systems (MSS) research group specializes in the design, fabrication, integration, and testing of physically and functionally compatible devices and components that differ in size by thousands or millions of times. With decades of multi-scale research and expertise, the MSS group is poised to dramatically change the face of technology across the full range of engineering and science applications.

Deployable Systems

The MSS group develops sensors that allow real-time monitoring and control to ensure system stability for applications that require feedback at each process stage, from the molecular scale detection of phenomena to wide area measurement. Currently, a major area of research for the MSS members is the development of distributed sensing for sustainable fuel production and utilization. To increase the efficiency and optimization of energy conversion from biomass, the group is developing sensors that will support the operation of biofuel production plants and ethanol engines. The goal is to detect and report feedback at every stage of energy use, from the nano-scale reactions at the moment of combustion to the reactions as exhaust leaves an automobile.

As part of the Multi-Scale Technologies Institute (MuSTI) at Michigan Tech, the MSS group encourages interdisciplinary research and implementation of nanotechnologies and microtechnologies into deployable systems. With continuing projects funded by sources including the Department of Energy (DOE), the Department of Defense (DOD), and NASA, group researchers collaborate with cross-departmental colleagues on projects that include biosensing technologies, microfluidics for fuel cells, and micro-scale metal-forming.

Bio-Mechanical Systems

The future of multiscale sensors and systems research, says MSS group Director Dr. Craig Friedrich, lies in the use of biological materials and processes that are able to function in non-biological systems.

With funding from the DOD, the group is exploring the possibility of lightweight body armor constructed with bio-mimetic nano-scale materials and structures that are able to work at the human scale. When completed, the flexible armor will protect soldiers from shrapnel and improve battlefield mobility. Also with the support of the DOD, MSS group researchers are working on a bio-toxin sensing system that integrates molecular-scale sensing with conventional microelectronics (see page 20 for more information).

GREG ODEGARD, PhD

In addition to his work with the Multiscale Sensors and Systems research group, Dr. Odegard serves as the interim director for the Mechanics of Multiscale Materials research group and is the Director of the Computational Mechanics & Materials Research Laboratory (CMMRL). His research interests include multiscale computational and experimental mechanics, computational chemistry, materials science, and biomechanics.

ABOUT THE IMAGE:

Pictured is a satellite micro thruster with self-regenerating nanotips that was a collaborative effort between the Multiscale Sensors and Systems research group and the Space Systems research group. It was designed and assembled by Jason Makela, a PhD student in the Ion Space Propulsion Lab, with micro-machining support from the MSS group.

IN THE AIR AND SPACE AGE, PROPULSION RESEARCH AND DEVELOPMENT CAPABILITIES WILL CONTINUE TO BE OF EVEN GREATER AND MORE URGENT IMPORTANCE.

— AIR & SPACE POWER JOURNAL

OSSAMA ABDELKHALIK, PhD

Dr. Abdelkhalik's research interests are in astrodynamics. He has conducted research in optimal orbit design for remote sensing missions, spacecraft formation flying control, optimal orbit transfer using genetic algorithms, and space surveillance. Current areas of research include spacecraft attitude estimation from optical imagery and spacecraft formation navigation using star trackers.

The Final Frontier

SPACE SYSTEMS RESEARCH GROUP

When NASA launches a spacecraft, it employs high power, low efficiency chemical propulsion systems to achieve Earth orbit. Each launch requires massive amounts of fuel, and as a result, the payload must be small—generally 1% of total liftoff mass. Included in that precious 1% payload is fuel for low thrust maneuvering after reaching space, making thrust efficiency a crucial factor in trade studies of mission planning. The Space Systems research group at Michigan Tech is researching high efficiency thrust technologies that will make space travel more feasible, efficient, and economical as the U.S. space program moves into the next generation of stellar exploration.

Electric Propulsion Systems

To reduce fuel costs and improve the efficiency of space travel, the Space Systems group is creating innovative electric propulsion systems. These systems have a higher potential exhaust velocity than their chemical counterparts and require less fuel to reach orbit. In their Ion Space Propulsion Laboratory, the group designed and built the first bismuth-fueled Hall-Effect thruster demonstrated outside of the Soviet Union, and are working toward a full bismuth system. The cheaper, lighter propellant used by these systems will allow government and private spacecraft to carry additional payload and, potentially, provide the necessary power to explore deeper regions of space.

While they research future applications of non-chemical propulsion, the Space Systems group addresses the immediate challenge of integrating plasma propulsion systems into existing satellite technology. As they come face-to-face with the practicalities of such integration, the group is developing methods and devices to improve real-time performance. With funding from the United States Air Force and micromachining assistance from the Multiscale Sensors and Systems group (see page 12), the Space Systems group is building micro-thrusters using electron emitter arrays with self-regenerating nanotips, solving the problem of nanotip degradation and allowing an extended system lifetime. Researchers are also creating methods to identify and mitigate common issues associated with electric propulsion, with projects that investigate refractory powder metallurgy, thruster thermal modeling, magnetic field topology, electron trapping, and sputter erosion. These thrusters may also see operation on the Oculus (see images on back cover), a student-built nano-satellite designed with a high power camera for inspection of debris or other spacecraft. The goal is to launch the Oculus in 2011 after winning the NASA/AFRL University Nano-sat 5 competition in January 2009.

Collaborative Research

With plans to hire six additional faculty over the next five years, the Space Systems group will expand their research expertise and build a foundation of experimentalists in attitude control technology, robotics, chemical propulsion, power systems, lightweight structures, and astrodynamics. To create inter-university collaboration, researchers from the University of Michigan and the Space Systems group are working to form an Industry/University Collaborative Research Center (IUCRC), which will tackle space power and propulsion projects by combining the forces of cross-departmental faculty at both universities with a consortium of industry sponsors. Through the efforts of the IUCRC and other research projects, the Space Systems group is poised to shape the future of space exploration.

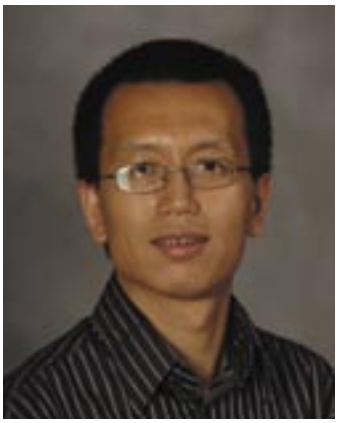
New Faculty

Dr. Ossama Abdelkhalik
PhD: Texas A&M
Experience: One year of post doctoral experience at Texas A&M and was a visiting assistant professor in the College of Engineering, Embry-Riddle Aeronautical University, Daytona Beach, for a year.
Research Areas: Space mechanics and spacecraft dynamics

Dr. Olanrewju Aluko
PhD: Howard University
Experience: Ten years as a lecturer at the University of Ado-Ekiti, Nigeria.
Research Areas: Engineering mechanics, stress analysis, composite materials and materials science

Dr. Bo Chen
PhD: University of California – Davis
Experience: At the University of California – Davis, she was an associate director and post doc fellow for two years, associate professor in the Electrical Engineering department at Zhejiang Sci-Tech University, China, for two years.
Research Areas: Mechatronics and embedded systems, agent technology, distributed control systems, and intelligent transportation systems

Dr. VC Rao Komaravolu
PhD: Indian Institute of Technology
Experience: Thirty-four years experience as a lecturer and visiting professor and for the past several years as a technical consultant for VGS-PLM Solutions for all of India.
Research Areas: Thermodynamics, Heat Transfer, Power Plant Engineering



Dr. Dennis Meng
PhD: University of California – Los Angeles
Experience: Two years at UCLA as a post doc and a lecturer.
Research Areas: MEMS micro and nano technologies for energy and environmental applications, microfluidics, micro fuel cells, microelectromechanical systems (MEMS), and micro and nano fabrication

Dr. Fernando Ponta
PhD: University of Buenos Aires
Experience: Three years at University of Illinois at Urbana as a post doc, one year as an interim assistant professor at the University of Buenos Aires, and two years as a visiting assistant professor at U of I.
Research Areas: Theoretical and computational fluid mechanics, vortex dynamics, fluid-structure interaction, wind-turbine aerodynamics, renewable-energy sources, and energy systems

Dr. Reza Shahbazian-Yassar
PhD: Washington State University
Experience: Two years at Mississippi State University as a post doc.
Research Areas: Microstructure-mechanical property relationships in bio- and nano-materials, in-situ electron microscopy, crystal plasticity modeling, and artificial neural network modeling

Faculty & Staff Awards

Our commitment to excellence is reflected through this year's faculty and staff awards, recognitions, and promotions. The Mechanical Engineering-Engineering Mechanics Department honors the following faculty and staff for their achievements and success.

Dr. Jeffrey Allen
Professor of the Month, Sigma Phi Epsilon Fraternity, 2006

Dr. Jeffrey Allen
Invited to speak at the inaugural workshop on Water Management of Fuel-Cells for the Fuel-cell Water Management Global Research Center (FWGRC) at the Pohang University of Science and Technology (POSTECH) in Pohang, Korea, 2007

Dr. Carl Anderson
Appointed Associate Dean of Engineering for Graduate Education and Research in the College of Engineering, 2007

Dr. Jason R. Blough and Dr. Gordon G. Parker
Highlighted in the article "Teaching the Teachers", Michigan Tech Magazine, Winter 2007-08

Dr. Jason R. Blough
Scientist of the Year Award for his successful efforts to promote and protect responsible recreational use of public lands, BlueRibbon Coalition Inc, 2006

Connie Dillman
Upgraded to Research and Accounting Coordinator, 2006

Gerald Dion
Upgraded from Laboratory Supervisor to Manager of Laboratory Facilities, 2006

Gerald Dion
Honored by the University for 35 years of service, 2007

Dr. Craig Friedrich
Appointed Associate Chair and Director of Graduate Studies, 2007

Dr. John Gershenson
Promoted to Professor, 2007

Kathleen Goulette
Upgraded to Administrative Associate, 2006

Dr. Mahesh Gupta
Promoted to Professor with tenure, 2007

Dr. Mahesh Gupta
Board of Directors of the Extrusion Division, Society of Plastics Engineers, 2006

Dr. Tammy Haut Donahue
On sabbatical leave at the Centre for Bioengineering at Trinity College in Dublin, Ireland, 2007

Danise Jarvey
Upgraded to Senior Engineering Academic Advisor, 2006

Dr. John H. Johnson
Chair, Review of the 21st Century Truck Partnership Committee, National Research Council, 2007

Dr. John H. Johnson
Member, Committee on Fuel Economy of Light Duty Vehicles, National Research Council, 2007

Dr. John H. Johnson
Fellow, American Society of Mechanical Engineers, 2007

Dr. L. Brad King and Dr. Gordon G. Parker
Developed a tractor beam that could hold a small group of spacecraft in formation, 2007

Dr. L. Brad King
Highlighted, Great Lakes IT Report article, "Michigan Tech's Terrific" on his research with ion drives, 2007

Michael LaCourt
Upgraded to Research Engineer/Scientist II, 2007

Michael LaCourt
Honored by the University for 30 years of service, 2007

Dr. Spandan Maiti
Co-author of the paper "Continuum and Molecular-Level Modeling of Fatigue Crack Retardation in Self-Healing Polymers" which was selected as the best fatigue and fracture paper, Journal of Engineering Material and Technology for the period July 2006 through June 2007

Dr. Spandan Maiti and Dr. Ghatu Subhash
Co-authors of the paper "Static and Dynamic Indentation Response of Fine Grained Boron Carbide" that received the Best Paper Award - Second Prize of the Engineering Ceramics Division, American Ceramic Society, 2007

Marlene Lappeus
Promoted to Administrative Assistant, 2006

Dr. James A. Mattson
Upgraded to Senior Engineering Academic Advisor, 2006

Dr. Donna J. Michalek
Appointed Assistant Provost, 2007

Dr. Abhijit Mukherjee
Co-author of the poster "Study of water removal mechanism of aphids for application in low temperature fuel cells that was awarded third place, Fuel Cell Science, Engineering & Technology Conference, 2007

Dr. Jeffrey D. Naber
SAE Ralph R. Teetor Educational Award, Society of Automotive Engineers, 2008

Dr. Jeffrey D. Naber
Interviewed by Wisconsin Public Radio on maximizing your car's gas mileage, 2006

Dr. Jeffrey D. Naber
Member of the Renewable Fuels Working Group, State of Michigan, 2007

Dr. Amitabh Narain
Fellow of American Society of Mechanical Engineers, 2007

Dr. Gordon G. Parker
Associate Editor, Journal of the Franklin Institute, 2007

Dr. Gordon G. Parker
Appointed the first recipient of the John and Cathi Drake Endowed Professorship, 2007

Dr. Mohan D. Rao
Promoted to Professor with tenure, 2007

Dr. Mohan D. Rao
Fellow of American Society of Mechanical Engineers, 2007

Dr. William R. Shapton
Honored for his outstanding contributions to the field of modal analysis to both the IMAC conferences and the community, IMAC-XX Conference and Exposition on Structural Dynamics, 2006

Dr. William R. Shapton
Excellence in Engineering Education Award, Society of Automotive Engineers, 2008

Dr. John W. Sutherland
Fellow of American Society of Mechanical Engineers, 2006

Dr. John W. Sutherland
Member, Research Committee on Sustainable Products and Processes, American Society of Mechanical Engineers, 2006

Dr. Madhukar Vable
Best Paper Presentation Award for "Improving Mechanics Courses" American Society for Engineering Education, 2007

Prof. Charles Van Karsen
Appointed Associate Chair and Director of Undergraduate Studies, 2007

New ME-EM Staff

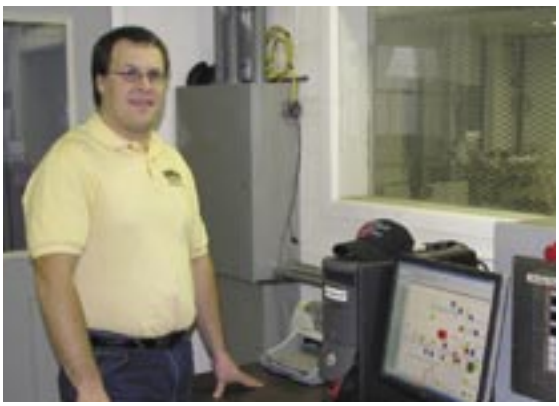
The ME-EM Department staff forms the functional base of the department's education, research, and service activities. Working in three groups—administrative, technical, and computer—they support students, faculty, and alumni. Their contributions have a direct impact on the success of the ME-EM Department and the continued improvement of education at Michigan Tech.

Nancy Barr

Nancy Barr joined the ME-EM staff in March 2007 as an Office Assistant with the Capstone Design Program and the Director of Undergraduate Studies. She is the author of two mystery novels and a graduate of Lake Superior State University with a bachelor's degree in Business Administration. Pictured with Nancy is Senior Design student Danielle Schneider.

Javier Fernandez

Javier Fernandez has been promoted to Director of the West Engineering Computer Network, which he joined in 2003 as a System Administrator. He holds a BS in Computer Science and an MBA from Michigan Tech, and is an avid motorcyclist, programmer, and reader, as well as an amateur of finance and economics.



Jeremy Worm

Jeremy Worm joined the ME-EM staff in May 2007 as a Research Engineer supporting the Advanced Power Systems Research Center. Prior to joining Michigan Tech, Jeremy was an engineer at General Motors where he worked on SI engine development with focus on combustion, variable valve timing, and calibration. Jeremy is a graduate of Michigan Tech with a bachelor's degree in Mechanical Engineering.

Graduate Seminar Series

A committee of Michigan Tech faculty members puts together the dynamic ME-EM Graduate Seminar Series every year. Dr. Roshan D'Souza is the Chair of the committee, which creates an agenda of compelling topics for both students and faculty. The seminars offer graduate students opportunities to expand their knowledge base to areas of study outside of their specific research. Composed of a diverse mix of renowned leaders representing academia, industry, and government; the 2007-2008 Academic Year Seminar Series featured the following leaders:

EXTERNAL SPEAKERS

Prof. Ioannis Chasiotis
University of Illinois
Mechanical Behavior of Polymeric Nanofibers Subject to Cold Drawing

Dr. Bo Chen
University of California-Davis
Mobile Agent Based Adaptive and Collaborative Mechatronic and Embedded Systems

Dr. Constantin Ciocanel
University of Toledo
Magnetorheological (MR) Fluids – Constitutive Modeling and Applications

Dr. Karen Crosby
Southern University, Baton Rouge, LA
Tiered Mentoring in a Cross-disciplinary and Multi-institutional Research Project

Dr. Marten P. de Boer
Sandia National Lab
Mechanics of Micromachines

Dr. William Desmet
Katholieke University – Belgium
Automotive NVH refinement - an overview of some recent experimental and numerical research activities at the K.U.Leuven - Noise and Vibration Research Group

Dr. H. Thomas Hahn
University of California – Los Angeles
Multifunctional Polymer-Matrix Nanocomposites

Jeff Hamilton
Vice President & Chief Technical Officer for GM Exhaust, Filtration Business for Cummins Inc.
Technology Development for Energy Efficiency and Low Emissions

Dr. Caroline Hayes
University of Minnesota
Challenges Faced by Globally Distributed Engineering Design Teams

Dr. Michael A. Hickner
Sandia National Lab (MTU Alum)
Neutron Imaging of Liquid Water Transport in Proton Exchange Membrane Fuel Cells: Heat Transfer and Fluid Dynamics

EXTERNAL SPEAKERS CONT.

John Huhn/Steve Stahlhut
Motion Engineering Company Inc.
High Speed Imaging & Advanced Image Processing

Prof. Satish Kandlikar
Rochester Institute of Technology
Challenges in Fuel Cell Development from Heat Transfer & Fluid Flow Consideration

Dr. Hailin Li
National Research Council, Canada
An Investigation on the Combustion and Emission Characteristics of HCCI Engine Operation Using n-Heptane

Dr. Dennis Desheng Meng
University of California-Los Angeles
An Embedded Microfluidic Self-Pumping Structure for Micro Direct Methanol Fuel Cells

Prof. Tim Osswald
University of Wisconsin
Modeling & Simulation of Polymer Processes Using Radial Functions Method

Prof. R, Byron Pipes
Purdue University
Carbon Nanotube fibers and Yarns

Dr. K.T. Ramesh
Johns Hopkins University
The Processes of Massive Dynamic Failure

Dr. Reza Shahbazian-Yassar
Mississippi State University
Structural Evolution in Materials with Hardening Inclusions

Prof. Anthony Waas
University of Michigan
Microstructural Instabilities in Braided Textile Composites: Experiments and Analyses

Dr. Xiangfa Wu
University of Nebraska-Lincoln NE
Delamination of Nanofiber-Reinforced Advanced Polymer Composites and Nanomechanics of Nanofiber Network

Prof. Hussein M. Zbib
University of Washington
Recent Advances in Multi-scale Modeling of Materials Behavior

MICHIGAN TECH SPEAKERS

Prof. Qingli Dai
ME-EM
Micromechanical FE Modeling Approaches for Constitutive and Damage Behavior of Heterogeneous Cemented Particulate Composites

Prof. Craig Friedrich
ME-EM, *Multi-Scale Technologies Institute*
Mechanical Micromachining Techniques and Applications

Prof. Abhijit Mukherjee
ME-EM
Numerical Study of Growth Vapor Bubbles during Flow Boiling

Prof. Amitabh Narain
ME-EM
Experimental/Computational Investigations of Internal Condensing Flows – Effects of Specified and Unspecified Exit Conditions

Prof. Ranjit Pati
Physics Department
Spin Modulated Molecular Electronics: Opportunities and Challenges

Dr. Stanislaw Szwaja
Visiting Professor from Poland
Cogeneration of Heat and Power in the Biogas Fueled Internal Combustion Engine

Engineering Across Boundaries

As countries worldwide become increasingly interconnected, engineering is going global.
— Mark Griep

For PhD student Mark Griep, the multidisciplinary nature of his doctoral research is indicative of engineering's future. "Like most cutting-edge research, nanotechnology research occurs at the intersection of many engineering disciplines. In addition to mechanical engineering, I've had opportunities to work with chemical, electrical, and biomedical engineering techniques."

Griep, a recipient of the prestigious National Science Foundation (NSF) Graduate Research Fellowship, is part of a team that is researching and fabricating a protein-based nanosensor that will be used to detect minute concentrations of airborne toxic agents. The project, which is funded by the U.S. Department of Defense, was conceived as an alternative to the bulky detection systems currently used by U.S. military forces.

"The end goal is to create a sensor that will occupy an area roughly the size of a computer chip, allowing it to be integrated into soldiers' clothing or placed in a pen-sized device that can be launched into potentially hazardous areas to determine toxin concentrations," says Griep.

The sensor is a bio-electrical device that utilizes the unique properties of the optical protein bacteriorhodopsin and functionalized semiconductor quantum dots to convert optical energy into an electric signal. "We're creating a functional prototype to detect a specific substance," says Griep, "but the technology is designed for easy modification to detect a full range of toxins with a single lightweight, manageable piece of equipment." In addition to applications in smart munitions and enhanced soldier security, the sensor will have civilian functions in airports, hospitals, and other public spaces.

Griep will spend a semester working on the sensor construction at the US Army Research Laboratory in Aberdeen and also at the Edgewood Chemical and Biological Center near Baltimore. After his projected PhD completion in 2008, Griep plans to continue his research with a post-doctoral position in Asia.

"Global, social, and technical competencies are paramount to success in a rapidly changing engineering environment," he says. "As countries worldwide become increasingly interconnected, engineering is going global."

Engineering Outreach

I want to stand before inner-city students as proof that they do not have to be products of their environment. It is possible to rise above.

— Kari Brown

Kari Brown believes that access to education should be universal. As a female minority engineering student, she is passionate about outreach to underprivileged and historically-underrepresented groups in technical fields. "I want to stand before inner-city students as proof that they do not have to be products of their environment," she says. "It is possible to rise above."

A first-generation college student, Brown is pursuing her PhD in Mechanical Engineering, researching sustainable methods of material recovery from vehicles to reduce material consumption and carbon dioxide emissions. She is the recipient of the King-Chavez-Parks Future Faculty Fellowship and has worked throughout her undergraduate and graduate career to promote engineering education to high school students nationwide. Brown is a member of the National Society of Black Engineers, serving since 2001 on regional and national boards and participating in the organization's online mentoring programs. "Our goal is simple but challenging: to increase the number of minority students in the engineering discipline," she says.

Brown earned her BS in Mechanical Engineering from Michigan Tech in 2006 and cites her international senior design project in Copenhagen as a major influence in her decision to return for a PhD. "I was fascinated by the way the learning process changes in an international situation with a multi-national team. I'd like to use that experience to teach students how to learn in a global context." In addition to her coursework and research, Brown is involved in the Sustainable Futures Institute and the university's Concert Choir.

Michigan Tech, she says, has provided an ideal academic environment. "The Mechanical Engineering faculty have been incredibly supportive of my goals, providing invaluable guidance every step of the way. Professors know students by name, and the community is welcoming and diverse. I can't imagine a better place or a better education."

Global Engineering

My experiences at Michigan Tech and my work with Engineers Without Borders have created in me a sense of global citizenship that is critical in an increasingly smaller world.

— Patrick Miller

For senior ME student Patrick Miller, engineering is a way to effect change on a global scale. He says, "I have discovered that engineering is more than lab work and equations; it is a tool that allows me to personally impact the lives of people worldwide."

As a member of the Michigan Tech chapter of Engineers Without Borders (EWB), Miller has witnessed firsthand the impact of engineering work. In 2007, he took part in the group's first complete project, which involved the planning and construction of wells in two Guatemalan border villages. As the project's Engineering Leader, it was Miller's responsibility to coordinate the design of the wells with consideration of the remote location and lack of equipment. After months of research and development, Miller and the team devised a cement ring method that proved successful despite challenges presented by location and conflict between the villages. "Before we installed the wells, the villages used a contaminated, open-pit water source that was the cause of widespread waterborne illness. We found a solution to a seemingly impossible problem, and, through engineering, were able to change lives."

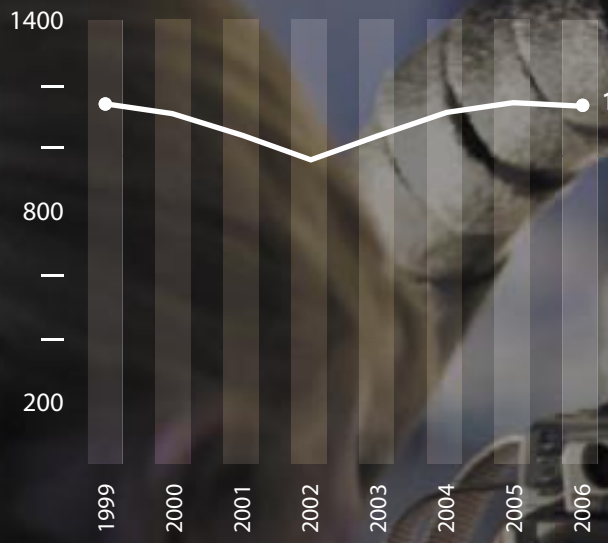
The success of the EWB project gave Miller the confidence to tackle a difficult senior design project, an ambitious endeavor to create an alternative rotary engine sponsored by inventor Alex Van Holstyn. It also provided direction for Miller's future: eventually he plans to start a company that works with non-profits and other groups to determine appropriate engineering technologies to solve basic problems in developing nations. He explains the factors involved, saying, "The human aspect is equally as important as the technical constraints—planning and design must be done using materials available, with a process that is mindful of location, political climate, and a variety of other factors. It is a well-rounded engineering process that holds the greatest potential to improve the quality of life in the farthest corners of the world."

Miller will graduate in 2008. He believes his time at Michigan Tech has prepared him well. "My experiences at Michigan Tech and my work with Engineers Without Borders have created in me a sense of global citizenship that is critical in an increasingly smaller world."

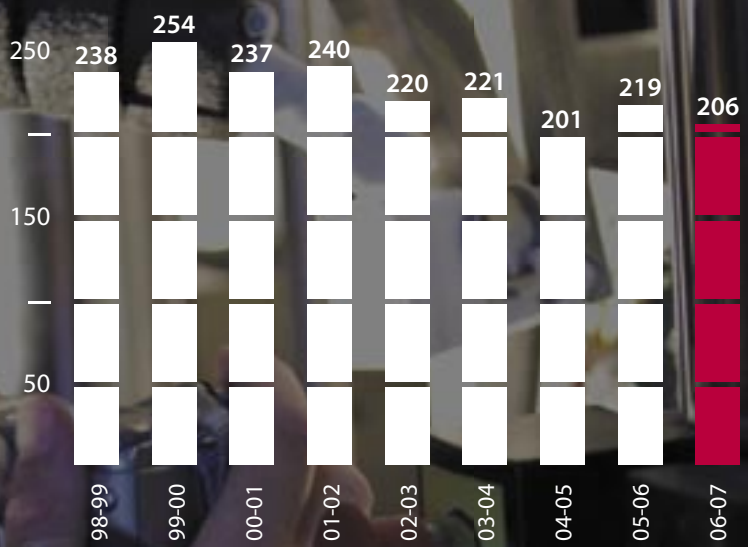
Top: Villagers pump water from completed EWB well. Bottom: Open-pit, contaminated water source previously used by village.

Department Enrollment and Degrees

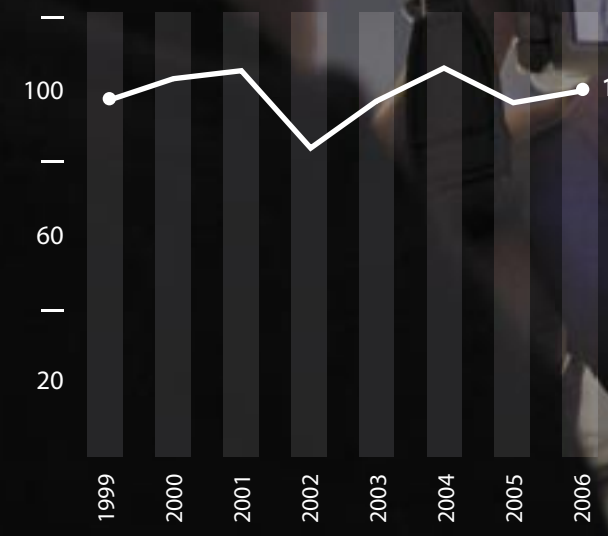
BS Enrollment



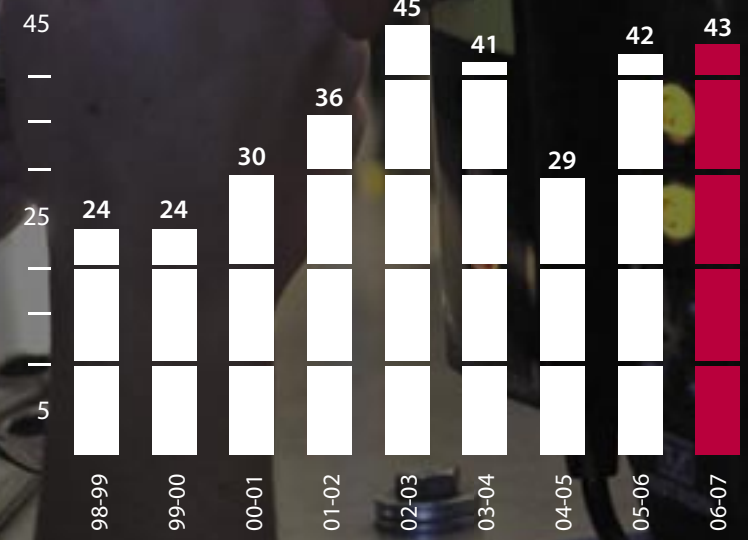
BS Degrees



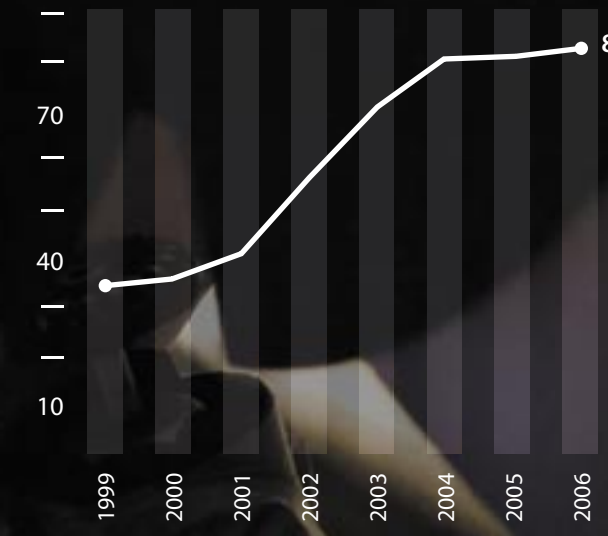
MS Enrollment



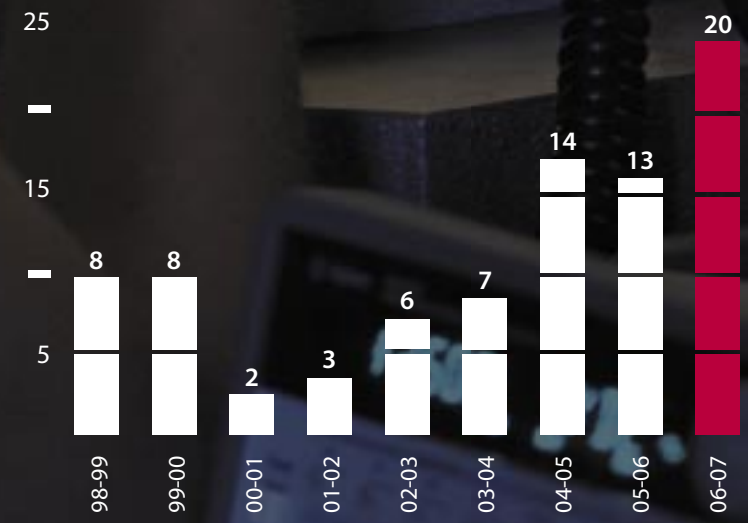
MS Degrees



PhD Enrollment



PhD Degrees



PCA Inductees

Merrily D. Madero, Martha N. Sullivan, and Judy J. Swann are the most recent alumni to be inducted into the Presidential Council of Alumnae (PCA) at Michigan Tech. The PCA recognizes successful Michigan Tech ME women for their educational excellence, past student service, professional accomplishments, and community contributions.

Merrily D. (Dente) Madero

Colonel Merilly Madero is Vice Commander, 17th Training Wing, Goodfellow AFB, Texas. She is the principle assistant to the wing commander and provides support training for over 10,000 fire protection, special instruments, and intelligence experts for the US Air Force, Marine Corps, Navy and Army, as well as government civilian agencies and allied nations. Prior to this she was the Commander, 50th Mission Support Group, 50th Space Wing, Shriever AFB, Colorado, where she managed $625 million in contracts and was also responsible for ensuring that a wide range of services were provided to over 6,200 Shriever AFB personnel.

Colonel Madero graduated in 1985 from Michigan Tech with a Bachelor's Degree in Mechanical Engineering. She also has two master's degrees, one in Personnel Management from Troy State University-Alabama and the other in National Resource Strategy from the Industrial College of the Armed Forces. She has also graduated from Squadron Officer School and Air Command and Staff College at Maxwell AFB, Alabama. She has completed an Anti-Terrorism Force Protection Seminar Level IV and has achieved certification as a Department of Defense Chief Information Officer. She was selected to attend War College at National Defense University.

Colonel Madero entered the US Air Force through the Reserve Officer Training program at Michigan Tech. Her assignments over the last 20 years have been varied. A career highlight was the transitioning of the combined intelligence collection concept from Metro Tango in Germany to stand up the first Deployable Ground Station (DGS-1) at Langley AFB. She also served as a joint task force deputy director of communication for both US and UN force in Haiti for Operation Uphold Democracy. Colonel Madero has been deployed twice – from January 1995 to May 1995, as Deputy J6, JTF-190, operation Uphold Democracy, Port-au-Prince, Haiti, and from January 2006 to June 2006 as Commander, 380th Expeditionary Mission Support Group, operations Enduring Freedom and Iraqi Freedom, Al Dhafra AB, United Arab Emirates.

Colonel Madero has received numerous awards and decorations during the course of her career including a Legion of Merit, Meritorious Service Medal with two oak leaf clusters, Defense Meritorious Service Medal with one oak leaf cluster, Air & Space Campaign Medal, Humanitarian Service Medal, Global War on Terrorism Service Medal, and a Joint Service Commendation Medal. She has also earned a Master Communications Badge and a Parachutists Badge.

Besides participating in ROTC while a student at Michigan Tech, Colonel Madero was a member of Alpha Gamma Delta Sorority, the Skydiving Club and was a captain on the intramural hockey team.

Colonel Madero has one daughter, Leia, and lives in San Angelo, Texas. She is active in her church and as a junior high youth leader.

Martha N. (Newman) Sullivan

Martha Sullivan earned a Bachelor's Degree in Mechanical Engineering from Michigan Tech in 1980 and has since completed studies toward a Master's in Business Administration at the University of Michigan.

FYI THE MICHIGAN TECH AERO DESIGN TEAM TOOK 1ST PLACE AT THE SAE AERO EAST NATIONAL COMPETITION ON MAY 2006 IN FORTH WORTH, TEXAS AND 3RD PLACE AT THE SAE AERO WEST NATIONAL COMPETITION IN MARCH 2006 IN VAN NUYS, CALIFORNIA. THE AERO DESIGN COMPETITION CHALLENGES ENGINEERING STUDENTS TO DESIGN AND BUILD A RADIO-CONTROLLED AIRCRAFT THAT CAN TAKE OFF AND LAND WHILE CARRYING AS MUCH CARGO AS POSSIBLE.

She started her career with Texas Instruments in 1984 and is now the Chief Operating Officer and Vice President of Sensata Technologies, Inc. in Attleboro, Massachusetts. Sensata Technologies is the former Sensors and Controls Group of Texas Instruments. Sullivan also serves as a member of the Sensata Board of Directors.

Sullivan's career has firmly established her as a leader in the sensor and control industry. At Texas Instruments she held numerous managerial positions including Global Business Unit Manager of Sensor Products, Automotive General Manager for North America, Automotive Marketing Manager, and Detroit Sales Manager. Sullivan was promoted to Vice President at Texas Instruments in 1998 and has been instrumental in establishing a sensors and control business that has developed into a worldwide industry leader. When Texas Instruments sold the Sensors and Controls Group in 2006, Sensata Technologies became a stand-alone company.

In addition to her corporate responsibilities, Sullivan has served on several industrial and educational advisory boards. At Michigan Tech, Sullivan served on the ME-EM External Advisory Board and was recently selected for induction into the Michigan Tech Academy of Mechanical Engineering and Engineering Mechanics.

Sulllivan is also a member of the Ford International Supplier Advisory Council (ISAC), Board of Trustees at Kettering University, and Key Executive Council at Rensselaer Polytechnic Institute. She is also a frequent speaker and panelist in a variety of forums that have included iNEMI Innovation Leadership Forum (International Electronics Manufacturing Initiative) and the Executive Women's Conference at Morgan Stanley. Martha was the keynote speaker in 2004 at the annual Building our Future Day at Rensselaer Polytechnic Institute. Sullivan has also volunteered for Odyssey of the Mind, a national academic program for students.

Sullivan, her husband Mike, and their two children live in Wrentham, Massachusetts.

Judy J. (Hartman) Swann

Judy Swann earned a Bachelor's Degree in Mechanical Engineering from Michigan Tech in 1983. Following graduation, she accepted a position as a Patent Examiner with the Patent and Trademark Office of the United States Department of Commerce in Alexandria, Virginia. Swann has remained with the Patent Trademark Office throughout her career, and now serves as Supervisory Patent Examiner.

During the course of her career, Judy has received numerous professional awards for exemplary service, including two Department of Commerce Bronze Medals, Superior Achievement Awards, Exceptional Career Award, and the EEO Directors Award. She also continued her education in recent years, earning a master of arts in Public Administration from Syracuse University in 2003.

Swann became a member of the Patent and Trademark Office Society in 1983 and has held various offices within the organization. She was honored by her peers in 1991 when she was elected to serve as the first female president of the PTO Society. She has also served on the US Patent and Trademark Worklife Committee and worked with the Federal Women's Program. At Michigan Tech Swann was active in ROTC-Air Force as a Regulations Officer and Personnel Officer. She was also active in intramural sports, Volleyball Club, Sabre Jets Drill Team, and with the Michigan Tech Little Theatre as the drama club backstage manager. Swann now volunteers in her community and schools and recently raised $20,000 for Hurricane Katrina support.

Swann and her husband Tod live in Alexandria, Virginia, with their daughter Taylor and son Travis.

Featured Alumni

Graduates of the Department of Mechanical Engineering-Engineering Mechanics at Michigan Tech are making a difference in the lives of students at some of the top universities around the U.S. In this report we feature a few of the ME-EM Department alumni who have risen through the faculty ranks to various leadership positions in academe. They indeed honor us through their accomplishments.

Teik C. Lim
Professor and Department Head, Mechanical Engineering, University of Cincinnati

Originally from Malaysia, Dr. Lim came to Michigan Tech in 1983 and graduated with a BS in Mechanical Engineering in 1985. "I chose Michigan Tech because of its worldwide reputation," he says. "It is a top engineering program." He went on to earn his MS in 1986 from the University of Missouri-Rolla and his PhD in 1989 from Ohio State University. Upon the completion of his doctoral work, Lim spent seven years in the industry with the Structural Dynamics Research Corporation and served on the faculty at the Ohio State University and the University of Alabama before joining the University of Cincinnati in 2002.

Currently, Lim is a Professor and the Head of the Department of Mechanical Engineering at the University of Cincinnati. He is the founding director of the Vibro-Acoustics and Sound Quality Research Laboratory, and directs a consortium of industrial companies on hypoid gear mesh and dynamic modeling. In addition to his research and administrative responsibilities, Lim continues to teach in order to "maintain a connection with students," and is the recipient of numerous teaching awards. He has published over 110 technical papers, is an elected Fellow of the SAE and the ASME, and is a member of several professional societies including the ASEE, the INCE and the ASA. His research interests are in machine dynamics, structural acoustics & vibrations, sound quality techniques, and automotive NVH.

In his academic and professional activities, Lim strives to emulate the lessons he learned at Michigan Tech: "The ME-EM faculty were excellent teachers, and more importantly, had a positive attitude of curiosity and dedication. Michigan Tech is an example of excellence in engineering."

Richard Lueptow, PhD
Senior Associate Dean of the McCormick School of Engineering and Applied Science, Northwestern University

Richard Lueptow graduated from Michigan Tech with a BS in Mechanical Engineering in 1978. At the recommendation of ME-EM professor John Ligon (now retired), Lueptow went on to graduate study at the Massachusetts Institute of Technology (MIT), where he received his SM in 1980. After three years as a research engineer with the Haemonetics Corporation, Lueptow returned to MIT to begin his doctoral work and completed his ScD in 1986. Lueptow is currently the Senior Associate Dean of the McCormick School of Engineering and Applied Science at Northwestern University and a former mechanical engineering department chair. He co-directs the Masters of Product Development program and maintains a rigorous teaching and research schedule. His research focuses on granular flow, planetary atmospheric acoustics, water filtration, and Taylor-Couette flow.

A believer in educational innovation, Lueptow is the recipient of numerous teaching awards, including the Charles Deering McCormick Professor of Teaching Excellence, Teacher of the Year (1991, 2002), the Outstanding Young Faculty Award, and the McCormick Excellence Award. He serves as a reviewer for a number of journals, has an extensive publication and presentation history, and is a member of a variety of professional organizations, including the APS, ASEE, ASME, and SAE.

Michigan Tech's Mechanical Engineering program prepared Lueptow for a dynamic, successful career. "My time in the ME-EM Department taught me the value of experiential education and curiosity, and I strive to pass the same lesson along to my students."

FYI THE MTU SAE FORMULA CAR ENTERPRISE TEAM, ADVISED BY RON SAVELA, FINISHED IN THE TOP HALF OF THE 2007 SAE FORMULA CAR COMPETITION MAY 16-19 AT THE FORD PROVING GROUNDS IN ROMEO, MICHIGAN, WHERE 129 TEAMS COMPETED. IN THE SOCIETY OF AUTOMOTIVE ENGINEERS FORMULA COMPETITION STUDENTS FROM COLLEGES ALL OVER THE WORLD CONCEIVE, DESIGN AND FABRICATE SMALL FORMULA-STYLE RACE CARS.

Mark Tuttle, PhD
Chair, Department of Mechanical Engineering
University of Washington

Mark Tuttle completed his BS and MS degrees in Mechanical Engineering at Michigan Tech in 1975 and 1978, and accepted a position at Battelle Columbus Laboratories in 1979. After several years as a research scientist he began his doctoral work at Virginia Tech and earned his PhD in 1984. "My entire career in engineering and academics began at Michigan Tech," he says. "I received an excellent education."

Tuttle joined the University of Washington in 1985 and currently serves as the chair of the Mechanical Engineering Department. He is the director of the university's FAA Center of Excellence on Advanced Materials in Aircraft Structures (AMTAS), which investigates the use of polymer composite materials in aerospace vehicles. Tuttle's research interests include applied solid mechanics, viscoelasticity, composite materials, and adhesion mechanics. His research has been sponsored by the FAA, the National Science Foundation, the U.S. Department of Energy, the Boeing Company, Ford Motor Company, and NASA.

Tuttle has published over 120 journal and conference articles and is the author of the textbook Structural Analysis of Polymeric Composite Materials (2004). He is an elected SEM Fellow and a Past-President of the Society for Experimental Mechanics (SEM). In his professional activities, Tuttle is pleased to encounter numerous ME-EM graduates. "My fellow alumni are doing phenomenal things in engineering and academia," he says. "Michigan Tech's Mechanical Engineering-Engineering Mechanics program is one of the major engineering departments in the country."

Hussein Zbib, PhD
Director, School of Mechanical and Materials Engineering, Washington State University

Originally from Lebanon, Dr. Hussein Zbib came to the United States in 1979 to attend Michigan Tech, where he earned his BS, MS, and PhD degrees in Mechanical Engineering. After completing his doctoral work, Zbib spent a year as a visiting assistant professor in the ME-EM Department before accepting a position at Washington State University (WSU) in 1988. "I love Michigan Tech," he says. "I received an excellent education there that has impacted every aspect of my career."

Zbib is the director of the School of Mechanical and Materials Engineering at WSU, where he has built a successful research and teaching career. He is the recipient of numerous awards, including the 2003 Computational Mechanics Achievement Award from the Japanese Society of Mechanical Engineers. "Education has always been my passion," says Zbib. "I am fortunate to work in an environment that has allowed me to nurture all forms of academic inquiry." Zbib's research interests are in the areas of solid mechanics, plasticity, dislocations, and applications to manufacturing processes.

In addition to his teaching and research activities, Zbib maintains an involvement in various service organizations and publishes regularly. He is a member of the American Academy of Mechanics, the Materials Research Society, ASM International, the ASEE, ASME (Fellow), and the Society of Engineering Mechanics. Zbib seeks to maintain a broad range of experience—a key factor of success for modern engineers, he says. "With technological advances and the increased importance of globalization, engineers must be prepared for communication and social situations that extend far beyond technical challenges."

$1 Million Drake Professorship Aims to Improve Education

John and Cathi Drake wanted to see the benefit of their estate gift during their lifetime, and together we came up with a plan for them to provide a donation starting this year and continuing annually until the estate is realized. Their annual donation is equivalent to the revenue generated had the $1 million contribution been given as cash today. This is a truly wonderful and generous gift from John and Cathi. — William W. Predebon, ME-EM Department Chair

John Drake believes strongly in the importance of education. "I had an excellent education at Michigan Tech. It served me well throughout my career and gave me the foundation for a lifetime of learning."

To support the continued quality of education in the ME-EM department, Drake and his wife have pledged $1 million to create the John and Cathi Drake Endowed Professor in Mechanical Engineering, including gifts to provide immediate funding. The purpose of the award is to support a faculty member who displays excellence in teaching. The first recipient of the professorship, named in October 2007, is Gordon G. Parker, a longtime Michigan Tech professor and Director of Research for the ME-EM Department. Dr. Parker earned Michigan Tech's Distinguished Teaching Award in 2001 and the SAE Ralph R. Teetor Educational Award in 2003.

"The Mechanical Engineering Department is near and dear to my heart," says Drake, "and it is my hope that this endowed professorship will help the department continue to recruit and retain excellent professors who have the ability to inspire and engage. I had great teachers during my time at Michigan Tech, and I wish the same for all students."

A native of Houghton, Drake earned his BS in Mechanical Engineering from Michigan Tech in 1964 and began his career at Delphi Packard Electric in Warren, Ohio. He took a leave of absence from Delphi Packard to pursue a Masters degree in Business Administration at Michigan Tech, graduating in 1969. In 1972, he founded Drake Manufacturing Services (DMS) after identifying a market need for outside engineering services to corporations. The company, which provides machine tools and remanufacturing services, grew under Drake's leadership until his retirement in early 2007, and continues to operate under the guidance of five longtime managers.

The decision to support Michigan Tech was a natural next step. The donation process is easy, says Drake, and the benefits are immeasurable. "I would like to encourage all ME-EM alumni to support the department so that it can continue to provide the top-quality engineering instruction we all received. The return on education is priceless."

Left to right:
William Predebon, Cathi Drake, John Drake, Gordon Parker

External Advisory Board
2007-2008

The External Advisory Board (formerly the Industrial Advisory Committee) is a select group of corporate, education, and government leaders, many Michigan Tech alumni, who advise the ME-EM Department, sharing their expertise and providing assistance with curriculum direction, research topics, education-and-industry partnerships, and resource development. EAB members offer their professional insight and provide valuable input that shapes the state-of-the-art engineering education taking place in the ME-EM Department.

MEMBER	COMPANY	POSITION
Kirby J. Baumgard	John Deere Power Systems	Staff Engineer
Alan Frank	Whirlpool Corporation	Manager, Approval Labs
Michael Hofman	Roush Inc.	Vehicle Engineering Program Manager
Brian Johnson	Chrysler Corporation	Aero/Thermal Supervisor
Roger Keranen	Visteon Corporation	Supervisor, Electronic Components
Tanya Klain	General Motors Corporation	Engineering Group Manager
John Leinonen	Ford Motor Co/Exponent Inc.	Failure Analysis Associates
Kevin Manor	Toyota Corporation	Engineering Manager
Brenda Moyer-Kochen	Dana Corporation	Director, Technical Resource Park
Seth Newlin	Kimberly-Clark Corporation	Senior Process Engineer
Leigh Otterlei	3M Corporation	Plant Manager
Peter Sandretto	Chrysler Corporation	Senior Manager, Vehicle Certification, retired
John Schweikert	General Motors Corporation	Executive Director, Manufacturing Engineering
James D. Sickinger	Caterpillar Inc.	Product Development and Process Manager
Michelle Zawadzki	Zimmer Corporation	Global Director, Knee Product Development
Jeff Zawisza	Dow Chemical Co.	Development Scientist
Hussein Zbib	Washington State University	Professor and Department Head, Mechanical and Materials Engineering

Building the Future

2007 ME-EM Donations

Our donors are critical to the success of the Mechanical Engineering-Engineering Mechanics Department. Their contributions assist ME-EM in Building for the Future, a campaign that promotes the development and expansion of our education and research.

Phase I of this campaign was exceeded and has been completed. Phase II, entitled Endowing Excellence, is well on its way to the goal of raising $54 million by 2012. With these monies, the ME-EM department will focus its efforts on attracting, rewarding, and retaining high quality faculty, students, and staff. This fund will establish endowments for faculty chairs and professorships, fellowships, scholarships, and student programs.

The following list encompasses the many people who have generously shared their resources to create an outstanding ME-EM department. ME-EM is extremely grateful for their ongoing support. *Those contributing from January 1, 2007 to November 30, 2007 are listed below.*

$200,000 and above

Richard & Elizabeth Henes
Felicia Topping

$100,000 - 199,999

John & F. Cathi Drake

$10,000 - $24,999

Roger & Joann Bonahoom
John & Joan Calder
Roy & Carol Johnsen
Craig & Donna Lazzari

$5,000 - $9,999

Frank & Leslee Agosti
George & Georganne Ehlert
Gerald & Ann Haycock
Denis & Ruth Hayner
Mohan & Rajashree Rao
Wallace & Helga Renn
Arthur Weaver & Phyllis Boutilier

$1,000 - $4,999

Jean & LaVerne Anderson
William & Wendy Basta
Dale & Gwen Dunlap
Richard & Dorothy Dunnebacke
John & Daphne Eggert
Mark & Michelle Gauthier
James & Wanda Gerdeen
Michael & Kristie Gerulski

$1,000 - $4,999 (cont.)

Gerald & Verla Hill
Steven & Elaine Jones
Daniel Kapp & Linda Lavastida-Kapp
Karl & Christine LaPeer
Gary & Corliss Lawrey
James & Carolyn Luyckx
Dianne Malesko
Robert & JoAnn Matheson
Michael & Carol Paradis
James & Connie Peterman
Lynn E. Peterson
William & Mary Ann Predebon
Douglas & Marlene Radloff
Gordon & Debbie Renn
Daniel & Eleanor Rivard
Dale & Sarah Roberto
John & Marsha Schweikert
Earl & Sylvia Seppala
David & Julee Sipes
Ronald & Elaine Starr
Lawrence W. Stewart
David & Linda Stone
Rex D. Stone P.E.
Eugene & Nancy Suppelsa
Thomas J. Tanciar
Camiel & Anne Marie Thorrez
John & Beverly Van Nieuwal
Dean & Suzi Waldie
Rodney & Donna Wegner
Geoffrey & Terri Weller
Jeffrey & Melissa Zawisza

$500 - $999

John & Elizabeth Allen
Donald & Joyce Bouws
John & Sharon Campbell
Antone & Barbara Cavadeas
Brett Chouinard & Brenda Kasper
Juan & Dorothy Dalla Rizza
Robert & Carrol Falberg
Alvin & Janice Gebeau
James & Susan Hall
Ronald W. Henning
Randolph & Cheryl Hill
Arthur J. Koski
David & Maureen Lang
Daniel & Jean Mauk
James & Barbara McKenna
Paul & Elsa Miller
Darwin & Margarita Moon
Hugh & Nancy Moore
Nathalie E. Osborn
William & Mary Owens
Clinton & Mary Phalen
Christopher & Melissa Plude
Rosann & Arthur Schwartz
James & Jacqueline Sima
Craig & Becky Tester
Robert & Mary Thresher
Don & Mary Wacker
Erick & Kathleen Webb
Robert & Sandra Westphal
LCDR Gary L. Wick
Clyde & Elizabeth Work

Contracts & Grants

ME-EM research is supported and sponsored by an expanding number of industrial partners. These partnerships strengthen and sustain the superior quality engineering research taking place at Michigan Tech. During the fiscal year 2007, 45% of all ME-EM research was supported by industry with the following active contracts and grants.

Design/Dynamic Systems (DDS)			
Sponsor	**Title**	**Name**	**Total Award**
International Snowmobile Manufacturing Assoc	Understanding the Ground and Environmental Effects of Snowmobile Noise for SAEJ192	Blough, Jason	$96,600
Jorge Scientific Corp	RTK-GPS Evaluation for Crane and Payload Motion Tracking	Blough, Jason Co-PI: Parker, Gordon	$175,000
Polaris Industries Inc	Elastomer Characterization of Snowmobile Powertrain Mounts	Blough, Jason	$2,450
Ford Motor Co Inc	2007 Staffing for the C3P ISD	Lumsdaine, Edward	$240,140
National Science Foundation	Creating an Entrepreneurial Culture in a Rural Setting	Reed, David Co-PI: Lumsdaine, Edward	$659,108
International Truck & Engine	Model Based Analysis and Investigation of Advanced Control Strategies for an Integrated Urea- SCR After-Treatment System	Parker, Gordon Co-PI: Devarakonda, Maruthi Co-PI: Johnson, John	$119,644
Sandia National Laboratories	Switch Bounce Modeling and Control	Parker, Gordon Co-PI: Blecke, Jill	$20,000
John Deere Co	Correlation of Finite Element and Test Models for Thin Sheet Metal Structures	Rao, Mohan	$43,585
Volvo Construction Equipment Korea	Enterprise: NVH Enterprise - Study and Reduction of Interior Noise in Volvo 210 Excavator Cab - Phase II	Rao, Mohan	$108,522
NanoSonic Inc	Harvesting Electric Power Through an Instrumented PVDF Backpack Harness	Sodano, Henry	$42,002
National Science Foundation	Biologically Inspired Autonomic Structural Materials with Controlled Toughening and Healing	Sodano, Henry	$281,160
Briggs & Stratton Corp	AVS Engine Noise Identification	Van Karsen, Charles	$60,800
Battelle	Uncertainty Data Acquisition and Integration of Response Surface Method to Statistics-Based Analysis and Design Methodology in Distributed Environment	Youn, Byeng Dong	$59,533
Framax Co Ltd	Development of Robust Design Component for PIDO Tool	Youn, Byeng Dong	$135,750
General Motors Corp	Integration of Bayesian Principle to Reliability/Quality Assessment with Both Aleatory and Epistemic Uncertainties (JD Power Survey Data)	Youn, Byeng Dong	$118,836

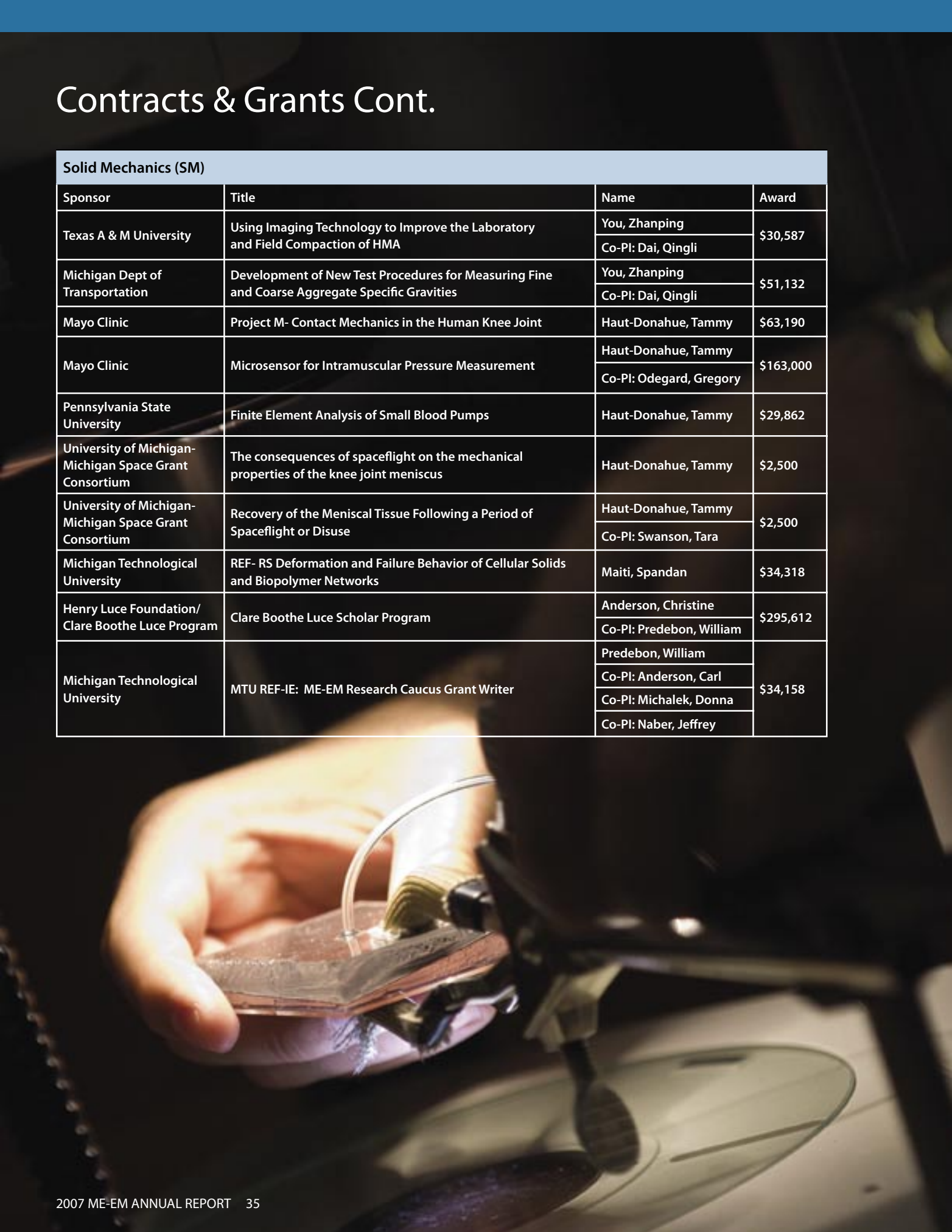
FYI NASA HAS SELECTED THE MTU AEROSPACE ENTERPRISE TEAM'S PROPOSAL TO FLY AN EXPERIMENT ON THE AGENCY'S O-G PLANE FOR THE THIRD YEAR IN A ROW. THIS YEAR'S PROJECT IS TO TEST THE ABILITY TO FREEZE LIQUID-METAL NANOTIPS. THIS EFFORT IS RELATED TO A PATENT THAT MICHIGAN HOLDS ON THIS TECHNOLOGY. THE TEAM IS ADVISED BY DR. L. BRAD KING.

Energy Thermo-fluids (ETF)			
Sponsor	**Title**	**Name**	**Total Award**
Michigan Universities Commercialization Initiative	Fuel Cell Water Control System Prototype-Alternative Energy	Diebel, John Co-PI: Allen, Jeffrey	$60,949
National Science Foundation	Collaborative Research: Interfacial Instability, Convective Motion and Heat Transfer in Evaporating Films	Allen, Jeffrey	$140,056
Rochester Institute of Technology/DOE	Visualization of Fuel Cell Water Transport and Performance Characterization	Allen, Jeffrey	$991,930
General Motors Corp	The Effect of Torque Converter Design Parameters on Noise and Cavitation Characteristics	Anderson, Carl Co-PI: Blough, Jason	$294,966
Dow Automotive Corp	Characterization and Performance of Dow Automotive Advanced Ceramic Material Substrate for Diesel Particulate Filter	Johnson, John Co-PI: Naber, Jeffrey	$128,361
John Deere Co	Modeling of a Diesel Oxidation Catalyst and a Catalyzed Particulate Filter (DOC-CPF) System with Active Regeneration Using a Hydrocarbon Injection System	Johnson, John Co-PI: Yang, Song-Lin	$318,234
National Science Foundation	CAREER: Electron Fluid Dynamics in a Hall-effect Accelerator: Using Fundamental Research to Enhance Education and Technology	King, Lyon	$602,334
US Dept of Defense	Microplasma Device Characterization Facility	King, Lyon	$151,069
US Dept of Defense	A Nanosatellite for Space Situational Awareness	King, Lyon	$149,218
US Dept of Defense	PECASE: Spacecraft Interaction Studies of a 20-kW Bismuth-Fueled Hall Thruster	King, Lyon	$602,971
US Dept of Defense	Self-Regenerating Nanotips: Indestructible Field-Emission Cathodes for Low-Power Electric Propulsion	King, Lyon	$324,487
University of Michigan-Michigan Space Grant Consortium	Design of Device for Electromagnetic Lunar Dust Removal	King, Lyon	$2,500
University of Michigan-Michigan Space Grant Consortium	Electromagnetic Lunar Dust Removal	King, Lyon Co-PI: Meyer, Edmond	$2,500
University of Michigan-Michigan Space Grant Consortium	Aerospace Enterprise Nanosatellite Design	King, Lyon	$3,900
University of Michigan-Michigan Space Grant Consortium	MISNER: Aerospace Enterprise CanSat Development	King, Lyon	$3,900
University of Michigan-Michigan Space Grant Consortium	High Altitude Glider Telecommunications and Power	King, Lyon	$5,000
University of Michigan-Michigan Space Grant Consortium	Experimental Investigation of High Power Bismuth Thrusters	Massey, Dean Co-PI: King, Lyon	$5,500
Endres Machining Innovations LLC	Empirical Modeling of Convective Heat-Transfer in Micro-Ducts	Mukherjee, Abhijit	$8,486

Energy Thermo-fluids (ETF) continued			
Endres Machining Innovations LLC	Empirical Modeling of Convective Heat-Transfer Coefficient in Micro-Ducts	Mukherjee, Abhijit	$36,117
Ford Motor Co Inc	Investigation of In-cylinder Ionization and Examination of Stochastic Analysis of SI Engine Combustion Knock	Naber, Jeffrey	$87,000
General Motors Corp	Direct Injection Ethanol Flex-Fuel Engine Optimization and HC Cold-Start Emissions Reduction For Hybrid Applications-Applied Research Activities	Naber, Jeffrey Co-PI: Beard, John Co-PI: Michalek, Donna	$52,052
General Motors Corp	Direct Injection Ethanol Flex-Fuel Engine Optimization and HC Cold-Start Emissions reduction for Hybrid Applications	Naber, Jeffrey Co-PI: Beard, John Co-PI: Michalek, Donna	$272,146
National Science Foundation	MRI: Development of Combustion Vessel for the Study of Gas and Dispersed Liquid Phase at Elevated Pressure and Temperature	Naber, Jeffrey Co-PI: Anderson, Carl Co-PI: Post, Scott	$1,341,011
National Aeronautics Space Administration	Direct Computational Simulations and Experiments for Internal Condensing Flows' System-Instabilities/Dynamics in Micro-Gravity and Terrestrial Environments	Narain, Amitabh	$750,626
Manufacturing/ Industrial (MI)			
Sponsor	**Title**	**Name**	**Total Award**
Michigan Technological University	REF- Mentoring Grant - Dr. Camelio (mentee) & Dr. Ceglarek (mentor)	Camelio, Jaime	$9,000
Schneider National Inc	Application of Control Theory Principles to Improve the Performance of a Dynamic Trucking Network	Camelio, Jaime Co-PI: Sutherland, John	$41,000
National Science Foundation	Graphics Hardware Accelerated Real-time Machinability Analysis of Free-from Surfaces	D'Souza, Roshan	$256,445
National Science Foundation	Utilizing Quantum Dots as an Onboard Light Source for Bacteriorhodopsin Based Nanosensors	Greip, Mark Co-PI: Friedrich, Craig	$121,500
University of Michigan	An Engineering Research Center in Wireless Integrated Microsystems	Warrington, Robert Co-PI: Friedrich, Craig	$1,311,902
Michigan Economic Development Corp	Optimizing Chemo-Mechanical Structure for MEMS Chemical Vapor Sensor Arrays	Miller, Michele Co-PI: Bettig, Bernhard Co-PI: Parker, Gordon Co-PI: Sodano, Henry	$1,362,337
Caterpillar Inc	Evaluation of Low Greenhouse Gas Bio-Based Energy Technologies: Supplement to 060144: / SFI	Shonnard, David Co-PI: Sutherland, John	$180,000
National Science Foundation	Implementing a Curriculum for Service Systems Engineering	Sorby, Sheryl Co-PI: Sutherland, John	$601,294
Caterpillar Inc	Engine Remanufacturing Assessment	Sutherland, John Co-PI: Adler, Daniel	$19,864
National Science Foundation	IGERT: Achieving Environmental, Industrial, and Societal Sustainability via the Sustainable Futures Model	Sutherland, John Co-PI: Gershenson, John	$6,519,800

Contracts & Grants Cont.

Solid Mechanics (SM)			
Sponsor	**Title**	**Name**	**Award**
Texas A & M University	Using Imaging Technology to Improve the Laboratory and Field Compaction of HMA	You, Zhanping Co-PI: Dai, Qingli	$30,587
Michigan Dept of Transportation	Development of New Test Procedures for Measuring Fine and Coarse Aggregate Specific Gravities	You, Zhanping Co-PI: Dai, Qingli	$51,132
Mayo Clinic	Project M- Contact Mechanics in the Human Knee Joint	Haut-Donahue, Tammy	$63,190
Mayo Clinic	Microsensor for Intramuscular Pressure Measurement	Haut-Donahue, Tammy Co-PI: Odegard, Gregory	$163,000
Pennsylvania State University	Finite Element Analysis of Small Blood Pumps	Haut-Donahue, Tammy	$29,862
University of Michigan-Michigan Space Grant Consortium	The consequences of spaceflight on the mechanical properties of the knee joint meniscus	Haut-Donahue, Tammy	$2,500
University of Michigan-Michigan Space Grant Consortium	Recovery of the Meniscal Tissue Following a Period of Spaceflight or Disuse	Haut-Donahue, Tammy Co-PI: Swanson, Tara	$2,500
Michigan Technological University	REF- RS Deformation and Failure Behavior of Cellular Solids and Biopolymer Networks	Maiti, Spandan	$34,318
Henry Luce Foundation/ Clare Boothe Luce Program	Clare Boothe Luce Scholar Program	Anderson, Christine Co-PI: Predebon, William	$295,612
Michigan Technological University	MTU REF-IE: ME-EM Research Caucus Grant Writer	Predebon, William Co-PI: Anderson, Carl Co-PI: Michalek, Donna Co-PI: Naber, Jeffrey	$34,158



PhD & MS Graduates

PhD GRADUATES FOR SUMMER 2006, FALL 2006, AND SPRING 2007

Bhatnagar, Samved (2006) Advisor: William J. Endres
Feasibility Study of Micro Quantity Internal Cooling (MQuIC) of Cutting Tools

Deaton, Larry T (2006) Advisor: Mohan D. Rao
Investigations into the Causes and Methods of Reducing Airflow Induced Buffeting Over Vehicle Rear Windows

Emblom, William J (2006) Advisor: Klaus J. Weinmann
Closed-Loop Control of the Sheet Metal Stamping Process with Active Drawbeads, a Flexible Blankholder, and Variable Active Blank Holder Forces

Galley, Sarah A (2006) Advisor: Seth W. Donahue
The Role of Fluid Flow in Targeted Remodeling

Gupta, Tumul (2007) Advisor: Tammy L. Haut Donahue
Mechanotransduction of Cellular Loading into Catabolic Activity in Meniscal Tissue

Hong, Yong Kyu (2006) Advisor: Michele H. Miller and Kee S. Moon
Development of an Integrated Atomic Force Microscopy-Nanoindentation System

Kieckhafer, Alexander W (2007) Advisor: Lyon B. King
The Effect of Segmented Anodes on the Performance and Plume of a Hall Thruster

Kumar, Vishesh (2006) Advisor: John W. Sutherland
A Material Flow and Economic Exchange Model to Characterize the Impact of Vehicular Changes and Policies on the Automotive Recovery Infrastructure

Liew, Ka Heng (2006) Advisor: Song-Lin Yang
Aerothermodynamic Cycle Analysis of a Dual-Spool, Separate-Exhaust Turbofan Engine with an Interstage Turbine Burner

Maddi, Jaihind Reddy(2006) Advisor: Madhukar Vable
pr-Mesh Refinement for the Boundary Element Method Analysis of Multiple Material Problems

Ng, Tian Wei (2006) Advisor: Amitabh Narain
Development and Calibration of a Fluorescence and Fiber-Optics Based Real-Time Thickness Sensor for DynamicLiquid Films

Phan, Lucas A (2007) Advisor: Amitabh Narain
Flow Simulations and Code Developments for Internal/External Condensing Flows

Robinette, Darrell L (2007) Advisor: Carl L. Anderson
Detecting and Predicting the Onset of Cavitation in Automotive Torque Converters

Shaik Ahmedullah, Sharizal (2006) Advisor: Oner Arici and Donna J. Michalek
Integrated Solar Energy and Absorption Cooling Model for HVAC (Heating, Ventilating, and Air-Conditioning) Applications in Buildings

Shi, Zhiru (2006) Advisor: Gordon G. Parker
Dynamic Modeling, Simulation and Parameter Identification of a Hydrostatic Transmission with Application to Crane System Characterization

Ting, Foo Chern (2006) Advisor: Song-Lin Yang and Scott L. Post
Intra-Parcel Collision Model

Urip, Egel (2006) Advisor: Song-Lin Yang
The KIVA Code with Conjugate Heat Transfer Model for IC Engine Simulation

Yao, Shengqi (2007) Advisor: Ghatu Subhash
Nanoindentation Response of Diatom Frustules

Zheng, Jiang (2006) Advisor: William J. Endres
Dynamic Behavior of a Fixed Cup-Lid Joint Under Multi-Dimensional Time Varying Loading

Zielinska, Barbara (2007) Advisor: Tammy L. Haut Donahue
Mechanotransduction in Meniscal Tissue

MS GRADUATES FOR SUMMER 2006, FALL 2006, AND SPRING 2007

Adler, Daniel (2007) Advisor: John W. Sutherland
Measuring the Environmental Benefits of Engine Remanufacturing from the Original Equipment Manufacturer Perspective

Ahmad, Zaryab (2006) Advisor: Roshan D'Souza
Application of Genetic Algorithm in Process Planning: Tool Sequence Selection for 2.5D Pocket Machining

Bansal, Mohit (2007) Advisor: Chuck Van Karsen
Evaluation of the Inverse FRF Based Sub-Structuring Approach Applied to Plexiglas Plates

Bhandary, Kirtan Ram (2006) Advisor: Jeffrey Naber
Characterization of Knock/Pre-Ignition and Combustion Study of a Hydrogen Engine

Bhushan, Kangana (2006) Advisor: Gopal Jayaraman
A Finite Element Study on the Efficacy of Football Helmet for Direct Versus Oblique Impacts

Bilyeu, Jordan Douglas (2006) Advisor: Amitabh Narain
Flow Simulations for Optimized Performance of Displacement Pumps Manufactured by Engineered Machined Products

Brantley, Kelly J (2006) Advisor: Ghatu Subhash
Course work only

Cheah, Sze Kwan (2006) Advisor: Henry Sodano
Modeling and Application of an Eddy Current Damper for a Rotating System

Chella, Sukumar (2007) Advisor: Ghatu Subhash
Evaluation of Quality of Extrusion Welds in Hydroformed Aluminum 6063 Tubes under Cyclic Fatigue

Clarke, Abigail R (2006) Advisors: John Gershenson and John Sutherland
Course work only

Delgadillo Rocha, Hector Omar (2006) Advisor: Amitabh Narain
Measurement and Modeling of Film Thickness Variations for Annular In-Tube Flows Through Design and Development of a Flow-Loop Test Apparatus

Dholaria, Jagdish K (2006) Advisor: Mohan Rao
Course work only

Dreyer, Jason T (2007) Advisor: Mohan Rao and Sudhakar Pandit
Estimation of Low-Frequency Sound Absorption of Three-dimensional Treatments Based on Impredance Tube Measurements

Eggart, Brian I (2007) Advisor: Carl Anderson
Course work only

Hemstreet, Scott M (2006) Advisor: Carl Anderson
Course work only

Hepokoski, Mark A. (2007) Advisor: David Nelson
A High-Resolution Model of Human Thermoregulation for Predicting Thermal Comfort

FYI THE ME-EM CAPSTONE DESIGN PROJECT "AUTOMATICALLY INDEXING INSERT TOOLHOLDER," SPONSORED BY ENDRES MACHINING INNOVATIONS OF HOUGHTON, EARNED FIRST PLACE AT THE 2007 ASME INTERNATIONAL MANUFACTURING SCIENCE AND ENGINEERING CONFERENCE STUDENT MANUFACTURING DESIGN COMPETITION IN ATLANTA ON OCT. 10, 2007. THE TEAM WAS ADVISED BY DR. JAMIE CAMELIO.

Hittepole, Philip A (2006) Advisor: Spandan Maiti
Course work only

Jangale, Ashish (2006) Advisor: Mohan Rao
Calculation of Powertrain Mount Loads using Multibody Dynamic Model

Kale, Vaibhav S (2007) Advisor: John Beard
Modified Frontier Algorithm with Solution Selection

Klein, Mark (2007) AdvisoR: Ghatu Subhash
Transverse Tensile Property Determination of Hydroformed and Unhydroformed Aluminum Tubes

Krishna, Karthik (2007) Advisor: William Endres
Effects of Tooth Parameters on the Performance of MetalCutting Circular Saw Blades

Kulkarni, Abhay (2006) Advisor: Craig Friedrich
A Multi-Chambered Monolithic Actuated Cochlear Prosthesis Insertion Tool

Kumpelis, John P (2007) Advisor: Carl Anderson
Course work only

Kurita Nagasawa, Jorge (2007) Advisor: Amitabh Narain
Experimental Investigation of Fully Condensing Downward Vapor Flows in a Vertical Tube – Unspecified (Free) Exit Condition Cases

Lai, Xiaoxia (2006) Advisor: John Gershenson
Course work only

Mankar, Sanjog S (2007) Advisor: Carl Anderson
Course work only

Mantri, Abhishek N (2006) Advisors: Bernard Bettig and Roshan D'Souza
Issues in Integration of Engineering Analyses for Multi-Disciplinary Optimization

Nagar, Nishit (2006) Advisor: Craig Friedrich
Development of Electrokinetic Micro-Pump for an Actuated Cochlear Prosthesis Insertion Tool

Nanjundareddy, Rajiv B (2006) Advisor: John Johnson
Course work only

Nathak, Subhro S (2006) Advisor: Mohan Rao
Development and Validation of an Acoustic Encapsulation to Reduce Noise from a Diesel Engine

Oswal, Sumeet (2006) Advisor: Gopal Jayaraman
A Finite Element Study of the Human Skull Fracture Pattern Due to Free Falls

Padate, Swapnil Arun (2006) Advisor: Jeffrey Allen
Dynamics of Evaporating Films: A Numerical Model and an Experimental Approach

Poradek, Jr., Francis (2007) Advisor: Mohan Rao
Study and Reduction of Noise Transmission from the Volvo EC210 Excavator

Premchand, Kiran Chand (2006) Advisor: John Johnson
An Experimental and Modeling Study of the Filtration and Oxidation Characteristics of a Diesel Oxidation Catalyst and a Catalyzed Particulate Filter

Pyrkosz, Michael (2007) Advisor: Chuck Van Karsen
Development of Tools for Teaching Core Dynamic Systems Material

Rajagopalan, Satheesh Rajh (2006) Advisor: Jeffrey Naber
Experimental Measure and Analysis for Determination of Combustion Knock Intensity in Spark Ignition Engine

Sanyal, Nikhil (2006) Advisor: John Gershenson
Value-Based Improvement Prioritization Using Process Relative Worth Analysis

Sharma, Arun (2006) Advisor: Ghatu Subhash
Course work only

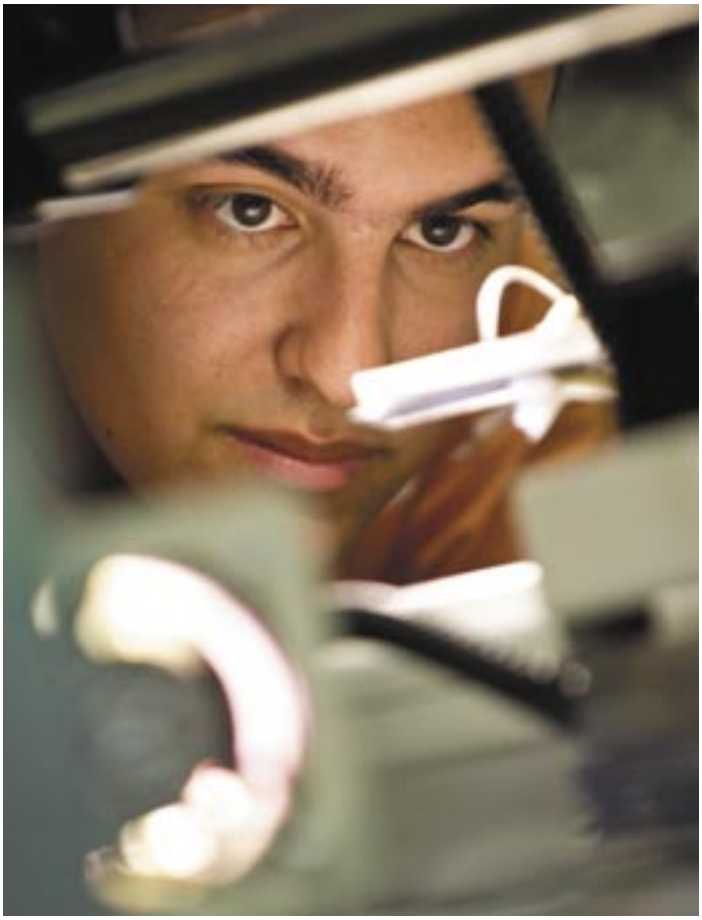
Shirodkar, Prasad Suresh (2006) Advisor: John Sutherland
Characterization of Value Flow During the Product Life Cycle

Tseng, Sheng Han (2006) Advisor: Jeffrey Allen
Fluidic Oscillator Design for Enhanced Water Removal from Gas Flow Channels of a PEM Fuel Cell

Vettel, Drew (2006) Advisor: John Gershenson
Analysis of Engineering Processes Using Lean Manufacturing Tools: A Manufacturing Equipment Design Application

Walter, Timothy Ray (2006) Advisor: Ibrahim Miskioglu
Evaluation of Sandwich Panel Parameters with Hydromat Testing Method

Ye, Xiaoli (2007) Advisor: John Gershenson
Course work only



2006-2007 BS Graduates

SUMMER 2006

Adrian, Andrew Thomas
Besonen, Thomas Paul - Cum Laude
Christian, Kevin John
Dillon, Robert John
Dahlheimer, Nicholas Steffen
Freeberg, Erik A
Harjer, Jennifer L
Iduma, Godwin Chukwuemeka
Kero, Matthew Paul - Cum Laude
LaCosse, Justin S
Mann, William Elliot
McCabe, Patrick E
O'Parka, Alycia Marie
Paiva, Christopher Michael
Palmreuter, Jonathan Arnold
Richard, Aaron Roland
Rogers, Robin Ranee
Rokke, Christopher J
Todd, Matthew
Walsh, Matthew Wayne
Walter, Jon Andrew
Zitzer, Thomas Richard

FALL 2006

Allan, Jeremy James - Cum Laude
Armstrong, Nathaniel Robert
Barnaby, Michael Lee - Magna Cum Laude
Belling, David Ashton
Benes, Philip MIchael - Magna Cum Laude
Bluhm, Matthew Alan
Boes, Steven T
Branson, Jonathon Michael
Brown, Adam C - Magna Cum Laude
Bruce, Andrew David - Cum Laude
Charais, Daniel Robert
Crandell, Beau Evan
Crawford, Alan Dean
Crouch, Molly S - Summa Cum Laude
Daavettila, David Carl - Summa Cum Laude
Davidson, Andrew P
Deffendall, Sean Alexander
Dehring, Pierce Gregory
Fenderbosch, Andrew James
Gifford, Jonathon Lee - Cum Laude
Guan, Yong Ee
Hesselroth, Peter John
Holihan, Kyle A
Hwang, Hwan I
Johnson, Benjamin William - Cum Laude
Johnson, David Lee - Cum Laude
Juckette, John Brian
Kamensky, Martin Ernest
Kitzman, Jeffery D - Cum Laude
Kivisalu, Michael Toomas - Magna Cum Laude
Lawniczak, Adam Jeffrey
Lee, Pooi Yee
Leong, Jason Khai Wai
Maher, Daniel Joseph
Maksym, Christopher Jason
Mayo, Daniel Joseph
Miller, Samuel John - Summa Cum Laude
Mittag, Matthew D - Magna Cum Laude
Nagel, Gregory Raymond
Nelson, Matthew Thomas - Magna Cum Laude
Parker, Seth R - Cum Laude
Podleski, Jason Michael
Pryor, Joshua J
Quade, Brekke Elizabeth
Rang, Michael James
Rinckey, Patrick Lee
Rogers, Catherine Leigh
Roskamp, Bryce A - Cum Laude
Rumawas, Stefanus Karel
Sage, Douglas Houghton - Cum Laude
Sebastian, Christopher Mark - Cum Laude
Sorensen, Philip Hans
Strickland, Jessica Ann - Cum Laude
Stuckmann, Justin Lee
Sturos, Chase Philip - Cum Laude
Swathell, Joshua John
Soon Siong Tan
Tarzwell, Nicholas B
Tittman, Adam Francis - Magna Cum Laude
Voshol, David Bryan - Summa Cum Laude
Watkins, Steven Gregory - Summa Cum Laude
Wenzel, Tyler Zackary
Westrope, Benjamin Edward
Woelfel, Timothy John

SPRING 2007

Arthur, Joshua James
Austin, Gregory Thomas - Summa Cum Laude
Balogun, Nurudeen Oladapo
Bartell, Joseph Robert
Bobchik, Joseph Peter - Summa Cum Laude
Bowron, Micah Joel
Brouwers, Andrew James
Brunet, Chad Jason
Canepa, Rachel Elizabeth
Clifton, Justin Thomas
Cox, John Aaron
Crockett, Jason David
Daavettila, Andrew Reid - Cum Laude
DeMarte, Roberto A
DeVormer, David D'artagnan - Cum Laude
Dehlinger, Mark J
Deyo, Benjamin E
Ditty, Aaron Joshua - Magna Cum Laude
Dodde, Luke Andrew
Drexler, Nicole Lynn
Essex, Ryan William - Summa Cum Laude
Ferguson, Douglas Gene
Fields, Tom Henry
Figi, Gary A
Fleck, Michael Benjamin
Folson, Stephen Webster
Frantti, Neal Vernon
Frazier, Jason R
Gamble, Bailey Bogart
Gancer, Anthony Lawrence - Cum Laude
Grant, Peter W - Cum Laude
Grunlund, David Sumner - Cum Laude
Haber, Jeffrey Michael
Hall, Christina Jean
Halt, Thomas Michael - Magna Cum Laude
Hanson, Ryan Kenneth
Hatch, Tenasia Elon
Heidbrier, Jeremy Gordon
Janicke, Matthew Evan
Johnson, Samuel Elliot - Cum Laude
Kalenauskas, Eric W - Cum Laude
Kempeinen, Matthew P - Magna Cum Laude
Kendziorski, Derrick J
Knepfler, Carl Michael
Kolhagen, Benjamin Jared
Kosinski, Adam Matthew
Kostrzewski, Thomas J - Cum Laude
LaFord, Christian Adam
Latvis, Lora S
Lechnyr, Joseph William - Cum Laude
Leonard, Edgar John - Magna Cum Laude
Loiselle, Jacob Adam
Love, Richard William - Magna Cum Laude
Martin, Jennifer Lynn - Summa Cum Laude
McCabe, Aaron James
McGee, Patrick O
Merriman, Jeffrey D
Metsa, Justin Paul
Metz, Blake A - Cum Laude
Meyer, Aaron R
Moran, Jonathan Wayne - Cum Laude
Morris, Ryan Lewis
Motz, Julie Ann
Neisen, Michael Jerome - Cum Laude
Norwood, Kyle Daniel
O'Brien, Sean N
O'Brien, Jeffrey D - Cum Laude
Olsen, Joshua T

Olson, Eric Daniel
Otremba, Kyle William - Magna Cum Laude
Owen, Kristina M
Pagel, Tyler W
Panczenko, Jason A
Parenteau, Alan R
Pasquali, Dean Anthony - Cum Laude
Pearson, Sarah J - Cum Laude
Perander, James Michael
Peterson, Thomas Matthew
Peterson, Kyle Israel
Pham, Thanh Phuoc
Pieniadz, Alan P
Pietsch, Travis Donald
Plott, Christopher A
Polzien, Stephen John
Punzel, Zachary David
Putnam, Douglas Clark - Cum Laude
Rajala, Andrew Marvin
Reeves, Matthew D
Reider, Paul James
Riley, Timothy Philip - Magna Cum Laude
Riutta, Benjamin James - Cum Laude
Rottier, Catherine Theresa - Cum Laude
Sabol, Bryan Patrick
Salisbury, Mark James
Sanders, Neil Howard
Sandor, Thomas P
Schleif, Andrew Charles - Cum Laude
Sherrington, Matthew Ralph
Sherzer, Rachel Ann - Cum Laude
Smith, Richard Gregory
Snover, Andrew T
Stanczuk, Grant Alexander
Taylor, Jeffrey David
Tenkel, Garret Roger
Thompson, Scott Bryan
Thoms, Christopher Glen
Toutant, Daniel Paul
Tuinstra, Kimberly Anna
Vanderhovel, Kiel D - Magna Cum Laude
Volmering, Andrew Daniel - Summa Cum Laude
Walton, Stephanie Janel
Werner, Andrea Nichole
Whaley, Jeffrey Louis
Wieferich, Casey Joseph
Williams, Sean Edward
Wilson, Jacquelyn Marie - Magna Cum Laude
Wimalasena, Lakmini Manuja
Windgassen, Ryan James - Cum Laude
Winer, Evan T
Woelmer, Lee Norman

Order of the Engineer

All graduating seniors from the ME-EM department are invited to join the Order of the Engineer with a public induction where they accept the responsibilities and duties outlined in the formal statement, Obligation of the Engineer. These Michigan Tech graduates, along with engineers nationwide, acknowledge the primary purpose of engineering as being a service to the public.

SPRING 2007

Mr. Geoffrey Weller, ME-EM Alumnus, Assistant Plant Manager, Lansing Delta Assembly, General Motors Corporation
Keynote address

FALL 2007

Mr. Michael V. Hofman, ME-EM Alumnus, Vehicle Engineering Program Manager, Roush Industries
Keynote address

Fernando Ponta,
Michigan Tech Inductee

Jeremy Worm,
Michigan Tech Inductee

Fellowships 2006-2007

Alumni Fellowship
Jaclyn Nesbitt

Cummins Fellowship
Rayomand Dabhoiwala

Fulbright Fellowship
Yeliana

Henes Fellowship
Vishesh Kumar
Margot Hutchins

IGERT Trainee
Abigail Clarke
Chelsey MacNeill
Jeremy Rickli
Margot Hutchins

King – Chavez – Parks
Joseph Hernandez
Kari Jordan

NSF
Mark Griep

Journal Articles 2006-07

* Please note: **Bold text** indicates ME-EM faculty members and *italicized text* indicates ME-EM students.

Allen, **J.S.,** 2006, "Two-Phase Flow in Small Channels and the Implications for PEM Fuel Cell Operation," ECS Transactions, Vol. 3, No. 1, pp. 1197-1206.

Wee, S.K., Kihm, K.D., Pratt, D.M., **Allen, J.S.,** 2006, "Microscale Heat and Mass Transport of Evaporating Thin Film of Binary Mixture," Journal of Thermophysics and Heat Transfer, Vol. 20, No. 2, pp. 320-326.

Som, S.M., Kimball, J.T., Hermanson, J.C., and **Allen, J.S.,** 2007, "Stability and Heat Transfer Characteristics of Unsteady Condensing and Evaporating Films," International Journal of Heat and Mass Transfer, Vol. 50, pp.1927–1937.

Herescu, A., and **Allen, J.S,** 2007, "A Theoretical Discussion of a Menisci Micropump Driven by an Electric Field," Journal of Fluids Engineering, Vol. 129, pp. 404-411.

Naber, J.D., Blough, J.R., Franowski, D., Goble, M., and Szpytman, J.E., 2007. "Analysis of Combustion Knock Metrics in Spark-Ignition Engines," SAE Transactions Journal of Engines, Vol. 115, pp. 223-243.

Holt, J.R., **Rao, M.D., Blough, J.R.,** and Gruenberg, S., 2007, "Time History Based Excitation in the Dynamic Characterization of Automotive Elastomers," Journal of Automobile Engineering, Vol. 221, Part D., pp. 271-284.

Camelio, J., Yue, J., and Chin, M., 2007, "Product-Oriented Sensitivity Analysis of Multistation Compliant Assemblies', ASME Journal of Mechanical Design, Vol. 129, No. 8, pp. 844-851.

Camelio, J., Youn, B.D., *Xie, K.,* and *Well, L.,* 2007, "Variation Propagation Analysis on Compliant Assemblies Considering Contact Interaction," Journal of Manufacturing Science and Engineering, Vol. 129, No. 5, pp. 934-942.

Camelio, J., and Yim, H.J., 2007, "Identification of Dimensional Variation Patterns on Compliant Assemblies," Journal of Manufacturing Systems, Vol. 25, No, 2, pp. 65-76.

Dai, Q. and You, Z, 2007, "Prediction of Creep Stiffness of Asphalt Mixture with Micromechanical Finite Element and Discrete Element Models," ASCE Journal of Engineering Mechanics, Vol. 133, No. 2, pp. 163-173.

Dai, Q., Sadd, M.H. and You, Z., 2006, "A Micromechanical Finite Element Model for Viscoelastic Creep and Viscoelastic Damage Behavior of Asphalt Mixture," International Journal for Numerical and Analytical Methods in Geomechanics, Vo. 30, No. 11, pp. 1135–1158.

Dai, Q., and You, Z., 2007, "A Review of Advances in Micromechanical Modeling of Aggregate-Aggregate Interaction in Asphalt Mixture," Canadian Journal of Civil Engineering Rev. can. génie civ. Vol. 34, No. 2, pp. 239-252.

D'Souza R., 2006, "Tool Sequence Selection for 2.5D Pockets With Uneven Stock," Journal of Computing and Information Science in Engineering, Vol. 6, No. 33, pp. 33-39.

D'Souza R., 2006, "Selecting an Optimal Tool Sequence for 2.5D Pocket Machining While Considering Tool Holder Collisions," Journal of Intelligent Manufacturing, Vol. 17, pp. 363-372.

D'Souza R., 2006, "On Setup Level Tool Sequence Selection for 2.5D Pocket Machining, Robotics and Computer Integrated Manufacturing," Vol. 22, No. 3, pp. 256-266.

Endres, W.J., Gershenson, J.K., Michalek, D.J., Sutherland, J.W., *Kumar, V., Haapala, K.R., Rivera, J.L., and Hutchins, M.J,* 2006, "Infusing Sustainability Principles into Manufacturing/Mechanical Engineering Curricula," *SME Journal of Manufacturing Systems*, Vol. 24, No. 3, pp. 215-225.

Friedrich, C., *Arcand, B*., and *Shyamsunder, S*., 2007, "A Fluid Actuator for Thin Film Electrodes," ASME Journal of Medical Devices, Vol.1, pp. 70-78.

Gershenson, J.K. and *Guo, F*., 2007, "Discovering Relationships between Modularity and Cost," Journal of Intelligent Manufacturing, Vol. 18, No. 1, pp. 143-157.

Gershenson, J.K., Hagemeyer, C., and Johnson, D., 2006, "The Classification and Application of Problem Solving Quality Tools," The TQM Magazine, Vol. 18, No. 5, pp. 455-483.

Gupta, M., *Ling, D*., Myers, P.R., and Upadhyay, R.K., 2006, "Simulation of Core Deflection in Powder Injection Molding," International Polymer Processing Journal, Vol. 21, pp. 309-218.

Gupta, M., *Sun, Y.,* 2006, "An Analysis of the Effect of Elongational Viscosity in a Spiral Mandrel Die," Advances in Polymer Technology, Vol. 25, pp.90-97.

Haut Donahue, T. L., *Hull, M. L., Howell, S.M.,* 2006, "A New Algorithm for Selecting Meniscal Allografts that Best Match the Size and Shape of the Damaged Meniscus," Journal of Orthopaedic Research, Vol. 24, No. 7, pp. 1535-1543.

Haut Donahue, T. L., and *Maes, J.A.,* 2006, "Time Dependent Properties of Bovine Meniscal Attachments: Stress Relaxation and Creep," Journal of Biomechanics, Vol. 39, No. 16, pp. 3055-3061.

Haut Donahue, T.L., *McHenry, J.A.,* and *Zielinska, B.,* 2006, "Proteoglycan Breakdown of Meniscal Explants Following Dynamic Compression Using a Novel Bioreactor," Annals of Biomedical Engineering, Vol. 34, No. 11, pp.1758-1766.

Haut Donahue, T.L., and *Gupta, T.,* 2006, "Role of Cell Location and Morphology in the Mechanical Environment Around Meniscal Cells," Acta Biomaterialia, Vol. 2, No. 5, pp. 483-492.

Johnson, J.H., Naber, J.D., *Singh, P., Thalagavara, A.M*., and Bagley, S.T., 2007, "An Experimental Study of Active Regeneration of an Advanced Catalyze Particulate Filter by Diesel Fuel Injection Upstream of an Oxidation Catalyst," SAE 2006 Transactions Journal of Fuels and Lubricants, Vol. 115, pp. 334-357.

Johnson, J.H., Yang, S.L., *Triana, A.P*., and Baumgard, K.J., 2006, "An Experimental and Computational Study of the Pressure Drop and Regeneration Characteristics of a Diesel Oxidation catalysts and a Particulate Filter", SAE 2006 Transactions Journal of Fuels and Lubricants. Vol. 115, pp. 115-135.

Hasan, M., *Triana, A.P*., **Johnson, J.H., and Yang, S.L.,** 2007, "An Advanced 1D 2-Layer Catalyzed Diesel Particulate Filter Model to Simulate: Filtration by the Wall and Particulate Cake, Oxidation in the Wall and Particulate Cake by NO2 and O2, and Regeneration by Heat Addition," SAE 2006 Transactions Journal of Fuels and Lubricants, Vol. 115, pp. 171-191.

King, L.B., and Kieckhafer, A.W., 2007, "Energetics of propellant options for high-power Hall thrusters," Journal of Propulsion and Power, Vol. 23, No. 1, pp. 21-26.

King, L.B., and *Fossum, E.C*., 2007, "Cross-field mobility in a pure electron plasma," Problems of Atomic Science and Technology No. 6, Series: Plasma Physics (12), pp. 219-221.

King, L.B., Parker, G., Schaub, H., and Natarajan, A., 2007, "Coulomb Force Virtual Space Structures," European Space Agency Special Publication, ESA SP 633, pp. 39-44.

Loukus, A.R, Subhash, G., and *Imaninejad, M.,* 2007, "Optimization of Material Properties and Process Parameters for Tube Hydroforming of Aluminum Extrusions," Journal of Engineering Materials and Technology, Vol. 129, pp. 233-241.

Maiti, S., Dantuluri, V., Geubelle, P.H., Patel, R., and H. Kilic., 2007, "Cohesive modeling of delamination in Z-pin reinforced composite laminates," Composites Science and Technology, Vol. 67, No. 3-4, pp. 616-631.

Maiti, S., Shankar, C., Geubelle, P.H., and Keiffer, J., 2006, "Continuum and molecular-level modeling of fatigue crack retardation in self-healing polymers," Journal of Engineering Materials and Technology, Vol. 128, No. 4, pp. 595-602.

Maiti, S., Parks, M.L., de Sturler, E., Mackey, G., and Johnson, D.D., 2006, "Recycling Krylov subspaces for sequences of linear systems," SIAM Journal on Scientific Computing, Vol. 28, No. 5, pp. 1651-1674.

Maiti, S., Subhash, G., and.*Marszalek, M.A*., 2006, "Sensitivity of Scratch Resistance to Grinding-Induced Damage Anisotropy in Silicon Nitride," Journal of the American Ceramic Society, Vol. 89, No. 8, pp. 2528-2536.

Maiti, S., Subhash, G., and *Jing, X*., 2007, "A new analytical model for estimation of scratch induced damage in brittle solids," Journal of the American Ceramic Society, Vol. 90, No. 3, pp. 885-592.

Miller, M.H. and *Fan, X*., 2006, "Force Analysis for Grinding with Segmental Wheels," Machining Science and Technology, Vol. 10, No. 4, pp. 435-455.

Galley, S., **Michalek**, **D.J.,** Donahue, S.W., 2006, "A fatigue microcrack alters fluid velocity in a computational model of interstitial fluid flow in cortical bone," Journal of Biomechanics, Vol. 39, No. 11, pp. 2026-2033.

Miskioglu, I., Baker, K.C., Drelich, J., Israel, R. Herkowitz, H. N., 2007, "Effect of Polyethyelene pretreatments on the Biomimetic Deposition and Adhesion of Calcium Phosphate Films," Acta Biomaterialia, Vol. 3, No. 3, pp. 391-401.

Miskioglu, I., Van Karsen, C.D., King, J.A., and Wright-Charlesworth, D.D., 2007, "Nano-Scratch Testing of Short Carbon Fiber Composites to Assess Fiber Adhesion," Journal of Applied Polymer Science, Vol. 103, No. 1, pp. 328-335.

Miskioglu, I., *Peers, W.J*., and Wright-Charlesworth, D.D., 2006, "Pin-on-Disc Evaluation of Self-Reinforced Composite Poly Methyl Methacrylate for Total Hip Replacements", Journal of Biomedical Materials Research: Part B-Applied Biomaterials, Vol. 79B, No.1, pp 16-24.

Mukherjee, A., and Kandlikar, S.G., 2007, "Numerical study of single bubbles with dynamic constact angle during nucleate pool boiling," International Journal of Heat and Mass Transfer, Vol. 25, pp. 127-138.

Mukherjee, A., and Kandlikar, S.G., 2006. "Numerical study of an evaporating meniscus on a moving heated surface," Journal of Heat Transfer, Vol. 128, No. 12, pp. 1285-1292.

Naber, J.D., Bradley, R.K., and Szpytman, J.E., 2007, "Target Based Rapid Prototyping Control System for Engine Research," SAE Transactions Journal of Passenger Cars, Vol. 115, pp. 334-377.

Narain, A., and *Phan, L.,* 2007, "Non-linear Stability of the Classical Nusselt Problem of Film Condensation and Wave-Effects," ASME Journal of Applied Mechanics, Vol. 74, No. 2, pp. 279-290.

Odegard, G.M., *Valavala, P.K*., Clancy, T.C., and Gates, T.S., 2007, "Nonlinear Multiscale Modeling of Polymer Materials," International Journal of Solids and Structures, Vol. 44, No. 3-4, pp. 1161-1179.

Pandit, S.M., and *Mattson, S.G*., 2006, "Statistical moments of autoregressive model residuals for damage localization," Mechanical Systems and Signal Processing Journal, Vol. 20, pp. 627-645.

Pandit, S.M., *Dreyer, J.T*., Bett, T.A., Milbrodt, P., and Ungpiyakul, T., 2006, "Application of Data Dependent Systems Modeling to Failure Prediction in Non-Stationary Manufacturing Processes," Transactions of the North American Manufacturing Research Institution of SME, Vol. 34, pp. 461-468.

Pandit, S. M. and *Mattson, S.G.,* 2006, "Damage detection and localization based on outlying Residuals," Smart Materials and Structures Journal, Vol. 15, pp. 1801-1810.

Rao, M.D., *Qu, R.,* and Patankar, R., 2007, "Stochastic Modeling of Fatigue Crack Propagation by Collective Motion of Dislocations", International Journal of Fatigue, Vol. 29, No. 1, pp. 181-191.

Rao, M.D., *Qu, R.,* and Patankar, R., 2006, "A Third Order State-Space Model of Fatigue Crack Growth," Fatigue & Fracture of Engineering Materials and Structures Journal, Vol. 29, No. 12, pp.1045-1055.

Rao, M.D., and Letowski, T., 2006, "Callsign Acquisition Test (CAT): Speech Intelligibility in Noise", Ear and Hearing Journal," Vol. 27, No. 2, pp. 120-128.

Sodano, H.A., and *Anton, S.R.*, 2007, "A Review of Power Harvesting Using Piezoelectric Materials (2003-2006)," Smart Materials and Structures Journal, Vol. 16, pp. R1-R21.

Sodano, H.A., Simmers, G.E., Dereux, R., and Inman, D.J., 2007, "Recharging Batteries using Energy Harvested from Thermal Gradients," Journal of Intelligent Material Systems and Structures Journal, Vol. 18, No. 1, pp. 3-10.

Sodano, H.A., Simmers, G.E., Park, G., and Inman, D.J., 2006, "Detection of Corrosion using Piezoelectric Impedance Based Structural Health Monitoring," AIAA Journal, Vol. 44, No. 11, pp. 2800-2803.

Sodano, H.A., 2006, "Non-contact Eddy Current Excitation Method for Vibration Testing," Experimental Mechanics, Vol. 46, No. 5, pp. 627-635.

Sodano, HA., Lloyd, J., and Inman, D.J., 2006, "An Experimental Comparison between Several Active Composite Actuators for Power Generation," Smart Materials and Structures Journal, Vol. 15, pp. 1211-1216.

Sodano, H.A., Inman, D.J., and Belvin, W.K., 2006, "Development of a New Passive-Active Magnetic Damper for Vibration Suppression," ASME Journal of Vibration and Acoustics, Vol. 128, pp. 318-327.

Sodano, H.A., Bae, J.S, Inman, D.J., and Belvin, W.K., 2006, "Improved Concept and Model of Eddy Current Damper," ASME Journal of Vibration and Acoustics, Vol. 128, pp. 295-302.

Sutherland, J.W., Zheng, Y., *Hu, X*., 2006, "Application of Finite Deformation Theory to the Development of an Orthogonal Cutting Model, Part 1: Model Development," *ASME Trans., Journal of Manufacturing Science and Engineering*, Vol. 128, No. 3, pp.760-766.

Sutherland, J.W., Zheng, Y., *Hu, X*., 2006, "Application of Finite Deformation Theory to the Development of an Orthogonal Cutting Model, Part 2: Experimental Investigation and Model Validation," *ASME Trans., Journal of Manufacturing Science and Engineering*, Vol. 128, No. 3, pp.767-774.

Sutherland, J.W., Beach, D.N., *Hutchins, M.J*., and Gierke J.S., 2007, "Evolving Undergraduate Engineering Education for the 21st Century, Part 1: Enabling Sustainable Thinking," *International Journal of Engineering Education*, Vol. 23, No. 2, pp. 218-230.

Sutherland, J.W., *Xue, H*., and *Kumar, V*., 2007, "Material Flow and Environmental Impacts of Manufacturing System via Aggregated Input-Output Models," *Journal of Cleaner Production*, Vol. 15, No. 13-14, pp. 1349-1358.

Vable, M., and. *Maddi, J.R*, 2006,"Boundary element analysis of adhesively bonded joints," International Journal of Adhesion and Adhesives, Vol. 26, pp.133-144.

Yang, S.L., *Liew, K.H., Urip, E*., Mattingly, J.D., and Marek, C.J., 2006, "Performance Cycle Analysis of Turbofan Engine with Interstage Turbine Burner," AIAA Journal of Propulsion and Power, Vol. 22, No. 2, pp. 411-416.

Youn, B.D., Du, L., Choi, K.K., and Gorsich, D., 2006, "Possibility-Based Design Optimization Method for Design Problems with both Statistical and Fuzzy Input Data," Journal of Mechanical Design, Vol. 128, No. 4, pp. 925-935.

Youn, B.D., Ramu, P., Qu, X., Haftaka, R.T., and Choi, K.K., 2006, "Safety Factor and Inverse Reliability Measures," International Journal of Reliability and Safety, Vol. 1, No. 1/2, pp. 178-205.

Youn, B.D., Du, L., and Choi, K.K., 2006, "Inverse Possibility Analysis Method for Possibility-Based Design Optimization," AIAA Journal, Vo. 44, No. 11, pp. 2682-2690.

Youn, B.D., Choi, K.K., Du. L., and Gorsich, D., 2007, "Integration of Possibility-Based Design Optimization to Robust Design for Epistemic Uncertainty," Journal of Mechanical Design, Vol. 129, No. 8, pp. 876-882.

Youn, B.D., 2007, Integrated Framework for Design Optimization under Aleatory and/or Epistemic Uncertainties Using Adaptive-Loop Method," International Journal of Risk and Reliability, Vol. 221, No. 2, pp. 107-116.

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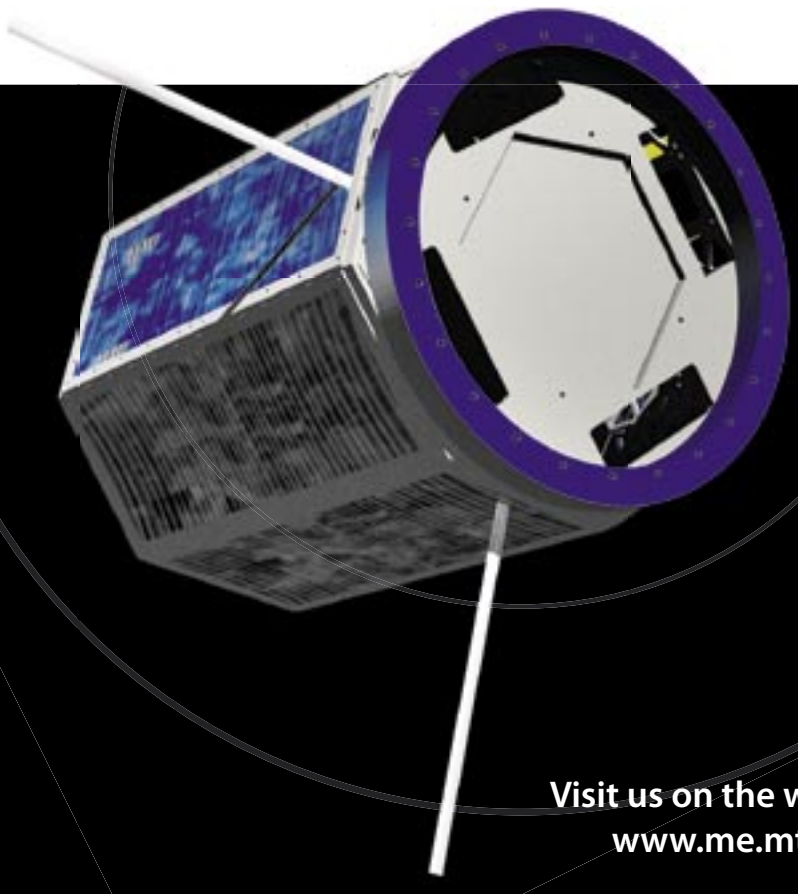
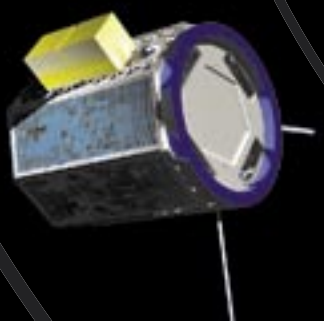


ME-EM Mission

Prepare engineering students for successful careers

ME-EM Vision

Be a nationally recognized mechanical engineering department that attracts, rewards, and retains the very best students, faculty and staff— be a department of choice nationally



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