

August 24, 2012

Zhang named Binger Assistant Professor of Mechanical Engineering

Song Zhang was recently appointed as the William and Virginia Binger Assistant Professor of Mechanical Engineering. This professorship recognizes the success of early career faculty, and he will retain this title until tenured.



Zhang

After receiving his Ph.D. degree from Stony Brook University in 2005 and completing a post-doc at Harvard, he became an Assistant Professor of Mechanical Engineering at Iowa State in 2008. His current research focuses on developing super-fast, super-resolution 3-D imaging technologies and on exploring their applications. He received a 2012 NSF CAREER Award for a project titled "CAREER: Dense super-fast 3D sensing for extremely rapidly changing mechanical and biological scenes."

Zhang is currently authoring a book and has published 4 book chapters, over 40 peer-reviewed journal papers, over 50 conference papers, and has given nearly 25 invited talks. He teaches ME 370 – Engineering Measurements and ME 557 - Computer Graphics and Geometric Modeling, and is developing a new course on machine vision.

Hashemi speaks at UKC 2012

Assistant Professor and William March Scholar in Mechanical Engineering **Nastaran Hashemi** was invited by the Korea-US Science Cooperation Center (KUSCO) to the US-Korea Conference (UKC) 2012 on Science, Technology, and Entrepreneurship in Los Angeles, CA. The invitation was initiated by National Institute of Health Senior Investigator, Dr. Kyungjae Myung.



Hashemi

On August 11, Hashemi spoke during session nine: Immunology and bioscience with multidisciplinary research tools. Her talk was entitled "Algae Characterization On a Chip." This was part of many lectures given for the Biology, Biomedical Engineering, and Medical Sciences unit of the conference.

Huseman awarded NASA scholarship

Ben Huseman, senior in mechanical engineering, has been awarded a \$7,000 NASA scholarship by the Iowa Space Grant Consortium. This scholarship is based on academic merit and interest in participating in ISGC-funded research. The awardee is supervised by a faculty mentor and is required to complete independent study research that pertains to NASA. Huseman's NASA proposal is entitled "Developing a Novel Algal Culture as a Life Support System under Microgravity Conditions." His research will involve studying microalgae's effectiveness at converting CO2 to O2 in simulated microgravity conditions.



Huseman

Recent Grant Award Announcements

Bryden and McCorkle win Excellence in Technology Transfer award

Professor of mechanical engineering and program director for Ames Laboratory's Simulation, Modeling and Decision Science program, **K. Mark Bryden** and **Doug McCorkle**, Ames Laboratory associate scientist, recently received an Excellence in Technology Transfer Award from the Mid-Continent Federal Laboratory Consortium.



Bryden

Bryden and McCorkle won the award for their development of Virtual Engineering Process Simulator Interface (VE-PSI), a virtual engineering process simulator software. VE-PSI combines information about process simulation – data and models about chemical, physical and biological processes – with computer-aided design drawings and fluid dynamics data to create a comprehensive real-time graphic display of power plant designs. In the interactive virtual environment, engineers can analyze multiple aspects of a proposed power plant at the same time with the aim of optimizing the overall system.

Hanson interns at ConAgra Foods

Mechanical engineering senior **Robert Hanson** has learned first hand from internships how valuable experiential learning really is. In his latest internship, Hanson has spent his summer working at the well-known packaged-foods company [ConAgra Foods](#). The internship has given him a good look at the engineering industry and provided valuable perspective he would not have gained without the internship.



Hanson says he has met some fantastic engineers who have supported him throughout the internship, and he has had experiences he will never forget. One of these includes getting to talk with one of the vice presidents of the company, who was touring the plant for updates.

"Each of the employees at the plant's stations had the chance to present their work to the plant managers and VP, but when they got to our station he specifically asked what I was working on," Hanson explains. "I only talked for about 30 to 40 seconds, but I was proud to share my work with people so high up in the company." ([Full Story](#))

Levitas publishes two papers in highly ranked journals

Valery Levitas, Schafer 2050 Challenge Professor and faculty member of aerospace engineering and of mechanical engineering, has published two papers in highly ranked journals on his theory of virtual melting phenomenon, which describes short-term melting of materials followed by immediate recrystallization.



Levitas

Levitas and **Ramon Ravelo**, a collaborator from Los Alamos



Gap-Yong Kim accepting his DARPA grant.

PI: Gap-Yong Kim

Title: "Manufacturing of High-strength, Lightweight Magnesium Panels with Hierarchical Structures"

Program: Young Faculty Award

Award Amount: \$231,902

Awarding Agency: Defense Advanced Research Projects Agency (DARPA)

The goal of the project is to establish a manufacturing platform that can flexibly create custom reinforcement structures in a magnesium alloy composite panel. A new manufacturing route which will integrate ultrasonic spraying and mushy-state sintering will be developed, and the composite structure-property relation will be studied.

Dr. Kim hopes to deliver a technology that can cost effectively produce high-strength, lightweight magnesium composite panels for applications in armors, protective structures, fuel-efficient vehicles, etc.

Co-PI: Song Zhang

Title: "Development of a Mobile, Automated Tool Mark Characterization / Comparison System"

Award Amount: \$499,000

Awarding Agency: National Institute of Justice



Zhang

We propose the development of a prototype instrument designed to provide forensic examiners with the ability to characterize a tool marked surface, compare the data from that surface to data files obtained from any other surface, and evaluate the likelihood that the two surfaces were made using the same tool. The proposed instrument would serve as a prototype system that could enhance current efforts as exemplified by the National Integrated Ballistics Network (NIBIN). As such it should be recognized that it will still be a research system, not one suitable for immediate and widespread use. However, if successful the system would: 1) be able to compare all types of tool marked surfaces; 2) be portable; 3) provide objective statistical evaluation of data files; 4) elucidate factors that existed when the tool mark was made; 5) provide an open source platform that other researchers can write algorithms for and test, while offering data-files that can be used by any system or researcher; and hopefully 6) provide all these benefits at a greatly reduced hardware cost as compared to current systems in use.

National Laboratory, were published in the Proceedings of the National Academy of Sciences of the United States of America (Levitas and Ravelo, PNAS, 2012), the world's foremost interdisciplinary journal. In their paper "[Virtual melting as a new mechanism of stress relaxation under high strain rate loading.](#)" the researchers have discovered a new and very unexpected mechanism of plastic, or irreversible, deformation in shock waves.

Levitas' second paper "[Crystal-crystal phase transformation via surface-induced virtual pre-melting](#)" was published as a Rapid Communications piece in Physical Review B (PRB), and encompassed the work he has been doing with an experimental group in China. ([Full Story](#))

Tourek receives first place for poster

Graduate student in mechanical engineering **Chris Tourek** received the First Place Poster in Instrumentation Award from the Microscopy Society of America for his poster at Microscopy and Microanalysis 2012. The conference discusses cutting edge microscopy techniques and how to apply them. Tourek presented his work on using atom probe tomography to investigate the native oxide layer and material transfer on the near apex region of atomic force microscopy.

MacDonald given Outstanding Young Investigator Award

Assistant professor and Michael and Denise Mack 2050 Challenge Scholar **Erin MacDonald** recently received the ASME Design Automation Committee Outstanding Young Investigator Award. The Design Automation Young Investigator Award is given to recognize an outstanding young investigator who is making noteworthy contributions in the area of design automation, including research in design representation, design optimization, design evaluation, and/or design integration.



MacDonald

MacDonald's current projects in the Interdisciplinary Research in Sustainable (IRIS) Design Lab include optimizing wind farm layout for landowner concerns; improving designers' ideation skills through behavioral priming; morphing product aesthetics to match consumer preference using novel data; and optimizing product designs with a consider-then-choose consumer decision model.

Hyperion wins design awards



Hyperion and Team PrISUM's official race crew photo for the 2012 American Solar Challenge competition.

Along with a second place over-all finish in the American Solar Challenge in mid-July, Team PrISUM and their solar car Hyperion were given the best electrical and mechanical system design awards from ASC tech inspectors.

PI: Xinwei Wang

Title: "Collaborative Research: Development of a Robust, High-Speed, High-Quality Laser-Assisted Nanomanufacturing System"

Award Amount: \$107,938

Awarding Agency: National Science Foundation



Wang

In this project, Dr. Wang will work with Profs. Qingze Zou and Zhixiong Guo of Rutgers University to (1) clarify and distinguish thermal effect and radiation enhancement effect of the tip during the LA-TBN process, (2) analyze and optimize the fabrication condition for fabrication robustness and quality; (3) develop and implement advanced control techniques to achieve high-speed nanofabrication with no loss of quality, and (4) implement and evaluate the proposed technique by fabricating a maze-like complicated pattern on single crystal silicon, and quantify the line quality, pattern quality, tip uniformity, and laser consumption.

Title: "Graphene-SiC Interface: Effect of Atomic Bonding Type on Thermal Transport"

Award Amount: \$250,000

Awarding Agency: National Science Foundation

In this project, Dr. Wang will work with his team to utilize a novel method involving steady-state joule heating with simultaneous Raman spectroscopy to achieve nanometer-resolution temperature fields probing. This powerful new technique will allow for the study of thermal resistance and how it is influenced by local atomic binding. They will study Van der Waals non-covalent interaction of graphene and substrate and covalent graphene-substrate interactions. An atomic modeling effort will be coupled with the thermal transport data to gain fundamental insights into the physical nature of these interactions and advance theory in solid-state physics. This enhanced knowledge of thermal transport between graphene and substrate may lead to enhanced performance of graphene-based devices.

Hyperion won the Electrical Design Award for its pack design. Adequate space between modules allowed cooling air to pass and the method to mount the cells was well applied. The design included all the High Voltages components located in the pack enclosure. The pack did survive the event unscathed. Wiring was clean, secured and identified for easy service. Team PrISUM's electrical report was applauded by the judges for its in-depth detail and schematics.

The Mechanical Design Award was won by Hyperion for three major reasons. First, the uniqueness of the front suspension in regards to shock loading on three pivot points connecting the two a-arms and the shock tension strut was a design not previously seen by judges. This arrangement removed bending stresses from the two a-arms. Second, the uniqueness of the wheel mounting and wheel nut lock also was new to judges. The integrity of the wheel mounting and the wheel spoke design proved itself during the driving mishap on the second day of racing which caused a failure the bottom a-arm. The wheel mounting and wheel spoke design maintained structural integrity while transferring sufficient load to the bottom a-arm that caused the rear strut of the a-arm to buckle. Finally, Team PrISUM provided an excellent, easy to read mechanical report.

Upcoming Events

August 24 – [VRAC Tour](#)

August 28 – [Engineering Dean Search Open Forum](#)

August 29 – [Engineering Dean Search Open Forum](#)

Septmeber 6 – Women in Mechanical Engineering Welcome Back Picnic, 5 p.m., southeast lawn of Black

September 6 – [College of Engineering Convocation](#)

September 11 – ["Tour the World"](#) Engineering Study and Work Abroad Fair