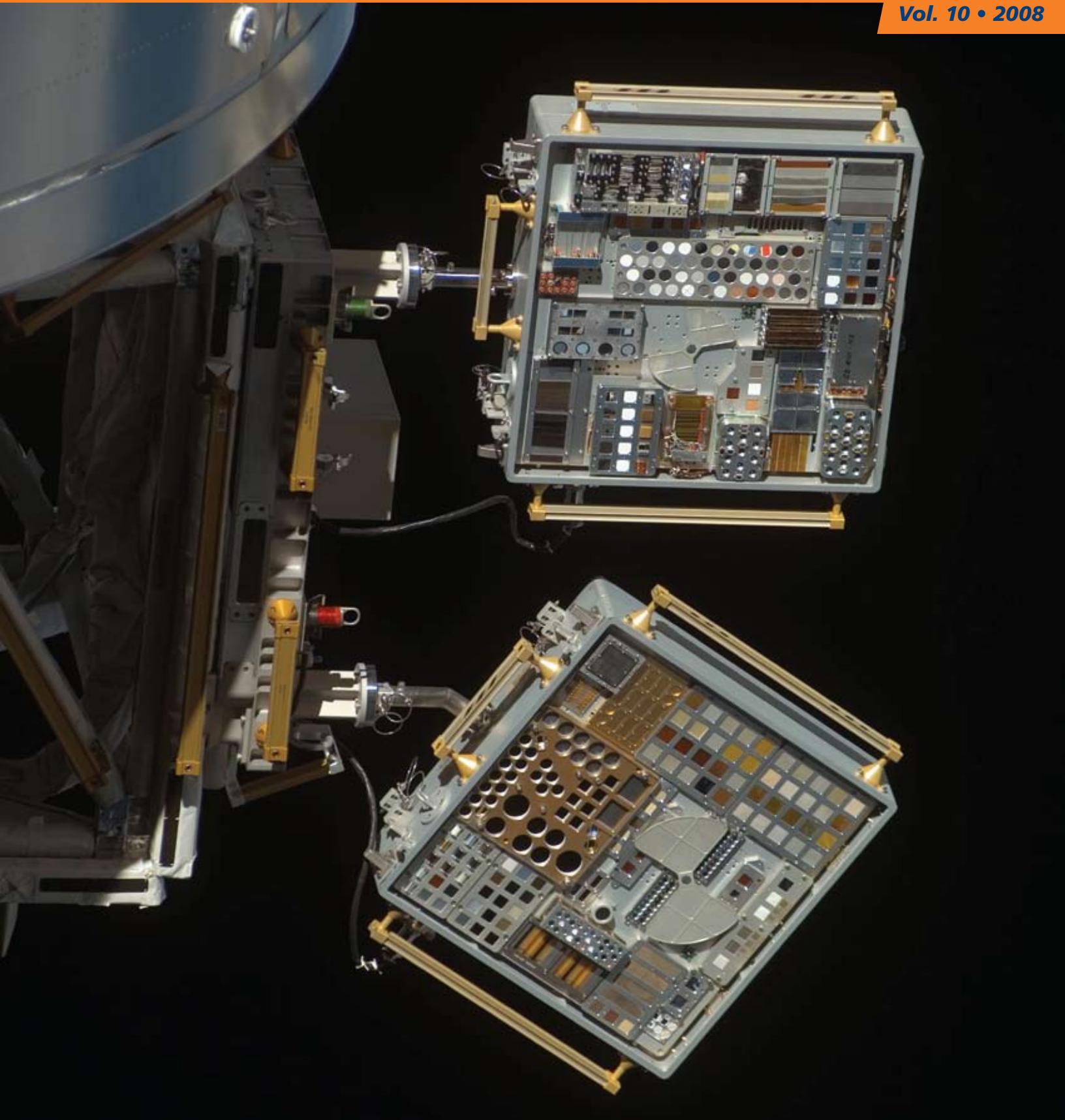


# AE Illinois



Newsletter of the Department of Aerospace Engineering  
University of Illinois at Urbana-Champaign

Vol. 10 • 2008



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## Letter from the Department Head

I am very pleased to write to you in this, my first newsletter, since I became Head of the AE Department in September 2007. Indeed, the past year has been an exciting journey for me as I reflect upon all the happenings in this vibrant and ever-evolving Department.

One of our efforts has been to reach out across the nation to you, our alumni. In addition to the traditional Alumni Board meeting we hold in the fall, we also this year hosted alumni receptions in Houston and at the AIAA Aerospace Sciences Meeting in Reno, and participated in a College of Engineering alumni event in Seattle. We also met with many of you individually in Seattle, Chicago, Los Angeles, San Francisco, and Washington, DC. Wherever we go, it's great to hear your stories about the outstanding education you received and experiences you had during your days in AE at Illinois. It's particularly gratifying when you come full circle and choose to invest in future generations of graduates through participation in AE events and with financial gifts to the department. Our alumni and friends provide our programs with the "margin of excellence" that state educational and federal research funds cannot cover, so you continue to play a pivotal role in our success.

Just as AE did when you were here on campus, the department continues to draw topnotch students. We currently enjoy very strong enrollments with 418 undergraduate and 96 graduate students as of fall 2008. We are proud to report that our students are superbly qualified, with very high entering GPAs, high school percentage ranks, ACT, and/or GRE scores. Talented graduate students, such as Heather Arneson, winner of a highly-competitive NASA Aeronautics Scholarship (see page 22) and Manu Sharma, honored in the Boeing 2008 Student of the Year Awards (see page 21), form the core of our research programs. It is also a blessing to work with our outstanding undergrads, including the teams that swept the AIAA Space Design Competition this year (see page 19).



### On the Cover

Space Station Carries AE Experiment; story on page 28.

**Editor/Writer:** Susan Mumm

**Designer:** Gretchen Wieshuber, Studio 2D



The following pages provide a glimpse of the most noteworthy accomplishments of our students, faculty, and alumni over the past year. So, read and enjoy.

We're also working to enhance our students' experiences. This year, we worked diligently to revise our undergraduate curriculum and streamline the total number of degree hours to 128, to create more flexibility for the students to study abroad, or participate in co-ops and internships. Our plan is to finish this revision and submit it for approval in the very near future. We're also working to improve upon our graduate and research programs, and will report on those efforts in future issues of *AE Illinois*.

Our research efforts also continue to flourish. In the last fiscal year, the research expenditures of our 20 fulltime equivalent faculty exceeded \$7 million, and were spread across our three major groups: aerodynamics/propulsion, controls/dynamical systems, and materials/mechanics. The addition of four new faculty members over the past two years (Dan Bodony, Tim Bretl, Cedric Langbort, and myself) has brought the Department new research emphases in robotics, motion planning, control systems, information technology, aeroacoustics, and high-speed flows. These new faculty add to the depth and diversity of our research efforts, and we look forward to their contributions.

The following pages provide a glimpse of the most noteworthy accomplishments of our students, faculty, and alumni over the past year. So, read and enjoy. We look forward to hearing from you; our contact information is readily available on our website at: <http://ae.engr.uiuc.edu/>.

Sincerely,

Craig Dutton  
Bliss Professor and Head

## Department of Aerospace Engineering

### Tenured/ Tenure Track Faculty

Joanna M. Austin

Lawrence A.  
Bergman

Daniel J. Bodony

Michael B. Bragg

Timothy W. Bretl

Rodney L. Burton

Ioannis Chasiotis

Bruce A. Conway

Victoria L.  
Coverstone

J. Craig Dutton

Gregory S. Elliott

Jonathan B. Freund

Philippe H. Geubelle

John Lambros

Cedric Langbort

Ki D. Lee

Eric Loth

N. Sri Namachchivaya

Natasha A. Neogi

Michael S. Selig

Petros G. Voulgaris

Scott R. White

### Emeritus Faculty

John D. Buckmaster

Harry H. Hilton

Allen I. Ormsbee

John E. Prussing

Lee H. Sentman

Kenneth R. Sivier

Wayne C. Solomon

Shee Mang Yen

Adam R. Zak

### Affiliate/ Adjunct Faculty

Kenneth T.  
Christensen

Naira Hovakimyan

Thomas L. Jackson

Arif Masud

Karel Matous

George H. Miley

James W. Phillips

Srinivasa Salapaka

Nancy R. Sottos

Alexander F. Vakakis

### Administrative Staff

Lori Ballinger-Pankau

Barb Bohlen

Brett Clifton

Kent Elam

David Foley

Diane Jeffers

Barbara Kirts

Kendra Lindsey

Greg Milner

Susan Mumm

Angie Pitard

Staci Tankersley

Jon Weber

### *AE Faculty Listed As Excellent*

Six AE faculty members were included on the Spring 2008 List of Teachers Ranked as Excellent By Their Students, and four were on the Fall 2007 List. AE faculty members who made the Spring 2008 list were Daniel J. Bodony, Bruce A. Conway, Gregory Elliott, Philippe H. Geubelle, Natasha Neogi and John E. Prussing. On the Fall 2007 list were Bodony, Lawrence A. Bergman, Conway and Prussing.



## Rolls-Royce Announces New Partnership with Illinois



Rolls-Royce executives hosted a banquet in March at the Alice Campbell Alumni Center for University of Illinois administrators and staff, including several from the Aerospace Engineering Department, to celebrate a new partnership with the University. From left are: John Gill of Rolls-Royce; Sam Truesdale of Rolls-Royce; AE Prof. Eric Loth; Molly Tracy of the College of Engineering Advancement Office; Kent Studer of the College of Engineering Advancement Office; Doug Dean of Rolls-Royce; Lisa Teague of Rolls-Royce; David Quick of Rolls-Royce; AE Prof. Dan Bodony; Norm Egbert of Rolls-Royce; AE Prof. Mike Bragg; Mechanical Science and Engineering Department Head Huseyin Sehitoglu; AE Department Head Craig Dutton; Gene Jend of Rolls-Royce; Joe Krok of Rolls-Royce; Todd Surinak of Rolls-Royce; and Dan Jensen of Rolls-Royce.

Rolls-Royce, a world-leading provider of power systems and services for use on land, at sea and in the air, this spring announced broad plans to grow its partnership with the University of Illinois. This new relationship, which could evolve into Rolls-Royce establishing a university technology center here, holds many opportunities for students and faculty in units across campus, including Aerospace Engineering.

To kick off this new era, Rolls-Royce provided two, \$10,000 annual scholarships for students studying in a science or technology-related field at the University of Illinois. The scholarships will recognize students of all backgrounds who demonstrate outstanding academic achievement and reflect the core values of Rolls-Royce: reliability, integrity and innovation.

A University of Illinois scholarship committee will select scholarship winners each year. The 2008 winners were Luis J. Mendez, a freshman studying computer science; and Ernest L. Baker, a sophomore studying accountancy.

Norm Egbert, Vice President of Engineering and Technology for Rolls-Royce Corporation said: "Our congratulations go out to Luis and Ernest for their academic success. These scholarships underpin our commitment to fostering an interest in science and technology in young people with a view towards opening the door on future careers in these areas."

"These scholarships are an example of the important relationship that exists between Rolls-Royce and the University of Illinois, who we've chosen to partner with because of their world-class research capabilities, effective training programs and talented students."

Mike Bragg, Aerospace Engineering professor and Executive Associate Dean in the College of Engineering, said of the new development: "Our growing relationship with Rolls-Royce has the potential to impact many students in Engineering and across campus. Research grants, scholarships and fellowships, internships and co-ops are all areas where we hope to increase our interaction."

Company executives shared their ideas for an expanded relationship with the University of Illinois during a banquet they hosted earlier this spring at the Alice Campbell Alumni Center. Among invited guests were Vice Provost Ruth Watkins and Vice Chancellor for Research Chip Zukoski, as well as several administrators from the colleges of Business and Engineering, including Aerospace Engineering faculty and staff. Joining the guests were company officials that included Egbert and John Gill, Vice President of Human Resources.

# New Recipe for Self-Healing Plastic Includes Dash of Food Additive

BY JAMES E. KLOEPEL, PHYSICAL SCIENCES EDITOR,  
UNIVERSITY OF ILLINOIS NEWS BUREAU

CHAMPAIGN, Ill.—Adding a food additive to damaged polymers can help restore them to full strength, say scientists at the University of Illinois who cooked up the novel, self-healing system.

The repair process, in which solvent-filled microcapsules embedded in an epoxy matrix rupture when a crack forms, is a major improvement over the original self-healing process first described in February 2001.

“While our previous solvent worked well for healing, it was also toxic,” said Scott White, a professor of aerospace engineering and a researcher at the university’s Beckman Institute. “Our new solvent is both non-toxic and less expensive.”

During normal use, epoxy-based materials experience stresses that can cause cracking, which can lead to mechanical failure. Autonomic self-healing—a process in which the damage itself triggers the repair mechanism—can retain structural integrity and extend the lifetime of the material.

Designed to mimic the human body’s ability to repair wounds, self-healing materials release a healing agent into the crack plane when damaged, and through chemical and physical processes, restore the material’s initial fracture properties.

In November 2007, White and collaborators reported the use of chlorobenzene, a common—but toxic—organic solvent, which in epoxy resins achieved a healing efficiency of up to 82 percent.

In their latest work, which combined a non-toxic and Kosher-certified food additive (ethyl phenylacetate) and an unreacted epoxy monomer into microcapsules as small as 150 microns in diameter, the researchers achieved a healing efficiency of 100 percent.

“Previously, the microcapsules contained only solvent, which flowed into the crack and allowed some of the unreacted matrix material to become mobile, react and repair the damage,” said graduate research assistant Mary Caruso. “By including a tiny amount of unreacted epoxy monomer with the solvent in the microcapsules, we can provide additional chemical reactivity to repair the material.”

When the epoxy monomer enters the crack plane, it bonds with material in the matrix to coat the crack and regain structural properties. In tests, the solvent-epoxy monomer combination was able to recover 100 percent of a material’s virgin strength after damage had occurred.

“This work helps move self-healing materials from the lab into everyday applications,” said graduate research assistant Benjamin Blaiszik. “We’ve only begun to scratch the surface of potential applications using encapsulated solvent and epoxy resin.”

In addition to White, Caruso and Blaiszik, the other co-authors of the paper were materials science and engineering professor and AE affiliate professor Nancy Sottos and chemistry professor Jeffrey Moore. The researchers reported their findings in the scientific journal *Advanced Functional Materials*.

The work was supported by the U.S. Air Force Office of Scientific Research and the U.S. Department of Defense. Some of the work was performed at the university’s Center for Microanalysis of Materials, which is partially supported by the U.S. Department of Energy.



L. Brian Stauffer

**U. of I. researchers have improved a self-healing process originally described in 2001. In the new repair process, solvent-filled microcapsules that are embedded in an epoxy matrix rupture when a crack forms. The new solvent is non-toxic and less expensive. Researchers: from left, Jeffrey Moore, a professor of chemistry; Nancy Sottos, a professor of materials science and engineering and AE affiliate professor; Scott White, a professor of aerospace engineering; and graduate research assistants Mary Caruso and Benjamin Blaiszik.**

## Coverstone, Walenczewski Receive Pierce Awards



**Victoria H. Coverstone**

AE Prof. Victoria H. Coverstone and Sylvee Walenczewski, who graduated with her bachelor's degree in May, have won the 2008 Stanley H. Pierce faculty and undergraduate awards, respectively, from the College of Engineering at the University of Illinois at Urbana-Champaign.

The awards, established in 1969 to honor Stanley H. Pierce, an associate dean, are in recognition of a faculty member's and student's efforts to develop empathetic student-faculty cooperation.

### **Prof. Victoria H. Coverstone**

Over the past 12 years, students from Coverstone's senior design class have taken first, second, or third place—sometimes all three—in the AIAA national design competition, the result of high standards set for these capstone projects. Coverstone has established a strong teaching record with the ability to motivate students to pursue advanced work. With AE Prof. Philippe Geubelle, she redesigned the space section of the Department's introductory freshman course, adding a section on spacecraft design and performance, which includes the design, building, and launch of a payload-carrying model rocket to conduct flight experiments and gather data to verify classroom exercises. Currently, she is working to create another version of the course called BalloonSats that was offered for the first time last spring.



**Umberto Ravaioli, Interim Associate Dean for Academic Programs, presents the Pierce Award to AE undergraduate Sylvee Walenczewski, who now works for Lockheed Martin Space Systems in California.**

As campus director of the NASA Illinois Space Grant, Coverstone was a co-founder of the Undergraduate Research Opportunities Program, initiating the program and securing funding from Boeing, NASA, and other sources. Since the program's 2004 beginning, 85 students have connected with approximately 75 faculty research programs. In 2002, with ECE Prof. Gary Swenson, Coverstone co-founded the CubeSat program that has introduced over 100 students

to the design, development, and flight of earth satellites. She continues as co-director of this program, which is now building its second satellite.

Coverstone was selected for the AIAA student chapter's Teacher of the Year Award in 1995, 1997, and 2001. She has received both the College of Engineering Teaching Excellence Award and the Everitt Award for Teaching Excellence, as well as an

Honorable Mention for the Campus Award for Excellence in Undergraduate Teaching. In addition, she has appeared on the "Incomplete List of Teachers Ranked as Excellent by Their Students" 11 times and has received eight College of Engineering Excellence in Advising awards. Beginning in fall 2006, Coverstone was appointed associate head for graduate studies in the AE Department. Most recently, she has assumed a similar position as associate dean for graduate and professional programs for the College of Engineering.

### **Sylvee Walenczewski**

Walenczewski's teachers considered her to be one of the most talented students in AE. She speaks four languages, and her broad interests range from chairing Habitat for Humanity locally, to being a regional finalist with a paper on rocket engines (in Russian) in the Moscow Technical Paper Competition. Throughout her undergraduate career, Walenczewski has worked diligently to create empathetic student-faculty relations. She has chaired the Aerospace Undergraduate Advisory Board, worked with the Department's faculty and administration on curriculum revisions, helped increase study-abroad participation, helped the Department with enrollment retention, and helped to provide students with computer lab access.

To help students get to know the faculty, she developed a set of AE faculty trading cards, featuring each professor's photo, area of concentration, PhD degree information, number of years at Illinois, and a "fun fact." Two years ago, in addition to attending all of the events related to AE Prof. John Prussing's retirement, Walenczewski commissioned a life-sized cardboard cutout of the Department's beloved professor and placed it in the office so he would "always be around."

Walenczewski is a dedicated member of the Illinois Space Society, the American Institute of Aeronautics and Astronautics (AIAA), Students for the Exploration and Development of Space (SEDS), and Sigma Gamma Tau, the honor society for aerospace engineering. She is a member of the Polish Club as well as the Russian conversation table.

From January to June 2006, Walenczewski studied at Moscow Technical University. There she worked with SEDS colleagues at Illinois to begin establishing a sister chapter for the organization at MTU. Recently, both the U of I chapter and the MTU chapter shared a CubeSat launch on the same booster rocket, a result of connecting Russian students and faculty with their counterparts at Illinois.



## **Austin Wins Young Investigator Award**

AE Assistant Prof. Joanna M. Austin has received a Young Investigator Award from the U.S. Air Force Office of Scientific Research. Austin's proposal was one of 29 chosen from among 215 submitted.

Austin's work for the award studies hypervelocity boundary layers for axisymmetric engine flowpaths. Her research interests focus on reacting, compressible flows. Other current research projects include the study of thermochemical nonequilibrium effects on transition and turbulence in hypervelocity flow; hotspot formation and detonation initiation in heterogeneous energetic materials; the study of compressible flows in geological applications, such as volcanic blasts and impact craters; compressible flows at small scale; and engine exhaust studies for the supersonic business jet.

## **Bodony is AIAA Teacher of the Year**

In only two years time, Daniel J. Bodony has already made a lasting impression upon AE's students. The local American Institute of Aeronautics and Astronautics (AIAA) student chapter selected the young faculty member as AE's 2008 Teacher of the Year. He also has been listed this year in Who's Who in Engineering Education.

Bodony's research has particular emphasis on flows that generate sound, using large-scale simulations (large-eddy and direct numerical simulations) and analytical methods. His work includes high-speed flows (e.g., the noise produced by modern turbo-fan engines and turbulent jets), low-speed flows (e.g., the sound produced by the human voice), and in the interaction of a compressible fluid with mechanically and thermally compliant structures.

## **Bragg is New AIAA Vice President; Muellner Assumes Organization's Presidency**

AE Prof. Michael B. Bragg is the new Vice President, Publications, of the American Institute of Aeronautics and Astronautics.

Bragg was selected during the 2008 AIAA Board of Directors election in April, and assumed office in May. Also at that time, AE alumnus and Alumni Board

member George K. Muellner, BS 1967, assumed office as AIAA President.

In addition to serving on the AE faculty, Bragg also is Executive Associate Dean in the College of Engineering. Bragg served as AE Department Head from 1999 until 2006, having joined AE in 1990.

Muellner retired as president of Advanced Systems for the Integrated Defense Systems business unit of the Boeing Company, responsible for developing advanced cross-cutting concepts and technologies, and executing new programs prior to their reaching the System Design and Development phase. Since starting with Boeing in 1998, Muellner has held a variety of positions, including vice president-general manager of Air Force Systems and president of Phantom Works, the advanced research and development unit.

## **Chasiotis' Work in MEMS and Nanostructured Materials Recognized**

The work of AE Associate Prof. Ioannis Chasiotis and his graduate students in MicroElectroMechanical Systems (MEMS), thin films and other materials has been well-received and recognized over the past year.

Chasiotis received a 2007 Office of Naval Research Young Investigator Program Award for his proposal on Polymer Nanocomposites, work that aims at bringing nanotechnology to the service of the U.S. Navy. In 2008 he was also selected for an NSF-CAREER award from the Materials Design and Surface Engineering Program at the National Science Foundation. This five-year award will support his group to develop a research program on soft/hard interfaces in polymeric materials with applications to Aerospace Engineering.

In addition, an article he co-authored with his graduate students on "Mode I and mixed mode fracture of polysilicon for MEMS," published by the *Fatigue and Fracture of Engineering Materials and Structures* in January 2007, received the journal's 2007 Best Paper Award. According to the award, "This paper addressed for the first time experimentally the



**Joanna M. Austin**



**Daniel J. Bodony**



**Michael B. Bragg**



**George K. Muellner**



**Ioannis Chasiotis**

problem of mixed mode fracture in brittle materials for Microelectromechanical Systems (MEMS) by novel experiments coupled with a detailed numerical analysis. A key finding of this paper is that fracture of brittle thin polycrystalline silicon films that are routinely used in MEMS is stochastic in nature, because it is strongly controlled by the random orientation of individual nanoscale grains comprising the material. As a consequence, one cannot talk about a unique value of fracture toughness for such thin films, but rather a broad envelope of fracture toughness values with the grain boundaries providing a toughening effect."

The research interests of Chasiotis' group are experimental mechanics at the nanoscale with emphasis in

mechanical reliability, fracture, and fatigue of MEMS, NanoElectroMechanical Systems (NEMS), and thin film electronic materials. These materials are employed to fabricate microscale sensors for common engineering systems including aircraft and satellites. In addition, his group is working on the experimental failure mechanics of inhomogeneous and anisotropic materials for lightweight applications with emphasis in the nanoscale deformation and damage mechanics of polymer nanocomposites.



**Jonathan B. Freund**

### **Freund Chosen for APS Frenkiel Award**

Jonathan B. Freund, associate professor in Aerospace Engineering, has been selected as the 2008 winner of the Francois Frenkiel Award, a prestigious honor given by the American Physical Society's Division of Fluid Dynamics.

Freund was chosen for his paper, "Leukocyte margination in a model microvessel," published in the February 20, 2007, online edition of *Physics of Fluids*. The Frenkiel Award recognizes significant contributions to fluid mechanics that have been published by young investigators in *Physics of Fluids* during the preceding year.



**Philippe H. Geubelle**

Freund's research concerned the fluid mechanics of white blood cells when a body responds to physiological inflammation. Said Freund, "As part of inflammation, the white cells somehow get preferentially pushed toward the walls of vessels. There have been lots of ideas about why this happens. My simulation model suggests that it just involves the interaction with the red cells."

Continuing, he said, "I was also able to look at the detailed flow when a white cell is near the wall and explain, in part, why, once there, it is in a relatively stable configuration. I developed a sophisticated simulation tool to study these mechanisms."

Freund has appointments in Aerospace Engineering and in Mechanical Science and Engineering at Illinois. His research areas include aerodynamic sound, compressible turbulence, numerical methods, large-scale parallel computing, molecular dynamics simulation of nanometer scale flows and heat transfer in solids.

### **Geubelle Earns Best Paper Award**

Prof. Philippe H. Geubelle and his colleagues have been recognized by the Materials Division of the American Society of Mechanical Engineers (ASME) as the authors of the Best Fatigue and Fracture paper published in the *Journal of Engineering Materials and Technology* between July 2006 and June 2007.

The paper, "Continuum and Molecular-Level Modeling of Fatigue Crack Retardation in Self-Healing Polymers," was co-written by Spandan Maiti, Chandrashekar Shankar and John Kieffer. The paper, which appeared in the journal's October 2006 issue, describes a multi-scale model of the fatigue response of the self-healing polymers developed at the University of Illinois by a group led by Prof. Scott White. Geubelle's research interests are theoretical and computational solid mechanics, (dynamic) fracture mechanics, multiscale modeling of complex materials, computational aeroelasticity, massively parallel computing, solid mechanics issues in manufacturing, and computational design of novel autonomic materials.

Geubelle is the AE Associate Head for Graduate Programs and directs the Illinois Space Grant Consortium.



## Voulgaris Awarded NCSA Fellowship

Aerospace Engineering Professor Petros Voulgaris has been awarded a National Center for Supercomputing Applications (NCSA) Fellowship for his project, "Simulation-Based Performance and Robustness Analysis of Large Distributed Control Applications."

Voulgaris, a 17-year veteran of the AE Department, was one of five Engineering faculty members awarded fellowships. Projects from a total of nine researchers across the University of Illinois at Urbana-Champaign were chosen for the honor.

The fellowships are a joint effort between the Urbana campus and NCSA. Through this program, faculty can access and benefit from NCSA's high-performance computing and storage environment, cutting-edge visualization and data analysis capabilities, and opportunities for multidisciplinary collaboration.

Voulgaris' research interests include robust and optimal control and estimation, structured and distributed control, networks and control, and applications of advanced control and estimation methods to engineering practice.

His project through NCSA builds on recent technological advances that have made it possible to construct complex systems and networks with a very large number of actuation and sensing devices possessing communication and computation capabilities. For example, in the case of large arrays of Micro-Electro-Mechanical-Systems (MEMS), there are potentially tens of thousands of actuator/sensor and imbedded control sub-systems. Similarly, for systems like giant segmented telescope mirrors, several thousands of sensors and actuators are present.

However, a standing hurdle in validating the performance of such complex systems is high fidelity simulation. In particular, for the high precision systems like telescopes or microcantilever arrays on which this project concentrates, where accuracy requirements reach the nano-meter scale, it is essential to have a detailed model and simulation capability.

Voulgaris plans to use NCSA expertise in order to obtain reliable simulation capability that can test thoroughly the distributed control system. These high fidelity simulation models will require the use of several software tools (ABAQUS, Simulink, Matlab and interfaces) in parallel performing massive computations.

For example, an estimated minimal computational ability to perform only 0.5 sec simulation for an overly simplified 1000-microcantilever array model, under

closed loop and with 10 states in every subsystem, runs into hundreds of peta flops.

With more reliable models and graphic capability, the overall computational task can become a challenge met only by using NCSA expertise. By developing this master computing framework for such applications, Voulgaris' group will be able to simulate these complex systems in closed loop control, reliably analyze their performance and robustness characteristics, and provide enough tangible evidence for their successful operation.

## SciAm 50 List Recognizes White, Sottos

Aerospace Engineering Prof. Scott R. White and affiliate Prof. Nancy R. Sottos were included in the SciAM 50 for 2007, a distinct honor that appears in the January 2008 edition of *Scientific American* magazine.

The awards list recognized 50 individuals, teams, companies and other organizations whose accomplishments in research, business or policymaking during 2006-2007 demonstrate outstanding technological leadership. The SciAM 50 honorees were celebrated for their contributions to areas including biotechnology, microelectronics, energy and genetics. White and Sottos, of Materials Science and Engineering, were recognized for their development of self-healing materials. Both White and Sottos are Donald Biggar Willett Professors in the College of Engineering.

White was also recognized for this research by the Champaign County Economic Development Corp. and several University of Illinois groups when they honored him with the Innovation Discovery Award in February. These awards are designed to encourage technological development in Champaign County, Illinois.

## Engineering Council Honors AE Faculty

Emeritus Prof. John E. Prussing has been honored with the 2008 Engineering Council/Accenture Multi-Year Faculty Achievement Award.

Profs. Lawrence A. Bergman and Victoria L. Coverstone and Associate Prof. Jonathan B. Freund have been recognized with the 2008 Engineering Council Award for Excellence in Advising. AE Alumnus Robert E. Tatro, BS 49, and his wife, Mary, made a donation to the AE Department so that the advising honors would include a monetary award as well.



Petros Voulgaris



Scott R. White



Nancy R. Sottos

## At Illinois, Everyone Counts as a Member of the Alumni Association

The University of Illinois Alumni Association (UIAA) has introduced a new membership model that is the first of its kind among major alumni associations. The UIAA now automatically extends membership to all alumni and all currently enrolled students. Membership is also available to former students, faculty, staff, parents of students, and friends of the University, upon request.

During recent University-wide strategic planning efforts, the Alumni Association explored new ways to connect with more alumni and engage their talents, support and advocacy for the University of Illinois and the Urbana campus. As a result, the UIAA Board of Directors endorsed an all-inclusive membership plan.

That means a group of more than 400,000 alumni who have a shared interest in a vibrant, thriving University of Illinois. Adding in alumni from the UI sister campuses in Chicago and Springfield, that number increases to an even more impressive 600,000.

In this case, there is strength in numbers. The U of I Alumni Association wants to foster a collegial environment that involves as many alumni and students as possible with Illinois and with each other—now and throughout their lives.

For those who are already Life Members of the Alumni Association, the UIAA continues to honor their commitment and appreciate their support.

Although this new plan requires no dues, those who choose to make annual gifts of \$50 or more will be recognized as Sustaining Members. Going forward, Life Membership is attained when cumulative Alumni Association-designated gifts reach \$1,000. And a new Sustaining Life Member category will recognize existing Life Members who voluntarily make additional contributions.

Sustaining and life membership levels activate additional benefits and services, such as a subscription to Illinois Alumni magazine and access to the vast Pro-Quest online periodicals database library, in addition to tax-deductible gift credit from the University.

The U of I Alumni Association invites all alumni and students to actively participate in the incredible Illinois alumni network—the world’s largest alumni community—a highly diverse and global family with shared experiences and pride in the University of Illinois. To learn more about how you can get involved, visit [www.uiaa.org](http://www.uiaa.org).

### Here’s How to Support Your Alma Mater

In support of high-quality education in the Department of Aerospace Engineering, enclosed is my gift of:

\$1,000    \$500    \$250    \$100    Other \_\_\_\_\_

I have enclosed a check in the above amount made payable to:  
 UIF/AE unrestricted fund (lab improvements, student activities)  
 Other AE fund \_\_\_\_\_

I authorize the U of I Foundation to collect my gift in the amount above through the credit card checked:  
 Visa    MasterCard   Card no.: \_\_\_\_\_ Exp. date: \_\_\_\_\_  
 Discover    American Express   Signature: \_\_\_\_\_

My company, \_\_\_\_\_, will match my gift with \$ \_\_\_\_\_  
 I am enclosing my employer’s Matching Gift form.

Name \_\_\_\_\_  
 Home address \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Return this form and your check to:  
 University of Illinois Foundation  
 P.O. Box 3429  
 Champaign IL 61826-9916

When you use a credit card, you can fax your donation to 217-333-5577.  
 Please send to the attention of Cash Receipts.

I understand that this gift is tax deductible as allowed by law.

5M5DH

## Greetings from Your Alumni Constituent Board

We have just completed our 2008 AE Alumni Board meeting, and it has caused me to think about a couple of topics that should be of interest to you.

First let me congratulate those faculty and students who have won awards during the past year, especially the student teams that swept the AIAA Space Design Competition. This is one very good sign of a vigorous and talented Department. I want to also acknowledge Craig Dutton who has picked up the reins as Department Head and by all indications is doing a very good job.

We added something new to our meeting this time. In the past we have generally listened to and commented upon information that members of the Department presented us. This time, Board members prepared some short presentations on the "state of the industry" in four different categories:

- large aviation projects
- large space projects
- small aviation and general aviation projects and
- commercial and entrepreneurial projects.

The intent of these presentations was to give the Department an indication of what kind of skills new graduates should have as they enter the workforce and the types of topics the Department should be teaching to its students. We also wanted to give an indication of longer term technology trends that would require research in areas of interest to the Department. This seems to have been a useful experiment and we plan to continue with it next year. But we will look for an appropriate location so that we can invite a larger number of faculty and students to hear these presentations.

As I am writing this article, this idea of trends in the industry and the skills needed to be ready to work in these areas has been reinforced for me. I am sitting in a NASA van located on top of a lava flow at about 7,000 feet altitude in the middle of nowhere (actually in the northwest corner of Arizona, near Flagstaff, not far from where some early testing and training for Apollo took place). This van is a sort of miniature mission control supporting one concept for a small, two-person pressurized rover that NASA is evaluating for lunar missions not scheduled for flight until after 2020. These tests are important for a number of reasons. One very important reason is that analysis can only go so far before you have to build some of these concepts and try them out, especially when you are trying to do something that has rarely, if ever, been done before.

The picture I have included here shows NASA's current best understanding of what a two-person pressurized rover, capable of performing the kinds of missions NASA wants to perform, could look like. But this is a means for NASA to get a better understanding of the real implications of a design before they start building flight hardware. The engineers and astronauts and mission controllers participating in these tests will learn lessons from this and look at whether their preliminary analyses hold up, or if they need to be changed. And there will undoubtedly be more field tests like this.

You may be asking yourselves why I am using a wheeled vehicle as an example for an Aerospace Engineering Department. Those of you who remember their history will recall that the only other human surface transportation vehicle—the Lunar Rover Vehicle—was not the work of Ford or GM, companies that NASA first approached. Instead, Boeing did the design work and construction. This aerospace company understood not only the environment in which this rover would operate but also the transportation system that would be used to deliver it and the other systems with which it would interface. Those of you who are students now are likely to have an opportunity to work on the development of this new lunar rover in the not too distant future. And the education you are receiving now will give you the broad-based tools you will need to successfully work on the design of a surface rover or a lunar lander or a spacecraft that will always operate in space. But analytical tools will only get you close to the final design. You will still need to build and test your ideas to understand if they will really do what you want them to do, and to reveal facets of the vehicle's operation that become apparent only when your design must interact with other systems. This is where lab classes and design-build-fly contests will help take your understanding beyond what can be accomplished with analysis alone.

I am looking forward to reading about Aerospace Engineering Department graduates playing a leading role in developing the next generations of aerospace vehicle, whether they fly in the air, in space, or rove around on the surface of other planets.

Stephen J. Hoffman, Ph.D.  
78, 80, 84



**Model of a two-person, pressurized space rover.**



## Class Notes

**JOHN NICHOLAS, BS 68**, recently published two books, *The Portal to Lean Production* and *Project Management for Business, Engineering, and Technology*, the later of which includes several examples and illustrations from the aerospace industry. He is a professor of operations management at Loyola University Chicago, where he has been since 1977.

**PETER G. HUSEMAN, BS 79, MS 80**, has been named Senior Manager for the Aerosciences Organization on the Orion Program for Lockheed Martin Space Systems in Denver. Orion, also known as CEV (Crew Exploration Vehicle), is a NASA contract Lockheed has been awarded through 2013.

**ALEXANDER ANTARTIS, MS 81**, visited the Aerospace Engineering Department with his son, Dimitrios, who transferred to AE as an undergraduate this fall. Alexander is Director of Research and Development for Hellenic Defense Systems in Athens.

**CLARK SNODGRASS, BS 85**, recently returned to campus to speak to aerospace and other engineering students at the Illinois Space Society monthly meeting. He spoke on "Building Satellite Systems: Advancing our Understanding of the Universe We Live In." Snodgrass works at Northrop Grumman Space Technology in Redondo Beach, California where he is the Director of System Engineering Integration Test and Operations for the National Polar-Orbiting Operational Environmental Satellite System (NPOESS), the nation's next generation environmental and operational weather system. While visiting the University of Illinois, he was pleased to catch up with Profs. John Prussing, Harry Hilton, and Bruce Conway.

**DANIEL T. JENSEN, BS 88**, has been appointed Chief of Engineering Management Systems for Rolls-Royce Corp. In this role, Jensen will be responsible for leading this new team, including Product Definition Processes, Configuration Services, Publication Services, Engineering Data Services and Outsourcing Services, to define and implement efficient approaches to managing the engineering process and documentation. Engineering Management Systems is a new organization comprised of functions that were previously part of Propulsion and Power Systems Engineering, Operations Engineering and Engineering Improvement. Jensen joined Rolls-Royce in 1995 and has worked in various engineering roles during this time, most recently as the Global Engineering Collaboration Team Lead in support of the Rolls-Royce Product Lifecycle Management (PLM) development program. He also previously worked for six years at Boeing in various aerodynamics, controls, and propulsion engineering roles.

Visiting campus for the Fall 2008 Engineering Employment Expo were AE alumni **TODD KELLER, BS 91**, MSV Mission Systems Manager for Boeing Satellite Systems International, Inc. in El Segundo, California; **PAUL MARTIN, BS 06**, civilian Flight Test Engineer for Naval Air Systems Command in Patuxent River, Maryland; and **RICHARD "TRIP" PAGE, BS 05, MS 07**, from Analytical Graphics, Inc. (AGI), Pennsylvania.

**ERIK ANTONSEN, BS 97, MS 01, PHD 04**, is back on campus to finish medical school as the last part of his MD/PhD program. He spent the last year in Zambia, Africa, as a Scholar for the National Institutes of Health/Fogarty International Center Research Program. Antonson plans to pursue aerospace medicine.

AE alumni **JULIA LAYSTROM, BS 00** and **BRIAN WOODARD, BS 01, MS 04**, were married on Sunday, May 25, 2008, at the Illini Union. AE alumni in attendance were: **DAVID CARROLL, BS 85, MS 86, PHD 92**, **TYLER FIELD, BS 05, KIRK KITTELL, BS 03, MS 06**, **CASEY HOERCHER, BS 07, EDWARD WHALEN, BS 01, MS 03, PHD 07, MATTHEW HAUSMAN, BS 01, SCOTT ZIMMER, BS 01, STEVEN NEURAUTER, BS 00, MS 02, JENNIFER HARGENS RYSANEK, BS 97, MS 01, PHD 06, FILIP RYSANEK, BS 98, MS 02, PHD 07, GABRIEL BENAVIDES, BS 01, MS 04, MATTHEW SEXTON, BS 03, MILES JOHNSON MS 07, HEATHER ARNESON MS 07, JOSEPH ZIMMERMAN, BS 01, MS 03, and DARREN KING, BS 96, MS 00.**

AE alumni very active in the American Astronautical Society (AAS) include **KIRK KITTELL, BS 03, MS 06**, and **JEFF ELBEL, BS 90, MS 93**. Kittell is Vice President-Education and serves on the AAS Executive Committee as liaison to Students for the Exploration and Development of Space -USA (SEDS-USA). Elbel is the Editor of *SPACE TIMES* magazine. Kittell is a systems engineer at Orbital Sciences Corporation and Elbel is an engineer at SAIC in Schaumburg, Illinois.

**ANDREA (FRANZEN) LACKEY, BS 06**, is now in charge of FAA compliance for Frasca International in Urbana, Illinois. Previously, she was working at Rolls-Royce in Indianapolis.

Both **JOHN MACKIN, BS 06, MS 08**, and **ADI BOULOS, BS 08**, have accepted positions in Mission Control at NASA Johnson Space Center in Houston. They join other alums, **CATHY KOERNER, BS 87, MS 89**, and **MIKE MISIORA, BS 94**.

**JON HUFFMAN, BS 08**, has taken a position with United Space Alliance as an ISS Flight Controller and Astronaut Crew Instructor with the Motion Control Group. He reports the work at NASA is "absolutely fantastic!"

# In Memoriam

**ERIK C. RINGSTAD, BS 90**, 39, of Geneva, Illinois, died May 21, 2008, at his home. He was born Oct. 22, 1968 in Chicago. Erik was formerly employed by Accenture Consulting in Chicago. He also was a member of St. Peter's Catholic Church and the Fox Valley Aero Club. He is survived by his daughter, Emma; his parents, David and Joyce Ringstad of Geneva; and a sister, Dawn (James) Jacoby of Downers Grove, Illinois.

**CHARLES E. BOND, PROFESSOR EMERITUS OF AEROSPACE ENGINEERING**, died Jan. 5, 2008, at the Champaign County Nursing Home, Urbana.

Bond was born Feb. 1, 1930, at Royston, Georgia, a son of Jones T. and Irene Nelson Bond. He earned a bachelor's in physics from the Georgia Institute of Technology in 1951. He earned a master's in Aerospace Engineering and a doctorate in Aeronautical and Astronautical Engineering from the University of Michigan in 1956 and 1964, respectively.

He was Project Engineer at the Jet Propulsion Lab at the California Institute of Technology in Pasadena, California, from 1956 to 1957. Bond was also Lead Scientist for the hyperthermal wind tunnel group at AVCO Research and Advanced Development Division in Wilmington, Massachusetts.

Bond was Professor of Aerospace Engineering at the University of Illinois at Urbana-Champaign from 1964 until his retirement in 1999. His work centered on supersonic and hypersonic wind tunnel testing and electric arc research. While at the University of Illinois, he designed the thermionic rail accelerator, a unique experimental facility for conducting research in plasma physics. He taught courses in aerodynamics, magnetohydrodynamics, and electric propulsion. Bond developed and taught university courses in renewable energy sources, wind power technology, the energy-environment crisis, and technology assessment for non-engineers.

He was a member of the American Wind Energy Association, the American Solar Energy Society, the American Institute of Aeronautics and Astronautics, and the American Society for Engineering Education.

Bond also was an actor, appearing locally in community theater and university productions of "The Glass Menagerie," "Blithe Spirit," "Arsenic and Old Lace," "A Thousand Clowns" and "Look Back in Anger," among others. He served as president of the Champaign-Urbana Community Theatre in 1970 and 1971.

In 1968 Bond and his wife, Carol, formed a comedy team known as "Charles and Carol," and for the next four years performed their original comedy show for many Central Illinois organizations, including the USO at Chanute Air Force Base and the Society of Professional Engineers.

Bond's professional acting credits include "Two for the Seesaw" at Red Barn Playhouse in Rockton, and many productions at The Little Theater on the Square in Sullivan, including "Sweet Charity," "Teahouse of the August Moon," "Annie Get Your Gun," "1776" and "A Christmas Carol."

Concerts that students and faculty of the University of Illinois Department of Dance gave at the Krannert Center for Performing Arts inspired Bond to write poetry reflecting his singular gift for capturing in words the movement, the color, the meaning, and the grace of dance.

He married Carol A. Unzicker on April 4, 1971, at Champaign. She survives. Also surviving are three sons, Turner D. Bond of Columbia, Mo., Nelson K. Bond of Champaign, and Kyle E. Bond of Wauconda; three daughters, Laura S. Bond-Harris of Naperville, Irene Bond Anderson of Batavia and Cynthia D. Bond of Chicago; one stepson, Timothy Unzicker of Naperville; five grandchildren, Grayson Bond, Lindsay and Andrew Bond-Harris, and August and Dixon Anderson; and two sisters, Janet Chester of Savannah, Ga., and Alice Nelson Caldwell of Atlanta, Ga.

Bond's parents and his first wife, Frances Dixon Bond Turquette, preceded him in death.



Charles E. Bond

## AE Alumnus to Head Spaceport America



Steven Landeene

The New Mexico Spaceport Authority (NMSA) Board in January hired Steven Landeene, BS 86, as the new Executive Director for Spaceport America, the nation's first purpose-built commercial spaceport.

"Steven Landeene's credentials speak for themselves," said New Mexico Governor Bill Richardson. "His years of experience in engineering and business will be beneficial to marketing the aerospace industry and more importantly, to this critical stage for Spaceport America."

Landeene has extensive experience in aerospace-related fields, including 20 years with Honeywell Aerospace and three years with Landmark Aviation. As the Director of Aftermarket Services Marketing, Sales and Support at Honeywell International, Inc., Landeene served as the global marketing and sales support leader for the company's aftermarket services. Most recently, Landeene served as the Director of Strategy and Planning for Sales and Marketing of Landmark Aviation out of Phoenix, Arizona.

"I'm excited to be spearheading such a groundbreaking endeavor that will create increased commercial access to space," said Landeene.

As the Executive Director for Spaceport America, Landeene's duties include the oversight of all spaceport operations, staffing, planning and development. His role encompasses working as a liaison between government entities and managing the Spaceport's public relations. In addition, he works closely with New Mexico State University, nurturing a unique educational partnership between Spaceport America and the New Mexico education system. Landeene's first task as Executive Director has been to transition Spaceport America from planning to actualization.

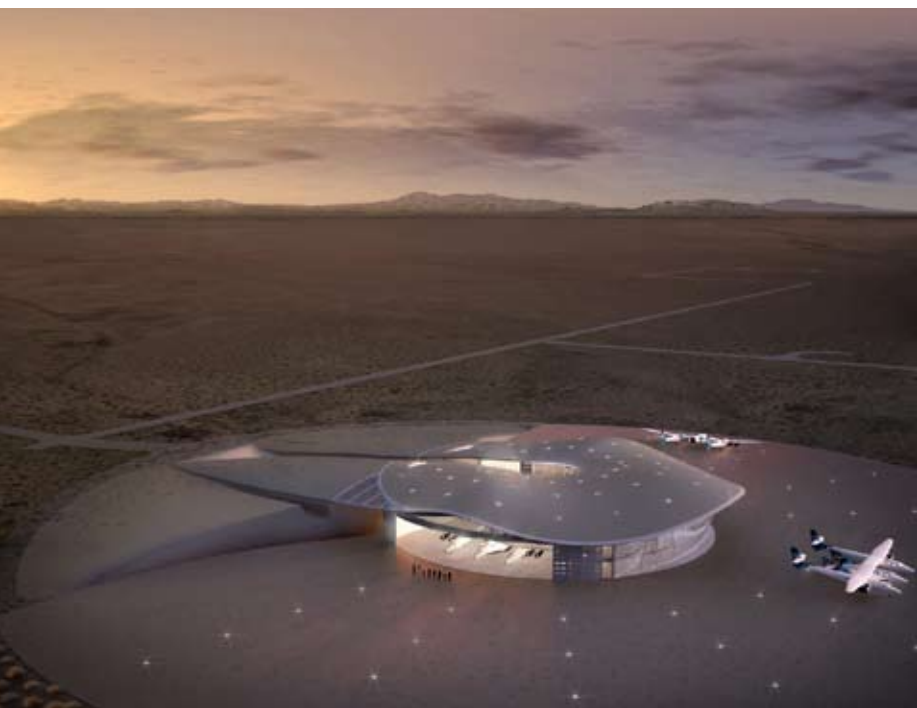
Spaceport America, a landmark project, is poised to become one of the world's leading commercial spaceport centers to be completed in Sierra County, 45 miles northeast of Las Cruces. According to economic forecasts by NMSU and Futron, Spaceport America may spur up to 5,000 new jobs and up to \$1 billion in new revenue in the state. Spaceport America is scheduled to open for business in mid 2010.

A number of developments for Spaceport America have occurred since Landeene assumed the directorship.

In April, UP Aerospace, Inc., the first company to launch a commercial payload at Spaceport America, agreed to make its home for spaceflight operations at the New Mexico facility for the next 10 years. Also in April, Lockheed Martin, one of the world's top aerospace companies, entered into an agreement with the NMSA to conduct operations from Spaceport America.

Spaceport America will also be home for Richard Branson's Virgin Galactic operation. Virgin Galactic will have its world headquarters in New Mexico and will be the anchor tenant for Spaceport America. Virgin Galactic is working with Burt Rutan to produce the WhiteKnightTwo and SpaceShipTwo. The WhiteKnightTwo rolled out of the hangar in Mojave on July 28, 2008 and is expected to be flight testing before the end of the year. These vehicles will carry passengers to suborbital space as well as provide for scientific and military missions.

More information on Spaceport America can be obtained at the company's website, [spaceportamerica.com](http://spaceportamerica.com).



Spaceport America Conceptual Drawing URS|Foster+Partners



# AE Alums Play Role in Phoenix Lander Mission

Three AE alumni participated in the successful landing of the Mars Phoenix Lander mission that touched down on the Martian northern arctic region on May 25, 2008.

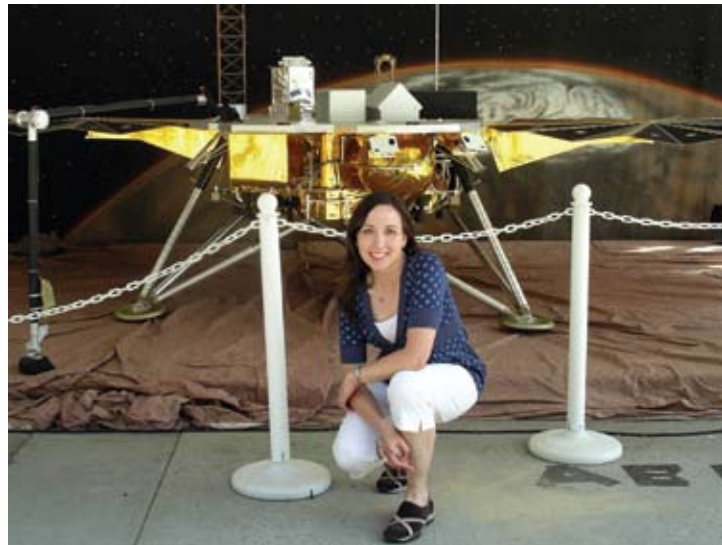
The alumni were Lynn Craig, BS 2000; Cliff Helfrich, BS 1990; and Theodore (Ted) Drain, BS 1995. Said Craig, "Seeing this mission through from its start in the proposal phase through successful surface operations has been an exciting and rewarding experience. It was such a thrill to be one of the cheering engineers in Mission Control and watching the first photos from the surface stream in."

Based at NASA's Jet Propulsion Laboratory in Pasadena, California since 2002, Craig has worked in Mission Design and Navigation on several projects, including serving as a member of the Navigation team for the 2003 Mars Exploration Rovers, Spirit and Opportunity.

For the past 4 years, she worked to determine the launch and arrival trajectory design, cruise navigation, and surface mission geometries for science and communication planning. Her focus has been optimizing the design of Phoenix's Entry Descent and Landing (EDL) communication to each of the three current Mars orbiters that provided near real-time telemetry of Phoenix's descent. Resulting from this EDL communication strategy was the first-ever image taken of a spacecraft's descent to Mars by another Martian orbiting asset. The Mars Reconnaissance Orbiter (MRO) captured Phoenix as it parachuted to the surface.

Craig said Helfrich assisted with Maneuver Design, planning the various propulsive maneuvers to correct the Phoenix trajectory during its cruise to Mars. Drain worked as a software developer who maintained the navigation software responsible for gathering and processing navigation and trajectory information for Phoenix.

Phoenix is a joint project between NASA JPL, Lockheed Martin Astronautics, and the University of Arizona.



**Lynn Craig (BS '00) with the Mars Phoenix Lander Full-Size model at NASA Jet Propulsion Laboratory in Pasadena, CA.**



**MRO orbiter captures image of Mars Phoenix spacecraft as it parachutes through the atmosphere to make a soft landing on the surface of Mars; May 25, 2008.**

## AE Alumni Earn Departmental Honors

**B**ruce K. Donaldson, PhD 68, has been named the 2008 AE Distinguished Alumnus; and Joyee (Qi) Zhu, PhD 01, and Justin B. Berman, BS 91, MS 93, PhD 01, are the 2008 AE Outstanding Recent Alumni.

The Department recognized the three during the AE Awards Dinner held Thursday, April 24.

### Bruce K. Donaldson

Donaldson was an aviator for the U.S. Navy in the mid 1950s before working for Boeing Company and Beach Aircraft Company as a structural dynamics engineer. He earned a bachelor's degree in engineering from

Columbia University and a master's from Wichita State University.

After earning his PhD, Donaldson spent his academic career at the University of Maryland, retiring from the Civil and Environmental Engineering Department in

2003. To his credit are two books, *Analysis of Aircraft Structures, An Introduction (2nd Edition)*, and *Introduction to Structural Dynamics*.

### Joyee (Qi) Zhu

Zhu is a senior engineer in the Advanced Material Systems Applications Lab for GE Global Research in Niskayuna, N.Y. Since 2001 she has been the project leader for braided composite fan case design, analysis, material modeling and FAA certification. Zhu has earned several awards for her work at GE, including most recently the 2007 Management Award recognizing her outstanding performance and commitment on the GENx-1B Composite Fan Case Design, Analysis, Containment Test Correlation, and FAA Certification. As a student in 2000, she was presented the Strehlow Award for outstanding research accomplishment and the Amelia Earhart Fellowship for outstanding female students in aerospace engineering.

Zhu has had eight research papers published, and holds a 2007 patent for Integral Puncture-Resistant Liners for Impact Protection. She earned a master's in structural engineering from Nanyang Technological University in Singapore; and a bachelor's in engineering mechanics from Shanghai Jiao Tong University in the People's Republic of China.

### Justin B. Berman

Berman is Chief of the Research & Engineering Division at the US Army Cold Regions Research and Engineering Laboratory (CRREL) in Hanover, New Hampshire. With a workforce of over 160 employees and an annual obligation authority of \$86 million, he serves as senior advisor to the CRREL Director on all research and engineering initiatives and assists in strategic planning and program development in CRREL's eight technical areas. He serves on the Army Materials Science Coordinating Group where he actively develops and shapes Army-funded Materials Science research needs to support Military Engineering applications.

Berman has been honored with the CRREL Investing in People Award and the ERDC Award for Outstanding Team Effort in 2006 and 2002, respectively. In 1997 he received the US Army Construction Engineering Research Lab R&D Product Team Award. That same year he was selected as a USACE Emerging Leader where he participated in the ERDC's Emerging Leaders Advisory Group (ELAG) for several years.

He has served as Adjunct Faculty for the University of Alabama at Huntsville and has over 35 publications including eight refereed journal articles.

### College Honors Hill with Distinguished Alumni Award

A leader in ground and in-flight icing research, AE Alumnus Eugene G. Hill, BS 57, has received the 2008 Alumni Award for Distinguished Service from the College of Engineering at the University of Illinois at Urbana-Champaign.

Hill, who also earned an MBA in 1973 in international finance from Seattle University, was cited for seminal contributions to aircraft safety as a researcher, designer, manager, and international leader in commercial aviation.



Berman and Donaldson and Zhu



Eugene G. Hill

Hill has a distinguished record of nearly 50 years of service to the advancement of aeronautics through improved flight safety. He worked for the Federal Aviation Administration from 1996 until his retirement in early 2007. In this role, he served as a recognized national and international expert and consultant in the field of aircraft icing protection.

Hill has worked with meteorological research organizations such as the National Center for Atmospheric Research (NCAR) and the Meteorological Service of Canada (MSC) to ensure the proper execution of vital weather research. His effort to foster and encourage collaboration among these groups has been key to the recent success enjoyed in weather research and forecasting capabilities for icing.

Before joining the FAA, Hill worked for The Boeing Company for 37 years. There, he managed ground and in-flight icing programs and was responsible for Boeing policies, plans, and strategies for addressing in-flight icing and related regulatory issues. This research led the field and defined and presented, for the first time, a clear understanding of icing effects and its quantified impact on aircraft operations.

His research on anti-icing fluids, in collaboration with Thomas Zierten, was the basis for the "aerodynamic acceptance test"—an important contribution to operational safety. The Society of Automotive Engineers adopted the test that is still used in industry. Earlier in his career at Boeing, Hill helped invent and holds two patents on reconfigurable leading-edge flap systems for high-lift wing configurations. He was responsible for the aerodynamic configuration and performance of the Next-Generation 737. Also, while he was at Boeing, Hill managed testing development at the Boeing Aerodynamic Laboratory and helped develop the Boeing models 707, 720, 727, and 767. He was further involved in those models' certifications for U.S. and foreign agencies.

Since 1998, Hill has served on the Department of Aerospace Engineering Alumni Advisory Board. AE awarded him the Department's Distinguished Alumnus Award in 1999. The Society of Automotive Engineers honored Hill with the 2004 Franklin W. Kolk Air Transportation Progress Award in recognition of his leadership in the field of aircraft icing and broad, outstanding contributions to SAE and to aviation safety. The SAE Technical Standards Board recognized Hill in 2007 for his outstanding contributions to that organization.

## AE Alums Gather in Seattle, Houston



Several AE alumni enjoyed the Engineering at Illinois Seattle Area Reception, held July 20 at the Boeing Museum of Flight.



Astronaut alumni were drawn to the Aerospace at Illinois Houston Reception held July 18 at the Space Center Houston. From left are Col. Lee Archambault, AE Department Head Craig Dutton, Joseph Tanner and Capt. Scott D. Altman.



# McDonald among National Scholar-Athlete Class



Ryan McDonald

Ryan McDonald, a graduate student in aerospace engineering and starting center on the varsity football team, has been named a 2008 National Scholar-Athlete as announced by the National Football Foundation and College Football Hall of Fame. The 15 class members each win \$18,000 postgraduate scholarships as finalists for the 2008 Draddy Trophy, celebrating half-a-century of NFF National Scholar-Athletes.

McDonald, who holds a 3.81 GPA, was named to the Dean's List or better every semester of his undergraduate career. McDonald was also a three-time Academic All-Big Ten choice. A recipient of the Coach Lou Saban National Scholar-Athlete Award (funded by George M. Steinbrenner III), McDonald is the eighth Fighting Illini player named an NFF National Scholar-Athlete.

A 2007 ESPN The Magazine First Team Academic All-America selection, McDonald was named the 2008 Anson Mount Scholar-Athlete Award recipient. As a four-year starter at Illinois, the Holland, Mich., native is on pace to break the school record for most starts in a career.

A vital part of the Illini offense that led the Big Ten in rushing in 2006 and '07, McDonald led Illinois to a record-breaking 2007 season and the team's first trip to the Rose Bowl since 1984. He was key to an offensive line that set the school record for fewest sacks allowed in a season (16) in 2007.

In honor of his mother, who suffers from multiple sclerosis, McDonald organized a team of fellow players for the 2008 MS Walk, raising \$1,500 for the charity. He is also a member of the Fellowship of Christian Athletes.

The NFF's National Scholar-Athlete program, launched in 1959, is recognized as the first and most prestigious initiative in the history of college sports to honor football players for their combined athletic ability, academic success and civic leadership.

Candidates must be a senior or graduate student in their final year of eligibility, have a grade point average of at least 3.2 on a 4.0 scale, have outstanding football ability as a first team player and have demonstrated strong leadership and citizenship. Selected by the NFF Awards Committee, the 15 National Scholar-Athlete Award recipients will

be honored at the 2008 NFF Annual Awards Dinner December 9 at the Waldorf-Astoria in New York City. The event will also include the induction of the 2008 College Football Hall of Fame and the presentation of several major awards.

Each will receive an \$18,000 post-graduate scholarship, and one of the 15 will be announced as the recipient of the 2008 Draddy Trophy, presented by HealthSouth, which recognizes an individual as the absolute best scholar-athlete in the nation. Established to honor former NFF Chairman Vincent DePaul Draddy, a Manhattan College quarterback who developed the Izod and Lacoste brands, the award comes with a 24-inch, 25-pound bronze trophy and increases the winner's scholarship to \$25,000.



Ryan McDonald plays offensive line at Illinois, just like his dad, Phil, did in the 1970s.

# AE Teams Sweep Space Design Competition

Aerospace Engineering teams from the University of Illinois swept all awards in the recent 2007-2008 Undergraduate Team Space Design Competition, sponsored by the American Institute of Aeronautics and Astronautics Foundation.

The competition requires teams to design a space vehicle to complete a specified task, focusing both on mission completion and on the total costs. This year's competition asked entrants to design a vehicle to retrieve various artifacts from Apollo moon missions and return them from the moon to the Earth. Eligible Apollo mission artifacts were those from Apollo 12 through Apollo 17; artifacts from Apollo 11 were off-limits.

Advised by AE Prof. Victoria Coverstone, five Illinois teams competed, doing the work as their senior design projects. Three teams took home prizes. "Each team conceptualized a unique approach to completing the mission," Coverstone said. "Our students are innovative and technically savvy. It comes as no surprise that they swept the national competition. They are simply the best and I'm very proud of them."

The first prize, \$2,500 from the AIAA Foundation and an opportunity to present the work at the recent AIAA Conference in San Diego, went to Team Lunatics, whose members were: leader Joel Nordness; members William Andrews, Brianna Aubin, Seth Baynar, Josh Birnbaum, Abdul Rahman El Fouly, Michael Larsen and Charles Spellman.

Second prize and a \$1,500 award went to Team Epimetheus, whose members were: leader Steven Moran; members Elizabeth Bozek, Peter Clark, Thomas Herges, Greg Sabina, Matthew Star, William Wheeler, and Robert Wilson.

Third prize and a \$1,000 award went to Team ARO (Artifact Recovery Operation), whose members were: leader Aaron D'Souza; and members Ryne Beeson, Kelly Cole, Justin Heppe, Jonathan Huffman, Adam Molski, Christopher Re, and Zaki Sheikh.

AIAA set up the contest as though a mysterious entrepreneur was offering a \$1 billion prize for teams

to recover items ranging in value from 100 to 500 points. The first team to return items worth 250 points would be the winners. Among the items were a U.S. flag, a moon buggy antenna, Alan Shepard's golf ball, and other discarded items.

Aubin said her team's goal was to recover Shepard's golf ball because it was worth the most points at 500. Aubin's team designed a landing craft that would get to the moon to release a rover to search for the artifacts. The rover was designed to then come back to a return capsule, also carried on the landing craft. The capsule would then fire and make the trip back to Earth.

The technical side of the mission involved designing a lander, rover and return capsule, planning orbital trajectories and propulsion, and determining how to bring the capsule back and recover it. Teams also had to plan the business end of the project and find the means to pay for it. Aubin said her team cited grants, advertising, loans, investors and payments to use the rover for public outreach and experiments.

Said AE Department Head J. Craig Dutton of the teams' achievements, "Obviously, the AE Department is extremely proud of its students' remarkable performance in this competition. This speaks volumes to their creativity, hard work, and dedication. Congratulations to all these students and their advisor, Prof. Coverstone."



**Members of AE's First Place 2007-2008 Undergraduate Space Design Competition Team: (back row, from left) Abdul Rahman El Fouly, Charles Spellman, William Andrews, Michael Larsen; (front row, from left) Joel Nordness, Brianna Aubin, Josh Birnbaum, Seth Baynar.**

# AE Group Works to Improve Athletes' Results in Paralympics

BY MELISSA MITCHELL, NEWS EDITOR FOR THE UNIVERSITY OF ILLINOIS NEWS BUREAU

CHAMPAIGN, Ill.—A group of aerospace engineering students worked this year to improve the racing speeds of athletes who competed in Beijing in the 2008 Paralympic Games. Those games took place in China's capital city Sept. 6-17.

For the past year, the students—under the tutelage of former department head Mike Bragg (now an associate dean in the College of Engineering) and research scientist Andy Broeren (now with NASA)—have been conducting a series of experiments with half-scale and smaller models of racing wheelchairs

“There are very few examples in the literature on wheelchair aerodynamics,” said research team member Greg Busch. “There is a lot of intuitive thought on how to do it. For instance, to keep the frontal area of the chair small, or for the racers to tuck their heads.”

Bleakney said some racers have tried other tricks, including taping contact paper to the undercarriage of the chair. As it turns out, “that doesn't do anything measurable,” said Busch, noting that undercarriage taping was one of several theories put to the test.

A couple of the other ideas did yield noticeable, measurable results. For instance, the research team found that athletes who position their heads and torsos in a tucked, rather than upright, position, realize a 10 percent reduction in drag.

The students also have studied the effect of attaching various sizes of fairings to the scale models they've tested. Similar in function to the windshield on some motorcycles (also known as a fairing), the bullet-shaped attachment “smooths airflow around riders, reducing aerodynamic drag,” Busch said.

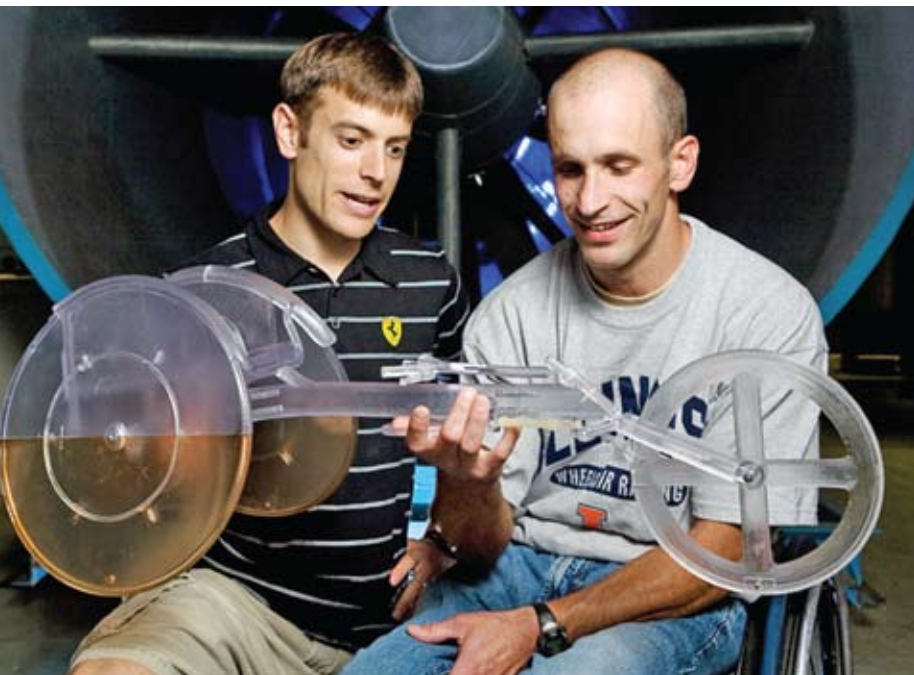
Their most successful attempt on that front yielded a 12 percent drag reduction.

The best overall benefit, however, appears to be combining a fairing with the racer in the tucked position. With that configuration, drag was reduced by 25 percent. “We figured we would have a few percentage-point differences,” Busch said, “but 25 percent was a big surprise.”

Other variables the engineering students have investigated include the design of the chairs' front wheel—spoked or solid—and positioning the rider's feet tucked under the body versus feet dangling.

U. of I. coach and Paralympics competitor Bleakney said he and the student athletes are excited about the initial findings of the engineering team because prior to this, ideas about what worked and what didn't were largely unproven.

“Because we had no scientific data, everything was ad hoc,” he said. “That's what's exciting about the work and the data we've got now. It gives us a base to work off of, for starting testing on the field to see if the data in the wind tunnel correlates to the real world.”



L. Brian Stauffer

Greg Busch, aerospace engineering graduate student, left, and Adam Bleakney, UI wheelchair track coach hold a racing wheelchair model that was tested in the wind tunnel on campus.

and their own mini-sized version of a crash-test dummy in the department's wind tunnel. Some of the students began working on the project in Broeren's senior design course last fall and have since formed a registered student organization called the Racing Wheelchair Aerodynamics Design Team.

The team's goal has been to figure out how the U. of I. racers—and other competitive racers—can make aerodynamic improvements that would ultimately enhance performance speeds.



## Boeing Recognizes AE Graduate Student in International Competition

Busch said the engineering team hopes to be able to move to that next phase—testing their theories using human racers, on the track—this fall. Such tests might include measuring the total power needed to propel a chair around a track.

According to the students' Web site, challenges of such future testing would be difficulties related to controlling external variables such as wind, and obtaining reliable measures of required power.

Besides Busch, other members of the engineering research team have included Jeremy Alonso, Jeff Burgess, Maulik Choksi, Austin Ellis, Wes Hammes, Bryan Lin, Krunall Patel and Chris Richgruber. The scale-model wheelchairs are based on a computer model from wheelchair manufacturer Invacare Top End and are constructed from rapid prototyping material in the engineering college's Ford Lab in the Mechanical Engineering Laboratory. Wind-tunnel time was donated by the Aerospace Engineering Department.



Greg Busch said the engineering team hopes to be able to test their theories using human racers on the track this fall. Such tests might include measuring the total power needed to propel a chair around a track.

AE graduate student Manu Sharma has been honored in the Boeing 2008 Student of the Year Awards.

According to the company, this year's competition attracted a record number of qualified entries from around the world, including Australia, India, Singapore, South Africa and the United Kingdom, as well as the United States.

Boeing's sponsorship is one of its many efforts aimed at encouraging students to pursue careers in aerospace-related engineering fields. The worldwide competition, now in its third year, is open to any full- or part-time engineering student pursuing a recognized degree. The winning student's work must be judged as likely to impact the future of aerospace engineering in areas such as new or enhanced capabilities, systems, processes or tools; new levels of performance; and improved life cycle costs.



Sharma received an honorable mention for his project involving the experimental investigation of compressible hypersonic flow using the recently constructed Hypervelocity Expansion Tube (HET) facility. He reports that he was heavily involved in the installation of the tube itself, the test section, data acquisition system, vacuum pump, gas lines and pressure instrumentation.

"I was responsible for the design of a novel primary diaphragm cutting mechanism and the test section sting and model mounts. Specifically, the long-term goal of my Ph.D. is to examine the high-temperature effects that are a defining hallmark of hypersonic flow. Thermochemical processes such as dissociation and vibrational excitation can have a substantial impact upon hypersonic aerodynamics. Towards investigating these high-temperature effects, we have selected a Mach reflection as a canonical flowfield and have used schlieren visualization, pitot pressure and wavespeed measurements and imaging spectroscopy to characterize the flowfield," Sharma said.

# Flying the Crowded Skies

## AE Grad Student Wins NASA Scholarship to Improve Air Transportation

BY DOUG PETERSON

Our current air transportation system has reached its capacity, says Heather Arneson, a graduate student working under Cedric Langbort, a professor of aerospace engineering and the Coordinated Sciences Laboratory. Every day, roughly 50,000 flights must be managed by the U.S. system, Arneson explains, but that number is projected to increase to anywhere from 100,000 to 150,000 flights per day by the year 2025.

### Something has to give

To solve the problem, the United States is actively developing the next-generation air transportation system, and Arneson is in the thick of the action. To work on the issue, she has received a highly-competitive NASA Aeronautics Scholarship, awarded to only five graduate students nationwide each year.

The NASA scholarship will fund two years of research—and a third, if needed. It also provides Arneson with two summer internships at top NASA research centers.

According to Arneson, there are two levels

of research on the new air transportation system. The individual aircraft level focuses on using new technology for automatic collision detection and avoidance. Arneson is working at the flow control level, managing the flow of large *groups* of airplanes through specific air spaces. In particular, she is looking at ways to more efficiently reroute airplane traffic around regions when they become congested due to factors such as weather.

The current air transportation system relies on humans to monitor sections of air space. When the weather is bad, certain flights must be grounded until the weather clears, causing massive backups, she says. The next-generation system would be more dynamic, keeping the aircraft flowing as the flights are rerouted.

Arneson hails from Barrington, Rhode Island, and came to the Department of Aerospace Engineering at the University of Illinois at Urbana-Champaign in 2005 after working on NASA's Mars Exploration Rover Mission for three years. One of her professors at Cornell University, where she received her bachelor's degree, was the lead researcher in developing panoramic cameras for the Mars rovers.

Arneson helped to calibrate the panoramic cameras, which are mounted on the rovers to take photographs of the Martian landscape. Once the first rover reached Mars in January of 2004, she then worked on the scientific team that took images of the Red Planet.

"Some of the most exciting moments were when the rovers would reach a crater," she says. "Arriving at craters was really exciting because they could potentially reveal a lot about how the Martian surface was formed. It took us months to get to certain craters, but the long treks were well worth it."

Today, Arneson's research is a little bit closer to Earth—but equally exciting, she says.

As part of her master's work at Illinois, she developed two algorithms that could be applied to an existing Eulerian flow model for air traffic management; but her focus was on air traffic between just a single take-off airport and single landing airport. Her PhD research will build on her master's work, dealing with increasingly more complex network scenarios. She and Langbort will concentrate on distributed control algorithms to solve problems with air traffic delays, primarily those caused by weather.

"With weather conditions causing approximately 65 percent of the delays in the national airspace system in recent years," she says, "adaptability to changing weather conditions will be an integral part of any new air transportation system."



Heather Arneson with Diane Jeffers, AE Coordinator of External Relations, at the department's Awards Banquet.

## AE Teams Win Firsts at EOH

The American Institute of Aeronautics and Astronautics and the Illini Space Jet (ISJ) student organizations captured First Place awards in projects demonstrated during the University of Illinois 2008 Engineering Open House in March.

AIAA students won first under the category "EOH Theme-Sparking Curiosity" for their Wind Tunnel Demonstration exhibit. The students demonstrated in a wind tunnel how wings work and what causes them to fail. They showed how wings are designed and tested, and tested the lift, drag and other aerodynamic properties of a wing, sphere and golf ball.

ISJ students won first for Best Underclass Class Project for their Jet Powered Airplane and Rocket Launch exhibit. They displayed a turbine-powered 10-foot, 1/10 scale airplane, built to demonstrate the possibility of rocket launch from a moving aircraft. They also ran drag races every 30 minutes between two 6-foot rockets fired between the two bridges over the Bone Yard Creek north of Engineering Hall.

### **Members of the AIAA team were:**

Sarah Fullmer  
Dennis Bosco  
William Wheeler  
Jacob Shulkin  
Jake Turelli  
Sara Streeb  
Gregory Sabina  
Steven Moran  
Brian Lester  
Ryan Palmer  
Tyler Gillen  
Joseph Bottalla  
Joel Houston  
James Osiol  
Jared Daum  
David West  
Jiang John Yu

### **Members of the ISJ team were:**

Christopher Richgruber-Team Leader  
Virag Shah  
Scott Allen  
Ryne Beeson  
Elizabeth Bozek  
Dain Christensen  
Aaron D'Souza  
Jonathan Huffman  
Patrick Looby  
Steven Moran  
Matthew O'Brien  
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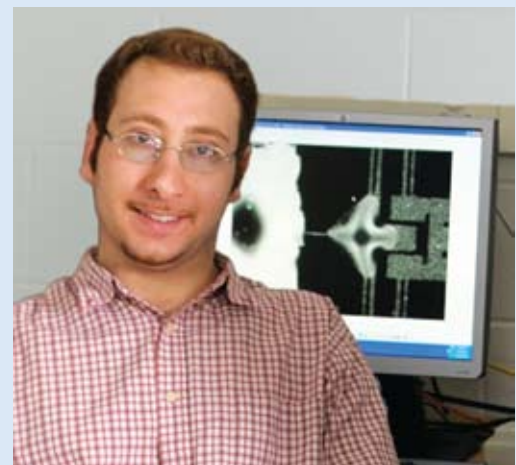
## AE PhD Takes First for Second Year in Sandia Lab Contest

Doctoral student Mohammad Naraghi has taken first place for two consecutive years at Sandia National Laboratory's University Alliance competition.

Most recently, Naraghi took first at Sandia's fourth annual competition for student micro-electromechanical systems designs. His design fit the category calling for a micro design to reliably inspect nanoscale phenomena. The Illinois device featured a mechanical testing platform specifically designed to perform creep/stress relaxation tests on soft polymeric and biological nanostructures. The device incorporated a piezoresistive loadcell with a novel on-chip actuator capable of generating large deformations on the sample. AE Associate Prof. Ioannis Chasiotis advises Naraghi.

The University Alliance competition gives universities around the country an opportunity to test their skills in developing all the intricate details of design, analysis, and fabrication of complex MEMS devices, says Mark Platzbecker, technical team lead in Sandia's MEMS Core Technologies Department.

Naraghi's work was supported in part by the National Science Foundation (NSF) under NSF-NIRT grant DMI-0532320.







Michael Duffy and John Prussing



Ryan McDonald and Ioannis Chasiotis



Gregory Sabina and Eric Loth



Jeremy Alonso and Larry Bergman



Wilbur Chang and Craig Dutton



Craig Dutton and Michael Day



Krishna Jonnalagadda and Ioannis Chasiotis



Matthew Cruce and Diane Jeffers

About two dozen of Aerospace Engineering's top students were recognized in April during the department's Awards Banquet.

- The **AIAA Scholastic Achievement Award**, given each year to the senior graduating in May with the highest class grade point average, was awarded to **Michael J. Duffy of Bloomington, Illinois**. Duffy was recognized this spring as a **Bronze Tablet** member, one of a select group of undergraduate students whose names are inscribed on bronze tablets displayed on the first floor of the University of Illinois Main Library. Only the top 3 percent of undergraduate students across campus receive this highly coveted award, which recognizes continuous high academic achievement. Duffy also was awarded an **Illinois Space Grant Scholarship** from the NASA Illinois Space Grant Consortium, based on his academic performance.

- The **H.S. Stillwell Memorial Awards** are presented annually on the basis of outstanding scholastic achievement and extracurricular activities. The 2008 winners were **Ryan P. McDonald of Holland, Michigan**, and **Gregory W. Sabina of Brookfield, Wisconsin**. McDonald also received the **Chancellor's Award** for Academic Excellence this past spring. The award recognizes the student athlete with the highest GPA on the University of Illinois football team. McDonald's position is offensive lineman. He was awarded second-team, All-Big Ten honors for his excellent work on the team last fall.

- **H.S. Stillwell Problem Solving Scholarship** recipients are junior-level students majoring in aerospace engineering who exhibit exemplary problem-solving skills. The 2008 winner was **Jeremy R. Alonso of Freeport, Illinois**. Alonso also was awarded an **Illinois Space Grant Scholarship** from the NASA Illinois Space Grant Consortium, based on his academic performance.

- The **Robert W. McCloy Memorial Award** is presented annually to a junior or first semester senior student in recognition of outstanding academic performance. The 2008 winners were **Wilbur Chang of Chicago** and **Michael T. Day of Homer Glen, Illinois**.

- The **Roger A. Strehlow Memorial Award** is presented annually to a graduate student in recognition of outstanding research accomplishment. The 2008 winner was **Krishna N. Jonnalagadda of India**.

- The **Dale Margerum Memorial Award** is presented annually to the AE undergraduate who exemplifies outstanding leadership qualities by participation in departmental extracurricular activities. The 2008 winner was **Matthew J. Cruce of Pekin, Illinois**.

- The **Faculty Outstanding Graduate Student Award** is presented in recognition of outstanding contributions to the teaching and/or research missions of the department. The 2008 winner was **Mohan G. Kulkarni of Pune, Maharashtra, India**. Kulkarni also was a winner of the College of Engineering **Mavis Memorial Fund Scholarship Award**. The Mavis Scholarship program, designated for students working on their doctorate in the College of Engineering, was made possible by a generous bequest of Frederic T. and Edith F. Mavis. Dr. Mavis received his B.S., M.S., and Ph.D. degrees in civil engineering from the University of Illinois. He was a professor of civil engineering at several universities and was dean of engineering at the University of Maryland. Recipients are chosen based on their academic performance, research accomplishments, and demonstrated interest in engineering education.

- **Illinois Space Grant Fellowships** are awarded to entering and continuing graduate students by the NASA Illinois Space Grant Consortium and are based on academic and research performance. In AY 07-08, fellowships were awarded to **Heather M. Arneson, Greg T. Busch, Miles J. Johnson, Andrzej Pukniel, and Robert E. Thomas II**.

- **Illinois Space Grant Scholarships** are awarded to entering and continuing undergraduate students by the NASA Illinois Space Grant Consortium and are based on academic performance. **Brandon E. Copp, Michael B. Dunkel, Thomas G. Herges, Albert Y. Lee, and Jacob P. Niehus** were among the AY07-08 scholarship recipients.

- The **Department University Fellowship Kenneth Lee Herrick Fellowships** are awarded to graduate students based on academic and research performance. Among the AY07-08 winners were **Jerome Barral and Felix D. Pflaum**.

- **Stephen M. Moran** earned **First Place in the Undergraduate Poster Competition** of the Great Midwest Regional Space Grant Conference.



Mohan Kulkarni and Philippe Geubelle



Heather Arneson and Diane Jeffers



Miles Johnson and Diane Jeffers



Andrzej Pukniel and Diane Jeffers



Brandon Copp and Diane Jeffers



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The alumni and friends listed below contributed to Aerospace Engineering during Fiscal Year 08 (between July 1, 2007 and June 30, 2008). Thank you for your gifts! (All degrees are in AE unless otherwise indicated.)

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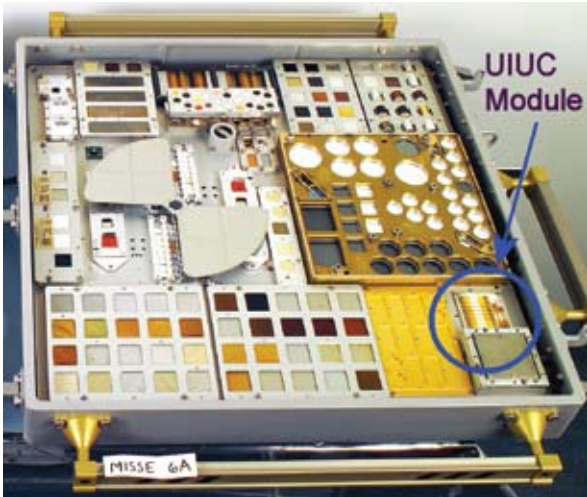
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## Space Station Carries AE Experiment



**Above: UIUC Module. On the cover: MISSE-6 experiments attached to the International Space Station, orbiting above the earth.**

An experiment of AE Associate Professor Ioannis Chasiotis and his graduate student Ms. Qi Chen is underway in a set of “briefcases” attached since the spring of 2008 to the International Space Station.

The polymer nanocomposite samples with various compositions and sizes of silica nanoparticles were divided into two identical groups and were mounted on two briefcases together with samples from other research laboratories. The two briefcases, transported aboard the space shuttle Endeavour and mounted in mid-March at the exterior of the International Space Station, will be in place for the next six months. They will be returned to NASA labs and then to Chasiotis’ laboratory at UIUC by another space shuttle mission. Both sets of samples will be exposed to UV radiation, and one set will be in contact with atomic oxygen. This project aims at investigating the shielding effect of nanocomposites, the degree of deterioration of their properties in space, and of course their qualification for space materials.

This work was made possible by AFOSR grant #FA9550-06-1-0140 and a collaboration with Wright-Patterson Air Force Base.



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