Æ Illinois

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

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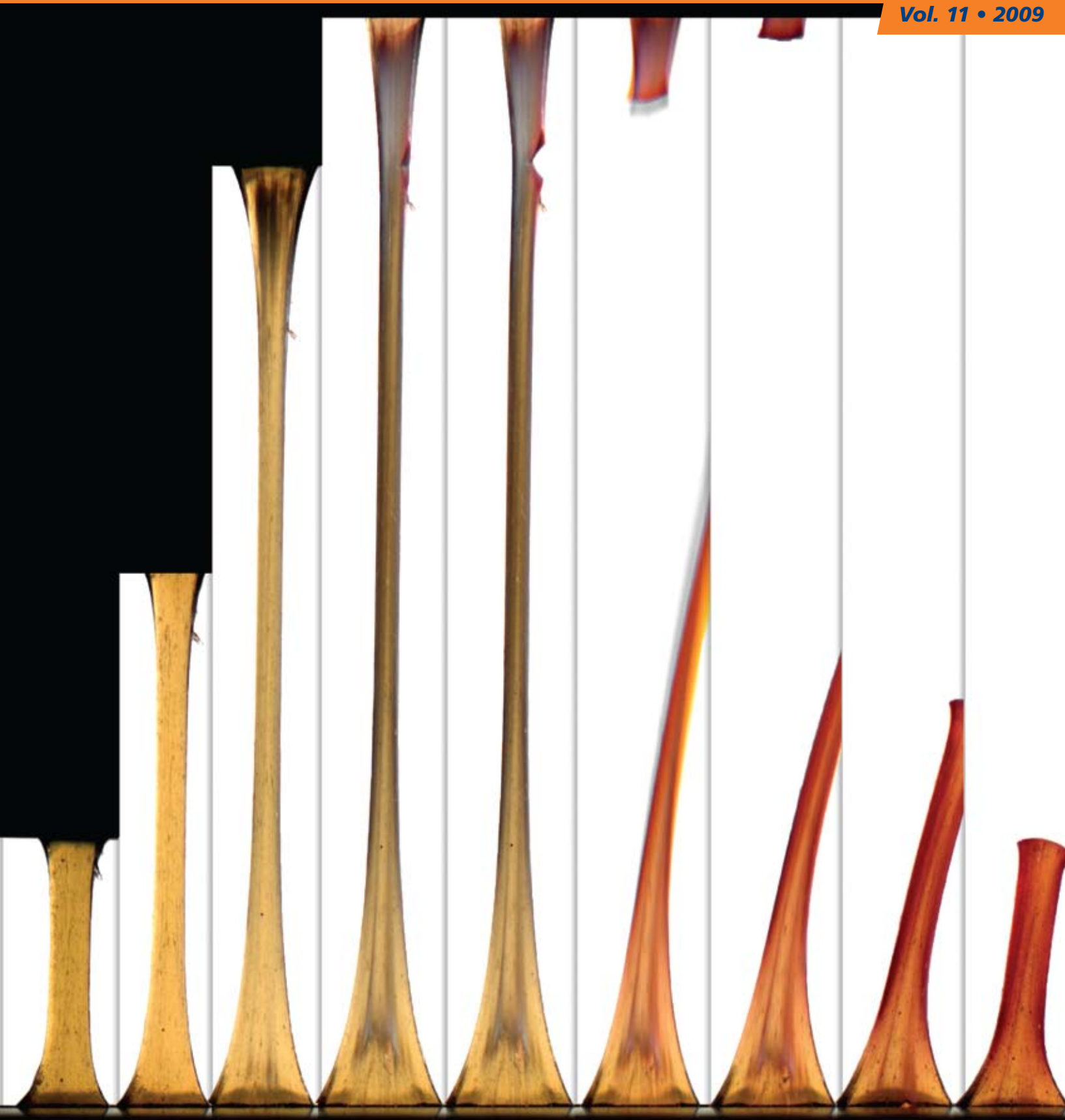

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Letter from the Department Head

How quickly this past year has flown by! It seems as though just a few weeks ago I was writing this same note to you, our loyal alumni and friends. But many interesting and exciting things have happened in the Illinois AE Department over the last year, and we're pleased to report those to you here.

Our enrollments continue to be strong in the face of the economic downturn with 382 undergraduates and 125 graduate students enrolled in AE this fall. The graduate enrollment is particularly impressive and stands at an all-time high for our department. Not only do we have strong enrollments, but the students are also of top-notch quality. In fact, the mean high-school percentile rank and composite ACT score of our entering freshman students this fall also stand at all-time highs. The entering graduate student cohort is superbly well qualified, too. As a result of the talents and energy of our students and alumni, they naturally have achieved great things. Many examples of these achievements can be found in the following pages.

Our faculty continue to excel in their research, education, and service duties. Within these pages, you can, for example, read about the developments of Scott White's group in the area of self-healing materials, as well as a new project of Eric Loth and colleagues on bone adhesion. A group led by John Lambros has just received a prestigious five-year DoD MURI grant on stress wave tailoring. You will be introduced to our

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Many interesting and exciting things have happened in the Illinois AE Department over the last year.

newest faculty member, Soon-Jo Chung, who just joined us from Iowa State University, and works in the areas of autonomous vehicles and robotics. Ioannis Chasiotis has received the National Science Foundation's Presidential Early Career Award for Scientists and Engineers. According to the NSF website, "the PECASE Award is the highest honor bestowed by the U.S. government on outstanding scientists and engineers beginning their independent careers." Finally, two of our senior faculty marked major milestones in the last year: Harry Hilton's 60th continuous year at the University of Illinois and Rod Burton's "retirement," although he still pursues an active research program.

We also continue to reach out to you, our alumni and friends. We have hired a new full-time alumni relations coordinator/advancement officer, Brett Clifton. This has allowed us to have much more continuity of effort in these areas. In addition to our Alumni Board meeting in the fall, we hosted an alumni reception this year at the AIAA Aerospace Sciences Meeting in Orlando, and participated in a College of Engineering alumni event in Seattle. We are planning another alumni event for this February in Houston, so please watch for the details as the event draws near. We also met with many of you individually in Seattle, Houston, St. Louis, Chicago, San Francisco, Washington DC, and Los Angeles during the last year. Wherever we go, we enjoy hearing about the excellence of the education you received and your wonderful experiences at Illinois and in AE. With your gifts you can "give back" by providing our programs with the "margin of excellence" that state educational and federal research funds cannot cover. Thus, you continue to play a pivotal role in our success.

So, read and enjoy. We look forward to hearing from you; our contact information is readily available on our website at: http://www.ae.illinois.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
Ioannis Chasiotis
Soon-Jo Chung
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
Michael S. Selig
Petros G. Voulgaris
Scott R. White

Emeritus Faculty

John D. Buckmaster
Rodney L. Burton
Harry H. Hilton
Allen Ormsbee
John E. Prussing
Lee H. Sentman
Kenneth R. Sivier
Wayne C. Solomon
Shee Mang Yen

Affiliate/ Adjunct Faculty

Kenneth T. Christensen
Naira Hovakimyan
Thomas L. Jackson
Arif Masud
Karel Matous
D. Michael McFarland
George H. Miley
James W. Phillips
Srinivasa M. Salapaka
Nancy R. Sottos
Alexander Vakakis

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Barb Bohlen
Brett Clifton
Kent Elam
David Foley
Joel Franzen
Diane Jeffers
Barbara Kirts
Kendra Lindsey
Greg Milner
Susan Mumm
Angie Pitard
Staci Tankersley

AE Faculty Listed As Excellent

AE faculty recently included on the List of Teachers Rated as Excellent by Their Students have been: Spring 2009, Assistant Prof. Daniel J. Bodony, Prof. Bruce A. Conway, Adjunct Prof. Thomas Jackson, Prof. John Lambros, Emeritus Prof. John Prussing, Teaching Assistant Brian Woodard; Fall 2008, Bodony, Prof. Rodney L. Burton, Conway, Prof. Gregory Elliott and Prof. Ki D. Lee; Spring 2008, Bodony, Assistant Prof. Timothy W. Bretl, Burton, Conway, Prof. Victoria L. Coverstone, Lambros, and Assistant Prof. Natasha Neogi.

New Developments in Autonomic Materials: Self-Healing Coatings and Force-Sensitive Color Changes

Photo by L. Brian Stauffer

Illinois researchers Paul Braun, right, and Scott White have created self-healing coatings that automatically repair themselves and prevent corrosion of the underlying substrate.

New polymer coatings prevent corrosion, even when scratched

Imagine tiny cracks in a patio table healing by themselves, or the first small scratch on a new car disappearing by itself. This and more may be possible with self-healing coatings that AE Prof. Scott R. White's group is developing.

The new coatings are designed to better protect materials from the effects of environmental exposure. Applications range from automotive paints and marine varnishes to the thick, rubbery coatings on patio furniture and park benches.

"Starting from our earlier work on self-healing materials at the U. of I., we have now created self-healing coatings that automatically repair themselves and prevent corrosion of the underlying substrate," said Paul Braun, a self-healing group member and a University Scholar and professor of materials science and engineering.

To make self-repairing coatings, the researchers first encapsulate a catalyst into spheres less than 100 microns in diameter (a micron is 1 millionth of a meter). They also encapsulate a healing agent into similarly sized microcapsules. The microcapsules are then dispersed within the desired coating material and applied to the substrate.

"By encapsulating both the catalyst and the healing agent, we have created a dual capsule system that can be added to virtually any liquid coating material," said Braun, who also is affiliated with Beckman Institute, Frederick Seitz Materials Research Laboratory, Department of Chemistry, and Micro and Nanotechnology Laboratory.

When the coating is scratched, some of the capsules break open, spilling their contents into the damaged region. The catalyst and healing agent react, repairing the damage within minutes or hours, depending upon environmental conditions.

The performance of the self-healing coating system was evaluated through corrosion testing of damaged and healed coated steel samples compared to control samples that contained no healing agents in the coating. Reproducible damage was induced by scratching through the 100-micron-thick polymer coating and into the steel substrate using a razor blade. The samples were then immersed in a salt solution and compared over time.

The control samples corroded within 24 hours and exhibited extensive rust formation, most prevalently within the groove of the scratched regions, but also extending across the substrate surface, the researchers reported. In dramatic contrast, the self-healing samples showed no visual evidence of corrosion even after 120 hours of exposure.

"Our dual capsule healing system offers a general approach to self-healing coatings that operates across a broad spectrum of coating chemistries," Braun said. "The microcapsule motif also provides a delivery mechanism for corrosion inhibitors, antimicrobial agents, and other functional chemicals."

With Braun, the paper's co-authors are White and former Beckman Institute and materials science graduate student Soo Hyoun Cho. A company Braun, White and other U. of I. researchers formed is exploring commercialization of the self-healing coatings technology.

Northrop Grumman Ship Systems, the U.S. Air Force Office of Scientific Research, and Beckman Institute funded the work.

Mechanical stress leads to self-sensing in solid polymers

Parachute cords, climbing ropes, and smart coatings for bridges that change color when overstressed are several possible uses for force-sensitive polymers the group is developing.

AE Prof. Scott White and his collaborators in the Autonomic Healing Research group have pushed the materials' boundaries by developing self-healing coatings and an ability for polymers to change color in reaction to force.

The polymers contain mechanically active molecules called mechanophores. Specific chemical reactions are triggered in the mechanophores when pushed or pulled with a certain force.

"This offers a new way to build function directly into synthetic materials," said Nancy R. Sottos, AE affiliate professor, a Willett Professor of materials science and engineering and an affiliate of the Beckman Institute. "And it opens the door to creating mechanophores that can perform different responsive functions, including self-sensing and self-reinforcing, when stressed."

In critical material systems, such as polymers used in aircraft components, self-sensing and self-reinforcing capabilities could be used to report damage and warn of potential component failure, slow the spread of damage to extend a material's lifetime, or even repair damage in early stages to avoid catastrophic failure.

To demonstrate the mechanochemical response, the researchers prepared two different mechanophore-linked polymers and subjected them to different levels of mechanical stress. In one polymer, an elastomer, the material was stretched until it broke in two. A vivid color change in the polymer occurred just before it snapped. The second polymer was formed into rigid beads several hundred microns in diameter. When the beads were squeezed, they changed from colorless to purple.

The color change that took place within both polymers could serve as a good indicator of how much stress a mechanical part or structural component made of the material had undergone.

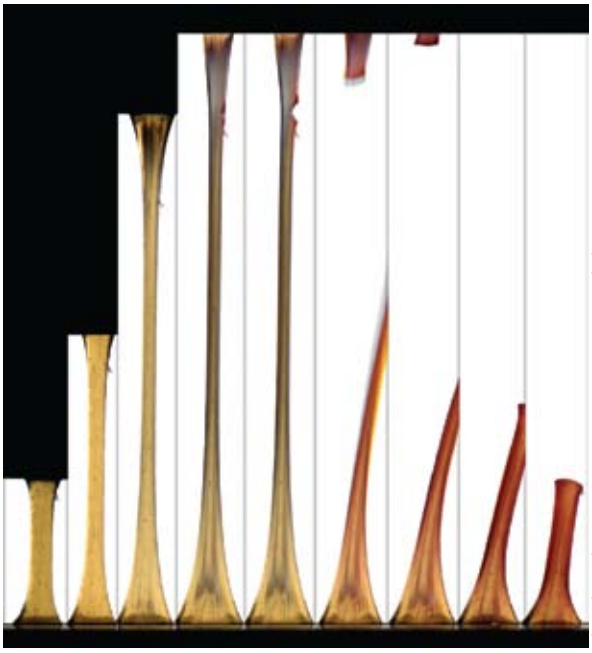


Photo by Beckman Institute ITG, Darren Stevenson and Alex Jerez

Progressive images of a mechanophore linked elastomer during tensile loading. After the polymer reaches a critical strain, a force-induced red color results from selective covalent bond cleavage in the mechanophore just prior to failure.

"We've moved very seamlessly from chemistry to materials, and from materials we are now moving into engineering applications," Sottos said. "With a deeper understanding of mechanophore design rules and efficient chemical response pathways, we envision new classes of dynamically responsive polymers that locally remodel, reorganize or even regenerate via mechanical regulation."

The paper's co-authors are Sottos, Douglas Davis, a graduate research assistant and the paper's lead author, White, Braun, Jeffrey Moore, chemistry professor at Illinois and Todd Martinez, chemistry professor at Stanford University, as well as members of their research groups. The U.S. Army Research Office MURI program funds the work.

Sottos

Davis

White

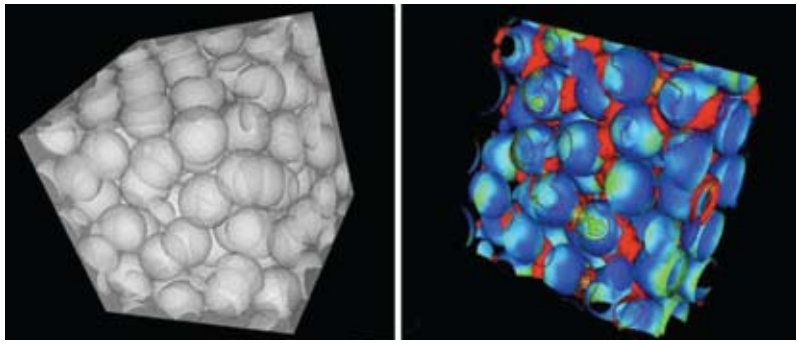
Braun

Moore

Martinez

Illinois-led Project Garners $6.25 Million DoD Grant

Both the electronic components of your cell phone and the explosive portions of military weaponry could be better protected by the smarter materials that scientists including AE Profs. John Lambros and Philippe H. Geubelle plan to design.



Space/time multiscale dynamic response of a highly-filled particulate composite: (left) representative unit cell; (right) damage distribution under dynamic unixial macroscopic strain, with contours on the particle surface denoting cohesive traction and iso-surfaces showing damage levels between particles.

The U.S. Department of Defense has awarded a $6.25 million grant for the University of Illinois-led project, "Design of Adaptive Load Mitigating Materials Using Nonlinear Stress Wave Tailoring." The DoD's Multidisciplinary University Research Initiative (MURI) will provide $1.25 million annually for five years to support the work.

"If you drop a cell phone . . . a smart casing would trap and annihilate the waves and mitigate impact effects."

Calling the project "ambitious," Lambros said the team wants to control the microstructure of materials that encase critical components. If the equipment is dropped or otherwise damaged, the casing material would channel resulting stress waves to desired locations and away from areas most needing protection.

"If you drop a cell phone, you don't want the interior components damaged so you don't want the stress waves to reach the interior. Instead, a smart casing would trap and annihilate the waves and mitigate impact effects," Lambros said.

Likewise, such casings would result in munitions being more insensitive to impact loading, making weapons handling safer for people and equipment, he said.

In addition to Lambros, the principal investigator of the project, and Geubelle, other Illinois researchers involved in the project are Profs. Alexander F. Vakakis and Daniel A. Tortorelli of Mechanical Science and Engineering, and Prof. Waltraud M. Kriven of Materials Science and Engineering. Joining them will be Chiara Daraio, an assistant professor of Aeronautics and Applied Physics from the California Institute of Technology.

It's clear to the team that more than one material will be needed to achieve the desired results. "We'll need a combination of materials in a heterogeneous composite system," Lambros said.

Vakakis and Daraio will begin by looking at the fundamental physics resulting from model experiments on simpler systems such as granular materials that include plastic and metal components.

Using the knowledge Vakakis and Daraio gain, Totorelli and Geubelle will do design and optimization work through computer simulation. Kriven will use the simulations to develop new processing methods and new materials, including granular materials, ceramics and geopolymers—inorganic, lightweight materials that don't have to be heated to high temperatures to be made, but that are hard and durable like ceramics.

continued on page 11

Lambros

Daraio

Geubelle

Kriven

Tortorelli

Vakakis

Bone Adhesion Project Gets Grainger Funding

A bone adhesion project of AE Prof. Eric Loth and Dr. Ilker Bayer is being funded as part of the Grainger Program in Emerging Technologies that the University of Illinois College of Engineering administers.

Loth and Bayer have teamed with Prof. Iwona Jasiuk of Mechanical Science and Engineering on the project, "Novel Biocompatible Bone Adhesion Technology."

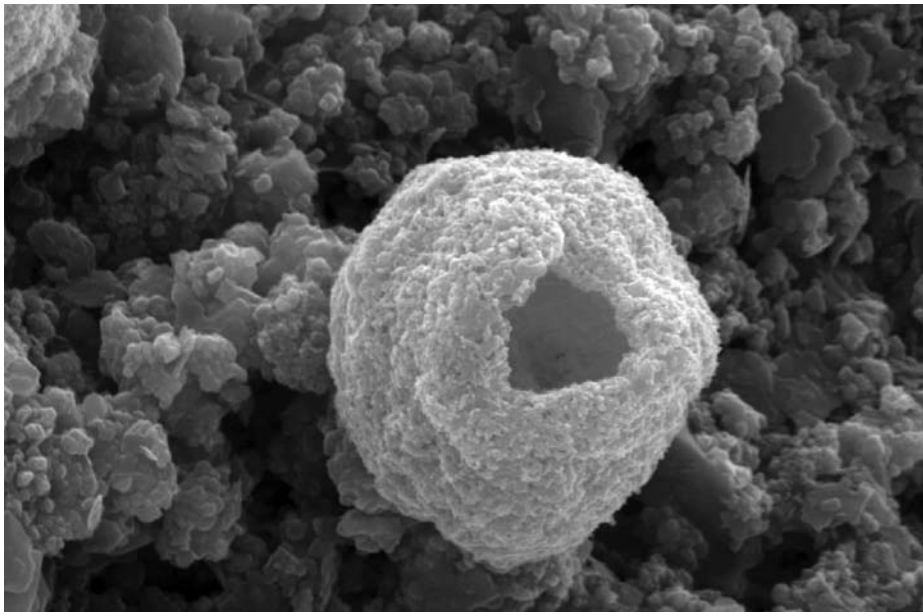
The researchers propose developing biocompatible adhesives and composites to bond bone to other bone, repair plates or to help make implants using an original orthopedic adhesion technology. More specifically, they propose to design bio-inspired porous nano-composite bone graft materials fortified with proteins and antibiotics, which can set and cure in moist environments while promoting new bone generation and/or healing.

Traditional approaches in bonding bone to bone or bone to metal or composite usually involve natural or synthetic polymers or cements but typically require use of other fasteners such as screws and/or chemical pre-treatments with corrosive chemicals. The researchers propose a novel approach involving new composite systems consisting of a polymeric matrix and a ceramic reinforcement to provide superior bonding and strength without pre-treatment.

In the future, this research can enable tissue-engineered implants for reconstructive skeletal deformities and cell-based therapies for osteoarthritis and osteoporosis Loth and his group believe. Several different polymer and ceramic combinations will be selected, synthesized to form composites and tested experimentally and theoretically to assess the quality and characteristics of the resulting adhesives.

This technology may be of great importance in orthopedics for securing scaffolds and implants as well as in dental applications involving gluing implanted teeth or other implants to bone, which is a multi-million dollar market.

The College of Engineering selected this project as one of ten proposals for Grainger Program in Emerging Technologies funding. The Grainger Foundation created the program to promote the translation of new academic developments in engineering into commercially viable products and services. It is designed to bridge the gap between traditional funding for basic theoretical research and typical industry funding, which targets already-proven technologies.



A scanning electron microscope photograph shows the nanostructured microporous surface morphology of the proposed composite adhesives.

Loth has been a faculty member since 1990 and Bayer, with expertise in polymers and nano-texture surfaces, has been a post-doctoral scientist since January 2008.

Loth

Jasiuk

Bayer

New AE Professor Developing Bat-Like Aircraft Flight

"The successful reverse-engineering of flapping flight will potentially lead to an innovation in aircraft design."

Equipped with a vision to develop aircraft that mimic the autonomy and agility of bats, Soon-Jo Chung begins this fall semester as a new assistant professor in Aerospace Engineering.

Coming to Illinois from Iowa State University, the biomimeticist brings with him a three-year, $300,000 Air Force Young Investigator research grant he received this year for his project, "Bio-Inspired Integrated Sensing and Control of Flapping Flight for Micro Aerial Vehicles."

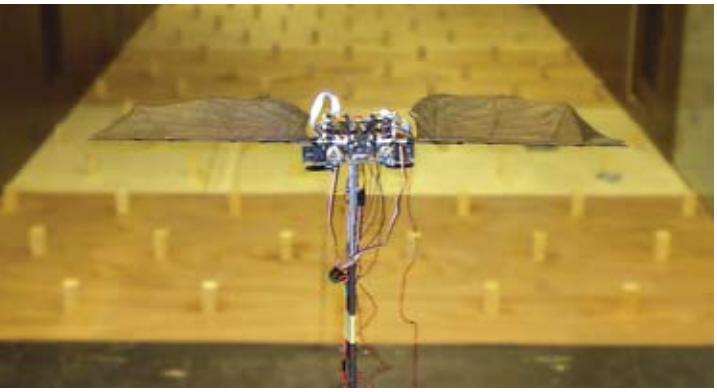
According to Chung, "Bat-inspired flapping flight holds promise for creating micro-aerial vehicles (MAVs) where rigid fixed wings drop substantially in aerodynamic performance. The successful reverse-engineering of flapping flight will potentially lead to an innovation in aircraft design, and push the frontier of our understanding of neurobiological mechanisms underlying animal flight and locomotion."

"There's a lot to learn from bio systems," Chung said. "Bats can fly with damaged wings. They are so agile and highly maneuverable; they can make rapid 180-degree turns autonomously and they can fly indoors without colliding with obstacles."

Bats' wings are designed to allow the animals to move acrobatically. Thousands of tiny hairs on the wing membranes provide sensory information that controls the shape and pitch of the wings. This enables bats to adjust their flight in response to wind gusts and obstacles.

These qualities are desirable for small aircraft that could be used in surveillance, particularly in urban settings where obstacles hamper movement and satellite control is blocked.

Chung is working on a MAV with an engineered neural control system that mimics bats' ability to synchronize their wings' flapping and joint movements, allowing them to respond to changes in environment. Meanwhile, his ongoing research on vision-based navigation is expected to make a break-through with a superior information-to-weight ratio. A small camera allows the vehicle to see obstacles while an onboard computer generates a map for navigation.



So far, Chung has successfully developed a small indoor helicopter that can autonomously navigate a path. He also has produced a robotic bat that, docked on a test bed, has a range of eight independent movements in flapping its wings. The next step is to combine the two advances in a vehicle light enough to fly.

While expanding this research, Chung will continue developing new theories and methods to coordinate the movements of individual space or aerial vehicles in formation, a project that comprised his doctoral work at Massachusetts Institute of Technology. Chung earned that degree in estimation and control in 2007, and earned his master's, also at MIT, in 2002 in aeronautics and astronautics. He was summa cum laude in earning his bachelor's in aerospace engineering in 1998 from the Korea Advanced Institute of Science and Technology (KAIST), a leading science and engineering school in Asia.

Chung came to Iowa State in 2007, spending two years as Assistant Professor of Aerospace Engineering. Prior to that, he spent six years as a research assistant in the MIT Space Systems Laboratory and half a year as a research engineer in the New Initiative Office of the National Optical Astronomical Observatories in Tucson, Arizona. He was also a consultant for NASA's Lunar Reconnaissance Orbiter during 2007.

In addition to the 2008 AFOSR Young Investigator Award, Chung's honors include Iowa State's Aerospace Engineering's Most Inspiring Professor Award, Fall 2008 and Spring 2009; Iowa State's Aerospace Engineering's Most interesting Line of Research Award, Fall 2008 and Spring 2009; Outstanding Faculty Award from Iowa State's VEISHEA celebration in 2009; the 2008 IEEE International Conference on Electro/Information Technology Best Paper Award; a finalist for the 2006 American Institute of Aeronautics and Astronautics Guidance, Navigation and Control Conference Best Student Paper; an AT&T Asia/Pacific 2000 Leadership Award; and a 1998 KAIST Action Committee Presidential Award.

Chung is a Senior Member of AIAA and has been nominated as Technical Area Co-Chair of the 2010 AIAA Guidance, Navigation, and Control Conference.

Sixty Years and Going Strong

Emeritus Prof. Harry H. Hilton reached a remarkable milestone in September 2009 — his 60th continuous year at the University of Illinois.

Hilton started on the Urbana-Champaign campus in 1949, while working to earn his PhD. His plan was to study with Prof. Alfred Freudenthal, but Hilton was left to his own devices when Freudenthal left for Columbia University early in 1950. Hilton didn't have the convenience of email and, in those days, one did not make long distance phone calls unless there was a major emergency. Standard mail was slow, and responses were not prompt. Nevertheless, Hilton finished his PhD in Theoretical and Applied Mechanics with a minor in Mathematics in 1951. Subsequently, he was promoted to assistant professor of aeronautical engineering with the then-substantial annual raise of $400.

He was promoted to professor in 1957 and served as department head from 1974 to 1985. Hilton served the College of Engineering as an assistant dean during the 1989 and 1990 summers. He has taught every undergraduate AE course except propulsion to over 3,000 students. He also taught Computer Science 101 during the 1980s.

Retiring from Illinois in 1990, Hilton has remained active in research, graduate teaching and public and professional service.

He is the Senior Academic Lead for Structural/Solid Mechanics at the National Center for Supercomputing Applications (NCSA). Hilton is a fellow of the American Institute of Aeronautics and Astronautics (AIAA); a director of Sigma Gamma Tau, the national aerospace honorary society; and a member of two AIAA Technical Committees on Structures and on Nondeterministic Applications. He is on the Editorial Board of a book series entitled *Advances in High-Performance Computing*. Several large aerospace companies have used his services as a consultant and expert witness at aircraft accident trials.

Hilton was appointed the Charles E. Schmidt Distinguished Visiting Professor at Florida Atlantic University in Boca Rotan from 1997 to 2002 and in 2007. He also serves as an external examiner at Nanyang University in Singapore.

He currently has two AE PhD thesis students and a research grant from the Boeing Co. administered through NCSA, where he holds a part-time appointment. He also continues his active membership in UIUC's Faculty-Student Senate, in which he has served for many years on the academic freedom and tenure and the faculty governance committees.

Hilton is an internationally recognized authority in viscoelasticity and aero-viscoelasticity. He has published or had accepted for publication over 300 papers in archival journals or conference proceedings. Among his active analytical and computational research areas are:

- deterministic and stochastic linear and nonlinear viscoelasticity
- composites
- aero-viscoelasticity
- aerodynamic noise
- probabilistic failure criteria and analysis
- damping and nonlinear dynamics
- linear and nonlinear anisotropic viscoelastic finite element analysis
- optimum designer materials and systems
- piezoelectric, magnetic, and functionally graded viscoelastic materials
- electronic packaging
- nonlinear creep and buckling of columns and plates
- analytical determination of damping properties
- material characterization
- stochastic minimum structural weight analysis
- probabilistic delamination of composites during service and manufacturing processes (cure)
- structural control and survivability
- engineering education
- structural integrity of dentures.

Hilton said his wife, Lois, is very supportive of all of his activities, which he plans to continue for a long time. The exchange that took place at his 1990 retirement dinner best describes his past and future. Emcee Prof. John Prussing asked him then, "So Harry, now that you are retired, are you going to go away quietly?"

Hilton's reply? "No, I will not be quiet and I will not go away."

"No, I will not be quiet and I will not go away."

Burton Retires from Teaching; Continues Research

By nature cheerful, enthusiastic and inquisitive, Rod Burton has never had a problem looking up. In fact, he's made a career of it.

It started when he was a boy, and he and his cousin, Jont Allen, now an ECE professor, first performed "experiments" with rocket propulsion (one nearly led to the death of a garage). Former AE Department Heads Mike Bragg and Wayne Solomon both can tell stories of how Burton's endless visions over the years for reaching beyond the stratosphere were limited only by the money needed to make them happen.

Even now, as he officially retired from the AE Department, the ideas keep coming.

He and AE Prof. Victoria Coverstone are working on putting solar sails on two CubeSats—nano satellites that are 10 cm. on a side. The "UltraSail" is made from shiny, metallic-looking plastic material, similar to that used for celebration balloons. The theory is that sunlight pushes the sail material, causing the satellites to move in orbit. But, says Burton, "No one's yet gotten them to fly."

Burton and Coverstone are working on the project with ECE professor Gary Swenson, as well as a collection of graduate and undergraduate students. The project is a contract of CU Aerospace, a partnership Burton has formed with Coverstone, Solomon, Bragg, AE Prof. Scott White and AE alumnus and former AE instructor David Carroll.

Burton also will be working with Gary Eden, another ECE professor, on a micro thruster project. The electric device uses neon gas as a propellant and, at a fifth the size of typical thrusters, should be more efficient to operate.

Furthermore, Burton has a student project—the Illini Space Jet 1/10 scale rocket-launching airplane that can be seen on YouTube.

Standing: **Rod Burton, left, with his cousin, Jont Allen, and his wife, Patricia Jeng.** ***Seated:*** **Burton's youngest son, Brandon, and wife, Linda.**

So, although he will no longer be teaching in the classroom, Burton will continue with research. His smiling face will still be seen for the years to come in the hallways of Talbot Laboratory.

Burton first came to AE at Illinois in 1989 after leaving Alexandria, Virginia-based GT-Devices, where he had been Director of Space Applications for eight years. Prior to that he spent 16 years in positions including research engineer at Princeton University (where he had earned both his bachelor's degree and PhD); senior scientist for JAYCOR in Alexandria, Virginia, and for Dutcher Industries in San Diego, and assistant professor of mechanical and aerospace engineering at the University of California-San Diego.

In the past 20 years at AE, Burton has accomplished a great deal:

- Has earned many teaching and advising awards throughout his career, including frequent appearances on the Incomplete List of Teachers Ranked Excellent and the College of Engineering Advising Award
- Earned the American Institute of Aeronautics and Astronautics 1996 Best Paper Award
- Has published three book chapters and over 150 journal and conference papers
- Has received substantial research funding throughout the years, especially from the Air Force Office of Scientific Research, the Office of Naval Research, and the National Aeronautics and Space Administration
- Has advised 21 master's degree and 13 PhD students
- Has provided superb service to the department, including eight years as Associate Head and one year as Interim Head.

Burton continues to act on behalf of the Department. In lieu of retirement gifts, he has requested that friends and colleagues instead donate to the AE Outstanding Graduate Student Fellowship Fund. About $1,300 has been collected in his honor.

As he considers his tenure in AE, Burton points out that the Department has made considerable progress in terms of faculty, students and research dollars. He looks forward to observing and participating in even further success in the future.

The 12-year-old kid in him that experimented in his garage is easy to imagine when Burton enthuses, "Aerospace is as exciting as it ever was: There are so many things left to discover!"

A Celebration of the Life of Aerospace Engineering Emeritus Prof. Adam Richard Zak, 1934–2008

AE Prof. Emeritus Harry Hilton wrote this tribute to the late AE Prof. Emeritus Adam R. Zak, who died Dec. 10, 2008, at his home in Florida.

Adam Zak

I first met Adam when he was a graduate student at Purdue University in the late 1950s and was instantly drawn to him due to his zest for life, his honest outspoken vision for things personal and professional and for his loyalty to the principles and people he believed in so passionately.

I followed his career at California Institute of Technology and eventually starting in 1964 at the then Aeronautical Engineering Department of the University of Illinois at Urbana-Champaign (UIUC). His research and teaching achievements were soon recognized by the profession. Among his many professional accomplishments, an outstanding research contribution to remember is his 1968 defining paper on finite element analysis in viscoelastic media, the first ever to be published on the subject. A number of results from his cutting edge research in aerospace structural dynamics were adopted by the industry. He was an active AIAA associate fellow, a member of the AIAA Structural Dynamics Technical Committee, chair of the AIAA Illinois Section and a member of Sigma Xi, the national research honor society.

He was known for his clear and incisive teaching and as the creator of a number of new courses at UIUC. Students would seek him out during their campus stay and when they returned after graduation.

Before and after retirement, he was and he continued as a consultant to a host of aerospace companies and government laboratories, where his sage advice was sought out and much appreciated. Yet during his busy and productive professional career, he found ample time and energy to devote to his family and to the community.

In 1939, when the Nazis and Soviets invaded his native Poland, he escaped to New Zealand. There he attended public and high schools and the University of New Zealand, where he obtained a BS degree in mechanical engineering in 1957. He then studied at Purdue where he was awarded MS (59) and PhD (61) degrees in aeronautical engineering.

Adam died unexpectedly of natural causes on December 10, 2008, in Winter Park, FL, where he was a consultant to Coleman Aerospace L3 Communications.

His raucous voice in the corridors first heard on the UIUC campus in the Transportation Building and later in Talbot Laboratory has been stilled and it will reverberate no more there, but he will never be forgotten. He will be sorely missed by all.

—Harry H. Hilton

Illinois-led Project Garners $6.25 Million DoD Grant, *continued from page 6*

Lambros will do experimental mechanics testing and oversee the entire project, which also will require the work of a dozen graduate students and three post-doctoral research associates.

The Army Research Office (ARO), Office of Naval Research (ONR), and the Air Force Office of Scientific Research (AFOSR) conducted the 2009 MURI competition for the DoD. ARO will oversee the Lambros team's work.

The MURI program supports research by teams of investigators that intersect more than one traditional science and engineering discipline in order to accelerate both research progress and transition of research results to application. Most MURI efforts involve researchers from multiple academic institutions and academic departments. Selection was highly competitive: a total of 152 proposals were submitted and 41 were funded.

Scholarships Awarded AE Students

Jessica Wayer of Park Ridge, Illinois, and **Sarah Fullmer of Highland Park, Illinois,** were winners of the ***Boeing Women-in-Engineering Corporation Scholarships.*** Wayer and **Liz Chapman of Champaign, Illinois,** also were winners of the ***Northrop Grumman Design and Engineering Support Program Awards.*** **Craig Merrett of Ottawa, Ontario, Canada,** was a winner of the ***Natural Sciences and Engineering Research Council Post Graduate Scholarship,*** and the ***College of Enginering Mavis Memorial Fund Scholarship*** *(see story page 32).*

Chasiotis Earns Presidential Early Career Award

Grant Supports Investigation of Nanoscale Polymer Behavior

Associate Prof. Ioannis Chasiotis will be traveling this fall to Washington, D.C., to receive from President Barack Obama a 2008 Presidential Early Career Award for Scientists and Engineers (PECASE).

The award is the highest honor the U.S. government bestows upon young professionals at the outset of their independent research careers. Chasiotis is among 100 individuals being honored in all fields of science and engineering.

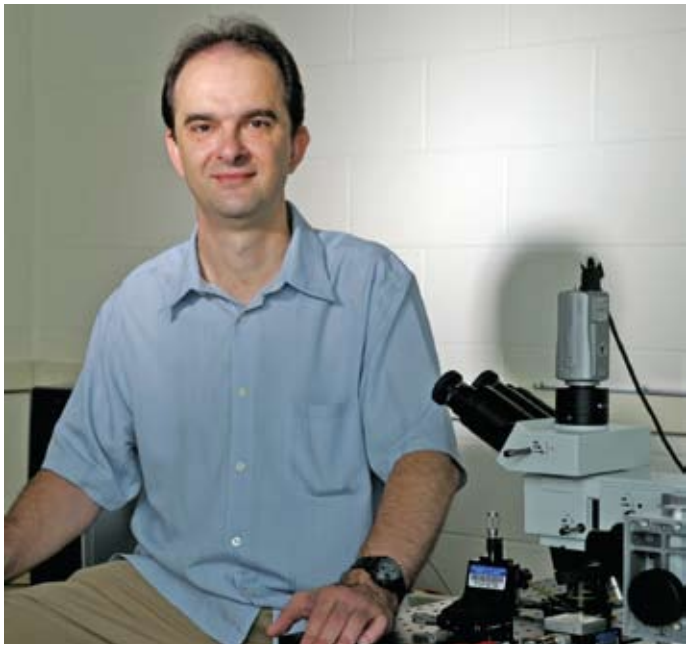
Young scientists and engineers with PECASE awards also receive a five-year research grant to further their study in support of critical government missions. Supported by the National Science Foundation, Chasiotis' project has been the study of the mechanical behavior of polymeric materials in ultra small volumes. At the nanoscale, these materials behave very differently from the way that polymers behave when fabricated in large quantities.

Although in every day applications polymers are not used directly in such very small quantities, when they are combined with nanopowders and nanotubes to form products such as nanocomposites, polymers are compartmentalized in such small quantities that their physical behavior is radically altered.

"Large fractions of the polymer molecules are either not as confined or are tightly confined when polymeric materials are limited to nanoscale sizes, forcing them to follow new deformation routes," Chasiotis said.

In recent years, aerospace firms and other sectors have explored the use of polymer-based composites for large-scale structures, such as the Boeing 787. Although the main structural material to fabricate the fuselage of a Boeing 787 will be a carbon fiber composite, nanocomposite materials are becoming the means to impart multifunctionality and improve upon the durability of existing laminate and woven carbon and glass fiber composites. The use of different forms of composites reduces the structure's weight, providing obvious savings in energy, and, potentially, in maintenance costs.

However, to this point, the mechanical behavior of such materials has not been scientifically investigated,



so their design is often being done in a trial and error manner. "The design of nanostructured materials proceeds with using properties for the polymer constituents that are not correct, and, consequently, computations and predictions do not agree with the experimental measurements for nanostructured composites," Chasiotis said.

His research group has the expertise to measure the mechanical behavior of polymeric nanofibers at different time and size scales by developing advanced experimental methods that hinge upon the technology of micro-electro mechanical devices.

"When this research is realized," Chasiotis maintains, "we envision being able to identify the limits and the potential of nanostructured polymeric materials, therefore gaining the ability to design and fabricate composite materials with advanced properties that will improve, and, potentially, revolutionize the way aerospace and other structures are built in the future."

AE Researchers' Paper Chosen as Best from Continuum Mechanics Conference

A group of AE researchers has earned the Best Paper Award from a major continuum mechanics conference held in February in Cambridge, the United Kingdom.

The International Association of Mechanical Engineers/World Scientific and Engineering Academy and Society (IAME/WSEA) chose the paper, "Theory of designer nano-viscoelastic composites," from the Proceedings of the Fourth International Conference on Continuum Mechanics.

Sharing in the honor are Emeritus Prof. Harry H. Hilton, Associate Prof. Ioannis Chasiotis and Mohammad Naraghi, who completed his doctoral degree in AE in May. Naraghi is now a post-doctoral research associate at Northwestern University.

The paper resulted from the group's new approach in analyzing potential structural materials. Instead of designing structures around standard materials' properties, Hilton and his collaborators attempt to determine the properties of ideal materials that would best suit the structure's uses.

This way of looking at structural analysis and design is unique because it defines materials that do not yet exist. The work determines what attributes the materials should have to produce optimum results.

The formulas produced through the research also allow materials designers to input variables like cost, performance and weight.

The award paper is an application to nano-viscoelastic composites of the general theory of designer materials developed previously by Hilton, Daniel H. Lee and Abdoul A. El Fouly.

Currently Hilton, Lee and Craig G. Merrett are conducting research to generalize the fundamental paper still further to encompass entire flight vehicles (aerodynamics, control, stability, propulsion, structures). They estimate that for a large transport aircraft this would entail solving some 800,000,000 simultaneous equations and will necessitate the use of the IBM-NCSA peta-scale computing system, which will become operational in 2011.

Lee and Merrett are PhD candidates in AE.

Hilton

Naraghi

Chasiotis

Kirts Receives Staff of the Year Award

A brand new departmental recognition, the AE Staff of the Year Award, was presented to Barbara Kirts, Coordinator of Undergraduate Programs during the April Awards Banquet.

Kirts serves as the point of contact for prospective and current undergraduate students, and is the Departmental contact for all AE student societies. She offers assistance to the AE chair of Engineering Open House, and serves on the Department's Undergraduate Curriculum Committee.

Joining AE's staff in August 2006, Kirts has been working within various university units the past 32 years. In May 2000 she received the Robert E. Larson Human Development Award from the Urbana campus Counseling Center for her contribution to the enhancement of student development.

AE Prof. Philippe Geubelle presents Barb Kirts, Coordinator of Undergraduate Programs, with the inaugural AE Staff of the Year Award.

Geubelle, Loth Named ASME Fellows

AE Prof. Philippe Geubelle was presented the 2009 American Institute of Aeronautics and Astronautics Illinois Chapter's Teacher of the Year Award. From left, Ryan Palmer, AE student and AIAA member; Joel Houston, AE student and AIAA president; AE Prof. Philippe Geubelle; and Mike Eder, Lockheed Martin Director of Airframe & Installation.

AE Profs. Philippe Geubelle and Eric Loth have been named Fellows of the American Society of Mechanical Engineers (ASME). Fellowship status in the 129-year-old organization is conferred upon veteran members who have contributed significant engineering achievements.

Loth

Both Geubelle and Loth have distinguished themselves nationally and internationally as engineers and educators: Geubelle, in computational mechanics and Loth, in the area of fluid dynamics.

Over his 15-year professional career, Geubelle's research accomplishments include development of novel numerical methods for fracture mechanics, computational design and modeling of biomimetic self-healing and cooling materials, multiscale modeling of heterogeneous materials and computational aeroelasticity.

A Bliss Faculty Scholar in the College of Engineering since 2005, Geubelle is the AE Associate Head for graduate programs and directs the Illinois Space Grant Consortium. He has supervised over 30 graduate students, and has obtained multiple awards for his research, teaching and advising work.

Among his honors have been the 1998 and 2009 American Institute of Aeronautics and Astronautics Illinois Chapter's Teacher of the Year Award; the 2007 Best Fatigue and Fracture paper published in the *Journal of Engineering Materials and Technology;* the 1999 and 2006 University of Illinois College of Engineering Xerox Research Award; the 2000 University of Illinois College of Engineering Everitt Teaching Award; the 2001 American Society for Composites Best Paper Award, 16th Technical Conference, Polymer Matrix Composite Division; a 1998 National Science Foundation CAREER Award; and a 1994 NATO postdoctoral fellowship.

Geubelle earned a bachelor's in mechanical engineering from Catholic University of Louvain, Louvain-la-Neuve in Belgium in 1988. He earned a master's and PhD in aeronautics from the California Institute of Technology in 1989 and 1993, respectively.

Loth's major research accomplishments include development of novel simulation methods and fundamental research in aerodynamic, aeroelastic, multi-phase, and supersonic flow phenomena.

A Willett Faculty Scholar in the College of Engineering since 2002, Loth has over 75 journal publications (including a review paper on multiphase flow with more than 90 citations), and over 100 conference papers.

Loth earned his PhD in 1988 from the University of Michigan, with a dissertation on experiments of multiphase supersonic turbulent flows. He earned a master's in 1985 from Pennsylvania State University and a bachelor's in 1983 from West Virginia University, conducting research in aerodynamic simulations and wind turbine systems, respectively.

Loth focused on computational fluid dynamics of shock waves with unstructured grids when he began his career at the Naval Research Laboratory. He joined the AE Department's faculty as an Assistant Professor in 1990, and rose to Associate and then Full Professor by 2002, when he was named a Willett Faculty Scholar of the College of Engineering. In 2008, he was appointed AE's Associate Head of Undergraduate Studies.

Among Loth's honors include being named a Visiting Scholar at Cambridge University in Fall 2004; the 2001 NASA Revolutionize Aviation Team Award; AIAA Associate Fellow since 2000; National Center for Supercomputing Applications Faculty Fellow, 2000-2002; List of Teachers Ranked as Excellent by Their Students numerous times; Senior Fellow, Naval Research Lab in Washington, D.C., 1995; 1994 AE Teacher of the Year; 1994 and 1990 Urbana campus

Research Board Award; 1994 finalist, Urbana campus Vice Chancellor Teaching Scholar; 1993 College of Engineering List for Excellence in Advising; 1992 Men of Achievement list; 1991 International Paper Co. Undergraduate Instructional Support Award; 1990 National Science Foundation Research Initiation Award; and the 1989 Department of Navy Exceptional Performance Award.

Founded in 1880, ASME is a not-for-profit professional organization that promotes the art, science and practice of mechanical and multidisciplinary engineering and allied sciences throughout the world. The core values of ASME are rooted in its mission to better enable mechanical engineering practitioners to contribute to the well-being of humankind.

Bodony and Coverstone Recognized for Excellence in Advising

Engineering Council, a student-operated organization in the College of Engineering, in spring 2009 recognized Assistant Prof. Daniel J. Bodony and Prof. Victoria Coverstone for Excellence in Advising. Bodony has been a member of AE's faculty since 2006, while Coverstone became a faculty member in 1992.

White is Finalist for Bepi Colombo Prize

White

AE Prof. Scott R. White was one of five finalists for the 2008 Bepi Colombo Prize, an international award named in honor of Italian scientist Giuseppe Colombo, famous for his contributions to aerospace technology and exploration.

White was considered for his pioneering work in developing self-healing polymers, materials that mimic the autonomic healing response natural to living systems. White's research team reported their initial breakthrough in 2001 with an epoxy polymer containing a microencapsulated healing agent and a catalytic chemical trigger. Cracks in the polymer rupture the embedded microcapsules, releasing the healing agent into the crack, healing it. In subsequent research White's team has developed a second generation of the polymers incorporating a vascular network akin to biological systems, so that the healing agent supply can be replenished indefinitely, extending the materials' lifetime greatly.

The research has gained worldwide attention and has resulted in White founding a company, Autonomic Materials Incorporated, in the University of Illinois Research Park. Applications for the self-healing polymers are far-reaching, ranging from aerospace structures, to sporting goods, to microelectronics to coatings and paint.

Candidates for the biannual Bepi Colombo Prize must have produced research that has contributed to a meaningful advance in a field related to Prof. Colombo's research activity, and/or has produced results that impact consumers' daily lives.

Colombo built his career at the University of Padova, Italy, lecturing on mechanical vibrations and celestial mechanics, as well as space vehicles and rockets. He participated in research at the Harvard Smithsonian Center for Astrophysics, then at Caltech and the Jet Propulsion Laboratory.

Colombo is known for his discovery of the spin-orbital coupling of Mercury, the planning of multiple fly-by of Mercury in 1972-1973, the conceptual design of the Solar Probe mission, the promotion of the Skyhook concept applications, a new type of orbiting gravity gradiometer, and the interpretation of the azimuthal brightness variation of ring A of Saturn as a spiral structure. He studied new concepts concerning space transportation, large space structures and evolution of space technology for space sciences and applications. He also was one of the pioneers of many tethered satellite applications.

AE Alumni Command Space Shuttle Flights, Join 2009 Astronaut Class

AP Photo by John Raoux

Space shuttle Atlantis crew, from right, commander Scott D. Altman, pilot Gregory C. Johnson, mission specialist, K. Megan McArthur, mission specialist John Grunsfeld and mission specialist Andrew Feustel, mission specialist Michael Good and mission specialist Michael Massimino, leave the Operations and Checkout building enroute to board the shuttle at Kennedy Space Center in Cape Canaveral, Fla., Monday, May 11, 2009.

Two AE alumni commanded space shuttle flights in 2009, while a third alumnus joined the ranks of the 2009 astronaut candidate class.

Veteran space flier Lee "Bru" Archambault, BS 1982, MS 1984, commanded the shuttle Discovery's March mission to the International Space Station. Scott Altman, BS 1981, another veteran in space, commanded Atlantis' mission to service the Hubble Space Telescope in May. In July, Lt. Col. Michael S. Hopkins, BS 1992, brought to four the number of astronauts produced by the Aerospace Engineering Department at Illinois (the fourth is Col. Steven R. Nagle, BS 1969).

Photo by NASA/Bill Ingalls

Leading NASA's STS-119 space shuttle crew, Commander Lee Archambault presented President Barack Obama with a montage in the Oval Office of the White House, Friday, May 1, 2009, in Washington, D.C.

Michael Hopkins

Archambault, a U.S. Air Force colonel, led a mission to deliver the space station's fourth and final set of solar array wings, completing the station's backbone, or truss.

The arrays were designed to provide the electricity to power science experiments and increase the crew size to six in May. Archambault and other members of the STS-119 crew were honored on May 1 with a White House visit with President Barack Obama.

During the servicing mission to Hubble, Altman's crew installed two new instruments, repaired two inactive ones, and performed the component replacements that will keep the telescope functioning into at least 2014. The Atlantis mission was Altman's fourth shuttle flight since joining the space program in 1995. He has previously flown to the International Space Station and on an earlier Hubble Space Telescope servicing mission.

Hopkins was one of nine men and women selected from among 3,500 applicants for the 2009 astronaut class. Relocating to NASA's Johnson Space Center in Houston in August, Hopkins had been working as special assistant to the Vice Chairman (Joint Chiefs of Staff) at the Pentagon.

Astronaut Honored as Distinguished Alumnus

The university, college, and Department of Aerospace Engineering welcomed Colonel Lee J. Archambault, BS 82, MS 84 AE, a distinguished United States Air Force pilot and NASA astronaut, back to campus during the Foundation weekend Oct. 2–4.

Archambault was presented the College of Engineering Distinguished Alumni Award "for contributions to the assembly of the International Space Station and for decorated service in the United States Air Force," during a special reception Oct. 2 in Engineering Hall.

Left to right: **Colonel Lee J. Archambault and Michael B. Bragg, AE Prof. and College of Engineering Executive Associate Dean for Academic Affairs.**

While on campus, Archambault participated in the annual AE Alumni Advisory Board meeting and made several presentations to campus officials. As a former hockey player at Illinois, he returned to the Ice Arena on Friday night to present the team with a jersey that had flown with him in space. On Saturday afternoon, Archambault was on the field at Memorial Stadium, armed with his own NASA commemorative coin for the coin toss prior to the Illinois vs. Penn State football game.

Upon graduating from Illinois, the Bellwood, Illinois-native became a distinguished graduate of the Air Force Officer Training School. He was commissioned as a second lieutenant in 1985 and earned his pilot wings a year later. Archambault served two F-117A tours of duty in Saudi Arabia in 1990 and 1991 during the Gulf War, flying 22 combat missions followed by post-Desert Storm peacekeeping efforts. In 1992, he was reassigned as an F-117A instructor pilot and operational test pilot. After graduating first in his class from the Air Force Test Pilot School in 1995, he performed weapons developmental flight tests.

A decorated military pilot, Archambault earned the Distinguished Flying Cross and Meritorious Service Medal, among other awards.

Selected as a pilot by NASA in 1998, he worked on flight instrument upgrades that were incorporated into the shuttle in 2003 and supported launch and landing operations at the Kennedy Space Center.

Archambault served as the lead astronaut support person for two shuttle flights in 2002 and 2005 and in October 2004 was assigned as the lead capsule communicator. He piloted the space shuttle Atlantis in June 2007, and in March 2009, he served as mission commander of the Discovery-both trips were to the International Space Station.

Since 1996, Archambault has served on the Department of Aerospace Engineering Alumni Advisory Board. In 1993, he was awarded the Department of Aeronautical and Astronautical Engineering's Outstanding Recent Alumnus Award.

Dowell Receives Prestigious Guggenheim Medal

AE Alumnus Earl H. Dowell, BS 1959, William Holland Hall Professor at Duke University in Durham, North Carolina, is the 2008 recipient of the Daniel Guggenheim Medal.

The award was presented during the AIAA Aerospace Spotlight Awards Gala on May 13, 2009, at the Ronald Reagan Building and International Trade Center, Washington D.C. The Medal recognizes Dowell for pioneering contributions to nonlinear aeroelasticity, structural dynamics and unsteady aerodynamics that had a significant influence on aeronautics, and for contributions to education and public service in aerospace engineering.

With this award, Dowell has amassed all the major honors in his field, including the Walter J. and Angelina H. Crichlow Trust Prize and the Spirit of St. Louis Medal. He is also a member of the National Academy of Engineering and an Honorary Fellow of the American Institute of Aeronautics and Astronautics.

Since 1983, Dowell has been the William Holland Hall Professor, Mechanical Engineering at Duke University. Prior to this he was Professor at Princeton University and Assistant Professor at the Massachusetts Institute of Technology. Throughout his career, Dowell continued vibrant research activities and made outstanding and lasting seminal contributions providing solutions to some of the most important problems in aeroelasticity, unsteady aerodynamics and structural dynamics. These endeavors led to major contribution to the flight safety of fighter aircraft and have also had a major impact on the design of both military and civilian aircraft.

Duke University Photography

In addition to his research, Dowell made extraordinary contributions to engineering education especially as a former Dean of Engineering at Duke University where he had major impact on not only the development of the school's unprecedented prominence but also on countless graduate students.

Throughout his distinguished career, Dowell also participated generously with professional service and service on high-level advisory panels including the Air Force and NASA.

Dowell is the principal author of the leading textbook in aeroelasticity, *A Modern Course in Aeroelasticity,* now in its 4th edition, and also a co-author of the now classic *Aeroelasticity of Plates and Shells*, and of the most recent *Dynamics of Very High Dimensional Systems.* Additionally, he is the author or co-author of over 250 technical papers.

Dowell's honors include Fellow of the American Society of Mechanical Engineers, Fellow of the American Academy of Mechanics, past president of the American Academy of Mechanics, current service on the National Research Council, and others.

His accomplishments have been recognized with the AIAA Theodore von Kármán Lectureship in Astronautics, AIAA Structures, Structural Dynamics and Materials Award, and the American Academy of Mechanics Distinguished Service Award.

The Daniel Guggenheim Medal, jointly sponsored by the American Institute of Aeronautics and Astronautics, American Society of Mechanical Engineers, American Helicopter Society, and Society of Automotive Engineers, was established in 1929 for the purpose of honoring persons who make notable achievements in the advancement of aeronautics.

AE Honors Outstanding Alumni

Stephen J. Hoffman, BS 78, MS 80, PhD 84, and Catherine Koerner, BS 87, MS 89, are the 2009 winners of the Aerospace Engineering Distinguished Alumni Awards. Pamela McVeigh, BS 93, and Daniel Thunnissen, MS 96, are the winners of the 2009 AE Outstanding Recent Alumni Awards.

All were recognized at the Department's Awards Banquet held April 30 at the Alice Campbell Alumni Center.

Stephen J. Hoffman

Hoffman is a division manager with the Space, Earth, and Aviation Science Business Unit of SAIC, managed by L. David Cazes. Hoffman joined SAIC in 1980. He is a recognized expert in the fields of interplanetary mission planning, preliminary spacecraft design, and orbital mechanics, primarily as they apply to future human space missions. Hoffman currently is working on advanced projects analysis for NASA's Constellation Program Office at the Johnson Space Center.

Hoffman is the immediate past president of the AE Alumni Constituent Board. He is an Associate Fellow of the American Institute of Aeronautics and Astronautics, and is a member of the American Astronautical Society and the U.S. Naval Institute. Hoffman was summa cum laude in earning his bachelor's degree.

Catherine Koerner

Koerner is the Deputy Manager of the NASA International Space Station (ISS) Vehicle Office. In this role, she is responsible for managing the ISS hardware vehicle and systems. This includes defining operational requirements, researching, developing, analyzing, integrating and evaluating flight systems, as well as providing near real-time engineering evaluation support for ISS operations. Koerner also chairs the Vehicle Control Board and the Multilateral Vehicle Control Board on behalf of the Vehicle Office.

Prior to these duties, Koerner served as the Technical Assistant to the Manager of the ISS Vehicle Office and was also the Mission Operations Directorate Shuttle Program Manager.

Koerner's master's thesis was on "Optimization of an Impulsive Intercept Maneuver Followed by a Low-Thrust Return." She has received numerous awards from NASA, and also received AE's Outstanding Recent Alumnus Award in 1999.

Pamela McVeigh

After earning her master's and PhD at Purdue University, McVeigh joined Boeing to work on the International Space Station Program in Houston, as part of the Structural Integrity Team. Her work included leading various stress analysis efforts such as the robotic installation of the P5 and S5 trusses, the validation of the P4 and S4 trusses for launch loads and the evaluation of the Z1 truss for unplanned flights. In 2007, McVeigh took on a management role and doubled the size of her team, both in terms of personnel and budgeted tasks. A key task ahead for her and her team will be extending the life of the U.S. space station primary structure in order to ensure many additional years of on-orbit research.

Daniel Thunnissen

Thunnissen is a Senior Systems Engineering Specialist at Space Systems/Loral in Palo Alto and a part-time faculty member in the Department of Mechanical & Aerospace Engineering at San Jose State University. Dan supports cross-program systems engineering issues at Loral and is currently teaching fluid mechanics (ME111) at San Jose State University.

He is a former propulsion flight system engineer at the Jet Propulsion Laboratory (JPL) in Pasadena,

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Greetings from the AE Alumni Advisory Board

The Aerospace Engineering Alumni Advisory Board exists in order to provide support for the department in many ways. This year, our meeting occurred on October 2 and had a very full agenda.

First, we had an AE Department and College of Engineering update from our current department head, Professor Craig Dutton. You will be happy to know that the department now has one of the highest rankings nationally that it has ever had (based on *U.S. News & World Report* rankings), a strong indication that the department is widely viewed as one of the best in the world for aerospace engineering education and research.

Aerospace Engineering Alumni Advisory Board members in attendance at the annual board meeting, held this year on October 2nd, 2009.

Next AE Advancement Director Brett Clifton brought us up to date on our new Fellowship Challenge.

After our 2008 meeting, the AE Alumni Advisory Board decided to initiate a Fellowship Challenge among the board members to attempt to lay the foundation for endowing a new graduate fellowship for the department. While other engineering departments at Illinois have multiple graduate student fellowships and endowed professorships, AE stands out by having neither. We hope to change that...and to do so, we need your help as well. Please thoughtfully consider making a financial commitment this year to help your department. Contact Brett Clifton, the Advancement officer for the department for more information.

One of the features of our annual meeting is hearing from students. This year, Heather Arneson, a graduate student in the department, delivered a presentation on "Air Traffic Flow Management." For this year's undergraduate presentation, Charles Wojnar spoke on "Mechanical Testing of TiO_2 Microfibers." Additionally Professors Eric Loth and Philippe Geubelle provided updates on the undergraduate and graduate programs, respectively.

For the "View from Industry," the group moved to a larger room in Everitt Lab in order to accommodate any interested students. There, board member Ms. Gail Jonkouski presented an update on Aviation, Airplanes and Safety and Dr. Mike Lembeck spoke on "NASA at the Crossroads." Later in the day, Dr. Harry Hilton, who is still going strong, gave a presentation on "A Rational Integrated Approach to Designer Systems."

This year, we are establishing a special committee to review the board's Bylaws, Mission Statement and Objectives. These have not been reviewed for a number of years, and in some cases are outdated. By next year's meeting I would like to have them refreshed and presented for approval by the whole board. We are also documenting and agreeing on the process for inviting new members to join the AE Alumni Advisory Board, as we want the board to be engaged and accurately represent the larger department alumni population.

To make the AE Alumni Board more effective, we are also formalizing five standing committees to undertake the business of the Board between our annual meetings. These standing committees are

- Curriculum Advisement and ABET Accreditation Support
- Advancement
- Faculty Support
- Publicity and Recruitment
- Student Group Support

Each of these committees will report annually at the meeting of the whole Board in the fall.

At the conclusion of our meeting, we adjourned to join a reception for Shuttle Astronaut Lee Archambault, (BS 1982; MS 1984) who was named a Distinguished Alumnus by the College of Engineering in April.

I can speak for all of us on the AE Alumni Advisory Board when I say that we are proud to be alumni of this fine department and are working to give something back. Please don't hesitate to contact any of us during the course of the year with questions, suggestions or your thoughts. We all look forward to hearing about the many future successes of our department 's graduates!

Best regards,

Dan Jensen, '88
AE Alumni Advisory Board President

Outstanding Alumni,

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California, and a former assistant professor of aerospace engineering at Nanyang Technological University (NTU) in Singapore. Thunnissen has taught introduction to aerospace engineering, thermodynamics, aerodynamics, propulsion, and space systems design.

In addition to his master's degree from AE, he holds a bachelor's in aerospace engineering from the University of Michigan in Ann Arbor, and a PhD in mechanical engineering from the California Institute of Technology, where his research focused on propagating and mitigating uncertainty in the design of complex multidisciplinary systems.

Thunnissen is also a licensed professional engineer in the state of California.

Recent AE Alum Helps to Develop New Lunar Lander Test Bed

AE alumnus Wayne W. Neumaier, BS 07, MS 08, has been instrumental in the testing of a Lunar Lander Test Bed (LLTB) that is being used to demonstrate and mature technologies required for future NASA robotic space exploration.

As an employee of Orion Propulsion, Inc. (OPI), Neumaier helped to successfully deliver the LLTB propulsion system in the spring. NASA's Marshall Space Flight Center (MSFC) is now flying the completed vehicle, which is equipped with thrusters that guide the lander via closed-loop, autonomous flight algorithms. One set of thrusters controls the vehicle's attitude; another directs the altitude and landing. On the test lander, an additional thruster offsets the effect of Earth's gravity, so the other thrusters can operate as they would in a lunar environment. MSFC is in partnership with the Von Braun Center for Science and Innovation and John Hopkins University's Applied Physics Laboratory.

OPI designed, developed, and tested the complete propulsion system, including new components not available commercially, and delivered the hardware to Teledyne Brown Engineering, the vehicle prime contractor. Headquartered in Huntsville, OPI is a small woman-owned aerospace company specializing in spacecraft and rocket propulsion design and fabrication, testing services, ground support equipment, and launch operations support.

Neumaier was responsible for testing, including writing procedures, designing test rigs, constructing and running tests, and processing and reporting test data.

While a student in AE, Neumaier was involved with Illinois Space Society, Float'n Illini and IJet.

Marshall Space Flight Center is testing a new robotic lunar lander test bed that will aid in the development of a new generation of multi-use landers for future robotic space exploration.

Fighting Illini on the Ike

Five Aerospace Engineering alumni had a mini reunion when they found themselves working together in fall 2008 on board the USS Dwight D. Eisenhower (CVN-69).

Writes US Navy Flight Test Engineer Paul Martin, AE 06, "I recently completed a large project flight testing the new EA-18G aircraft at sea, on board the USS Dwight D. Eisenhower. While out there, we discovered that five of our test team had all gone to U of I and gotten AE degrees. We took a picture on the flight deck, in front of one of our test aircraft." Working with Martin were Mike Cebrzynski MS 94, Hank Zitnik BS 82, Alan Wirth BS 95, and Jim Skerston BS 88.

According to the Navy, testing aircraft performance and handling at the carrier was an enormous effort, requiring a large team of both contract and government engineers and Navy test pilots.

Left to right: **AE Alums Mike Cebrzynski MS 94, Hank Zitnik BS 82, Alan Wirth BS 95, Paul Martin BS 06, and Jim Skerston BS 88.**

AE Alum's Research 36 Years Ahead of its Time

Thirty-six years after AE alumnus Ed Prior first published research showing high altitude hydrogen levels to be much greater than cited in national standards, the Air Force is now accepting his findings.

Prior, BS 65, was the NASA Principal Investigator for PAGEOS, still the second largest satellite by volume to be injected into earth orbit. He published a paper on orbital drag measurements at altitudes above 1,000 kilometers, from observations of the balloon satellite's orbital decay (*The Use of Artificial Satellites for Geodesy*, Byrd Press, 1972, pp. 197–207), and found hydrogen levels to be 200 percent greater than given in the **U.S. Standard Atmosphere**. Prior's results were so unexpected at the time that his own NASA supervisor decided not to cite the paper or recommend inclusion of his hydrogen observations in the next upcoming version of the **U.S. Standard Atmosphere**, published four years later in 1976.

According to Prior, hydrogen has been difficult to measure in the upper atmosphere because its concentration is so low that few instruments can measure it accurately. At the high altitudes where PAGEOS orbited, hydrogen predominates over the other heavier atmospheric gases. Researchers in England had been attempting to measure drag effects at such altitudes from the orbital decay of balloon satellites as a way to determine the concentrations of hydrogen in the upper atmosphere, but none had succeeded. The problem was complicated by the fact that even minute earth-reflected radiation (earthshine) forces gently push balloon satellites out of their orbits, an effect that has to be accounted for in order to isolate hydrogen drag.

Prior was familiar with the work of his Illinois astronomy instructor, Prof. Stanley P. Wyatt (now deceased). Wyatt was an expert on earth-reflected radiation forces and Prior successfully incorporated Wyatt's modeling approach into his hydrogen drag research with PAGEOS. The result was the first hydrogen drag measurements from a satellite orbit, which were so much greater than expected that Prior concluded hydrogen concentrations were three times greater than given in the **U.S. Standard Atmosphere**.

In 2008, the Air Force Space Command announced Prior's results had finally been accepted and incorporated his 36-year-old hydrogen measurements into its new (http://sol.spacenvironment.net/~JB2008/pubs/JASTP_Bowman_JB2006_2008.pdf) atmospheric drag model, used by the AF Space Battlelab for missile trajectories and for satellite orbit predictions.

Prior, who holds advanced degrees in astronomy from the University of Virginia and in information systems from George Washington University, retired from NASA in 2005, ending a 40-year career. His research has been variously cited in **The Stratosphere: Past and Present, the COSPAR International Reference Atmosphere**, the **U.S. National Report on Geodesy**, and the various **U.S. Standard Atmosphere** publications. There are a total of six references to his research in three different annual editions of **Significant Achievements in Space Science.**

Class Notes

RICHARD E. MARTIN, BS 50, MS 51, in April retired for the second time from United Launch Alliance, where he had been working as a part-time technical advisor. He had retired for the first time in 1994 after a 43-year engineering career on the Atlas rocket program at General Dynamics.Martin's local American Institute of Aeronautics and Astronautics chapter in May recognized his 60-year membership in the organization, and presented him with the Lifetime Achievement Award.

ALFRED INSELBERG, BS 58, MS 59 *Mathematics*, PhD 65 *Mathematics*, announces his new book, *Parallel Coordinates*. The book is about visualization, systematically incorporating human pattern recognition into the problem solving process, and focusing on parallel coordinates.

AE alumni and astronauts **COL. LEE ARCHAMBAULT, BS 82, MS 84; CAPT. SCOTT D. ALTMAN, BS 81; COL. STEVEN R. NAGEL, BS 69;** and **CATHERINE A. KOERNER, BS 87, MS 89,** shuttle program manager of NASA's Missions Operations Directorate, all were featured on Feb. 6, 2009, in a story the University of Illinois student newspaper the *Daily Illini* produced highlighting the AE Department. The article also featured astronaut Joseph R. Tanner, BS 73 Mechanical Science & Engineering, and Dale A. Gardner, BS 70 Engineering Physics. To read the full story, please see the Daily Illini article at http://www.dailyillini.com/news/2009/02/06/ui-aerospace-alumni-shoot-for-the-stars.

SCOTT S. PICKARD, BS 72, MS 79 *Civil and Environmental Engineering*, has been elected to the Association of University Research Parks. Pickard is manager of the Research Park and Incubation Facilities for the University of Illinois in Urbana-Champaign.

ERIC A. BARNES, BS 78, MS 80, is working on GPS-related problems for The Boeing Company in Colorado Springs, Colorado. He stopped by campus in the spring to visit Emeritus Prof. John E. Prussing.

AYHAN E. MERTOGUL, BS 86, MS 89, PhD 93 *Mechanical Engineering*, is a patent attorney at McCracken & Frank^{LLP} in Chicago. He is interested in legal aspects of aerospace engineering and recently rejoined the American Institute of Aeronautics and Astronautics.

RUSSEL S. WENZEL, BS 89, MS 91, works for Raytheon in Aurora, Colorado. His work involves software for satellite orbits. He also teaches an in-house course on orbital mechanics.

JYUN-JYE F. CHEN, PhD 97, is teaching in the Department of Electrical Engineering at the Royal University in Bhutan.

In Memoriam

Richard Adams

RICHARD "RICH" JOHN ADAMS, BS 65, of Williamsburg, Virginia and Arlington, Virginia, died May 1, 2009.

Adam's career started at Pratt-Whitney in West Palm Beach, Florida, as a test engineer. He became manager of the Palm Beach office of Systems Control Technology, and was Vice President of Advanced Aviation Concepts.

Adams, who earned a master's in mechanical engineering from the University of Florida and a PhD in human factors engineering from the University of Central Florida, was also an associate professor of aeronautics at Florida Institute of Technology. He found teaching exhilarating and loved his students; he won the 2000 Professor of the Year Award.

Adams went on to become a research psychologist for Booz Allen Hamilton after receiving his PhD. Most recently he was a research psychologist for the Federal Aviation Administration, Flight Standards Division, working on synthetic vision, the Small Aircraft Transportation system, and unmanned air vehicle projects. He was instrumental in the research and the writing of numerous technical reports on Aeronautical Decision Making for commercial pilots, EMS pilots, and hospital administrators.

A native of Brookfield, Illinois, Adams' greatest accomplishments were in research for the helicopter industry, formulating and facilitating safe instrument operations for helicopters. He won a prestigious award from the Wild Goose Association for his work in Loran-C. He was active in and started the SAE G10 Human Factors subcommittee on UAVs, helping to develop basic guidelines for their development and interaction in civil airspace. Adams was recognized frequently by SAE for his orchestrating the development of recommended practices for airspace, displays, and helicopter operations.

Over the years he served on many committees including Radio Technical Conference of America, Society of Automotive Engineers, the Helicopter Association International, and the American Helicopter Society. Adams published over 60 technical reports, book chapters, and journal articles. He also volunteered to review other's articles.

He was recognized for his work on the Eastern State Hospital board, where he advocated for treatment and services for patients.

Adams was an avid reader, tennis player, snow skier, and accomplished equestrian. He loved music, fishing, and his three mastiffs and two cats.

Adams is survived by his son, Kyle Adams, an associate professor of music at Indiana University, and his family; by his former wife, Catherine Adams of Williamsburg, Virginia,; and his former wife and the mother of his children, Judith Marcek Deskin of Palm Beach Gardens, Florida.

NORMA JEANNE "JEAN" FARMER, 81, of Champaign, former Aerospace Engineering staff member of the 1980s and 1990s, died February 14, 2009, at her home.

Surviving are two children, Judy Simpson of Urbana and Roger Landreth of Savoy, nine grandchildren, and 19 great-grandchildren.

Greetings Aerospace Engineering Alums,

I am very excited to be working as the Assistant Director of Advancement and Alumni Relations for the Department of Aerospace Engineering. My position focuses on engaging alums of the department to see how they can stay connected, whether through fundraising, research opportunities, coming back to campus, being a guest lecturer, giving a talk to our current students, etc.

I make several trips each year to key aerospace markets (Houston, San Francisco, Seattle, LA, Washington DC, St. Louis, etc.) to meet with alums and learn about their experience in the AE and at Illinois, and about how their careers have progressed. I also meet with our corporate partners to discuss opportunities for their companies to best work with our faculty and students or with the department as a whole.

I plan several department and College of Engineering events across the country, handle annual fund solicitations and work on cultivation/stewardship of our many generous alumni financial donors. I work with faculty and staff to help determine student awards given at our annual Aerospace Engineering Awards Banquet. I help organize the annual Aerospace Engineering Alumni Advisory Board meeting and also serve as the department liaison for several campus-wide advancement and alumni relations committees.

My background is in advertising and business communications. I worked for the Starcom Worldwide/Leo Burnett advertising agency in Chicago for over seven years and worked in national advertising for *The Champaign News-Gazette* for two years. Prior to my current position, I worked in advancement for the College of Engineering for over a year.

I look forward to working with many of our great alums on increasing our fundraising efforts for the department and finding even more ways to keep our alums engaged. Feel free to contact me should you have any questions or need any information about the department.

Sincerely,

Brett Clifton

Assistant Director of Advancement and Alumni Relations, Department of Aerospace Engineering

217-333-1149
bclifton@illinois.edu

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 _____

You can also choose to make your gift online by going to www.ae.uiuc.edu/alumni/giving.html

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.

This gift is tax deductible as allowed by law.

5M5DH

AE Senior Design Teams Take Second, Third in AIAA Space Design Competition

AE senior design teams once again did well in the 2009 American Institute of Aeronautics and Astronautics design competition, taking second and third places, following an AE sweep of first, second and third in the 2008 AIAA competition.

The goal of the project, "Commercial Orbital Transportation Services (COTS) System Design," was to design a transportation system to provide a COTS solution for servicing the International Space Station. This transportation system was to have the capability to transport both cargo and crew between Earth and the ISS. The specific requirements for this project were adapted from NASA requirements for the COTS program.

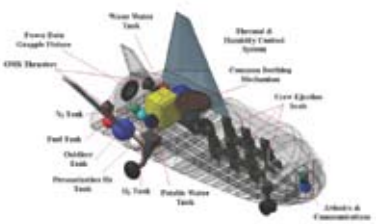
The transportation system was to be ready for a first flight in 2012. Therefore, teams had to carefully consider current technology readiness levels for new technologies to be integrated into vehicle design. Design decisions were to include selection of propulsion system components and propellants and launch vehicle configuration. The overall design solution had to consider safety, reliability, affordability, low operability and maintenance time.

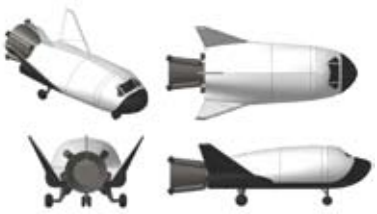
This project required a multidisciplinary team of students. Traditional aerospace engineering disciplines such as structures, propulsion, flight mechanics, orbital mechanics, thermal, environmental control and life support systems, and optimization were involved. In addition, economics and cost played a major role in determining design viability. Teams made significant design decisions regarding the configuration and characteristics of their preferred system. Choices had to be justified based on both technical and economic grounds, with a view to the commercial extensibility of any capability being developed.

Projects were judged on technical content, originality, practical application and feasibility, and organization and presentation.

Pyxis, the second place team, was awarded a $1,500 prize. AE seniors were:

- Michael Kevorkian, Team Leader and Reaction Control Systems
- Isaac Han, Propulsion Systems
- Hoong Chieh Yeong, Cargo Transfer Vehicle
- David Szybilski, Crew Transfer Vehicle
- Colin Das, Orbital Mechanics, Communications, GNC
- Patrick Walsh, Thermal Protection System
- Austin Ellis, Life Support Systems and Power
- Wilbur Chang, Performance Metrics





Pyxis

BlackSky Transit Systems

BlackSky Transit Systems, the third place team, awarded $1,000, had these seniors:

- Michael Ciffone, Team Leader
- Nirag Amin, Business Model
- Mallory Casperson, GSE & Logistics/Thermal Protection
- Michael Day, Flight Operations/ADCS
- Dan Anderson, Mechanical Design
- Andrew Wallace, Launch Vehicle Integration/Propulsion
- Jessica Wayer, Communications/Risk and Reliability
- Matthew Cruce, Crew Flight Operations/ECLSS

Prof. Rodney L. Burton advised a total of five AE teams as part of the "Space" section of the two-semester AE senior design course AE440S/441S, assisted by TAs Andy Pukniel, Ben McGuire and Christy Scheuer. Course design reviews were graded and advised by AE alumni Dr. Michael Lembeck of DCI Services and Consulting, Gary Joseph of Northrup Grumman, AE professors Vicki Coverstone and Wayne Solomon, and Dr. Albert Lee of Champaign Aerospace Systems Consulting.

Local AIAA Chapter Hosts Regional Conference

The AE Department's student chapter of the American Institute of Aeronautics and Astronautics hosted the AIAA Student Regional Conference on the Urbana campus April 4 and 5.

Sy Liebergot, flight controller and EECOM for Apollo 13, presented the keynote lecture. Corporate representatives of The Boeing Company, Rolls-Royce, Northrop Grumman and Arrow Technical Services presented a question and answer forum.

Award recipients, judges, corporate panlists and conference representatives in the recent AIAA Student Regional Conference on the Urbana campus were as follows: (front row, from left) Sy Liebergot, keynote speaker; Brandon Gulker, Sarah Lane, Ian Tobasco; Sivaram Gogineni, AIAA regional representative. Stephen Brock, AIAA national representative; (second row, from left) Bob Wood, Northrop Grumman; Michael Thake, Matt Schuster, Nick Schifer, Cedric Langbort, conference chair; Steve D'Urso, The Boeing Company; Gail Jankouski, Arrow Technical Services; Barnaby Wainfan, Northrop Grumman. Award recipients not in this photo were Phil Martorana and Erik Kroeker.

Presentations were given by students from the University of Illinois at Urbana-Champaign, Ohio State University, Case Western Reserve University, the University of Kentucky, the University of Michigan, Miami University, Michigan State University, Wright State University, Kent State University, Ohio Northern University, and the University of Notre Dame.

AE students whose projects won prizes were graduate student Phil Martorana, national competition second place for "Effect of Carbon-Based Nanoadditives on External Gear Pump Performance," and graduate student Erik Kroeker, regional competition first place for "Design of Low Boom Supersonic Inlet Model for NASA 8 foot by 6 foot Wind Tunnel."

In October, Assistant Prof. Cedric Langbort was presented a special service citation for being the faculty advisor for the conference.

AE Students Attend Goddard Symposium

The Illinois Space Society sponsored the trips of 17 AE students to the Goddard Symposium, held March 10-12 at the Goddard Space Flight Center in Greenbelt, Maryland.

While there, the students interacted with high-ranking aerospace industry executives, including chief executive officers and directors of NASA centers. ISS has sponsored a contingent of AE students at the symposium for the past four years.

"Because of our regular attendance we have made a great impression of the University of Illinois on the industry," said ISS Director Nick Kopp. "Every student who attended made some great contacts within the industry, contacts that often result in summer job opportunities."

The students also toured the NASA Goddard Space Flight Center and viewed flight hardware of new NASA missions.

AE students pose in front of the Enterprise Shuttle, now kept at Dulles International Airport, Chantilly, Virginia, as part of the Smithsonian National Air and Space Museum.

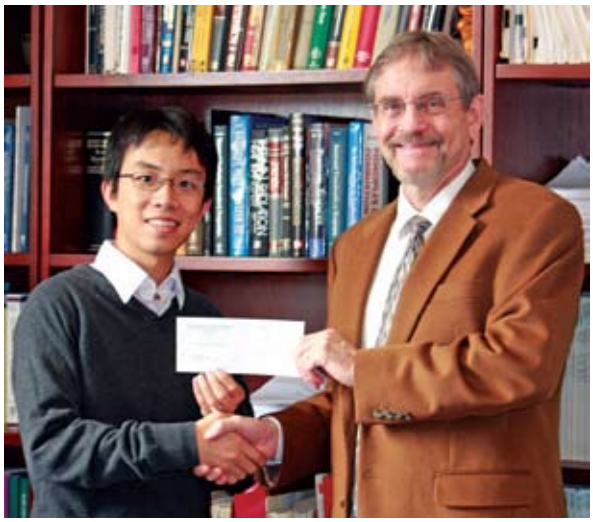
AE Students Awarded Defense, Armed Forces Scholarships

Jie Hua Lin of Bolingbrook, Illinois, and **Michael Duffy of Bloomington, Illinois**, are winners of the ***U.S. Department of Defense SMART Scholarships*.**

An acronym for the Science, Math, and Research for Transformation scholarship program, SMART is part of an effort to improve the flow of new, highly skilled technical labor into DoD laboratories and agencies and to enhance the technical skills of the workforce already in place. The program offers scholarships and fellowships to undergraduate, graduate, and doctoral students who have a demonstrated ability and special aptitude in the sciences.

The Army selected Duffy and the Air Force selected Lin.

Lin also has won an ***Armed Forces Communications and Electronics Association General John A. Wickham Scholarship***. These scholarships are awarded to American citizens who have achieved sophomore or junior year status; who are working toward a degree in a C4I-related field, such as aerospace engineering; and who have an overall GPA of 3.5 or better.

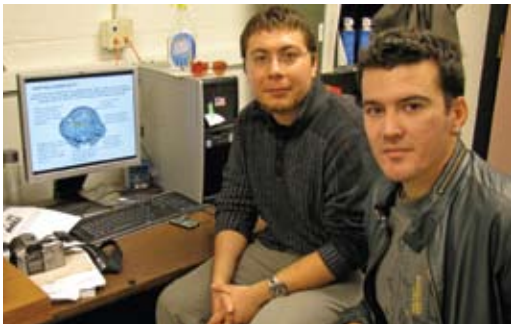


Left: **Lin;** ***right:*** **Dutton.**

AE Connects to Google's Project 10^100

Aerospace Engineering can boast connections to two finalists in the Google's Project 10^100 competition that seeks ideas to help the world.

One idea, proposed by Daniel Vidakovich, AE 02, is to create a free, web-based college. The other would develop a wristwatch embedded with a health monitoring system that would let emergency personnel know if the wearer were in medical distress. The latter idea was offered by Tanil Ozkan, a mechanical engineering graduate student that AE Associate Prof. Ioannis Chasiotis advises, and Ozkan's collaborators, Dr. Ilker Bayer, an AE postdoc, and Onur Ozyesil, a graduate student at Princeton University.



Left: **Okzan;** ***right:*** **Ozyesil.**

The web-browsing giant wants to celebrate its 10-year anniversary through ideas that can "change the world by helping as many people as possible." Participants in Google's 10^100 competition have submitted over 150,000 ideas. Similar ideas among the thousands collected were combined to make 16 final "themes." Up to five of those could share in the $10 million Google will make available for funding projects. The public was invited to vote on their favorite ideas on Google's website through October 8.

Vidakovich proposed the free, web-based college through his nonprofit organization, Innovative in Education. The project would provide accredited undergraduate degree programs free of charge. Vidakovich drew inspiration from MIT OpenCourseWare, iTunesU and Flat World Knowledge, all resources that provide free educational content on the Internet.

According to Ozkan's group, the wristwatch can be easily built and integrated to the existing cell phone communication network with current capabilities of sensory electronics and miniaturization. The designers believe the device could let emergency personnel know if the wearer were having an emergency, such as heart attack, even if the wearer were incapacitated.

Joseph Gonzalez

AE Undergrad Wins National Student Role Model Award

AE undergraduate Joseph Gonzalez has been selected as the Society of Hispanic Professional Engineers' National Student Role Model of the Year.

SHPE's highest honor for a student member, the STAR award recognizes academic excellence and outstanding contributions to the student SHPE chapter and the Hispanic community at large. The recipient, as an active SHPE member, brings honor and esteem to the Society through academic achievement, community service, and leadership.

Gonzalez, president of the local student chapter, will be presented the award during the 2009 SHPE Conference to be held from October 28 to November 1 in Washington, D.C. The SHPE Conference is the largest Hispanic technical conference in the nation, with approximately 5,000 attendees expected.

"Receiving this great honor acknowledges the sacrifice and passion that my peers, faculty and family have invested in molding me into the person I am today," Gonzalez said. "It feels great to be recognized as a role model, and it won't stop there. I will continue giving back to the community, inspiring others and promoting the development of underrepresented students."

Gonzalez entered the University of Illinois at Urbana-Champaign like many other Hispanic students – somewhat unprepared and with little knowledge of what the engineering field required. As a freshman he played saxophone in the concert band and was an outfielder for the club baseball team. He soon adjusted priorities to focus on academic and leadership opportunities.

His professional development began with joining Illinois' student SHPE chapter, initially as a member of the Freshmen Roundtable. The following year, Gonzalez stepped up to become chairman for high school outreach and promote higher education among minority youths. In this role, he reworked the visitation program to give incoming freshmen a real campus experience, which yielded a 100 percent attendance rate at Illinois for the participating students in the program. During his most recent term as external vice president, he nearly doubled company contacts and acquired more than $25,000 in sponsorships to send 51 members to the 2008 SHPE Conference.

In 2008, Gonzalez's technical interests led him to join the "Floatin' Illini" research team, where he explored the potential for studying Venus Flytrap behavior in microgravity conditions and proposed a flame propagation testing method. Earlier this year, he conducted research on the effects of inhomogeneities on the fracture of polyethylene. AE Prof. John Lambros, doesn't usually accept juniors into his research group but decided to advise Gonzalez. "(Joseph's) clear dedication to the subject of mechanics, his excellent performance in advanced classes, and his desire for further studies made me agree to take him on as an undergraduate researcher for the spring 2009 semester," Lambros said. Through the Undergraduate Research Opportunities Program, Gonzalez continued the research during the summer of 2009.

Overall, Gonzalez held nearly a 3.9 GPA as a junior, usually the toughest year of the aerospace engineering program. Upon graduation, he plans to pursue a master's degree with the ultimate goal of working for NASA as a mission engineer.

Heather Arneson

AE Grad Student Wins Ames Honor Award

The National Aeronautics and Space Administration (NASA) Ames Research Center has awarded AE PhD student Heather Arneson a 2009 Ames Honor Award, considered one of the Center's most prestigious honors.

Arneson was nominated for the work she did during internships at NASA Ames during the summers of 2008 and 2009. According to Arneson's mentor, Michael Bloem, and co-nominators Bob Windhorst and Shon Grabbe, Arneson made an impact on air traffic flow management research.

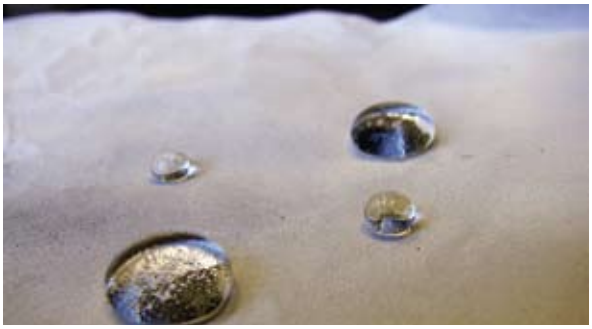
She developed an innovative method for scheduling flights that travel through severe weather-restricted airspace. Arneson's method for calculating ground delays and airborne holds for such flights uses an established aggregate traffic flow model and leverages updated probabilistic weather forecasts. Simulation results show a 13 percent cost reduction over a rough approximation of current practices.

This past summer Arneson began investigating an enhancement for Traffic Management Advisor, a tool that controllers use to manage arrivals at airports. Delays imposed on flights far away from the arrival

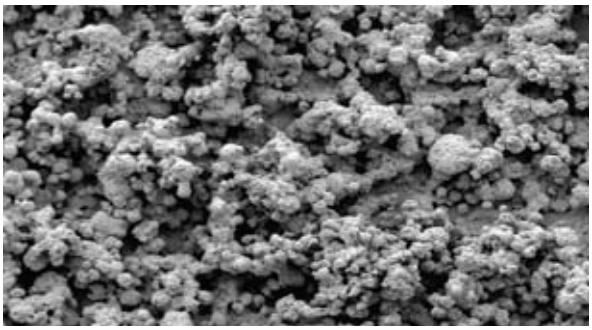
airport currently are not coordinated with those imposed on flights close to the arrival airport. To build the connection, Arneson is applying a distributed sliding mode controller developed through her PhD studies. The method has proved that certain maximum flow rates at airports can be matched.

AE Grad Student is Finalist for Lemelson Prize; Wins Cozad Venture Competition

AE graduate student Adam Steele was named among eight finalists across the University of Illinois at Urbana-Champaign campus for the $30,000 Lemelson-Illinois Student Prize.



This is an image of water droplets resting on a superhydrophobic nanocomposite coating. Water rolls freely with very low surface friction on the coating due to its suitably designed surface morphology and surface chemistry.



This is a scanning electron microscope (SEM) image showing the micro surface morphology of a superhydrophobic nanocomposite. The spherical agglomerations that can be observed are composed of nanoparticles and polymer, giving the surface nano-texture as well, which is critical for stable superhydrophobicity.

The prestigious award is an extension of the $30,000 Lemelson-MIT Student Prize that has recognized outstanding student inventors at the Massachusetts Institute of Technology since 1995.

In addition, SongAlive, a company that Steele helped form, has won First Prize for being the Most Fundable Venture in the 2009 V. Dale Cozad New Venture Competition. With a team of programmers and web designers, Steele created a social music website aimed at harnessing the creative power of individuals around the world.

Adam Steele

AE Prof. Eric Loth and Dr. Ilker Bayer, a postdoctoral research associate, advise Steele, who has created a biomimetic nanocomposite paint that exhibits extremely low friction to liquids, making it self-cleaning and non-wetting. This paint is both environmentally friendly and incredibly tough, enabling it to be used in a variety of applications.

Steele is also developing products to assist visually-impaired individuals in the avoidance of eye level collisions and in extending their current outdoor navigation technology to large indoor spaces.

Steele earned his bachelor's in aerospace engineering from Penn State University, and his master's in AE at Illinois in 2008.

AE Grad Student Wins NASA/GSRP Fellowship

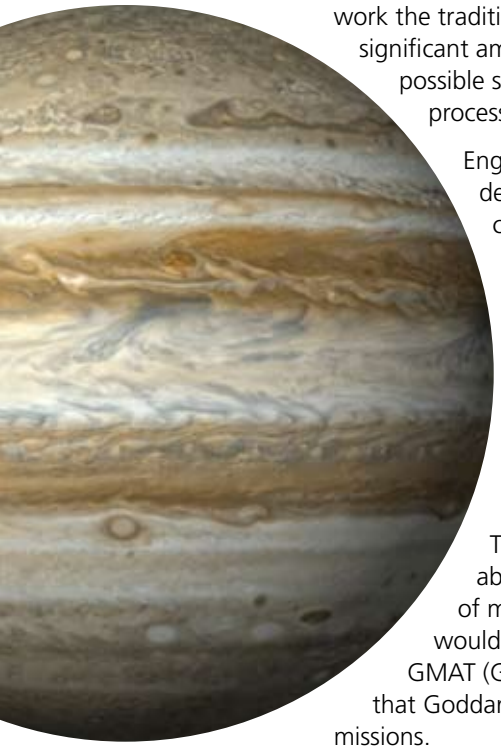
Jacob A. Englander

AE graduate student Jacob A. Englander has been chosen for a National Aeronautics and Space Administration fellowship for his work on developing an autonomous design tool for interplanetary spacecraft missions.

The NASA/Goddard Space Flight Center Graduate Student Researchers Program Fellowship will support Englander's PhD work for the next three years.

Typically, according to Englander, when NASA decides to send a probe to a planet that is difficult to reach, such as Jupiter, Saturn, or Mercury, analysts manually design a sequence of rocket burns and gravity assist maneuvers to get the spacecraft there efficiently. Numerical methods are used to optimize each maneuver in the sequence.

This method becomes problematic because the best sequence of maneuvers may be non-intuitive, so it may not occur to designers if they are doing the



work the traditional way, by hand. Unfortunately, the significant amount of time it would take to run all possible sequences on a computer makes the process prohibitive to simulate.

Englander's goal for the project is to develop an autonomous method for choosing an optimal sequence of maneuvers and events, and then optimize each maneuver in the sequence.

"The method has to be fast and robust because we don't want our program to crash in the middle and have to start over, wasting hours or even days of computer time," Englander said.

The method also has to be adaptable to handle many different types of missions. Finally, any code developed would be integrated into NASA Goddard's GMAT (General Mission Analysis Toolkit) so that Goddard engineers could use it to design real missions.

Englander said Bradley Wall, MS 04, PhD 07, and now an assistant professor at Embry Riddle Aeronautical University, and Christian Chilan, MS 02 Computer Science, did previous work on this concept. AE Prof. Bruce Conway advises Englander.

Ryan McDonald

McDonald Among National Scholar-Athlete Class

WRITTEN BY PHIL MARWILL, NATIONAL FOOTBALL FOUNDATION AND SUSAN MUMM

Ryan McDonald, a graduate student in Aerospace Engineering and starting center on the varsity football team, was named a 2008 National Scholar-Athlete as announced by the National Football Foundation and College Football Hall of Fame.

McDonald was named to the Dean's List or better every semester of his undergraduate career. He also was 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.

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 were honored at the 2008 NFF Annual Awards Dinner December 9 at the Waldorf-Astoria in New York City. The event also included the induction of the 2008 College Football Hall of Fame and the presentation of several major awards. Each of the National Scholar-Athletes received an $18,000 post-graduate scholarship.

USA Today captured a day in McDonald's life last fall in a video that can be seen at http://www.usatoday.com/sports/college/2008-11-18-majors-video_N.htm.

AE Students Garner College of Engineering Awards

AE students **Joseph Gonzalez** and **Michael J. Ciffone** are the winners of the College of Engineering's 2009 ***Andrea J. Culumber*** and ***Stanley H. Pierce*** awards, respectively.

The College also has awarded ***Mavis Memorial Fund Scholarships*** to AE graduate students **Sang Lee** and **Craig Merret**, and a ***SURGE Fellowship*** to graduate student **Marta Baginska**.

The Andrea J. Culumber Award honors a deceased student who received her bachelor's degree in Mechanical Engineering in 1997. The award is based on leadership skills as well as personal qualities, such as enthusiasm, creativity, and kindness. This award includes recognition at the Knights of St. Patrick Ball and a scholarship.

The Pierce awards were established in 1969 in honor of Stanley H. Pierce, who served as an associate dean in the College of Engineering and who was an inspiring leader in the constant endeavor for better relations between faculty and students. These awards are given to both an outstanding student and an outstanding faculty member in recognition of their efforts to develop empathetic student–faculty cooperation.

As high school visitation chair for the Society of Hispanic Professional Engineers (SHPE), Gonzalez was in charge of that group's biggest annual event—bringing high school students to campus for a four-day visit in spring 2008. As event chair, Gonzalez organized transportation, attendance, housing, food, and workshops for the event. He set up activities to introduce the students to college life and persuade those who were undecided that Illinois was the right choice for them.

In his role as external vice president of SHPE, Gonzalez develops relationships with a broad range of engineering companies and strives to give Society members an opportunity to interact with companies that pertain to their interests. For example, he arranged a bowling event with representatives from Qualcomm so that students would be able to interact on a personal level with company recruiters. He also raised $21,000 to send approximately 20 freshmen and 30 other SHPE members to the group's national conference in Arizona. During the Spring 2009 semester, he focused on raising money for new computers in SHPE's campus office so that students will have access to better technology for their studies and work.

Gonzalez is also involved with other mentoring activities such as being a volunteer youth baseball coach, a guest speaker for 8th grade graduation at Maria Saucedo Scholastic Academy in Chicago, and a volunteer with the Illinois ELITES Program, whose goal is to help increase the quantity, quality, and diversity of Chicago's contribution to the future knowledge-based workforce.

A junior last spring semester, Gonzalez plans to obtain a master's degree in aerospace engineering, with a focus on spacecraft structures and hopes also to pursue a doctoral degree. His career goal is to work for NASA as a mission engineer.

Joseph Gonzalez

Ciffone's dedication to community leadership has been praised by his advisor, teachers, and fellow students.

A senior last spring who also carried a minor in computer science, Ciffone found time for extensive involvement in extracurricular activities to help foster positive student-faculty interaction and cooperation. He was a member of the Aerospace Undergraduate Advisory Board for three years and currently served as its head, helping shape a major curriculum revision, and developing a mentorship program to integrate freshmen and sophomores into senior design groups. To implement this program, Ciffone gained the support of faculty who teach senior design, as well as the head of the department.

Michael J. Ciffone

As a member of the Engineering Council Dean Student Advisory Committee from 2006 to 2008, Ciffone brought student concerns from throughout the college to its deans and faculty. He also demonstrated his leadership by obtaining corporate sponsorships for the 2007 E-Book student planner, raising money for charitable organizations, and organizing community service events.

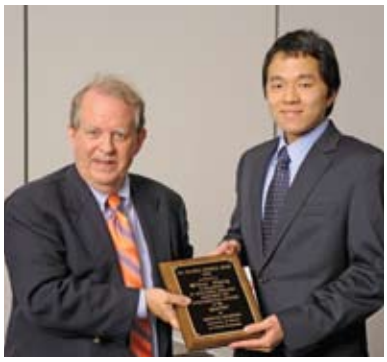
The College awards Mavis Memorial Fund Scholarships to entering and continuing Ph.D. students who have demonstrated an aptitude for the instructional program.

It is intended to encourage students to pursue an academic career. Applications are solicited from students and faculty and the department's Graduate Awards Committee makes the official nomination to the Graduate College.

SURGE Fellowships are awarded to women and underrepresented students in the engineering area. The department nominates applicants to this program based on their application for admission and supporting documents.

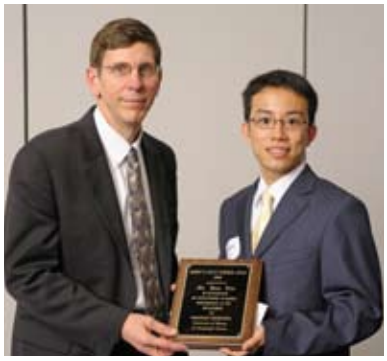
Several of Aerospace Engineering's Top Students were Recognized in April During the Department's Awards Banquet

Rodney L. Burton and Michael Day



Rodney L. Burton and Wilbur Chang

Brandon Copp and Brett Clifton



Michael B. Bragg and Jie Hua Lin

Michael B. Bragg and Muktha Srinivasan

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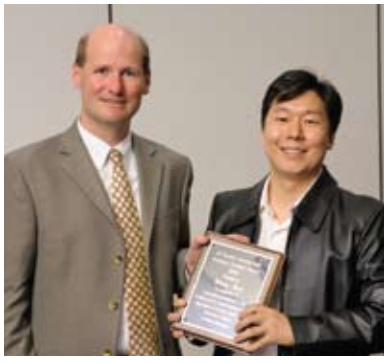

Philippe H. Geubelle and Sang Lee

The ***AIAA Scholastic Achievement Award***, given each year in AE to the senior graduating in May with the highest class grade point average, was awarded to **Michael Day of Homer Glen, Illinois**. Day also was recognized with AE's ***H.S. Stillwell Memorial Award***, presented annually on the basis of outstanding scholastic achievement and extracurricular activities.

Also winning the ***Stillwell Award*** was **Wilbur Chang of Taipei, Taiwan.** The Stillwell Award was established in honor of Professor H.S. (Shel) Stillwell. At the age of 27 Professor Stillwell founded the Department of Aeronautical Engineering at the University of Illinois in 1944. He served as department head at Illinois for 32 years. A graduate of the University of Minnesota, he served as Head of the Aeronautical Engineering Department at the University of Kansas prior to coming to Illinois. Professor Stillwell was influential in the design of the first ramjet-powered missile and was highly respected for his contributions to aerospace engineering education. Chang also 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.

H.S. Stillwell Problem Solving Scholarship recipients are junior-level students majoring in aerospace engineering who exhibit exemplary problem-solving skills. The 2009 winner was **Brandon Copp of Lawrenceville, Illinois**. A generous alumnus established this scholarship as a tribute to H.S. Stillwell and the role he played as a mentor to students.

The ***Robert W. McCloy Memorial Award*** in AE is presented annually to a junior or first semester senior student in recognition of outstanding academic performance. Professor McCloy was the first faculty member hired in the new Dept of Aeronautical Engineering. He was known for his research and teaching in propulsion and for his pioneering work in jet propulsion. The 2009 winners were **Jie Hua Lin of Bolingbrook, Illinois,** and **Muktha Srinivasan of Rochester, Minnesota**. Lin is also a winner of the ***U.S. Department of Defense SMART Scholarships*** and the ***Armed Forces Communications and Electronics Association General John A. Wickham Scholarship*** *(see story on page 27).*

The ***Dale Margerum Memorial Award*** is presented annually to the AE undergraduate who exemplifies outstanding leadership qualities by participation in departmental extracurricular activities. Dale Margerum was a 1979 graduate who died in an accident the summer after graduation. He was very involved in extracurricular activities. The 2009 winner was **Joseph Gonzalez of Chicago, Illinois.** Gonzalez has also been recognized with the ***College of Engineering 2009 Andrea J. Culumber Award,*** and the ***Society of Hispanic Professional Engineers' National Student Role Model of the Year Award*** *(see stories pages 28 and 31).*

The ***Roger A. Strehlow Memorial Award*** in AE is presented annually to a graduate student in recognition of outstanding research accomplishment. The 2009 winner was **Mohammad Naraghi of Tehran, Iran**. The award is presented annually to honor Professor Strehlow, who joined the aero faculty in 1961. His background was in chemistry, and he was an acknowledged expert in the field of detonations and explosions. He also made significant contributions toward the understanding of the structure, stability, and extinction of laminar premixed flames. He was an early advocate of microgravity combustion and successfully characterized the extinction and flammability states of flames under microgravity conditions. Professor Strehlow was the first AIAA Fellow in the Department of Aerospace Engineering.

The ***Faculty Outstanding Graduate Student Award*** in AE is presented in recognition of outstanding contributions to the teaching and/or research missions of the department. The 2009 winner was **Sang Lee of Seoul, Korea**.

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. **Kenneth Allen of Naperville, Illinois; Jeremy Alonso of Freeport, Illinois; Megan Danko of Woodridge, Illinois; Sarah Fullmer of Highland Park, Illinois; Scott Hargis of Sparta, Illinois; Sarah Streeb of Freeport, Illinois; Carissa Walker of Godfrey, Illinois;** and **Gary Weber of Crystal Lake, Illinois** were among the AY08-09 scholarship recipients.

Streeb, Alonso, Danko, Walker, Copp (standing with them is AE Prof. Philippe Geubelle)

Pukniel, Chiles, Deters (again, standing with them is Geubelle)

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 08-09, fellowships were awarded to **Greg Busch of Dayton, Ohio; Ingrid Chiles of Greenville, South Carolina; Robert Deters of Hedgesville, West Virginia; Miles Johnson of Champaign, Illinois; Andrzej Pukniel of Des Plaines, Illinois;** and **Robert Thomas II of Kalamazoo, Michigan.**

The alumni and friends listed here contributed to Aerospace Engineering during Fiscal Year 09 (between July 1, 2008 and June 30, 2009). Thank you for your gifts! (All degrees are in AE unless otherwise indicated.)

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Santa Claus Comes to Town in Nanocomposite Photo

Santa Claus made an early appearance in a photo AE Prof. Eric Loth's research group produced recently.

The photo won second place among 50 finalists in the Science as Art Competition at the Materials Research Society Spring Meeting in San Francisco.

Postdoctoral research associate Ilker Bayer said the photo is a scanning electron micrograph of a nanocomposite coating surface morphology.

"It showed very interesting surface roughness features, one of which was the structure that resembles Santa amazingly," Bayer said. "We just colored the image to highlight the resemblance. No image overlaying or other image processing was applied."

"The polymer nanocomposite was composed of a dispersion of sub-micron Teflon particles and carbon nanotubes in a polymer matrix," Bayer said.

In addition to Loth and Bayer, who originally recognized Santa, AE graduate student Adam Steele added the highlight color and has also been working on the project.