COLLEGE OF Science & Engineering
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AEM Update

Department of Aerospace Engineering and Mechanics
Winter 2013

Alum works to bring rover to Mars

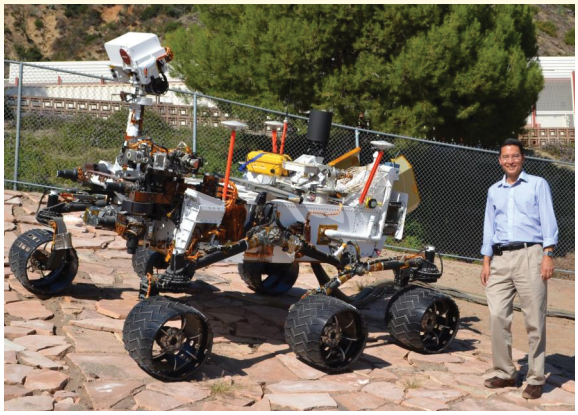
The August 6, 2012 touchdown of Curiosity, the Mars Science Laboratory Rover, began a robotic exploration effort to determine the habitability of Mars. Over the course of a full Martian year (687 Earth days), Curiosity will study rocks, soil, and the geological setting, looking for forms of carbon.

Steve Lee, an AEM alum, is one of the key NASA engineers involved with the project. Lee noted that the main science goals of the mission are to determine whether Mars could have sustained microbial life, to characterize the climate of Mars, to explore its geology, and to prepare for human exploration. "We've only just started answering these questions and exploring whether life is possible on Mars," Lee said.

Lee is deeply involved with the Mars Science Laboratory mission, both as the Guidance, Navigation, and Control System Manager and as Deputy Surface Phase Lead. His work controls the orientation and flight path of the spacecraft, guiding it through different phases of the mission. He helped develop the entry, descent, and landing guidance system, which steers the Mars Science Laboratory to a more precise landing on the surface of Mars culminating in the unique "skycrane" landing technique. He has also worked on the control system of the rover once it is on the surface.

Lee received a Bachelor's degree in Aerospace Engineering and Mechanics at the University of Minnesota in 1985. He went on to receive a Master's degree in Electrical Engineering at the University of South Florida in 1992. Prior to his work on the Mars Science Laboratory, Lee worked on the Space Shuttle, Space Station, Hubble Space Telescope, and Mars Reconnaissance Orbiter projects. He credits his aerospace education and the University of Minnesota as having a weighty impact on his career.

"It's great. When working on projects with entry, descent and landing profiles, 80 percent of my education is applicable to my job." Lee said. "The immediate contributions I was able to make to the field caused me to be noticed early and allow for future career growth."



Lee has found it rewarding to work with so many aspects of the Mars Science Laboratory mission, which he has been involved with for the past seven years.

"From a personal standpoint it's very exciting, putting together a very complicated system and then seeing it very successfully delivered, particularly when the science results will be so spectacular." Lee said.

The entry, descent, and landing system for the mission is very unique when compared to past missions to Mars. While past missions relied on parachute and airbag landings, the Mars Science Laboratory included powered descent and sky crane components. Upon entry to the Martian atmosphere, the spacecraft was controlled by small rockets to achieve a guided entry. It was initially slowed by a large parachute, which was then detached and rockets controlled the spacecraft's descent until it neared the surface. The rover was then lowered from the spacecraft onto the surface of Mars with a sky crane system. The sky crane/rocket system veered off to land a safe distance away, so as not to damage the rover. This system represents a huge engineering effort, and needed to be fully automated. It takes 14 minutes for a signal to travel from Mars to Earth, making any real-time control of the mission impossible.

"In the simulated world, we've landed on Mars millions of times," Lee said in an interview with The New York Times. "I'm actually very comfortable. I'm more comfortable with the [then impending] landing than I was with the launch."

Chairman's Corner

Semester in Review

Friends & Colleagues,

It's been a busy fall and winter for the department, with many successes and honors for our students, faculty, and alumni.

One alum, Steve Lee, saw his work come to fruition with the landing of Curiosity, the Mars Science Laboratory. We are excited to see what Curiosity will teach us about our neighboring planet as the exploration effort continues. Another alumna, Susmita Bhattacharyya, was recently awarded the Parkinson Award for her thesis in the field of Global Navigation Satellite Systems. We are very proud of her success.

Several of our own faculty members have also received honors this fall. Professor Mettler and Professor Seiler have each received prestigious NSF CAREER awards. Professor Seiler was also awarded a fellowship at the UMN Institute on the Environment (IonE) and his research on wind energy is particularly applicable to the goals of the Institute. Professor Schwartzentruber was awarded a grant from the Air Force Office of Scientific Research (AFOSR) for his research on heat transfer to the surface of a hypersonic vehicle. We are thrilled that our faculty members continue to be recognized for their superb research. We will also be welcoming Joseph Nichols to the faculty in fall 2013 as our newest Assistant Professor.

We've awarded the 2012-2013 scholarships and fellowships from the department, made possible through generous donations and endowments. Some of our recipients can be seen on pages 7-9. One of our graduate students, Daniel Showers, has also been awarded the National Science Foundation Graduate Research Program Fellowship.

We recently lost a decorated alum and friend of the department, Richard DeLeo. Countless AEM students benefitted from the support of Richard and his late wife Shirley and we continue to be grateful for their generosity. More information about Richard's work and involvement with the department can be seen to the right.

In closing, I would like to take the opportunity to thank all of you who generously donated your time and money to support the AEM department. Your contributions have helped us provide an outstanding education for our students and we very much appreciate it.

Gary Balas
Department Head


Prof. Gary Balas
Department Head

Nichols hired as Assistant Professor

The AEM department will be welcoming a new faculty member in fall 2013. Dr. Joseph Nichols will be joining the faculty as an assistant professor.

Dr. Nichols received his Ph.D. in Mechanical Engineering in 2005 from the University of Washington in Seattle. From there, he traveled to Palaiseau, France to join the Laboratoire d'Hydrodynamique at École Polytechnique as a Post-Doctoral Research Associate. Dr. Nichols then went on to become a Post-Doctoral Fellow at the Center for Turbulence Research at Stanford University, and a Research Associate, also at the Center for Turbulence Research.

Dr. Nichols' research spans a variety of fields. His doctoral work focused on simulation and analysis of turbulent reacting flows, with particular application to the interaction between lifted flames and the instability modes of light fuel jets. At École Polytechnique, he applied hydrodynamic stability and global mode analysis to investigate combustion instability and vortex breakdown. Mitigation of combustion instability in swirling combustors would enhance safety and enable leaner operation of gas turbines resulting in lower emissions.

Dr. Nichols has extensive experience with modern techniques of fluid dynamic stability analysis including identification of absolute vs. convective instability, weakly nonlinear/nonparallel stability theory, global mode decomposition, secondary instability/Floquet analysis, bifurcation analysis, adjoint-based methods for non-normal flow systems, and dynamic mode decomposition (DMD).

At Stanford, Dr. Nichols' work included extreme-scale unstructured LES (large eddy simulation) for the prediction and analysis of aeroacoustic phenomena such as the noise produced by aircraft engine exhausts. The noise produced by the turbulence in the exhaust stream can be modified or reduced by altering the shape of the nozzle

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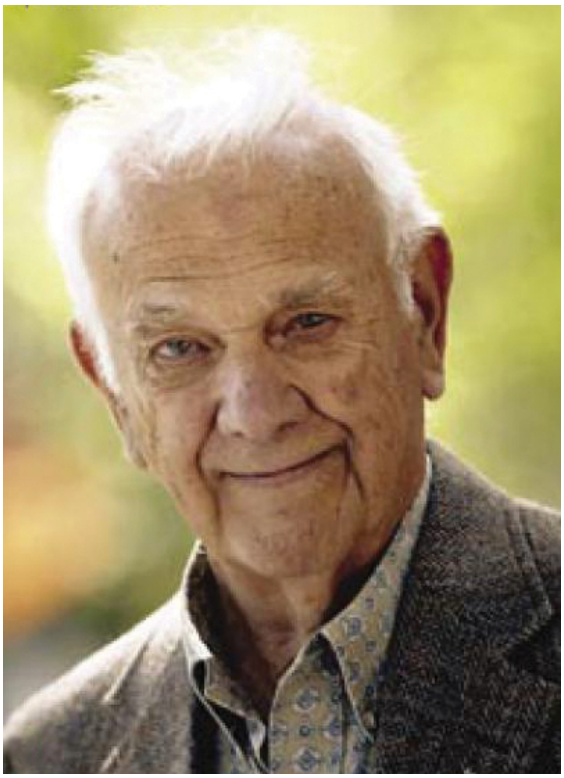
AEM alum Richard DeLeo passes away



AEM alum Richard DeLeo passed away on November 13 at the age of 90. DeLeo and his late wife Shirley were proud supporters for the University of Minnesota and generous donors to the AEM program. The AEM Undergraduate Student Office and AIAA Student Chapter room was dedicated in their honor in April 2012.

DeLeo began his aerospace career in 1940 as an undergraduate in aeronautical engineering at the University of Minnesota. In 1943, he left school to serve with the Army 84th Infantry Division. His 33-month tour of duty during World War II took him to Louisiana, Texas, and Germany. DeLeo then returned to the University in 1946 to finish his education. He received his bachelor's degree in aeronautical engineering in 1946 and his master's degree in 1948. DeLeo worked as a project scientist for the Rosemount Engineering Company for 10 years, from 1947 to 1957, and served as Vice President for Aeronautical Research at Rosemount from 1957 to 1988. He was a member of the Minnesota Inventors Hall of Fame and received the University of Minnesota Outstanding Achievement Award in 2005.

DeLeo was a pioneering leader in aeronautical engineering, whose major contributions in the design and development of air data sensors for aerospace vehicles have had a far-reaching impact. His inventions as a technical engineer have improved the performance and safety of aircraft, and he was seen as a visionary executive who greatly contributed to the development of a new high-technology industry in Minnesota. The DeLeos have provided outstanding support for students in the Department of Aerospace Engineering and Mechanics through scholarships and providing funding for student projects and competitions, and we continue to be grateful for their generosity.

Professor Schwartzentruber awarded AFOSR grant

AEM Professor Thomas Schwartzentruber has recently been awarded a large grant from the Air Force Office of Scientific Research (AFOSR). The funded project, "Reduced Heat Flux Through Preferential Surface Reactions Leading to Vibrationally and Electronically Excited Product States," seeks to understand the fundamental mechanisms by which energy (heat) is transferred to the surface of a hypersonic vehicle.

Professor Schwartzentruber is the Principal Investigator (PI) for the project. Other researchers involved in the project are Professor Donald Truhlar (as a Co-PI) of the Department of Chemistry, and two subcontractors from SRI International in Menlo Park, CA: Dr. Jochen Marschall and Dr. Richard Copeland. The project has been granted a $1.7 million budget over a three-year period.

In this project, Schwartzentruber and his research group seek to understand the fundamental mechanisms by which energy (heat) is transferred to the surface of a hypersonic vehicle. New concepts for hypersonic Air Force vehicles (flying faster than Mach 5) will induce extreme heating conditions for which new heat shield designs are required. The air in front of the vehicle gets so hot that air molecules break into atoms. These atoms can diffuse through the boundary layer and exothermically react with the heat shield surface, depositing significant energy to the vehicle. The long-term goal is to understand these gas-surface reactions at the molecular level so that new materials can be tailored to 'control' the energy transfer between a high temperature gas and the heat shield surface.

More specifically, it has been observed experimentally that oxygen atoms can recombine on silica-based heat shields to form oxygen molecules in electronically excited states. Such states are long-lived in the gas phase and may serve to 'lock-up' significant energy, which is carried away from the vehicle and thus not transmitted to the surface. An experimental setup will be designed and definitive experimental evaluation of the production of excited oxygen molecules resulting from oxygen-atom surface recombination will be performed at SRI's laboratory in Menlo Park, CA. At the most fundamental level, Truhlar's group will investigate oxygen-silica reactions with electronic excitation, and Schwartzentruber's group will provide the modeling link between quantum chemistry and experiment using large-scale stochastic particle simulations of the full experimental environment. The objective is to fully explain this gas-surface reaction phenomenon at the most fundamental level with the potential to impact future heat shield design and capability for high-speed vehicles.

CONTINUED FROM PAGE 1

– you may have observed chevron (serrated) nozzles on the latest aircraft engines. Dr. Nichols' recent research has shown that the challenging problem of accurate aeroacoustic prediction from arbitrary nozzle shapes is indeed possible using unstructured codes. He is also using high fidelity databases obtained from large-scale simulations to construct improved noise models for use in lower-fidelity approaches amenable to the design cycle.

Dr. Nichols' work at Stanford included performing one of the largest computational fluid dynamics (CFD) simulations to date, using more than a million computing cores to simulate supersonic jet noise. This work was featured in Phys.org, HPCwire, and Wired.com. A resulting image is shown in Figure 1, illustrating the relationship between exhaust turbulence (orange) and generated sound (blue).

"My research passion, summarized in one sentence, is to apply high performance computational tools and mathematical theory and analysis to gain better understanding of fundamental fluid dynamical processes, to drive the development of fluid technology to meet tomorrow's energy and environmental needs," Dr. Nichols said.

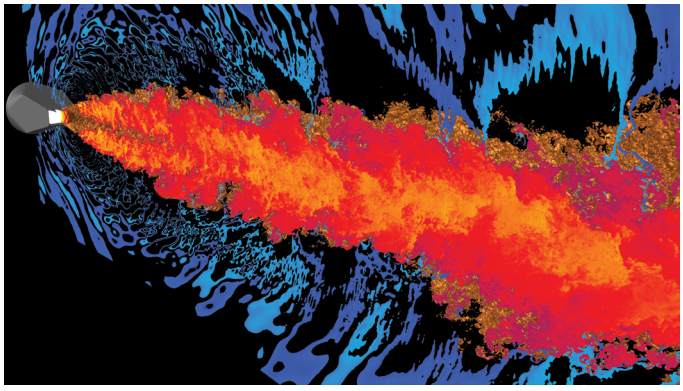
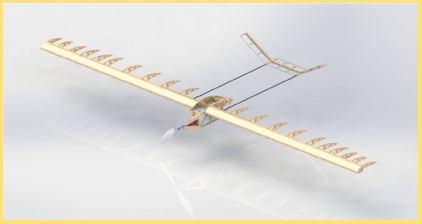


Figure 1: A visualization of noise produced by a supersonic jet issuing from a rectangular chevron nozzle. Contours of temperature (red scale) and exterior pressure (blue scale) are shown. The large eddy simulation that produced this image was run on over one million CPU's on the IBM BG/Q supercomputer at the Lawrence Livermore National Laboratory.

Senior Design Projects

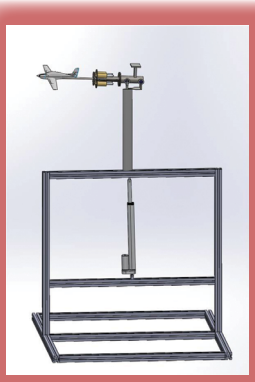
Fall semester yielded challenging design projects for this year's Aerospace Engineering and Mechanics senior class.

The course was taught by Professor William Garrard and project sponsors included Eric Kaduce from Boeing, Todd Colten from United Technologies Aerospace Systems, Pat Bergen from Cirrus Aircraft, and AEM Professors Yohannes Ketema and James Flaten. Several of the design groups will continue their work in the spring to prepare their projects for upcoming competitions. Project overviews can be seen below.



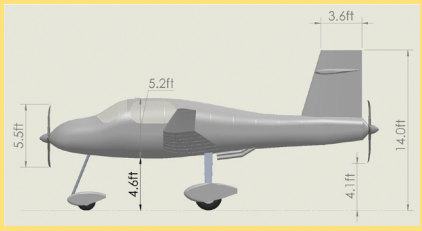
SAE Aero Design East Competition

Design goals:
- Design an electric powered aircraft with highest payload fraction and lowest empty weight
- Assemble from a case in 3 minutes by two people
- Fit inside case of 24x18x8 inches
- Win SAE Aero Design East Competition



Wind Tunnel Sting Design

Design goals:
- Sting can roll freely, measure roll motion, reach an angle of attack up to 45°, hold airfoil up to speed, and break rotation when testing is complete
- Airfoil is cheap and quick production, has an aspect ratio of at least 9, and has a proper weight distribution for moment of inertia



Diesel Hybrid Electric Aircraft

Design goals:
- Design a diesel hybrid electric aircraft with the following characteristics
  - Range of 800 miles
  - Fuel capacity of 70 gallons
  - Fuel efficiency of 10 gallons/hour

Firefighting Aircraft

Design goals:
- System capable of delivering >42000 gallons/hour
- Costs less than $100 million
- Single source shall locate and direct crews to fires
- Single source shall have all-weather capability
- System capable of 1 minute following distance during scooping

SAE Aero Design West Competition – Advanced Class

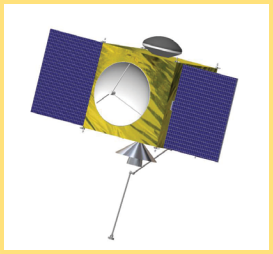
Design goals:
- Design an aircraft weighing less than 8 lbs with the following characteristics:
  - Can carry 15 lbs static payload
  - Can carry 3 lbs expellable payload
  - Can drop expellable payload on target
  - Can report accurate telemetry data

High-power Rocketry

Design goals:
- Design a one-stage, high-powered rocket that will achieve an apogee of 3000 ft
- Compete in the Wisconsin Space Grant Consortium (WSGC) Regional Rocket Design Competition

Asteroid Mining

Design goals:
- Design an asteroid mining mission that:
  - Shall retrieve a sample of asteroid 433 Eros that is >10 grams and representative of material composition
  - Shall maintain sample isolation
  - Shall minimize cost
  - Shall not create space debris



Multi-rotor UAV

Design goals:
- Design a small multi-rotor UAV with the following characteristics
  - Shall carry payload & fly effectively
  - Weight shall be under 2 kg (4.4 lbs)
  - Flight time shall be greater than 10 minutes
  - Shall be based off Ardupilot Program

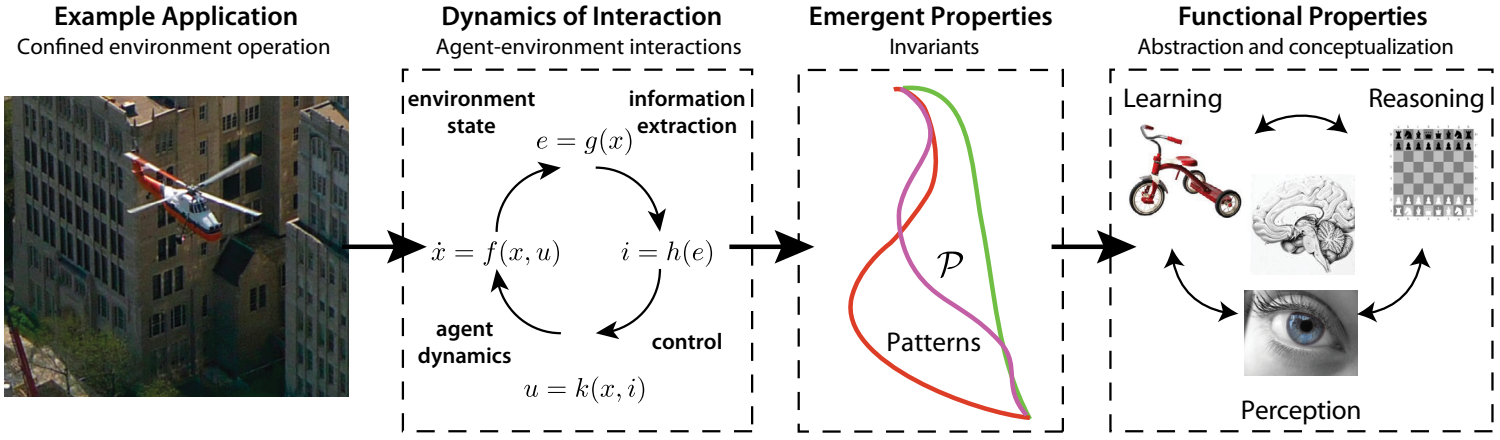
Two AEM Professors

Berenice Mettler

AEM professor Berenice Mettler has received a prestigious CAREER award from the National Science Foundation (NSF). Her award grant is titled "CAREER: Modeling the Dynamic Interplay of Control, Planning and Perceptual Functions in Agile Human Guidance" and the award date is from February 1, 2013 through January 30, 2018.

Professor Mettler's current research focuses on guidance of aerial vehicles in challenging tasks and environments, with an emphasis on algorithms for autonomous guidance and human interactive guidance. Specific examples of her research include real-time planning and decision making for dynamic systems; the system integration of control, planning, and perceptual functions; and the principles of cognitive functions involved in spatial reasoning and adaptation. She runs the department's Interactive Guidance and Control Lab (IGCL), with the primary aim of developing formal methods for the system-wide study of human, human-assisted, and autonomous control of vehicles. Professor Mettler is also affiliated with the University of Minnesota's Center for Cognitive Sciences.

The Faculty Early Career Development (CAREER) Program supports junior faculty who "exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations."



receive NSF CAREER awards

Peter Seiler

AEM professor Pete Seiler has received a prestigious CAREER award from the National Science Foundation (NSF). His award grant is titled "CAREER: Probabilistic Tools for High Reliability Monitoring and Control of Wind Farms" and the award date is from March 1, 2013 through February 28, 2018. The Faculty Early Career Development (CAREER) Program supports junior faculty who "exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations."

Professor Seiler's CAREER grant will focus on two innovative methods to reduce the costs of wind energy. First, probabilistic techniques will be developed to detect faulty turbine components in a fast and accurate manner. This will enable preventative maintenance or continued operation after selected component faults. Second, tools from stochastic optimal control theory will be applied to design damage-aware control strategies for the wind farm. Currently each turbine within a wind farm is operated to maximize its own captured power while ensuring that structural loads remain within design limits. Stochastic optimal control will be used to perform this trade-off by coordinating all turbines in the wind farm. This will enable a better trade-off between the revenue from power production and the true financial costs that arise due to structural loads. The research will lead to a significant reduction in operating costs for wind turbines thus improving the economic viability of wind energy. In addition, the research will be applicable to high reliability systems in other domains including aerospace, automotive, and medical devices.

Several collaborations were critical to the success of Professor Seiler's CAREER grant. First, Professor Seiler will collaborate with the EOLOS Wind Energy Consortium to test the proposed algorithms and ensure their relevance to the wind industry. The collaboration enables testing on a state-of-the-art 2.5MW Clipper Liberty turbine installed at the EOLOS Wind Research Field Station (Figure [top]). Professor Seiler will also collaborate with Mesabi Range Community and Technical College in Eveleth, Minnesota. Mesabi Range offers a two-year technical program in wind energy maintenance and has a Vestas V27 turbine on-site (Figure [bottom]). This collaboration will address the need to develop a highly skilled workforce to design and maintain reliable wind turbines.

Professor Seiler was also recently awarded a resident fellowship at the University of Minnesota's Institute on the Environment (IonE). The resident fellows program supports faculty from many disciplines to address environmental problems. The technical research proposed in Professor Seiler's CAREER grant was influenced by the discussions with other IonE scholars especially on the legal, policy, and environmental issues that surround wind energy.

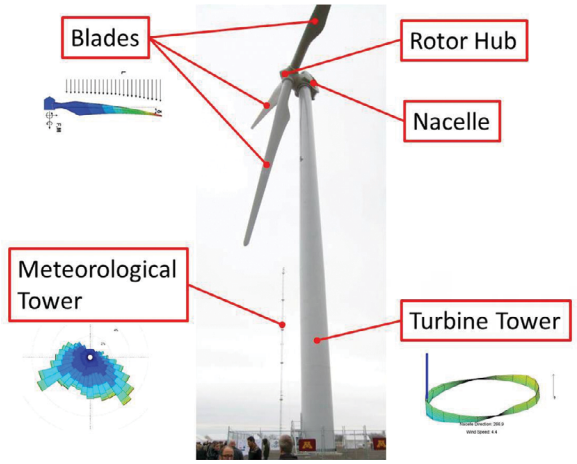


Figure [top]: Clipper Liberty turbine at the EOLOS Wind Research Field station
Figure [bottom]: Vestas V27 Turbine at the Mesabi Range Community and Technical College

2012-2013 Graduate FELLOWSHIP

Andrei Dorobantu

AEM graduate student Andrei Dorobantu was awarded the Louis F. Heilig Graduate Fellowship. This fellowship recognizes outstanding students working in the area of aerospace systems.

Dorobantu is a Ph.D. student in the Unmanned Aerial Vehicle (UAV) Research Group, which works to develop safe aircraft technology to enable small aerial vehicles to fly themselves. The goal of this facility is to support research activities within the department including control, navigation and guidance algorithms, embedded fault detection methods, and system identification tools. Dorobantu's specific research areas include UAV modeling, validation, and control design. One of the features that makes the lab and research unique is their open source code.

"Our open source code means that we're able to work with local, national, and international researchers," Dorobantu said. "I can talk to researchers on Skype about using our flight test system, they can send us their code, and we can go out and test it. It's very unique that we have a flight-ready and versatile system."

Kyle Winters

AEM graduate student Kyle Winters received the John D. Akerman Fellowship, which recognizes students with outstanding academic records.

Winters received an M.S. in Mechanical Engineering from Arizona State University in 2012 and a B.S. in Aerospace Engineering at Boston University in 2009. His research involves designing and building a pipe flow facility that will allow the study of delayed turbulence transition in emulsions of highly viscous liquids. The aim will be to take detailed velocity measurements in order to better understand the mechanism that dampens turbulent motion in these flows.

"I am excited to be beginning a new academic journey here at the University of Minnesota, and expect my education here to help me become a better experimental scientist," Winters said. "I hope to absorb all I can from the world-class research faculty here in the AEM department, and take full advantage of the extensive resources offered by the University."

Aman Verma

AEM graduate student Aman Verma was awarded the Peter J. Torvik fellowship in recognition of his outstanding academic record.

Verma's doctoral research is in the fields of computational fluid dynamics, and turbulence modeling and simulations. Turbulent flows commonly occur in many natural and engineering settings such as in the atmosphere, over an aircraft, inside engines, and over computer chips. Until recently, numerical simulations of turbulence have been restricted to academic problems. Verma seeks to help develop and apply a high fidelity numerical simulation methodology to simulate and analyze complex turbulent flows of practical interest. The over-arching objectives of this work are to develop the capability to simulate the off-design flow past a submarine and provide physical insight into the flow.

"After successful completion of my Ph.D., my major career objective is to pursue a career as a researcher in the industry, modeling and simulating complex flow phenomena," Verma said. "In the long term, I would strive to be an industry expert in my domain of expertise."

Since receiving this award, Dr. Verma has completed his degree and is working at Schlumberger.

RECIPIENTS

Daniel Showers

AEM graduate student Daniel Showers recently received the National Science Foundation Graduate Research Program Fellowship. This prestigious fellowship helps fund tuition and provides a stipend, enabling students to focus on their research and studies.

Showers was also awarded the John A. & Jane Dunning Copper Fellowship in Aerospace Engineering and Mechanics from the AEM Department. This fellowship is awarded to graduate students who have an outstanding academic record.

Showers is an incoming graduate student for fall 2012. He received an undergraduate degree in mechanical engineering from Clemson University in May. He is currently working with AEM professor Pete Seiler in the area of wind turbine control. He is particularly interested in the areas of modeling, prediction, and control.

"The idea of our research is to use all of the measurements taken by wind turbines in a wind farm, as an inexpensive way of predicting turbine action," Showers said. "For example, if a wind turbine sees a strong wind gust, the other turbines will know that it is coming and can take appropriate action to minimize structural loads."

The application process for the fellowship included writing three essays: personal statement, research experience, and proposed research. The essays must demonstrate "intellectual merit" and "broader impacts" are graded by a panel of professors in the proposed field of study.

Showers first became interested in the aerospace field when flying in a Cessna with his grandpa. He became even more interested in the field after participating in NASA internships over summer 2011 and summer 2012.

"The excitement surrounding the industry really got me interested in working there for a career," Showers said.

Xian Chen

AEM graduate student Xian Chen was awarded the Lawrence E. Goodman Fellowship in Theoretical and Applied Mechanics in the Department of Aerospace Engineering and Mechanics. This award honors a graduate student with an outstanding academic record who demonstrates a special commitment to graduate studies.

Chen is pursuing a Ph.D. in Aerospace Engineering and Mechanics and is advised by Professor Richard James. She is studying solid mechanics with application to materials that undergo phase transformations, especially a fascinating family of transformations called martensitic phase transformations. When heated or cooled through its phase transformation temperature, one of these materials suddenly changes crystal structure, but remains solid. Usually, on cooling, the lattice undergoes a distortion from a symmetric crystal structure, often cubic, to a lower symmetry structure. These materials are some of the most interesting in all of science, because the two crystal structures can have very different properties. For example, one of the materials that Chen discovered (together with another collaborator from James' group) is a strong magnet in the high temperature phase, but nonmagnetic in the low temperature phase. Such materials have enormous potential for technology, in energy conversion and storage devices, microelectronics, solid state refrigeration, information storage, actuators, sensors and optics.

James recruited Chen during a trip to China to visit a former postdoctoral fellow, Jian Li, who is now Chair of the Department of Materials Science at Huazhong University of Science and Technology in Wuhan. Jian Li, who directs a huge group of students, postdocs and assistant professors in diverse areas of energy science, recommended Chen as his top student. Chen said of James' lecture series there, "As a student in materials science, I could not believe that one could use sophisticated ideas in mathematics to understand materials."

Chen's research has been sponsored by two MURI projects (managed by the Army Research Office and the Air Force Office of Scientific Research).

s t u d e n t s

2012-2013 Undergraduate SCHOLARSHIPS

Eric W. Harslem Scholarship for Aerospace Engineering
- Benjamin Roettger

Robert H. & Marjorie F. Jewett Scholarship
- Jordan Larson
- Arthur Lace

John and Robert McCollum Memorial Scholarship
- Henry McCabe
- Grant Bauer

Richard & Shirley DeLeo Scholarship
- Ethan Fryer-Ressmeyer
- Shawn Reimann
- James Wittig

Chester Gaskell Aeronautical Engineering Scholarship
- Brigitte Pinsonneault
- Guy Squillace

Boeing Scholarship
- Tanner Bowell
- Loralee Bilke
- Michael Voller
- Patrick Price
- Kendall Schneider

IN THEIR WORDS:

"I am very excited to have been awarded the Chester Gaskell Aeronautical Engineering Scholarship. It's encouraging to know that the hard work I've put into my studies is being noticed and congratulated. The support given to me by this scholarship motivates me even more to achieve success. Thank you to the alumni who continue to support and encourage AEM students like myself."
-Brigitte Pinsonneault

"I am extremely blessed to have received the John and Robert McCollom Memorial Scholarship. This award has helped lighten the financial burden of college while reinforcing the hard work I am putting into my studies. I take pride in the AEM Department's top-notch staff and courses, and look forward to putting my education to use at Boeing upon graduation. Thank you again for this generous award."
-Grant Bauer

"I am extremely pleased and honored to be awarded the Boeing Scholarship and would like to thank all of those involved in my selection. Not only has this scholarship provided direct support for my education, it has also fully validated my choice to pursue a degree in aerospace engineering. From this foundation I hope to continue my studies well into the future and make a mark in both practice and education."
-Michael Voller

"The Richard & Shirley DeLeo Scholarship is a huge step towards paying for my education in AEM. Attending school is very expensive and even more so for being an out of state student with no reciprocity. Being awarded this scholarship is more helpful than I can say. It will decrease my ever accumulating student loans and free up more time for extracurricular activities and lab work.

I am incredibly thankful for this scholarship and that my hard work has paid off and I guarantee I will put this money to good use."
-Ethan Fryer-Ressmeyer

"I would like to say thank you to Richard and Shirley DeLeo and anyone else who was involved in awarding me the Richard and Shirley DeLeo Scholarship. Because of them I am both inspired and enabled to invest fully in my academics and other opportunities the University has given me. I am honored that such respected individuals would choose to invest in my education and flattered that my achievements have met the requirements for this scholarship. This award is the perfect encouragement as I face another semester and pursue my dream of someday seeing my handiwork soaring above me."
-James Wittig

"I am extremely honored for being awarded the John and Robert McCollom Memorial Scholarship. It has allowed me to put off getting a part time job this semester so that I am able to focus more on my classes. I love what I'm doing and look forward to what comes next. Being awarded this scholarship has further encouraged my enthusiasm. I would like to thank Mrs. Betty Clarkson McCollom for her generosity."
-Henry Kieran McCabe

"I am thrilled to be receiving the Boeing Scholarship. It is an honor to be recognized in our extremely talented department. I am especially grateful for this particular scholarship since I hope to enter the Aerospace industry as a Boeing employee after graduation in May."
-Loralee Bilke

"I am very grateful to have received the Boeing Scholarship. I want to personally thank Boeing and the University of Minnesota Department of Aerospace Engineering and Mechanics for this award. The scholarship will serve as motivation to continue to succeed in my studies. As a college student I am thankful for any financial assistance and I am honored that my hard work has been noticed."
-Tanner Bowell

Thank You to our Donors

The Department of Aerospace Engineering and Mechanics thanks the many generous alumni, faculty, and friends listed below for their donations and commitments to support the department and our students. We are so grateful for your support. **This list includes gifts made year-to-date in the 2013 Fiscal Year: gifts made between July 1, 2012 and February 1, 2013. The full list of donors for FY13 will be included in the next newsletter.**

Individuals

Jordan C Adams
Michael L Andre
Stuart S Antman
Greg R Augenstein
Vibhor L Bageshwar
Anil K Bajaj
Gary J Balas
Jeffrey M Barker
Daniel Baseman
Robert J Bateman
Scott A Beckfield
Michael H Bednarek
Frederick C Bereswill
Steven E Bickett
Barbara W Bowers
William D Brandt
Richard G Brasket
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From the Development Office

They say it takes a village to raise a child, and I think that is true for our college students as well. Undergraduates and graduate students are guided by academic and faculty advisers, they are often supported financially through scholarships and fellowships established by donors to assist students in getting a degree, and then they receive help in navigating the working world through the career center and the countless alumni volunteers who donate their time for projects, mentoring and networking. We are so grateful for this network of support.

The need for talented and capable engineers has never been more crucial. According to the Hertz Foundation, scientists and engineers are only 4 percent of the U.S. workforce but they account for up to 85 percent of the GDP. We will continue to produce outstanding graduates who will shape the future and lead the world with the continued support of our AEM alumni and friends.

A new opportunity to increase endowed support for students is the new limited-time University-wide program called Fast Start 4 Impact. This program is the best of two worlds - it creates an endowed fund that grows each year for long-term use, and it also provides four years' worth of immediate funding to students. For each new endowment gift or four-year pledge of $50,000 or greater, Fast Start 4 Impact will pay four years of annual scholarship or fellowship awards to students, while the earnings on the new endowment fund are re-invested for growth.

This program is an ideal way for donors to establish a scholarship or fellowship that will help students right away, while also creating a permanent source of support for years to come. Please contact me if you interested in further details about the Fast Start 4 Impact program or other ways to support the department, the college and our students.

Kathy Peters-Martell
Sr. Development Officer
College of Science and Engineering

For more information on giving or alumni involvement opportunities, please visit our web page at www.aem.umn.edu/alumni, or contact Kathy Peters-Martell at kpeters@umn.edu or 612-626-8282 in the College of Science and Engineering Dean's Office.

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AEM alumna receives Parkinson Award

AEM alumna Susmita Bhattacharyya was recently awarded the Bradford W. Parkinson Award for her thesis in the field of Global Navigation Satellite Systems (GNSS). Dr. Bhattacharyya received her Ph.D. from the AEM department in April 2012.

The Parkinson Award, named after Bradford Parkinson, one of the key inventors of GPS (and a Twin-Cities native), is presented annually by the Satellite Division of the Institute of Navigation (ION) for a Ph.D. thesis with an emphasis on GNSS technology. GNSS includes all global and regional satellite navigation systems, including the United States' Global Positioning System (GPS). The Parkinson Award specifically recognizes novel contributions representing significant innovations in the technology, application, or policy of modern satellite navigation systems.

Dr. Bhattacharyya's thesis focused on examining the performance of an improved method for processing the signals transmitted by GPS satellites to compute position. The method is called vector tracking and makes GPS more immune to outages caused by interfering radio signals or, as is common in urban settings, buildings that obstruct the signal coming from satellites. Dr. Bhattacharyya's thesis developed a method for detecting faulty satellite signals in vector tracking receivers so that they can be used in applications that demand a high level of safety and reliability such as precision landing of commercial aircraft.

"When I was first introduced to the field of satellite navigation during my master degree in India, I wanted to know about the internal operations of a GPS receiver. However, I did not get the opportunity then," Dr. Bhattacharyya said. "So, when my advisor (AEM professor Demoz Gebre-Egziabher)told me that I would work on an advanced GPS receiver architecture in my Ph.D., I grabbed that opportunity right away. Although it was not very clear to me in the beginning where I was headed, I took it up as an opportunity to learn the workings of a GPS receiver."

Dr. Bhattacharyya received a Bachelor's degree in Electrical Engineering from Jadavpur University in Kolkata, India. She is currently a Senior Systems Engineer at Accord Software and Systems Pvt. Ltd. in Bangalore, India. She hopes to eventually return to academia.