



COLLEGE OF Science & Engineering

UNIVERSITY OF MINNESOTA
Driven to DiscoverSM

AEM Update

Department of Aerospace Engineering and Mechanics

Winter 2014



Visiting Fulbright Scholar Reflects on Experience

Visiting Fulbright Scholar Bela Takarics joined the University's Department of Aerospace Engineering and Mechanics in December 2013. Working as a Research Associate, Takarics' interests include reduced

order modeling with a focus on aeroservoelastic vehicles and how their models vary across the flight envelope, and the application of a Tensor Product model based control design to aeroservoelastic vehicles. Now three months into his five-month stay, Takarics says his experience thus far has been "absolutely amazing."

Prior to applying for the Fulbright Scholar Program, Takarics received a Masters in Mechanical Engineering and a PhD in Control Theory from Budapest University of Technology and Economics. In 2010 he began working as a Research Fellow to develop a robust and multi-objective control and observer design based on Linear Parameter Varying (LPV) models and Linear Matrix Inequalities (LMI) at the Computer and Automation Research Institute, Hungarian Academy of Sciences.

"The University of Minnesota Department of Aerospace Engineering and Mechanics has one of the top research departments working in my research field and I was motivated to advance my work among the professionals here," says Takarics.

After connecting with AEM Professor Gary Balas through Professor József Bokor, Scientific Director of his home institute, the two wrote and submitted the application to the Fulbright committee in Hungary. The selection process is highly competitive and the criterion for Fulbright candidates includes high academic achievement, a compelling project proposal, demonstrated leadership potential, and an eagerness to interact with the host community abroad.

"Given his vast skill set and devoted approach to his studies it only made sense to welcome him to our team of researchers," explains

Distinguished McKnight University Professor Gary Balas. "We are always looking to advance our research and see this as a great opportunity to do so. The department has had a strong connection with the Hungarian Academy of Science. We truly benefit from the exchange of scholars between our two institutions."

Only three months into his stay, Takarics is highly motivated by the work he has accomplished, claiming that his research is on the "fast track in terms of development" and expressing interest in extending his stay for an additional four months.

When asked what is attributing to this success, Takarics

explains that working in the laboratory and collaborating with other researchers has been incredibly helpful.

"In Hungary, theoretical research can be discovered and then lay dormant for some time," Takarics elaborates. "Here, our results are tested in practical applications and find their way to academic and industrial networks throughout the world; thereby contributing to a global understanding of the subject matter."

“Since joining the AEM team, my research has been on the fast track in terms of development.”

– Bela Takarics,
Visiting Fulbright Scholar &
AEM Research Associate

Moving forward, Takarics looks forward to devoting himself to his research and becoming integrated into the global network of researchers working with linear, parameter-varying control theory and aerospace applications around the world. Furthermore, he is eager to establish roots with the University and become a collaborator between AEM and his home institute.

###

The Fulbright Program was established in 1946 as a highly competitive, merit-based grant program with the intention of "[increasing] mutual understanding between people of the United States and other countries through the exchange of persons, knowledge, and skills." Today, the Fulbright Program is one of the most prestigious awards programs in the world, providing approximately 1,000 grants to over 155 countries.



Chairman's Corner

Semester in Review

Dear Friends and Colleagues,

After a busy fall and (long) winter for the department, we welcome spring with many successes and honors for our students, faculty, and alumni. Before sharing these I want to express my thanks to Professor Gary Balas, who recently

stepped down as Head for personal reasons. All of us -- students, faculty and alumni -- have benefitted from Gary's leadership and from his tenacity and vision in making the Akerman Hall renovation a reality.

Some success stories from our faculty include Professor Ellen Longmire's election to Vice Chair of the American Physical Society Division of Fluid Dynamics for 2013-2014. The American Society of Mechanical Engineers has also honored Ryan S. Elliott, AEM Associate Professor and Russell Penrose Faculty Fellow, as a recipient of the 2014 Thomas J.R. Hughes Young Investigator Award. Professor Ellad B. Tadmor and former postdoctoral associate Dr. Woo Kyun Kim's groundbreaking paper on "Entropically Stabilized Dislocations" will be featured in the prestigious Physical Review Letters journal.

The Aerospace Systems group has been joined for the rest of the academic year by Fulbright Scholar Bela Takarics from the Computer and Automation Research Institute at the Hungarian Academy of Sciences. Dr. Takarics will be working as a Research Associate with Professors Balas and Seiler and their

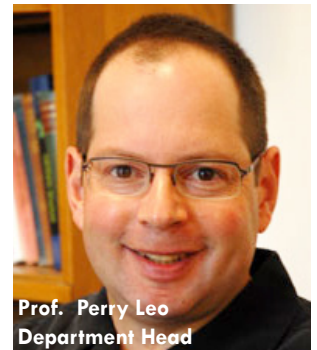
graduate students.

Our seniors have impressed us with another fall semester of successful senior design projects. Overviews of this year's projects can be seen on page 4. Some design groups have continued their design work this semester and several are preparing their designs for various competitions. We wish them the best of luck and will be updating our website with their progress.

We have awarded the 2013-2014 scholarships from the Department, made possible through generous donations and endowments. These scholarships enable us to award some of our outstanding students and recognize and award their commitment and attention to their studies and research. A full list of these awards can be found on our website at www.aem.umn.edu/alumni/.

In closing, I want to thank all of you who have generously donated your time, money, and talents to support the AEM department. Your contributions are valuable in our research and teaching efforts, both of which allow us provide an outstanding education to our undergraduate and graduate students. We very much appreciate it.

Professor Perry Leo
Department Head and Director
of Graduate Studies



AEM Program Highlights

In the fall, AEM made several big changes to its graduate program, the first being a new initiative to evaluate and assess graduate programs on quality metrics. Current faculty and graduate students identified the following learning outcomes as primary focus areas: (1) knowledge and scholarship; (2) intellectual curiosity; (3) communication skills; and (4) ability to work in a group/team. Success at these outcomes will lead to the measurable goals of research productivity and jobs. Faculty and students agreed that these outcomes are relevant for students pursuing either an M.S. or Ph.D. degree, and for students who find either academic or non-academic jobs.

The Department has also received approval to drop the coursework only

Masters of Aerospace Engineering and Mechanics (MAEM) degree and replaced it with a Plan C option Masters of Science degree. Years ago, the MAEM degree was introduced primarily for people in industry who wanted to get a Masters degree without doing a research project. While the degree was well used in the past, last year only one student was enrolled in the MAEM program, while 28 were in the MS program.

For undergraduates, AEM hosted the New Majors Welcome Event on Feb. 11th, in the Akerman Hangar. Students had an opportunity to learn more about the program and meet AEM faculty. The event included 20 students admitted for May of 2013 and 40 students admitted for January of 2014.



2014 Living Legends Reception Honors Ballooning Pioneer Donald Piccard

On February 6th, legendary balloonist and former UMN student, Donald Piccard, was honored with an appointment into the U.S. Ballooning Hall of Fame at the Living Legends Reception, hosted by Target Corporation Flight Services.

Much of the shape and form of hot-air ballooning today is the direct result of Piccard's enthusiasm and vision for ballooning. As an undergraduate at the University of Minnesota, Piccard made the first post- World War II free flight in 1947 with a captured Japanese balloon. A year later he organized the first balloon club in the United States, the Balloon Club of America.

By the 1960s he and his partner, Ed Yost, were instrumental in getting hot-air ballooning recognized as a serious sport with the



*Photo of Donald Piccard and a Piccard burner.
Image obtained from ballooninghistory.com.*

organizing of the first balloon races. Together, they were the first to fly the English Channel in a hot-air balloon and went on to establish Piccard Balloons, which was among the first manufacturers of hot air balloons. Piccard contributed much to the sport of hot-air ballooning, including the innovative use of plastic and Mylar materials.

Coming from a family of legendary balloonists, Piccard was no stranger to reaching new heights. Essentially born into ballooning, Piccard was exposed to such great innovators as Ed Hill, Henry Ford and Orville Wright at a young age. Furthermore, his parents began enlisting him as a crew member for their renown ballooning expeditions at the ripe age of seven.

His father, Jean, became involved in ballooning during World War I and dedicated his life to the study and improvement of high-altitude ballooning. In 1936, he joined the University of Minnesota faculty, teaching courses in stratosphere flight problems, doing research, and conducting many pioneer balloon flights.

Jeannette, Piccard's mother, was the pilot of the famous family ballooning voyages. She managed to accumulate a slew of firsts for women in the industry, including becoming the first licensed woman balloonist in the world and the first woman to fly to the edge of space -- a women's altitude record that she held for nearly three decades.

The Living Legends Reception honored Piccard as an influential innovator in the field of hot-air ballooning and as a member of a pioneering family that helped Minnesota take America to space.

AEM Alumna Nancy MacGibbon Passes Away

AEM alumna Nancy MacGibbon, age 88, died February 2, 2014. Nancy graduated from West High and the University of Minnesota Institute of Technology (now the College of Science and Technology) in 1948 with a Bachelor of Aeronautical Engineering. She was among the first ten women to graduate from the department. Nancy spent winters during college working and skiing in Winter Park, CO. A champion amateur golfer, she was a lifelong student of Les Bolstad. She won and placed in numerous amateur golf tournaments including the MN Women's State Amateur, the Alexandria Resorter's, the Birchmont in Bemidji, Pebble Beach, Mexico City, and many others. She was driven to make the community and the world a better place and volunteered many hours for her causes, including serving on the Hopkins School Board. After college, she worked at Rosemount Research Center between golf and ski seasons for a couple of years, but later made a living owning and managing rental property. Full obituary available at the Minneapolis Star Tribune.



Quantifying Zebrafish's Use of a 'Stealth Zone' to Capture Prey

A team from the University of Minnesota has provided new insights on the ability of zebrafish to alter aspects of fluid motion around their bodies to overcome escape responses and increase capture of prey.

Zebrafish prey on tiny crustaceans called copepods, which exhibit some of the shortest response times and fastest swimming speeds, relative to body size, in the animal kingdom. These tiny creatures have developed an incredible sensitivity to disruptions in water, enabling them to sense approaching predators and quickly evade attacks. Yet despite increased sensitivity and lightning-fast reactions, copepods still have problems evading zebrafish, who are frequently successful at catching their prey.



“We believe this high success rate can be attributed to a ‘stealth zone,’ created when an approaching zebrafish generates suction within its mouth,” explains Deepak Adhikari, doctoral candidate in the Department of Aerospace Engineering and Mechanics. “The zebrafish employ suction ahead of a strike to minimize the flow disturbance generated by their forward swimming. Thus, the copepods are unaware of the approaching threat

until the zebrafish is close enough to strike.”

While previous studies have focused on what occurs during the actual strike, the UMN team used high-speed, infrared tomographic particle image velocimetry (PIV) to study the flow field around the zebrafish during its approach. The team’s insights suggest that to create this ‘stealth zone’, the suction velocities at the opening of the fish’s mouth must approximately match the forward swimming velocity of the zebrafish.

“This study provides insight into a critical trophic interaction in aquatic food webs,” explains Ellen K. Longmire, professor in the Department of Aerospace Engineering and Mechanics. “The detection and quantification of a mechanism that aids in the capture of evasive prey helps explain how a common,

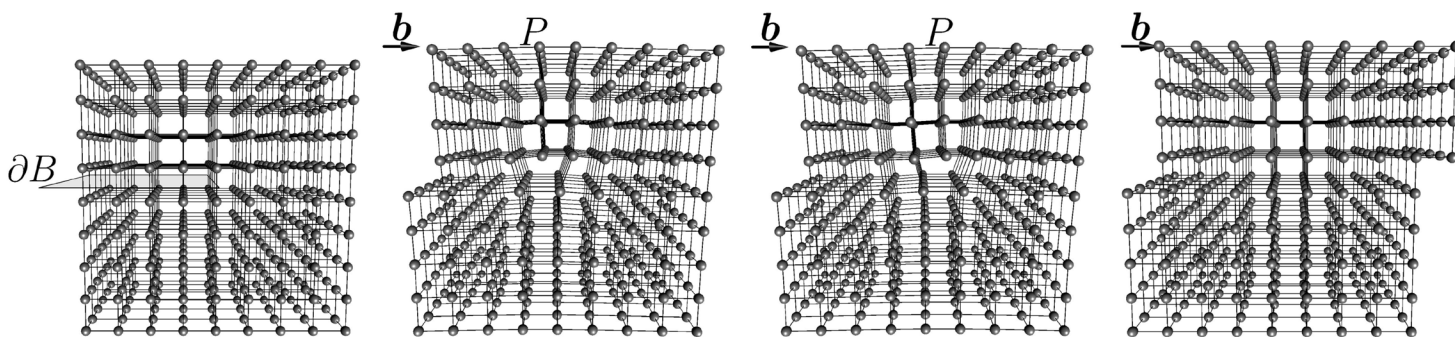
but short range, feeding mechanism can be deployed successfully on highly sensitive, evasive prey.”

To learn more, read the Royal Society Journal’s article on the topic. The full journal article is also available online at <http://ow.ly/viTvY>.

New Information on Entropically-Stabilized Dislocations

Professor Ellad B. Tadmor and former postdoctoral fellow Dr. Woo Kyun Kim’s paper on “Entropically Stabilized Dislocations” is the first explicit demonstration of a dislocation that is stabilized solely due to entropy without a corresponding potential energy well.

Dislocations are local misarrangements along a line in the pattern of atoms that is otherwise crystalline and perfect. Permanent deformation in metals and other crystals occurs as a result of the motion of these defects, each of which carries with it a quantum of plastic or irreversible deformation. Dislocations also affect the thermal, chemical and electrical properties of crystals.



Continued on next page

Entropically-Stabilized Dislocations continued

“Dislocations play a very important, and often destructive, role in electrical and optical materials, and they are responsible for the plasticity of metals; thereby making them of critical importance,” explains AEM Professor Tadmor. “Our paper highlights the discovery of something fundamentally new about the nature of dislocations, unknown since their discovery exactly 80 years ago.”

For the first time, Tadmor and Kim show the possibility of “Entropically Stabilized Dislocations” (ESD) that exist due to entropic effects without a corresponding energy well. Using simulations and theoretical modeling, the AEM team established that partial dislocations can form even when it is energetically unfavorable,

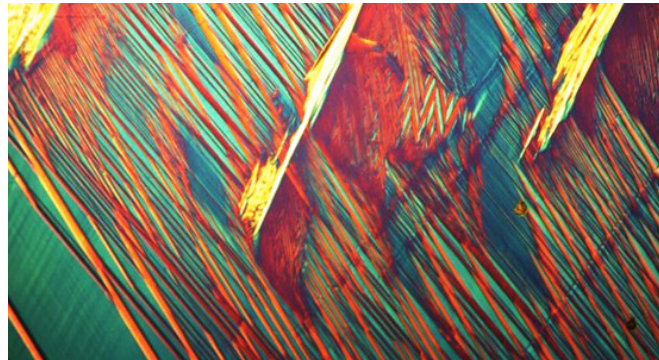
purely due to entropic effects. This means some dislocations exist simply because they increase the disorder in the universe.

The existence of ESDs would have profound consequences, as many scientists have long tried to explain the behavior of dislocations and the patterns that they form purely based on their energies. The possibility that some of these patterns are stabilized by entropy or disorder opens up new horizons in the understanding of crystalline materials.

Additional information is available in an upcoming article in the prestigious *Physical Review Letters* journal.

University Scientists Discover New Shape-Memory Metals

Professor Richard James and his team, including graduate student Vivek Dabade and post doctorate students Yintao Song and Xian Chen, have discovered a new shape-memory alloy made of zinc, gold and copper, which seamlessly switches between two different arrangements of atoms when prompted by a change in temperature.



The newly discovered alloy is the prototype of a family of smart metals with enhanced reversibility. The shortcoming of current martensite metals is that repeated shape changes builds up stresses inside that degrade them and eventually break them apart. To alleviate these stresses, Professor James and his team used computer modeling to find candidate alloys that would better satisfy the cofactor conditions. The result is a new crystal, made up of zinc, gold and copper that can go through 16,000 shape-shifting cycles with little internal damage, making it more robust than existing materials.

“Our aim is to make the transformations reversible so they can be applied in many situations,” explains Richard James, Distinguished McKnight University Professor in the Department of Aerospace Engineering and Mechanics. “The prototype could be used in applications ranging from space vehicles to electronics to energy conversion devices.”

During transformation, the alloy shows unusual microstructure,

not previously seen in phase transformations. As explained by physicsworld.com, shape-memory alloys are reversible phase-change materials that can exist in two crystal-lattice structures: one that is more stable above a certain transition temperature and the other favored at lower temperatures. The ability of these crystals to respond to temperature changes and click into a new shape

in an orderly manner enables their use in a variety of smart mechanisms.

“The theory for the material’s ultra high reversibility and unusual microstructure can readily be adapted to other alloy systems,” explains James. “Our result suggests a universal strategy for developing ultra-reliable martensitic materials particularly suited to medical, microelectronic and energy applications.”

Yet the potential of these materials is greater still: of particular interest in James’ group is a martensitic alloy for which one of the phases is strongly magnetic. As James explains, “These materials can be used in new ways to convert heat directly to electricity, without the need for a separate electrical generator.

Additional information on the topic can be found in the team’s paper in *Nature*. BBC News, Chemistryworld (RSC), Materials 360 (MRS) and Discovery News have also covered the topic.



Longmire Elected Vice Chair of APS Division of Fluid Dynamics

Professor Ellen Longmire was elected to Vice Chair of the American Physical Society (APS) Division of Fluid Dynamics (DFD) for 2014. The Vice Chair becomes Chair-Elect, and then Chair in the following two years.

and to ensure the quality and success of the annual DFD conference.”

Longmire has attended DFD meetings since she was a graduate student at Stanford University and has since been an active member. From 2002 – 2005 she was a member-at-large on the DFD executive committee, and from 2006 – 2009 she served as Secretary/ Treasurer. She was elected a Fellow of APS in 2007 and currently serves as Editor for Experiments in Fluids and the DFD representative on the U.S. National Committee for Theoretical and Applied Mechanics.

The DFD exists for “the advancement and diffusion of knowledge of the physics of fluids with special emphasis on the dynamical theories of the liquid, plastic and gaseous states of matter under all conditions of temperature and pressure.” As Vice Chair of the Division, Longmire will chair the Fellowship Committee, attend the APS Convocation in Washington, DC, participate in APS lobbying of Congress, and serve on the DFD Executive Committee.

“Based largely on the popularity of the annual DFD conference, the Division has grown steadily to more than 3,200 members, making it the third largest in APS,” explains Professor Longmire. “I am excited to support this conference, which encourages interactions among a broad array of disciplines and among an international set of researchers with diverse backgrounds.”

“I am honored by this opportunity to serve my community,” says Professor Longmire. “My goal is to promote interaction among younger and more senior researchers

Elliott Receives Young Investigator Award

Ryan S. Elliott, AEM Associate Professor and Russell J. Penrose Faculty Fellow, has been honored as a recipient of the 2014 Thomas J.R. Hughes Young Investigator Award by the American Society of Mechanical Engineers (ASME).

2009 McKnight Land-Grant Professor and 2012 Russell J. Penrose Faculty Fellow.

Established in 1998, the special achievement award is annually awarded by the Executive Committee of ASME to recognize special achievements in Applied Mechanics made by researchers under the age of 40.

Elliott was selected for the Young Investigator Award due to his “pioneering work in the area of atomistic simulations of shape memory alloys using modern bifurcation theory and stability to quantify the thermally and stress-induced martensitic transformations in shape memory alloys,” explained Larry Bergman, Applied Mechanics Division (AMD) Executive Committee Chair, in a statement on the awardees.

“I am very thankful to have been selected for this high honor,” says Elliott. “It is gratifying to see that the research results my students and I have obtained are appreciated by the Applied Mechanics community and are being highlighted by the leaders of the ASME engineering community.”

The award includes a medal, a plaque, and an honorarium of \$1,500 and will be presented at the AMD Honors and Awards Banquet, during the ASME International Mechanical Engineering Congress and Exposition in Montreal, Quebec, November 14 – 20, 2014.

Professor Elliott began his career with AEM in 2005 as an Assistant Professor and in 2011 he was promoted to Associate Professor. In his time with the University, Elliott has been named the 2005 Frederick A. Howes Scholar in Computational Science for the Department of Energy, 2009 Associate Fellow of Minnesota Supercomputing Institute,



Schwartzentruber Is Awarded the George Taylor Career Development Award

Assistant Professor Thomas E. Schwartzentruber has received the 2014 George Taylor Career Development Award for exceptional contributions to teaching.

Endowed within the College of Science and Engineering, the award was established in memory of George W. Taylor, a 1934 graduate of the department of Mechanical Engineering. The Career Development Award is designated to a faculty member who has made outstanding contributions to undergraduate and/or graduate teaching in the College. The award is made by the College Promotion and Tenure Committee and the Dean and is granted to candidates for tenure based on their dossier.

“I really enjoy teaching, and receiving this award means a lot to me,” says AEM Assistant Professor Tom Schwartzentruber. “I am very appreciative to the committee and Dean for this recognition, and I will continue to do my very best.”

Schwartzentruber joined the AEM department in December 2007 after receiving his Ph.D. in Aerospace Engineering

from the University of Michigan. Since then he has contributed much to the department in the form of teaching, advising and researching. His research utilizes particle simulation methods to model non-equilibrium gas flows. Special focus is given to understanding gas-surface chemistry and gas-phase chemistry under extreme conditions.

As the award recipient, Schwartzentruber will receive an award citation, and honorarium of \$10,000 and a copy of the award citation on permanent display outside the Taylor Undergraduate Academic Center in Lind Hall. Other AEM faculty whose citation hang here include Associate Professor Demoz Gebre-Eqziabher, former Professor Ivan Marusic, and former Professor Yiyuan Zhao.



Professor Zhao Steps Down

Professor Yiyuan J. Zhao is stepping down from his position in the Department of Aerospace Engineering and Mechanics to pursue other interests.

Zhao joined the AEM Department as an Assistant Professor following the completion of his doctorate at Stanford University in 1989. Over the course of his 23 year career at the University of Minnesota, Zhao has done research in the areas of algorithm optimization theory, air traffic control, multiple vehicle automation, and airborne networks. His work has resulted in 30 journal publications and 48 conference papers. In addition, Zhao has taught, advised and

mentored many students at both the undergraduate and graduate level.

The Department of Aerospace Engineering and Mechanics thanks Zhao for his many years of excellence and wishes him the best of luck in all his future endeavors.



SCHOLARSHIPS

2013-2014 Undergraduate

John and Robert McCollum Memorial Scholarship

- Henry McCabe
- Grant Bauer

Chester Gaskell Aeronautical Engineering Scholarship

- Maius Wong
- Kee Onn Fong
- Emily Timinski

Rose Minkin Aerospace Engineering Scholarship

- Michael Kroells
- Lucia Baker

Louis R. and Dona S. Wagner Aerospace Engineering and Mechanics Scholarship

- Nate Hildebrand

Robert H. & Marjorie F. Jewett Scholarship

- Ethan Fryer-Ressmeyer
- Christopher Gosch

Lawrence E. Goodman Scholarship in Theoretical and Applied Mechanics

- Sean Vanden Avond

Eric W. Harslem Scholarship for Aerospace Engineering

- Zach Fox

Richard G. Brasket AEM Scholarship

- Andrew Mahon
- Bryce Doerr

Boeing Scholarship

- Shawn Reimann
- Jake Hergert
- Ryan Carlson

Richard & Shirley DeLeo Scholarship

- Yunus Agamawi
- Timothy Chau
- James Wittig

IN THEIR WORDS:

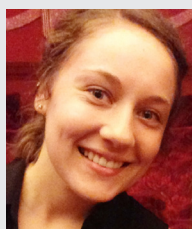


“ The Louis R. and Dona S. Wagner Aerospace Engineering and Mechanics Scholarship is important to me because it encourages me to continue to focus on my studies as well as achieve my goal of attending graduate

school in Aerospace Engineering. I want to thank Dona Wagner and everyone who was involved in this scholarship. It is an honor to be recognized by such an outstanding department. ”

- Nate Hildebrand

“ Receiving the Chester Gaskell Aeronautical Engineering Scholarship is an honor, and I am very grateful. By allowing me to focus more on school and stress less over financial matters, this scholarship is supporting me reach my goal of graduating with a degree in my desired major. This scholarship is motivation for me to continue to work



hard in all I do. I want to thank Judith A. Gaskell again for providing students like me with the opportunity to succeed in college. ”

- Emily Timinski



“ I am honored to be the recipient of the Richard & Shirley DeLeo Scholarship. Through its financial support, I am able to put more focus on both my studies and my extracurricular activities. As a student, academic success involves overcoming a constant stream of challenges. I am content in knowing that those who strive to improve both themselves and those around them through hard work, dedication and passion are recognized. ”

- Timothy Chau

“ I would like to thank those involved in awarding me the Boeing Scholarship. It is a true honor which has inspired me to continue giving my all to my education and which has enabled me to invest my complete time and energy into my academics and extra-curriculars. As my time at the University of Minnesota draws to a close, I grow nostalgic as I look back upon the friends and mentors I have gained and look forward to the countless possibilities before me and my fellow seniors. ”

- Ryan Carlson



“ I am extremely thankful to have been selected for the Rose Minkin Aerospace Engineering Scholarship this year. This scholarship will allow me to focus on my coursework and extracurricular experiences so I can get the most out of my time at the U. It will let me spend more time gaining knowledge and experience in the field and pursuing my goals of graduate school and full-time employment after graduation. ”

- Lucia Baker



“ I feel extremely blessed to have received the John and Robert McCollum Memorial Scholarship. This award has helped lighten the financial load of college while reinforcing the hard work I am putting into my studies. I am extremely grateful to Mrs. McCollum and the AEM faculty for presenting me with this honor, and guarantee that I will put it to good use during my final year. I am eager to apply my college education in industry at Boeing upon graduation. Thank you again for this generous award. ”

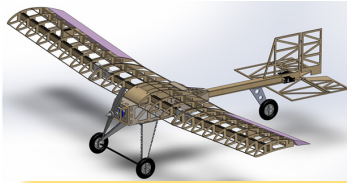
- Grant Bauer



Senior Design Projects

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

The course was taught by Professor William Garrard and project sponsors included Eric Kaduce and Eric Hiner from Boeing, Todd Colten and Rudy Piteri from United Technologies Aerospace Systems, Gary Stroick from Up and Away Rocketry, Vibhor Bageshwar from Honeywell, and AEM Research Specialist Brian Taylor and 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.

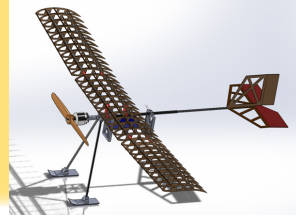


SAE Micro Aircraft Competition

Hosted in Atlanta, GA: April 11 - 13

Design goals:

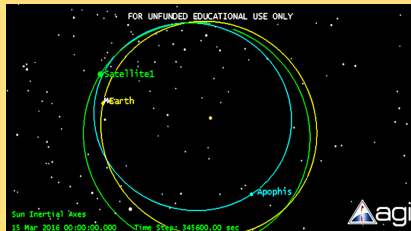
- Design a modular aircraft within the packaging requirements
- Carry the highest payload fraction while concurrently maintaining the lowest empty weight



Maritime Patrol

Design goals:

- Design a maritime patrol system utilizing a combination of existing and/or conceptual aircraft
- Must meet the following requirements:
 - Patrol area (EEZ): 1200 x 200 nmi
 - Cost: < \$1 billion



Asteroid Deflection Mission

Design goals:

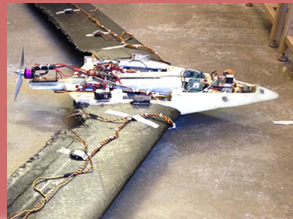
- Design an orbit that starts from LEO and intersects the asteroid Apophis
- Deflect the orbit of Apophis with a small spacecraft
- Ensure that new hyperbolic perigee of Apophis is increased by at least one Earth radius

Aeroelastic Wing

Sponsored by AEM UAV Lab

Design goals:

- Design a wing which will flutter within the flight envelope of an existing flight test vehicle
- Must meet the following requirements:
 - Vibrational Characteristics
 - Mold Line
 - Mass Properties
 - Interface with Aircraft



UAV for Reliability

Sponsored by AEM UAV Lab

Design goals:

- Analyze the reliability of current Ultra Stick 120 UAV
- Redesign and analyze a new configuration
- Increase reliability by a factor of 10 at no more than double the cost



High-Power Rocketry

Hosted in North Branch, MN: April 26

Design goals:

- Build a high-powered rocket to compete in the WI Space Grant Consortium Collegiate Rocket Competition
- Must meet the following requirements:
 - High power, single stage rocket
 - Dual-deploy electronic recovery with motor backup
 - Target altitude of 3,000 feet
 - Recover in a re-flyable condition

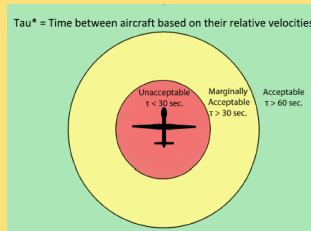


Unmanned Aircraft Systems (UAS) in the National Airspace

Sponsored by Honeywell

Design goals:

- Organize UAS into various categories
- Identify available equipage options for self-separation
- Set equipage requirements
- Determine ROW rules
- Define and demonstrate "well clear"



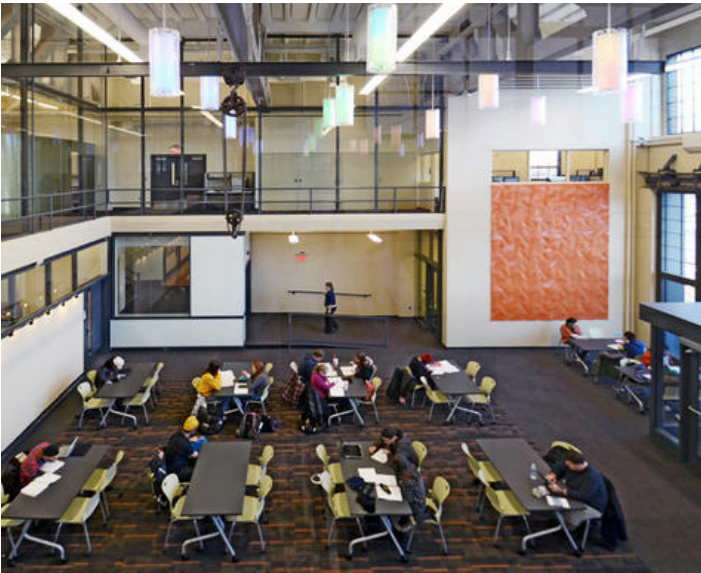
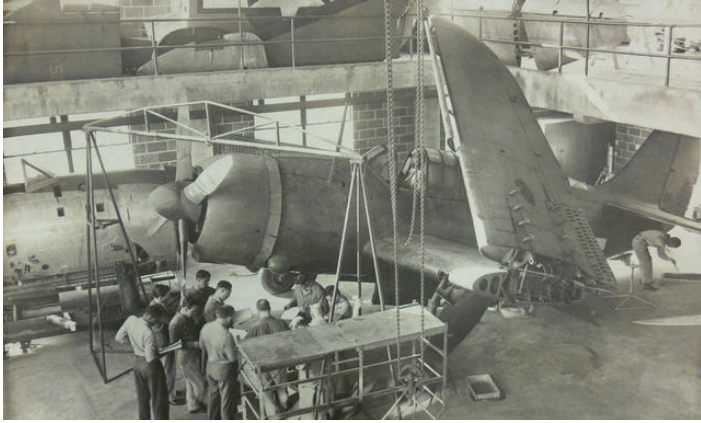
Packable multi-rotor UAV for Monitoring Wildfires

Design goals:

- Provide a detailed plan for creating a multi-rotor UAV with CTOL capability for monitoring wildfire responders
- Must meet the following requirements:
 - Cost: \$1,750 or less
 - Weight: < 2 kg
 - Guarded propellers



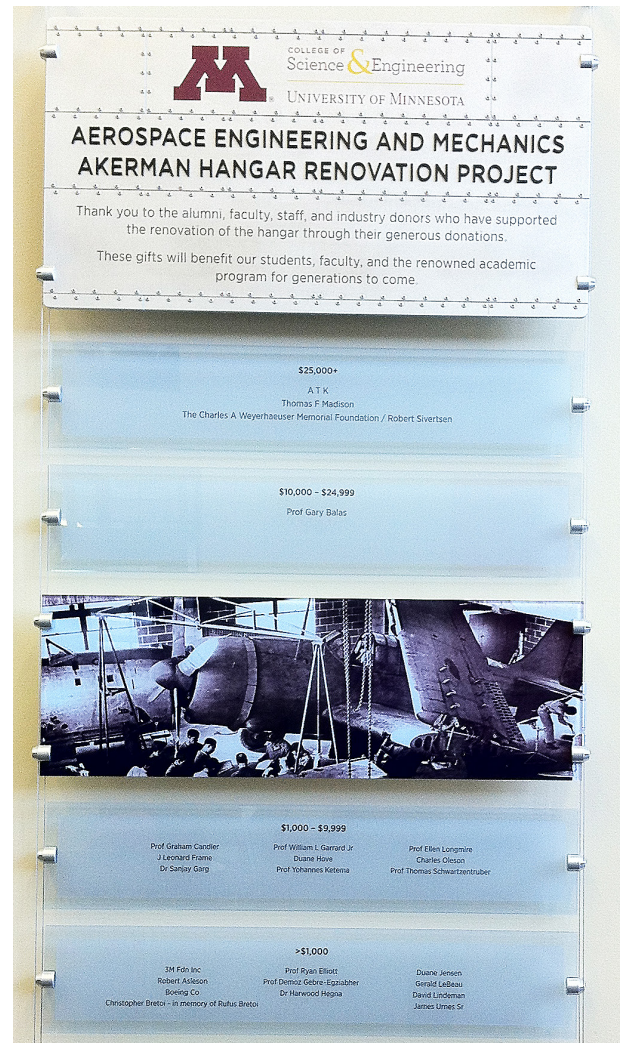
Donor Plaque Installed in Akerman's Hangar



As Akerman Hall's Hangar celebrates its third year since the 2010 renovation, the Department of Aerospace Engineering and Mechanics appreciates the alumni, faculty, staff and industry professionals who made generous donations to the project with a new and prominent donor plaque.

The Hangar has been transformed into an effective space for students and faculty; its refurbishing has created an environment for learning, collaborating and researching, and ensures the best education environment possible. Honored with the 2011 Minneapolis Heritage Preservation Award, the Hangar is a popular and creative learning environment that reflects the excellence of the Aerospace Engineering and Mechanics program.

"Today, the Hangar is constantly bustling with students as they pass between classes, meet with TAs, study for tests and convene with student groups," says Professor Perry Leo, AEM Department Head and Director of Graduate Studies. "A donor plaque is now prominently featured in the Hangar as a symbol of our thanks for the generosity of those who made the space possible."



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 2014 Fiscal Year: gifts made between July 1, 2013 and January 24, 2014. The full list of donors for FY14 will be included in the next newsletter.**

Individuals

Jordan C Adams
 Martin S Annett
 Stuart S Antman
 Robert A Asleson
 Vibhor L Bageshwar
 Anil K Bajaj
 Gary Balas & Stephanie Steele
 Matthew D Bartkowitz
 Robert J Bateman
 Scott A Beckfield
 Michael H Bednarek
 Sharon J Benton
 Sharon K Benton
 Frederick C Bereswill
 Steven E Bickett
 Patrick J Cain
 George R Ceman
 Gary T Chapman
 Jim D Clausen
 Aron J Cooper
 Glenn H Dalman
 Jason R Dick
 Thomas D Douma
 Clinton V Eckstrom
 Lester D Edinger
 Todd S Ekstrom
 Roger A Engdahl
 Alan S Estenson
 Christopher J Feist
 Zaichun Feng
 Thomas R Finke
 Janet L Fransen
 Paul C Gabor
 Judith A Gaskell
 John M Girard
 Robert J Gran
 Wendy Grosser
 James L Grunnet - Thomson Family Foundation-Capital Trust Co Delaware
 David E Hagford
 Alford J Hanson Jr
 Gregory D Happ
 George & Ieva Hartwell
 Harwood & Helen Hegna
 Richard R Heisler
 Gene W & Evelyn H Hemp
 Roger A Hickman
 Yucheng Hou & Peng Zhang
 Michael and Lorinda Jackson
 Jeffrey A Jackson
 Duane L Jensen
 Bert W Johnson
 Kevin J Kjerstad
 Dr Kenneth A Kline
 H Wayne Klopfenstein
 David J Koenen
 Michael & Victoria Konicke
 Gerald J LeBeau
 David D Lindeman
 Shaobo Liu
 Peter D Lohm
 Joel J & Debra A Luker
 Brian G Lundquist
 Sherilynn A Mahowald
 Gary D & Paulette G Malecek
 James G Malone
 Christopher J Matthews
 Donald R Monson
 Matthew R Moriarty
 Charles R Oleson
 Michael M Ondrey Jr
 Matthew R Otterstatter
 Susan V Parsons
 David M Peterson
 Douglas J and Tracey B Petesch
 Ronald L Prentice
 David L Quam
 Gerald J Reuter
 Lauren J Rezac
 Kristen J Riley
 Mitchell D Ryan
 Jon L Schasker
 Nicolas G Schellpfeffer
 David J Selvig
 David L. & Donna L. Sippel
 - David & Donna Sippel Charitable Fund
 Sheila & Andrew Smude
 Robert W Soderquist
 William C Spetch
 Mark C Thelen
 Thomson Family Fdn-Capital Trust Co Delaware
 Edward T Tolan
 Peter J Torvik-Torvik Fund for Charitable Giving
 James M Urnes Sr
 Daniel C Van Lith
 Andrew E Vano
 Daniel J Vavrick
 Michele Labre Veneri
 Dona S Wagner
 Ross M Wagnild
 William H Warner
 V Gregory Weirs
 Frank D Werner
 Anita C Westberg
 Daniel J Willemsen
 Laura L Willemsen
 Mr Thomas D Zeimet

Corporations

3M Foundation Inc
 Aerojet Rockedyne Delivers
 Alliant Techsystems Operations LLC
 ATK Matching Gift Program
 B A E Systems
 The Dow Chemical Co Foundation
 GE Foundation
 Goodrich Foundation
 IBM International Foundation
 Intel Foundation
 Lockheed Martin Corp Foundation
 Praxair



From the
Development
Office

Once again the halls and sidewalks of the U of M are crowded with students back for the last semester of the year and with dreams of spring just around the corner, we hope. Things are buzzing in the halls of Akerman as our dedicated students dive into the spring quarter – some for the last time and some for the first.

In the last newsletter I shared the importance of financial support for our students, faculty and the academic program and I am pleased to report that AEM alumni and friends were extremely generous to the department as you can see in the donor list in this newsletter (gifts in fiscal year 2014 as of January 24, 2014). We also put up a beautiful new plaque to recognize our donors who have made gifts to support the renovation of the Akerman Hangar. Please stop by if you haven't already seen the beautiful new renovated space. If you are still thinking of making a gift to this project, don't worry that you've missed your opportunity - the plaque is easy to update. If you haven't already come to campus to see the transformation of the hangar, we invite you to do so - it is amazing!

There were also a number of gifts to support AEM students through the AEM Alumni Scholarship Fund and everyone is grateful for these donations. In recognition of the ever-increasing need for more trained engineers, the Dean of the College of Science and Engineering set a goal 5 years ago to increase the number of undergraduates by 35% by the end of 2014 and this scholarship fund is helping us reach that goal. AEM has always attracted some of the most enthusiastic and motivated students and to be able to provide support for their education is an important part of our work.

Thanks to all of you who are supporting the department financially and with your time and talents.

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.

♻️ Printed on recycled and recyclable paper with 10 percent postconsumer waste material.

The University of Minnesota is an equal opportunity educator and employer.

This publication is available in alternative formats upon request.

Tel: 612-625-8000
Fax: 612-626-1558
dept@aem.umn.edu

Upcoming Events

APRIL

- 2 - 4:** American Institute of Aeronautics and Astronautics (AIAA) Region V Student Paper Conference
- 11 - 13:** Senior Design team attends SAE Micro Aircraft Competition in Atlanta, GA
- 25:** CSE Exposition
AirSpace Minneota Founding Flyers Gala
Astronaut Dr. Harrison 'Jack' Schmitt visits campus
- 26:** Senior Design team attends Regional Rocket Design Competition in North Branch, MN
AirSpace Minnesota Go Boldly Expo

MAY

- 16:** Last day of spring semester classes
CSE Comencement Ceremony

Astronaut Visit

The AEM and Earth Sciences Departments are excited to co-host Astronaut Dr. Harrison 'Jack' Schmitt's visit on Friday, April 25th.

As an Apollo 17 crewmember, Schmitt was a part of the final mission of the United States' lunar landing program, and was one of the last humans to land on the Moon.

Prior to joining NASA, Schmitt worked at the U.S. Geological Survey's Astrogeology Center developing geological field techniques to be used by NASA in space. However, pressure from the scientific community to have a trained geologist, as opposed to a pilot trained in geology, visit the moon resulted in Schmitt's assignment as the Lunar Module Pilot aboard the Apollo 17 mission.

Schmitt's talk on April 25th is entitled "Apollo 17 Field Geological Exploration Result" and will discuss many of the research techniques and findings employed during his twelve days in space.

For more information on the event, please refer to the AEM website under the 'Seminar & Events' page.