COLLEGE OF Science & Engineering
UNIVERSITY OF MINNESOTA
Driven to Discover℠

AEM Update

Department of Aerospace Engineering and Mechanics

Winter 2015-2016

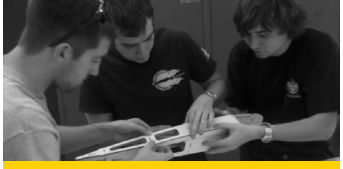
AEM alum named AIAA Fellow

AEM alum Steve Cook was recently named a Fellow of the American Institute of Aeronautics and Astronautics (AIAA). The AIAA confers Fellowships in recognition of "notable and valuable contributions to the arts, sciences, or technology of aeronautics and astronautics." A Fellows Dinner will be held in Washington DC in June to celebrate the 2016 AIAA Fellows and Honorary Fellows.

Cook is currently the vice president for corporate development at Dynetics in Huntsville, Alabama. Dynetics provides products and services in the national security, satellite, launch, automotive, cybersecurity, and critical infrastructure sectors. In this capacity, he oversees the development of company strategies, emerging business opportunities, focused programs, and products. He joined Dynetics in 2009 as the director of space technologies, leading Dynetics' efforts in launch systems, orbital spacecraft, and analysis and planetary exploration.

Prior to that, Cook served as the manager of the Ares Projects Office of NASA's Marshall Space Flight Center, where he worked on project management and direction of NASA's Ares I and V launch vehicles. He worked with NASA for nearly 20 years. Cook has received honors such as the Meritorious Executive Presidential Rank Award, the NASA Outstanding Leadership Medal, the NASA Exceptional Service Medal, the AIAA Holger Toftoy Award, and the NASA Outstanding Achievement Medal, among others.

Cook holds a bachelor's degree in aerospace engineering and mechanics from the University of Minnesota. He graduated from the department in 1990.



Year in Review

Chairman's Corner

Friends and Colleagues,

After a productive fall semester, the AEM department is looking forward to another exciting year in 2016. The department is pleased to highlight the recent successes and honors of our students, faculty, and alumni. However, we are also saddened to report the loss of Professor Emeritus William H. Warner, an influential and valuable member of our community. Dr. Warner made numerable contributions to the AEM department, serving as the Director of Graduate Studies and the Director of Undergraduate Studies for many years.

Congratulations are in order to many graduates of the AEM department this season. Steve Cook and Ajit Roy were recently named Fellows of the American Institute of Aeronautics and Astronautics (AIAA). Adam Creuziger was named by President Obama as one of the 2016 recipients of the Presidential Early Career Award for Scientists and Engineers. Finally, Kristen Gerzina was recently featured in the AIAA Momentum Member Spotlight. You can learn more about each of these alumni in the upcoming pages. We are very proud of our distinguished alumni and their achievements.

I am thrilled to highlight the outstanding work completed by our current AEM senior design teams. Student teams overcame many challenges to produce their senior design projects, which are described on page four. Several of these projects will be taken to upcoming competitions around the country. We are looking forward to seeing what successes these design teams will achieve this spring and we congratulate them on their work thus far.

Thanks to generous donations and endowments, we have been able to award the 2015-2016 student scholarships to 20 deserving undergraduates in our department. We are proud to recognize these exceptional students and their commitment to their studies. You can learn more about each of the scholarship recipients and their academic pursuits beginning on page nine. In addition, I would like to congratulate Sally Keyes and Kerry (Ke) Sun as the recipients of the Kenneth G. and Rosemary R. Anderson Graduate Fellowship. Sally and Kerry have both begun their graduate studies in the AEM department this past year.

As always, I would like to thank each and every one of you who has given your time, money, or support to the AEM department. Your continued commitment to the success of the program allows us to provide an exceptional education for our students. We are truly thankful for your generosity.

Professor Perry Leo
Department Head

AEM Department Mourns the Passing of Faculty Emeritus William H. Warner

Professor Emeritus William H. Warner passed away on December 27, 2015 after a brief illness. Dr. Warner came to the University of Minnesota as an assistant professor in 1955 in the Department of Mechanics and Materials, which a few years later merged with Aeronautical Engineering. He served as a professor in the Department of Aerospace Engineering and Mechanics from 1968 to 1995.

William H. Warner was born and grew up in Pittsburgh, where he graduated from Peabody High School at age 16. He then spent two years at Haverford College before transferring to the Carnegie Institute of Technology, eventually earning three degrees in mathematics: B.S. in 1950, M.S. in 1951, and Ph.D. in 1953. He had a two-year post-doctoral position at Brown University prior to coming to the University of Minnesota.

Dr. Warner contributed significantly to the reputation of the University through his outstanding research in many branches of mechanics, including static and dynamic elastic stability, plasticity, viscoelasticity, and optimal structural design. He was a member of the American Mathematical Society, the Mathematical Association of America, and the Society for Industrial and Applied Mathematics. He played a significant role in the education of several generations of mechanicians. Fourteen students wrote Ph.D. theses under his direction. Five became faculty members elsewhere, three became senior program managers at IBM, and several worked at leading industrial and governmental research laboratories. More than thirty other students received M.S. degrees under his guidance. Throughout his career, Dr. Warner was a tireless university citizen serving on numerous department, college, and university committees. His service to the department included lengthy appointments as the Director of Graduate Studies and the Director of Undergraduate Studies.

Dr. Warner was an enthusiastic and knowledgeable devotee of Gilbert and Sullivan, as well as Bach and Beethoven. He was a life-long philatelist, and a part-time collector of bad puns. Dr. Warner was an avid reader with a broad spectrum of literary tastes. He claimed that he was probably the only person to have read the whole of Dante's Divine Comedy on MTC bus trips between downtown Minneapolis and the University.

Thank You to our Donors

The AEM Department thanks the many generous alumni, faculty, companies, and friends for their donations and commitments to support the department and our students. This list includes gifts received year-to-date in the 2016 Fiscal Year (July 1, 2015 through February 15, 2016). These gifts help to enhance our academic program and provide opportunities for our students. We are grateful for your support.

From the Development Office

It is hard to believe that spring is almost here – signaling the end of the school year, but not the work of the department. The College of Science and Engineering has already received more than 13,000 applications for the 1,075 spots in the freshman class for the fall of 2016. This is part of a steady increase in well-qualified applicants we have seen over the last 5 years as we've been growing the undergraduate class, educating the next generation of engineers and scientists to meet the world's greatest challenges.

The College and AEM department are attracting these amazing students thanks in great part to the scholarships and fellowships established and supported by the donations of generous alumni and friends and the gifts that have helped us attract and retain our world-renowned faculty.

We are so grateful for the many ways our alumni support AEM, through financial gifts, countless volunteer hours, and by opening doors for our students to secure internships and jobs. The ongoing financial support from our generous alumni and donors is vital in helping the department maintain the level of excellence for which we are widely known.

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

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This listing includes all donations to the AEM department received by February 15, 2016. 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.

Senior Design Projects

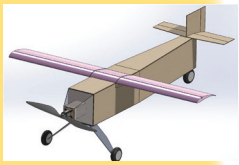
Fall semester yielded challenging design projects for this year's Aerospace Engineering and Mechanics senior class.

The course was taught by Professors William Garrard and John Weyrauch. Project sponsors included Todd Colten from Sentera, Eric Kaduce from Boeing, Joel Feigum from Orbital ATK, Suneel Sheikh from Asterlabs, Pat Doyle from Aerospace Corp, Colin Towne from United Technologies Aerospace Systems, Scott Cocchairella from United Technologies Aerospace Systems, NASA, AIAA, and AEM Professors Demoz Gebre-Egziabher, and Pete Seiler. 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.

High Efficiency Hand Launched UAV

Design goals:
- Carry Sentera Double imaging payload with PixHawk integration module
- Cruise speed of 25 mph
- Stable deep stall recovery landing
- Entire system fits in a gun case
- Able to cover a full field in one flight

AIAA Design, Build, Fly

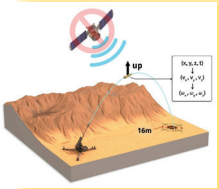


Design goals:
- Design, fabricate, and demonstrate the flight capabilities of 2 unmanned radio controlled aircraft: a production aircraft and a manufacturing aircraft
- Production aircraft must make 3 laps around the course with payload within 5 mins
- Manufacturing aircraft must carry all sets of sub-assemblies and fly all of them around the course within 10 mins

Subsonic/Supersonic Business Jet Design

Design goals:
- Design 2 airplanes and downselect based on performance

- Airplane 1 is a sub-sonic business jet, carrying 13 people with U.S. Midwest to East Asia range
- Airplane 2 completes the same mission at a supersonic cruise mach of 1.5 – 2.0

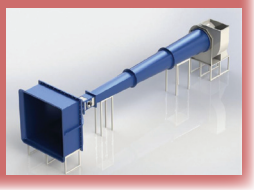


Low Cost GPS Denied Guidance for Munitions

Design goals:
- Provide a reliable, low-cost navigation solution for field artillery in any GPS-denied environment
- Key performance requirements:
  - Find/send "up"
  - Provide accurate timing solution
  - Determine spin rate
  - Determine position
  - Determine velocity
  - Reliability > 95%

Design of a Low-Speed Wind Tunnel

Design goals:
- Tunnel will be used mainly for testing and calibration of angle of attack (AOA) vanes
- Top level requirements:
  - 250 knots through test section
  - Integrate vane deflection device
  - <41' length
  - 12"x12" test section
  - Redesign mounting fixture

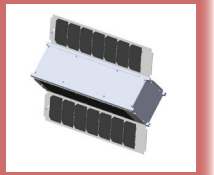


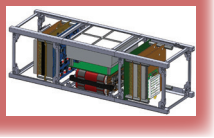
Design of UAV with one control surface

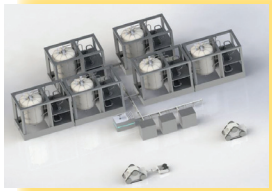
Design goals:
- Design an aircraft that is capable of flying with only one active control surface
- Customer requirements:
  - Flight time – 20 minutes
  - Payload – 2 lbs
  - Speed – 40 mph
  - Turn radius 440 ft
  - Glide slope/descent rate – safe landing

CubeSat Design

Design goals:
- Complete a small satellite design: will observe gamma-ray bursts and record the GPS time when ray was received
  - Using the time difference of arrival between cubsat and observatory on Earth, position and timing offsets are estimated

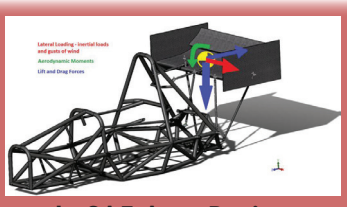






NASA Rascal

Design goals:
- Design a plant that:
  - Is capable of producing a minimum 100 t of oxygen/hydrogen propellant annually, and is scalable to significantly larger levels of production
  - Has a power source capable of operating the resource collection, processing, product storage and other required systems
  - Must be autonomous
  - Is fully operational in 2035



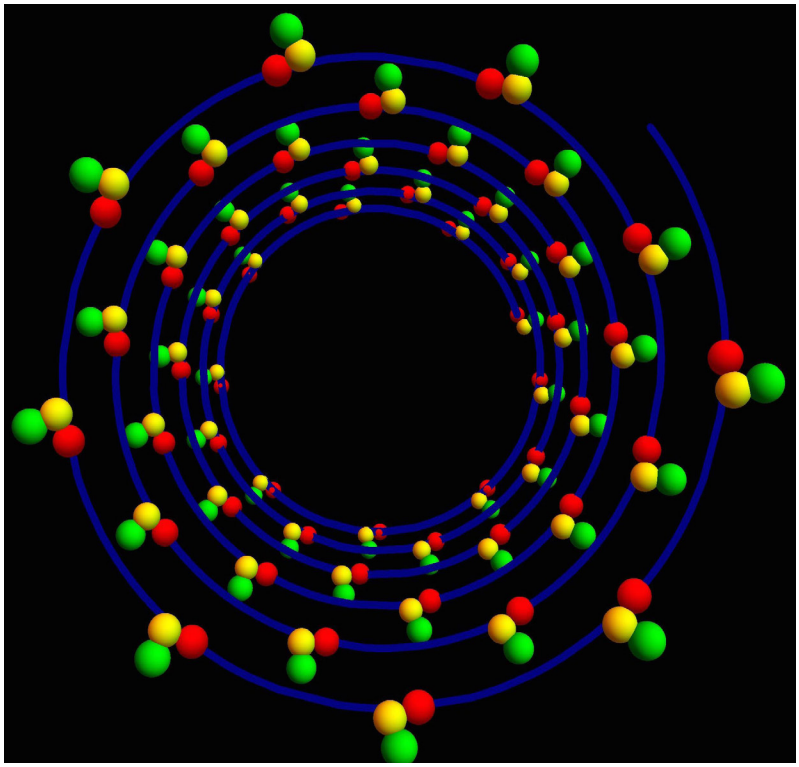
Formula SAE Auto Racing

Design goals:
- Design rearwing and attachment mechanism to significantly improve the lap times of the U of M SAE race car
- Must withstand 2 g sustained load
- Must withstand 3 g bump
- Must weight less than 10 lbs

Twisted

Professor James and collaborators unravel the complexity of helical structures

Nearly everything we know about the structure of matter—where the atoms lie, and what species go where—comes from X-ray analysis. Discovered by von Laue and the Braggs just over 100 years ago, its effectiveness lies in the conspiring effects of constructive and destructive interference. If one shines an X-ray (which is merely short wavelength light) onto a crystal with the correct geometry and frequency, strong localized spots of reflected radiation appear on the detector. In practice, there is a two to four order-of-magnitude ratio between the intensity of the spots and the background. The positions of the spots contain the key information that can be used to reconstruct the atom positions and crystal structure.



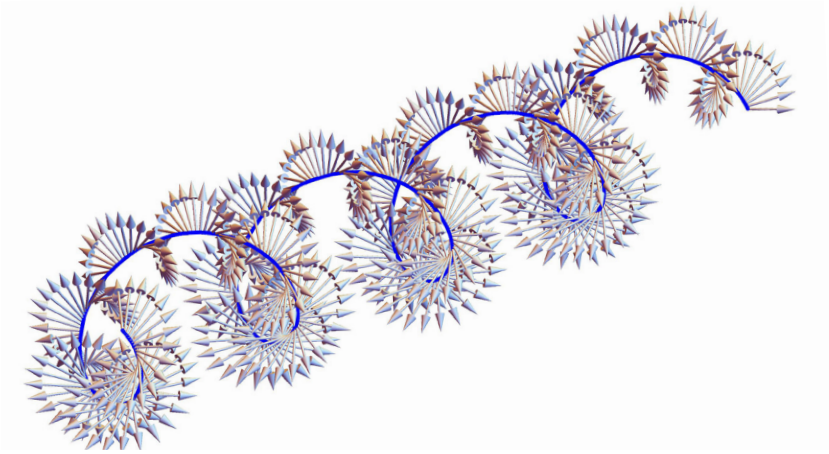
Briefly, this works because of symmetry. The symmetry of the "plane waves" that illuminate the crystal match the symmetry of the crystal, if all the parameters (geometry and frequency) are tuned correctly.

Many of the most important emerging materials, however, do not readily crystallize. This is particularly true of emerging nanostructures like buckyballs, carbon nanotubes and graphene, and, more recently, black phosphorus and the dichalcogenides. AEM Professor Richard James has a way of thinking quantitatively about these structures called the theory of Objective Structures. Objective Structures can be appreciated by the figure above showing a helical structure with three atoms colored red, green and blue. Imagine sitting on, say, a yellow atom and looking around. Take a picture. Now go to another yellow atom of the structure and look around. If one orients oneself in just the right way, one sees exactly the same picture. Do this with the green atoms and the environment is different from the yellow ones, yet each green atom also sees precisely the same environment, as do the red atoms. Buckyballs, carbon nanotubes and graphene have this property (each with only one color!), and many more. Why that is the case—why matter should spontaneously adopt structures with these identical environments so often—is one of the celebrated open problems of science.

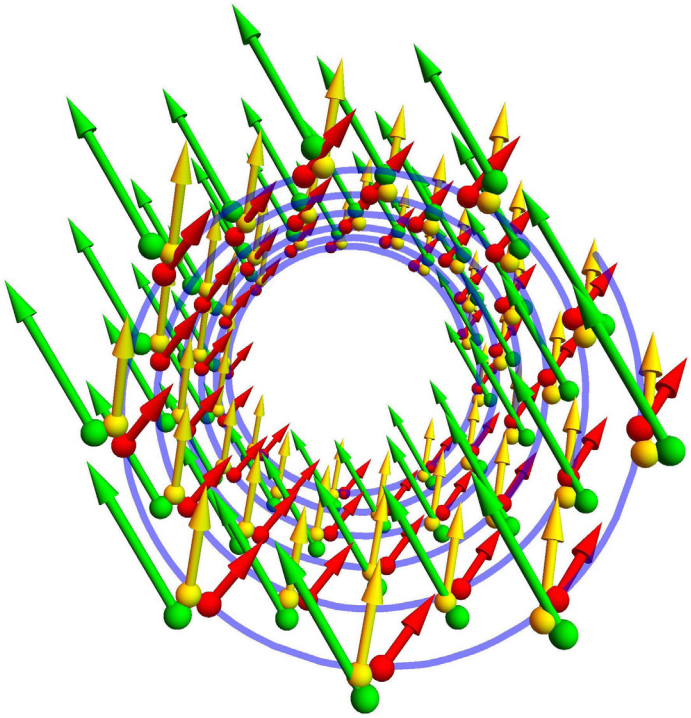
In 2006, James was invited to Munich by Professor Gero Friesecke to give lectures on Objective Structures. Thus began a fruitful collaboration with Friesecke and his then student Dominik Jüstel on the possibility of a new form of light, whose symmetry matches the symmetries of other Objective Structures, and which could be used in a similar way for structure determination. The key point is that the equations that govern the propagation of light (Maxwell's equations) allow for a much broader family of symmetries than the translational symmetries of plane waves, and these could match with other Objective Structures. An example

X-Rays

of one of the new exact solutions they found for helical structures is the "twisted wave" shown at right. The arrows are the electric field vectors of the twisted wave.



The results of Jüstel, Friesecke, and James (Acta Cryst. A72 (2016)) allows one to revisit the helical Objective Structure pictured. Below, the structure is replotted looking down the axis, and a twisted wave is superimposed on the structure. For clarity, only the electric field vectors are plotted at the positions of the atoms. The critical matching symmetry can be appreciated by observing that the electric field vectors at the green atoms (projected on the plane of the page) are all parallel, and so also for the red and yellow ones. This is not an accident, but is rather a generic property of helical structures and matched twisted waves. Jüstel, Friesecke, and James demonstrate theoretically that this leads to strong spots in the far-field radiation that can be used for structure determination.



Their work is theoretical and they do not build the machine, but the publicity surrounding the recent publication of their work gives hope that this is not far away: (for more information, visit http://z.umn.edu/14lm).

There could be urgency for society. The Ebola virus has at least four helical structures, and helical structures also appear in some amyloid proteins that are believed to cause Alzheimer's, Parkinson's and Creutzfeldt-Jakob disease.

These new forms of light could have other completely different uses—in optics, photonics, radar and communications—that James is now exploring.

Professor James' research is supported by the Air Force Office of Science Research and partially supported by the Office of Naval Research, the NSF Partnerships for International Research and Education, the MURI program, and a John Von Neumann visiting professorship at TU Munich.

Professor Nichols' Group Unco

High-fidelity simulations and analysis provide breakthrough understanding and modeling of noise generation

While on your next flight, take a look at the back end of your aircraft's jet engine. Not too close, through the window will do! Instead of being perfectly round, newer engine designs incorporate serrated nozzles such as those shown in figure 1. Besides their aesthetic appeal, serrated nozzles reduce the noise generated by high-speed turbulent engine exhaust jets. Exactly how they do this, however, is not entirely understood. As a result, noise-reducing nozzle designs are improved only incrementally, through trial-and-error. Because jet engines remain one of the loudest sources of human-created noise, finding new ways to systematically reduce their noise can have a big impact on communities surrounding airports, and on the health and safety of airport personnel.

Figure 1: One of several serrated nozzle designs tested by Boeing's Quiet Technology Demonstrator aircraft.

Even after extensive scientific investigation, our understanding of the way high-speed jets generate noise is incomplete. This is partly because only a small fraction of the turbulent kinetic energy contained in a high-speed jet is ever radiated as sound. Although turbulence is a chaotic phenomenon, it is not random, and it is in particular the coherent parts of the unsteadiness that are the most efficient radiators of noise. In the 1960's, Mollo-Christensen first showed these coherent fluctuations are connected to instability wavepackets. In recent years, researchers successfully computed instability wavepackets using the Parabolized Stability Equations (PSE) and found they nicely predict peak jet noise from supersonic jets. The theory breaks down, however, in the case of high-speed subsonic jets, especially in the "sideline" direction, perpendicular to the flow of the jet. For this important case, the existing theory under-predicts sound pressure levels by at least 20 dB, or two orders of magnitude.

Until now, a prevailing view has been that stochastic acoustic sources must be responsible for this missing sound. Using a systems-theoretic approach, AEM Ph.D. student Jinah Jeun has shown conclusively that this is not the case. Jeun's analysis has uncovered new coherent modes associated with linear dynamics of high-speed jets, and connected to sideline noise. Importantly, her analysis predicts when and explains why PSE-based methods fail in some cases. Jeun confirmed the existence of these new coherent modes using high-fidelity simulation data she obtained using 262,144 processors of a supercomputer at the Argonne

vers New Physics in Jet Noise

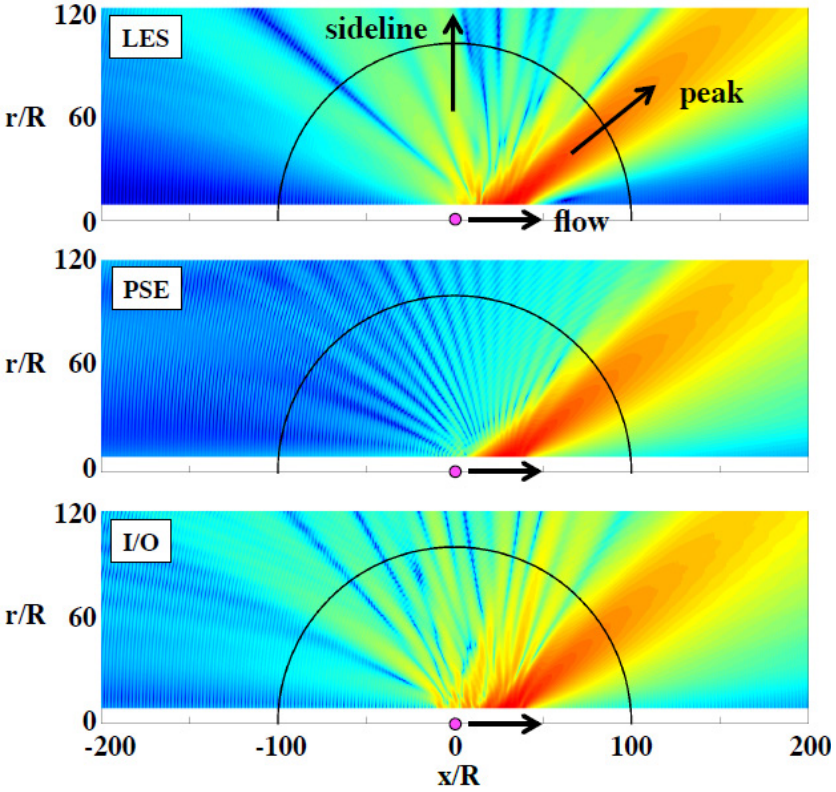


Figure 2: Contours of decibel levels in the acoustic far-field of a supersonic jet. The nozzle exit is located at the magenta dot in each figure, and the jet flows from it to the right. Jet noise is computed using high-fidelity large-eddy simulation (LES) in the top panel, using the parabolized stability equations (PSE) in the middle panel, and through a superposition of Jeun's input-output (I/O) modes in the bottom panel. While all three methods capture the peak jet noise at an angle of 30°, Jeun's modes also recover sideline noise as observed in the high-fidelity simulation.

National Laboratory. Figure 2 compares the acoustic signature of a supersonic jet computed from high-fidelity simulation (top panel) to that obtained from PSE-based method (middle panel) and finally to a superposition of just 24 coherent modes (bottom panel).

AEM Ph.D. student Nate Hildebrand is extending this analysis to the case of supersonic impinging jets, where the exhaust stream strikes a flat wall a short distance away from the nozzle. This happens, for example, when a short takeoff and vertical landing aircraft hovers a short distance above the ground. Sound created by the flow striking the wall provides a feedback mechanism by which acoustic tones exceeding 170 decibels are generated, loud enough to cause structural damage. Hildebrand is conducting high-fidelity simulations and linear analysis of supersonic impinging jets with aim of aeroacoustic design. Results of his work provide a systematic approach of determining the optimal way to modify the flow in order to eliminate dangerous tonal modes, without resorting to trial-and-error.

Noise can also be a novel way to find structure in otherwise chaotic flows because of its sensitivity to coherence. As such, the simulation and analysis techniques being developed in Nichols' research group are finding application to a broader range of problems. These include understanding instabilities in the wakes of wind turbines and explaining shock-induced transition in hypersonic boundary layers.

students 2015-2016 SCHOLARSHIPS &

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- Lucia Baker

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AEM Program Initiatives Fund
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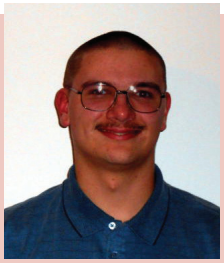
IN THEIR WORDS:



"I am a senior in Aerospace Engineering and Mechanics at the University of Minnesota, hoping to graduate in May of 2016. My goal is to graduate from college, debt free. This scholarship will help me to attain my goal. I chose the University of Minnesota for my post-secondary education since it is one of the leading institutions for Aeronautical Engineering. After graduation, I plan to begin working in the industry. My interests are varied and thus I am looking into a wide variety of potential careers. However, my main goal for a future occupation would be in the aerospace/defense industry, working for NASA or a military contractor designing aerospace systems."
-Sam Vanhavermaet

"I am honored to be receiving this scholarship. The AEM program has given me the core principles that will help me become a successful engineer. It has also allowed me to explore my interests and let me discover what I want to become. The Aerospace faculty and professors have been great and have always helped me. I am excited to spend the next year and half in the department to finish my undergraduate degree."
-George Thome

"I am a senior pursuing degrees in aerospace engineering and astrophysics. I am honored to have been chosen to receive the Richard G. Brasket Aerospace Engineering Scholarship this year and plan to use it for tuition during spring semester. I am grateful for the breadth of topics offered through the AEM department which have allowed me to explore and hone my interests. I hope to continue building on the skills I have gained through the AEM program as I pursue a graduate degree focusing on astronomical instrumentation."
-Ben Setterholm

"I have always had a fascination with the stars and space, and as a child I loved building rockets and watching Star Trek with my father. It seemed logical to pursue a degree in Aerospace Engineering and Mechanics. It was definitely the correct decision. The professors in the AEM department have supported me in achieving my goals, opening doors to research projects in my areas of interest. After graduation I hope to find a job with a small company involving spaceflight and exploration."
-Kate Schumitsch

& FELLOWSHIPS

students

"I am a senior in Aerospace Engineering, and my past four years in this program have been both challenging and rewarding. I am very thankful for the scholarships I've received, which have allowed me to concentrate on academics and undergraduate research. Next year I plan to start graduate school for a Master's and Ph.D., with the goal of doing research in fluid mechanics."
-Lucia Baker

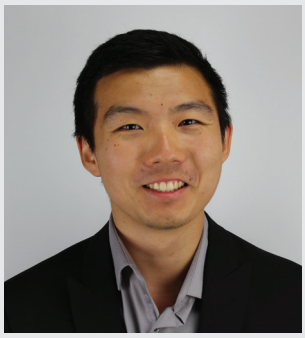
"My academic interests center around rockets and spacecraft. After graduation I hope to work in the growing commercial space industry making aerospace technology more capable, more efficient and safer. I like the AEM program at the University of Minnesota because I get to learn from faculty who are actively involved in research and the aerospace industry."
-Alex Hayes

"I am a junior in the wonderful Aerospace Engineering and Mechanics program here at the U of M. I am honored and thankful to have received the scholarships that I did, and appreciative that my hard work has been recognized. The scholarship money I have received will go towards my spring semester tuition. I am also grateful to be a part of such a great program as the AEM program here at the U of M. As a result of receiving these scholarships, I have been able to focus more on my academics and on a search for an internship this coming summer, so these scholarships have helped me greatly, and will continue to do so."
-Ben Hiltbrand

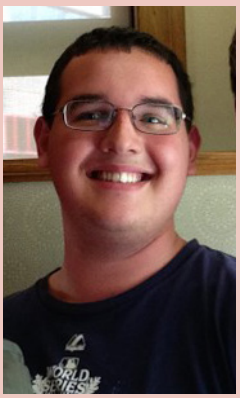
"I am in my junior year pursuing a Bachelor of Aerospace Engineering and Mechanics here at the U of M. I am grateful to receive this scholarship, which I plan on using to help pay for tuition and books. This will help me focus more on my academics. I enjoy my studies in the AEM department and find that the coursework not only covers a wide range of subjects, but is also comprehensive. I look forward to learning more from the brilliant faculty in the coming semesters."
-Andrew Akerson

"By striving for a degree in Aerospace Engineering and Mechanics, I am hoping to attain a career within an industry working on spacecraft and projects. The AEM major really ties into my interests, as I have always enjoyed and excelled in math, as well as enjoyed learning about space and aircraft. These scholarship funds will aid in paying for future academics, and make studying abroad more of a possibility."
-Robert Tanner

"Hi! My name is David Deng, and I'm a junior pursuing dual degrees in Aerospace Engineering and Marketing. I plan on using the proceeds from this scholarship to help fund an engineering project I started to build a liquid propellant rocket engine. I hope to go into industry after receiving my undergraduate degrees and work on increasing commercial access to space."
-David Deng



students 2015-2016 SCHOLARSHIPS &



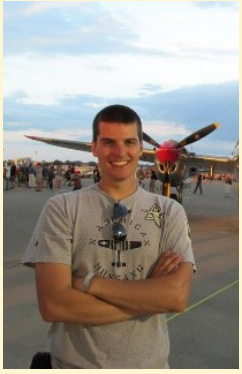
"My name is Tyler Kraut. I am a junior in the AEM program. I have always been fascinated by aircraft and spacecraft, which is why I chose to attend the University of Minnesota and study aerospace engineering. My favorite parts about the AEM program are interacting with students and faculty that share similar interests and learning more about topics that I care about."
-Tyler Kraut

"I am currently a red shirt junior pursuing a degree in Aerospace Engineering and Mechanics at the University of Minnesota. After I graduate, I plan to further my education in a graduate program. I enjoy the wide range of topics that have been covered in the AEM program here at Minnesota, and I look forward to taking my tech electives in the upcoming year; I hope to narrow my focus after I have taken these courses. The scholarship money I receive will allow me to focus more on my academic and athletic interests."
-Michael Kroells

"I'm a junior in the AEM program from Eagan, MN. My favorite classes thus far are aerodynamics and flight dynamics and control. After graduating, I plan to pursue a position in design engineering with a major aircraft manufacturer or supplier. I will be using this scholarship to support my goal of graduating with as little debt as possible."
-Daniel Hanson

"The AEM department has given me the chance to work on many exciting extracurricular design projects. As a junior, I have had the opportunity to lead the Rocket Team's IREC competition team as we compete against universities from all over the world. Because of my experience through the department I have been able to secure internships in both aircraft systems and space systems, and I am excited to decide which path to pursue as I move forward with my career."
-Jacqueline Sotraidis

"My name is Brady Wojt, I am a senior studying Aerospace Engineering and Mechanics. Ever since I can remember, I have been fascinated with flight. In order to graduate from the AEM program in the Spring of 2016, I took an engineering summer class abroad in Norway. My abroad experience was an incredible opportunity, and the scholarship I received will be used to help pay for some of the expenses associated with the trip."
-Brady Wojt



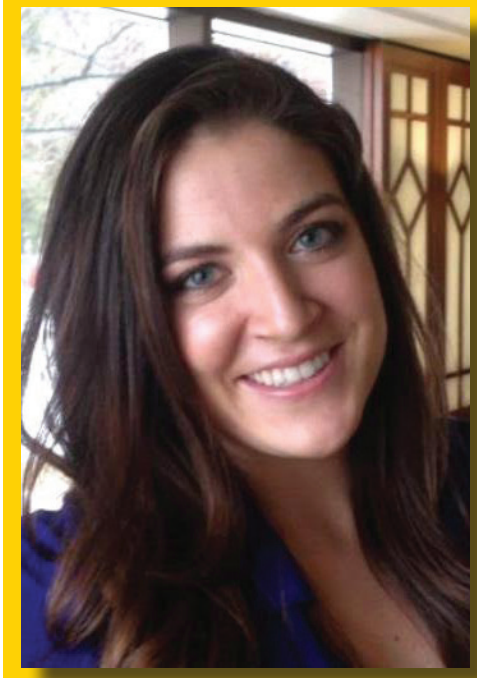
"I am a senior in Aerospace Engineering and Mechanics and will be graduating this May. Aside from classes I am involved in the U of M CanSat team, an aerospace related design competition. Instead of specializing within my degree, I decided to pursue math and astrophysics minors. Many of the professors within the AEM program are very good and have helped make a potentially dry subject quite interesting. The entirety of the scholarship is being put towards paying for my tuition."
-Kenneth States

& FELLOWSHIPS

Alumni support for graduate fellowships provides the department with the flexibility to directly support graduate students, augment fellowship awards to incoming students, and provide travel funds for students. Annual giving plays a crucial role in allowing us to successfully compete with peer institutions to attract the most promising students to AEM and to provide a high quality experience for all of our graduate students. For a list of additional giving opportunities to benefit graduate education, please visit AEM's scholarship/fellowship page at: www.z.umn.edu/u2t.

Two incoming AEM graduate students received the Kenneth G. and Rosemary R. Anderson Graduate Fellowship for this year.

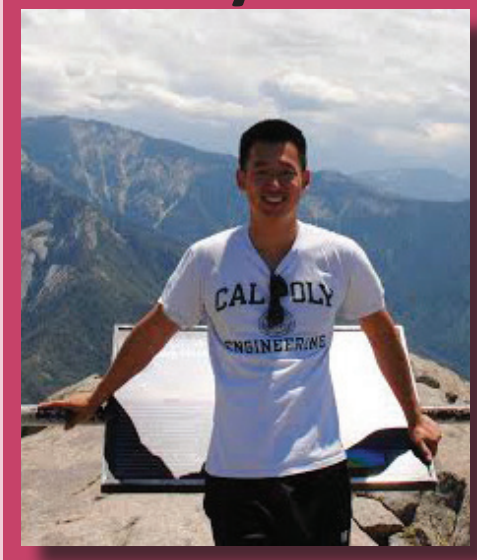
Sally Keyes



Sally Keyes, after completing her bachelor's degree in mechanical engineering at Purdue University, came to the University of Minnesota in the fall of 2015 to pursue a graduate degree in aerospace engineering and mechanics. She will be focusing on systems and controls, and she chose UMN because of all the opportunities that the program offered her.

"There is so much to learn from the great systems community at the university, and I am very excited to be a part of Professor Seiler's research group. I will be able to do exciting controls research that will be validated through flight tests with the UAV laboratory, which is an amazing opportunity. The Kenneth G. and Rosemary R. Anderson fellowship allows me extra freedom to focus on my research early in my graduate career, for which I am extremely grateful. I am humbled and grateful to have received this fellowship. It will be very helpful with the academic costs of graduate school, aiding me in creating a strong start to my graduate career. Furthermore, I am thrilled to be a part of the Aerospace Engineering and Mechanics community. From my short time here, it is clear that the program offers many opportunities and the professors are truly invested in the success of their students. I know that my time here will shape me into a better student, researcher, and engineer."

Kerry Sun



Kerry (Ke) Sun arrived in the fall of 2015 and is currently a first year graduate student studying aerospace dynamics and control. Before coming to UMN, he studied aerospace engineering (B.S.) and economics (M.S.) at California Polytechnic State University San Luis Obispo (Cal Poly).

"I have a strong passion for aerospace ever since I was little, and I still get excited whenever I see something flying in the sky. The aerospace engineering program so far has been great and I already have learned so much over the past a few months. Professors and students are friendly and helpful as well. I'm very thankful and honored for the fellowship award. This fellowship has benefited me in so many ways. When I was an undergraduate, I often had 2 or 3 part-time jobs every quarter so I could pay for my food, rent, and some tuition. Now I can spend more time on my classes, projects and research. It also alleviates some of my financial burdens such as student loans. I no longer have to stress out about my financial situation constantly. I want to obtain a Ph.D. in aerospace engineering here, and I believe the AEM Ph.D. program will prepare me to do anything in the future!"

AIAA names AEM alum as 2016 Fellow

Dr. Ajit K. Roy, of the Air Force Research Laboratory's (AFRL) Materials and Manufacturing Directorate, was recently named a Fellow of the American Institute of Aeronautics and Astronautics (AIAA). He received his Ph.D. from the University of Minnesota AEM Department as a student of Professor Emeritus Robert Plunkett. Dr. Ajit K. Roy is internationally recognized in the aerospace science community for his outstanding scientific contributions and technology leadership in complex (structural, thermal and electronic) materials, and through advancing aerospace science and technology transition.

"In view of the distinguished list of AIAA Fellows, I'm truly humbled by the recognition," he said. "I have had the privilege of working with a large number of very bright people over the years—my research team members, AFRL colleagues and collaborators. I'm immensely grateful to them for this accomplishment. Furthermore, the unconditional support from AFRL leadership and stimulating work culture at AFRL makes AFRL a rewarding place to grow professionally and certainly made this recognition possible."

Roy is a Principal Materials Research Engineer and Computational Group Leader at the Nanoelectronic Materials Branch, the Materials and Manufacturing Directorate of the AFRL. His research interests include functional materials, multiscale modeling, electronic and thermal materials design, 3D nanostructure, 3D composites, carbon foam, and carbon-carbon composites. Prior to AFRL, he was affiliated with the University of Dayton Research Institute for 10 years. His current work includes electronic materials behavior, energy transport in nanomaterials, behavior and failure mechanism in nano materials and hybrid graphitic (carbon) foam, and nanomechanics. He has published more than 200 articles in journals and proceedings, has given numerous invited lectures, and has co-authored three book chapters on thermal materials and composites. He serves on numerous panels, advisory boards, and editorial boards in journals. He holds adjunct faculty positions with Purdue, Rice, Case Western Reserve, and Wright State.

AEM alum receives Presidential Early Career Award for Scientists and Engineers

Adam Creuziger, a 2002 graduate of the Aerospace Engineering and Mechanics department, was named by President Obama as one of the 2016 recipients of the Presidential Early Career Award for Scientists and Engineers. The elite award is presented by the United States Government to professionals of science and engineering who are in the beginning stages of their independent research careers. The recipients of the award are chosen for their pioneering research in the frontiers of science and technology, as well as their dedication to serving the community through scientific leadership, public education, or community outreach. The awardees are recognized for their early contributions to the award agencies' missions—agencies that include the Department of Agriculture, the Department of Commerce, and the Department of Defense, and for accelerating American innovation. Creuziger is one of the 105 award recipients that will be honored at a ceremony in Washington, DC this spring.

As an undergraduate at the University of Minnesota - Twin Cities, Creuziger worked on NSF sponsored research on ductile crack growth in single crystals with Professor Thomas Shield. Following his graduation in the spring of 2002, Creuziger proceeded to earn a M.S. in Engineering Mechanics from the University of Wisconsin - Madison in December of 2005, and a Ph.D. in Engineering Mechanics from the University of Wisconsin - Madison in January of 2008. Creuziger has worked as a National Research Council post-doctoral associate at the National Institute of Standards and Technology (NIST) since 2008. The NIST is an agency of the U.S. Department of Commerce. Dr. Creuziger's research interests include experimental investigation into the deformation and fracture processes of ductile metals. His current research is focused on phase transforming steel (TRIP steel) and single crystal copper.

There are hundreds of UMN AEM alumni all around the country, so keeping in touch with each other can be quite a task! Share your life updates with us at aem-dept@umn.edu. We love to hear alumni stories and share them with our alumni networks. Connect with us to notify the department of your latest accomplishments and we will print them in upcoming newsletters.

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AEM alumna featured in AIAA Momentum Member Spotlight

Aerospace engineering and mechanics alumna Kristen Gerzina was recently featured in the American Institute of Aeronautics and Astronautics (AIAA) Momentum Member Spotlight for January 2016. Gerzina started at Orbital ATK as a Mechanical/Aero Design Engineer in 2005. She is currently involved in aerodynamics modeling and simulation of munitions. She also chairs the AIAA Twin Cities section and is involved in STEM education initiatives.

The Momentum Member Spotlight includes Gerzina's inspiration for entering the aerospace profession and favorite memories of the profession. She also discusses her advice for high school and college students thinking about entering the aerospace field and the value of AIAA to an aerospace engineer. The full Spotlight article, written by Duane Hyland of AIAA Communications, can be found here: http://www.aiaa.org/MemberSpotlightJanuary2016/