



A. JAMES CLARK SCHOOL OF ENGINEERING

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AEROCONTACT

Spring/Summer 2011
AEROSPACE ENGINEERING
A. JAMES CLARK SCHOOL of ENGINEERING

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A NEWSLETTER FOR ALUMNI AND
FRIENDS OF THE DEPARTMENT
OF AEROSPACE ENGINEERING AT
THE A. JAMES CLARK SCHOOL OF
ENGINEERING, UNIVERSITY OF
MARYLAND, COLLEGE PARK.

Gamera Flies!



The National Aeronautic Association has certified that on May 12, 2011, the human-powered helicopter Gamera, designed and built by graduate and undergraduate students of the University of Maryland's A. James Clark School of Engineering and piloted by biology student Judy Wexler, achieved lift-off and hovered for 4.2 seconds, thereby establishing the U.S. national records for the duration of a human-powered helicopter flight and the duration of a human-powered helicopter flight by a female pilot.

The May 12th flight was the team's first step toward winning the Sikorsky Prize. To win the Sikorsky Prize, valued at \$250,000, an individual or team must:

- Build a helicopter powered only by human means

- Lift off and achieve a hover time of 60 seconds
- Achieve a height of 3 meters sometime during the 60 second flight
- Stay within a 10 square meter area during the 60 second flight

The prize was established by the American Helicopter Society in 1980 in honor of helicopter pioneer Igor Sikorsky. Since that time, no vehicle has fulfilled all the requirements--yet.

On July 13, the students on the Gamera team completed their scheduled summer flight session with a new unofficial flight duration of 12.4 seconds. If verified by the National Aeronautic Association, this new time will shatter the team's previous 4.2-second U.S. national record set in May.

greatEXPECTATIONS

Contribute to the department through the University of Maryland's *Great Expectations* campaign and support our mission to transform lives through exceptional educational and research opportunities. Your contributions can support aerospace engineering initiatives such as graduate fellowships, undergraduate scholarships, and named professorships. Please visit <http://advancement.umd.edu/giving/> to learn more.

Gifts may be made by check to "University of Maryland College Park Foundation (UMCPF)." Please designate "The Department of Aerospace Engineering" in the memo line, and mail to:

Dr. Mark J. Lewis, Chair
Department of Aerospace Engineering
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College Park, MD 20742

You can help make a difference with a gift of any amount!

AEROCONTACT is published for alumni and friends of Department of Aerospace Engineering at the A. James Clark School of Engineering, University of Maryland.

Your alumni news and comments are welcome. Please send them to: Becky Sarni, Department of Aerospace Engineering, 3181 Martin Hall, College Park, MD, 20742. Visit our web site at: <http://www.aero.umd.edu>

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DR. MARK J. LEWIS

CHAIRMAN'S CORNER

Dr. Mark J. Lewis | Willis Young Professor and Chair

Another academic year has come and gone, summer is here, and with this comes an opportunity to pause and reflect on the past year's accomplishments in our department. These are interesting times in the aerospace field – “interesting” in the sense of the apocryphal Chinese curse. Our

profession overall is clearly at a crossroads – driven in part by economic and social forces beyond our direct control. As the Pentagon embarks on cost-cutting “efficiency” measures, and the direction of NASA's programs seem caught in a political tug-of-war, the future of our field is at best uncertain. And yet in many ways this continues to be an incredibly exciting time to be an aerospace engineer, and an especially exciting time to be an aerospace engineer at the University of Maryland.

By any measure, our department continues to thrive and grow. This year we added an incredibly talented new faculty member, Dr. Anya Jones, who joined us from Cambridge University, and saw the promotion of one of our fast-rising stars, Dr. Sean Humbert. Our students continue to do great things – winning competitions, presenting top quality research papers, and setting the standard for academic performance not only in our college, but also across the entire campus. A team of our students set two world records by building and flying a human-powered helicopter; another team of our students went to Houston, Texas, to demonstrate their design for a folding space habitat module; still others won an award in a NASA robotics competition. Our students also continue to lead in the local AIAA paper competitions, and one of our students, Teju Jarugumilli, even represented our AIAA Region at this year's International Student Paper competition in Orlando, Florida after winning last year's regional competition. Teju won another award in this year's

regional paper competition, as did undergraduate Alex Leishman and graduate student Robbie Vocke. And out of the 16 Vertical Flight Foundation Scholarships awarded this year to rotorcraft students across the country, an amazing ten went to Maryland students. And these are just the highlights; a complete list of our student and faculty accomplishments would fill up my column space.

As an academic institution, we can take particular pride in the contributions of our alumni, a point that was brought home to me as this year's Collier's Award was chosen. As you may know, the Collier is presented each year by the National Aeronautic Association for “the greatest achievement in aeronautics or astronautics in America. It is, if you will, the Oscar for Aerospace accomplishment. The two lead contenders this year were both products of University of Maryland graduates: the winning Sikorsky X2 hybrid rotorcraft depended in large measure on the innovative design of its stiff rotor blades, an effort led by Maryland Ph.D. Ashish Bagai. And its competition, the hypersonic X-51, also depended in large part to the aerodynamic designs of Maryland undergraduate and Ph.D. graduate Kevin Bowcutt and the project management of his Maryland classmate, Charles Brink. We have other indications as well: the SpaceX Corp. made headlines with its launch of the Dragon capsule, the first privately built man-rated spacecraft, designed in large part by our graduate Justin Richeson. And one of our most famous graduates, former NASA Administrator Dr. Michael Griffin, was chosen as President-elect of AIAA. It is no wonder our students are so highly sought in industry – in fact, Maryland is the largest single supplier of new hires to NASA of any university in the country.

But of course, as aerospace engineers we always look to the future, and are never satisfied to rest on our laurels. What a bright future we have ahead! Our incoming class of aerospace engineering freshmen is the largest we

have seen in many years – 106 total – and their academic qualifications place them among the very top students joining our campus. In fact, Aerospace Engineering is such a popular major that one of our biggest worries is overcrowding – what a great problem to have.

On a personal note, this May marked the end of my one-year term as President of AIAA, and now I slip into the role of Immediate Past President. One of the great joys of being AIAA President was the opportunity to meet and greet aerospace engineers around the world. Everywhere I traveled I received positive comments about the growing reputation, the quality of research, and the accomplishments of our graduates. Thanks to all of you for making this possible.

Camera has a rotor at each of the four ends of its X-shaped frame, with the pilot's module suspended at the middle. Each crossbar of the frame is 60 feet long, and each rotor is 42 feet in diameter. Yet, through the use of balsa, foam, mylar, carbon fiber and other lightweight materials, the entire vehicle weighs

only 210 pounds, including the student pilot. All power comes from a combination of hand and foot pedaling, transmitted through chains, gears, and lightweight string to the rotors.

For more information, please visit www.agrc.umd.edu.

THE AEROSPACE DEPARTMENT WELCOMES DR. ANYA JONES



PROFESSOR ANYA R. JONES

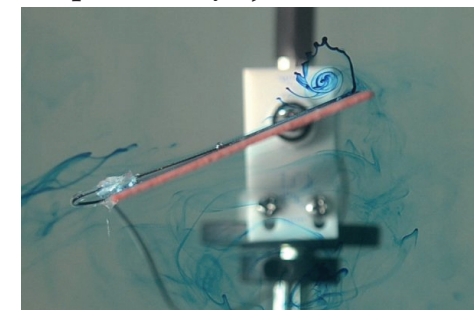
Dr. Anya Jones was welcomed to the aerospace department in November as an Assistant Professor. Dr. Jones was

previously at the University of Cambridge, United Kingdom, where she completed her Ph.D. in experimental aerodynamics. She received her B.S. degree in aeronautical and mechanical engineering from Rensselaer Polytechnic Institute in 2004 and her S.M. in aeronautics and astronautics from MIT in 2006. Her research focuses on experimental fluid dynamics including unsteady low Reynolds number aerodynamics, vortex dynamics, and flow control with applications to MAVs, flapping wings, and wind/water turbines.

In the Fall Dr. Jones will be teaching ENAE788J: Low Reynolds Number Aerodynamics in which students will survey and review incompressible flow concepts including potential flow, lift and drag, and the Navier-Stokes equations with a focus on low Reynolds number applications. Her past work includes experience with Flowind/Renewables East in Norwich, UK designing, building, and performing wind tunnel experiments to investigate the effects of different surface roughnesses on vertical axis wind turbine blade performance and a collaboration with Dr. Hubbard and the Morpheus laboratory.

You can view her complete profile online at

<http://www.aero.umd.edu/facstaff/fac-profiles/anya-jones.html>





UMD SSL VOTED ONE OF NATION'S "MOST AWESOME COLLEGE LABS" BY POPULAR SCIENCE

Aerospace's Space Systems Laboratory was recently featured in the Washington Post due in part to Popular Science magazine naming it one of the "most awesome college labs." The article highlighted the Neutral Buoyancy tank's status as the only facility of its kind operating outside of NASA and, as quoted by the lab's director Dr. Akin, "the best long-term simulation of weightlessness you can get on the surface of the Earth." The article also highlighted the amount of hands on experience that graduate students working at the Space Systems Lab get as part of their work. Employers are continually impressed by the amount and range of hands-on experience our students gain as part of their experience there. No wonder it's one of the nation's most awesome labs!

For the full article, visit:
<http://www.washingtonpost.com/wp-dyn/content/article/2010/10/29/AR2010102904786.html>

ENGINEERING GRADS ON TOP (AGAIN)

ACCORDING TO THE MOST RECENT NATIONAL ASSOCIATION OF COLLEGES AND EMPLOYERS (NACE), ENGINEERING GRADUATES STILL EARN THE HIGHEST PAYCHECKS STRAIGHT OUT OF SCHOOL. ENGINEERING MAJORS ALSO CAME OUT ON TOP LAST YEAR.

IN THIS YEAR'S SURVEY, CHEMICAL ENGINEERS, MECHANICAL ENGINEERS, ELECTRICAL/COMMUNICATIONS ENGINEERS AND COMPUTER ENGINEERS WERE FOUR OUT OF THE TOP 5 IN SALARIES. COMPUTER SCIENCE WAS THE OTHER HIGH-EARNING MAJOR.

INDUSTRIAL ENGINEERING, SYSTEMS ENGINEERING AND ENGINEERING TECHNOLOGY ALSO MADE THE TOP TEN.

CLARK SCHOOL LAB DONATES ORNITHOPTER TO SMITHSONIAN



(l-r): Cornelia Altenbuchner, Aimy Wissa, Alex Brown, Eric Avadikian, Jared Grauer.

The Clark School's Morpheus Lab, based at the National Institute of Aerospace, has donated an ornithopter (flapping-wing vehicle) sculpture developed by

Clark School students and researchers to the Smithsonian American History Museum Spark! Lab in Washington, D.C.

"The Morpheus Lab Team welcomes the opportunity to help create the dreams of tomorrow's aerospace engineers," said Morpheus Director James Hubbard.

Earlier this month, students from the Morpheus Lab took part in a robotic exhibition at Spark! Lab to illustrate current and future technologies. The students demonstrated their ornithopter systems, engaging with museum patrons of all ages. Representing the Morpheus Lab were graduate researchers Cornelia Altenbuchner, the late Alex Brown, Jared Grauer, and Aimy Wissa, as well as undergraduate researcher Eric Avadikian.

PROFESSOR WERELEY RECEIVES AIAA SUSTAINED SERVICE AWARD



Dr. Wereley explains testing methods for vibration and shock mitigating seats applied to fast boats currently under development with Techno-Sciences Inc. (Beltsville, MD) for the US Navy.

Norman M. Wereley, the Techno-Sciences Professor of Aerospace Engineering and Associate Chair of the Dept. of Aerospace Engineering, was

honored on November 4, 2010, with the American Institute of Aeronautics and Astronautics (AIAA) Sustained Service Award. The Sustained Service Award is presented to members of AIAA who show continuing dedication and who contribute sustained, significant service to the institute.

Dr. Wereley was honored for his "sustained service to, and leadership in, the AIAA Adaptive Structures Technical Committee, as a member, as Technical Chair and General Chair of its Adaptive Structures Conference, and for technical publications." Dr. Wereley received his B.Eng.'82 from McGill University, and M.S.'87 and Ph.D.'90 in Aeronautics and Astronautics from MIT. Dr. Wereley serves as the Director of the Smart Structures Laboratory and the Composites Research Laboratory.

He also serves as the Director of the Aerospace Honors Program. Dr. Wereley has published over 130 journal articles, 8 book chapter contributions, and over 200 conference articles. He is a co-inventor on 5 patents and over a dozen patents pending. Dr. Wereley serves as Editor (2007-present) of Journal of Intelligent Material Systems and Structures. He serves as associate editor for Smart Materials and Structures and AIAA Journal. Recently, he served as Student Symposium Chair for the AIAA Structures, Structural Dynamics and Materials Conference (2009). He is serving as Co-Chair (2010/11) and Chair (2012/13) of the SPIE Smart Structures/NDE Symposium, as well as Technical (2010) and General Chair (2011) of the AIAA Adaptive Structures Conference. Dr. Wereley is a Fellow (2008) of the American Society of Mechanical Engineers (ASME), Fellow (2001) of the Institute of Physics Associate Fellow of AIAA, and a lifetime member of the American Helicopter Society. Dr. Wereley was awarded the ASME Adaptive Structures and Adaptive Materials Best Paper Award (2004), named the AIAA National Capital Section Engineer of the Year (2009), and honored with the A. James Clark School of Engineering Faculty Service Award (2010).

Dr. Wereley was presented with the award, consisting of a certificate and a pin, at the Annual AIAA National Capital Section Honors and Awards Banquet in June 2011.

On Facebook, Dave Canter writes welcoming Dr. Jones:

"Experimental aerodynamics rocks!"

Visit us on Facebook to see and add more of your comments.

TWO AEROSPACE FACULTY BECOME AIAA ASSOCIATE FELLOWS

Dr. Pino Martin, Associate Professor of Aerospace Engineering, and Dr. Derek Paley, Assistant Professor of Aerospace Engineering, have been elected to the grade of Associate Fellow in the American Institute of Aeronautics and Astronautics. This grade is awarded to AIAA members who have demonstrated a successful practice in the arts, sciences, or technology of aeronautics.

Profs. Martin and Paley were honored at the AIAA Foundation Associate Fellows Dinner in conjunction with the 49th AIAA Aerospace Sciences Meeting and Exhibit, where they were presented with their Associate Fellow pins and certificates. The dinner was held on Tuesday, January 4, 2011 in Orlando, Florida.

DR. FLATAU AMONG WOMEN IN AEROSPACE 2010 AWARD RECIPIENTS



Awards. For 2010, WIA honored eight outstanding women for their contributions to the aerospace industry and to the advancement of women in the field.

Professor Alison Flatau was named the recipient of the Aerospace Educator Award, "for her exceptional leadership and dedication to aerospace education and for her unwavering commitment to the advancement of women in the Aerospace Engineering field."

Dr. Flatau and seven other award recipients were honored at a reception and dinner held on Tuesday, October 26, 2010 in Arlington, Virginia.

MARYLAND TEAMS WITH TECHNO-SCIENCES, WINS CONTRACT

The Techno-Sciences team and The University of Maryland (UMD) at College Park were awarded two commercial development contracts from the Bell/Boeing and Boeing Phantom Works teams to support DARPA's Mission Adaptive Rotor (MAR) Program. U.S. rotorcraft technology has received funding from a Pentagon research program that aims to fly a shape-changing rotor offering substantially more payload and range with significantly less noise and vibration. The goal of MAR is a rotor that can change its configuration before a mission and in flight, between mission segments and with every revolution. The blades on an adaptive rotor could change their length, sweep, chord, camber, tip shape, twist, stiffness, rotational speed or other attributes.

MAR objectives are aggressive: increase payload by 30% and

range by 40%, and reduce rotor acoustic-detection range by 50% and vibration by 90%, compared with a clean-sheet "non-adaptive," or conventional, rotor. Principal Investigator, Dr. Curt Kothera of Techno-Sciences, in collaboration with Prof. Wereley, the Techno-Sciences Professor of Aerospace Engineering, and his research group, will lead analyses and component-level evaluations of pneumatic morphing technologies for the Bell/Boeing next-generation tiltrotor aircraft and Boeing Phantom Work's advanced, single-rotor attack helicopter. Vehicle integration and flight testing will follow over the next four years.

PINES ELECTED TO ENGINEERING DEANS COUNCIL BOARD

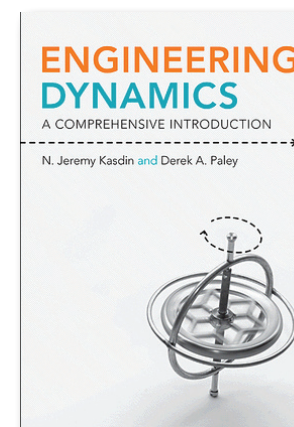
Aerospace Faculty Member and Clark School Dean Darryll Pines has been elected to serve on the Engineering Deans Council (EDC) Executive Board.

The EDC is one of the leadership organizations of the American Society for Engineering Education (ASEE), a non-profit organization which brings together engineering educators from all of the engineering and engineering technology fields to collaborate on solutions to promote excellence in instruction, research, public service, and practice.

The EDC sponsors an annual colloquium to review public policy issues that affect engineering education and encourages engineering deans to communicate with their congressional delegations regarding these issues. The public policy issues range from economic development and the engineering workforce, to support of federal agencies such as the National Science Foundation, National Institutes of Health and the Department of Defense. The council also supports a yearly dean's institute that focuses on issues such as curriculum development, enrollment and retention, diversity, faculty collaboration with industry and the globalization of engineering education.

PROFESSOR DEREK PALEY PUBLISHES NEW BOOK!

Dr. Derek A. Paley, Assistant Professor in the Department of Aerospace Engineering, has co-authored an undergraduate textbook with Princeton University Professor Jeremy Kasdin. The textbook, entitled *Engineering Dynamics: A Comprehensive Introduction*, is been published by Princeton University Press. It introduces engineering students to dynamics using an innovative approach that guides them from the basics to increasingly more challenging topics without sacrificing rigor. The textbook features numerous real-world examples and problems and ample use of MATLAB for solving problems.



Dr. Paley is the director of the Collective Dynamics and Control Laboratory and has more than 45 peer-reviewed publications in the areas of motion coordination

of autonomous vehicles, spatial models of biological collectives, and adaptive sampling of spatiotemporal processes. Paley is Associate Fellow of the AIAA and received the NSF CAREER award in 2010. He currently teaches introductory dynamics (ENAE 301), advanced dynamics (ENAE 788G), and nonlinear control (ENAE 743).

DR. SEAN HUMBERT PROMOTED TO ASSOCIATE PROFESSOR



On March 17th, Assistant Professor Sean Humbert was officially promoted to

Associate Professor with Tenure. Dr. Humbert joined the department in 2005 as an Assistant Professor and is the director of the Autonomous Vehicle Laboratory, which specializes in the development of biologically inspired autonomous robotics.

programNEWS

ADVANCE PROGRAM STRIVES TO INCREASE NUMBER OF FEMALE FACULTY IN STEM FIELDS

Despite the fact that women now earn 40 percent of all science and engineering doctoral degrees, female scientists and engineers make up only about 17 percent of all full professors at research universities nationwide (see <http://www.nsf.gov/statistics/wmpd/figh-3.htm>) and remain underrepresented at all levels of academia. A new University of Maryland program funded by the National Science Foundation hopes to change that. The five-year, \$3.2 million ADVANCE Program for Inclusive Excellence seeks to increase the representation of women faculty members in science, technology, engineering, and mathematics (STEM) fields at the university. Building on the university's achievements in inclusiveness and equity, the ADVANCE program will implement interconnected strategies designed to transform academic environments and promote the professional growth of women faculty in STEM.

"We are poised on the edge of a great transformative period in the history of the University of Maryland. The ADVANCE grant is designed to act as a catalyst for this transformation," says Nariman Farvardin, Senior Vice President for Academic Affairs and Provost, who is also the principal investigator on the grant. "We are committed to fostering the long-term professional growth of our women faculty members by investing in a culture of inclusiveness campus-wide."

The project will serve as a model for other institutions that endeavor to address similar challenges. A project website will share resources and disseminate research findings and project accomplishments. This information will also be published in peer-reviewed journals and shared through outreach efforts.

"This will truly be an institutional transformation," says Avis Cohen, project director. "We're thrilled that we'll be able to have an impact on all parts of the university with the support that we have received, and that we'll be changing the culture to make this a great institution for the excellent young women and men of today and the future."

UMCP TECHNO-SCIENCES RESEARCHERS AWARDED US PATENT

The University of Maryland (UMD) and Techno-Sciences Inc. (TSi) were awarded a utility patent on October 28, 2010 by the United States Patent and Trademark Office, entitled "Adaptive Energy Absorption System for a Vehicle Seat," as U.S. Patent Number 7,822,522 with inventors Prof. Norman M. Wereley, Dr. Gregory J. Hiemenz (Ph.D.'07), Dr. Young-Tai Choi, Dr. Gang Wang (Ph.D.'01) and Dr. Peter Chen (Ph.D.'96). Of the five inventors, three are Ph.D. graduates of the Dept. of Aerospace Engineering, and two are Aerospace Engineering faculty. The abstract for the patent is as follows.

"An adaptive energy absorption system for a vehicle seat is disclosed, utilizing an adaptive energy absorber or variable profile energy absorber for mitigating occupant injury due to extreme vehicle movement (e.g., during a vehicle shock event), and/or for mitigating vibration experienced by an occupant of the vehicle seat during normal operating conditions. The adaptive energy absorption system achieves the aforementioned objectives for a wide range of occupant weights and load levels. Various configurations of dual-goal energy absorption apparatuses that enable both shock mitigation and vibration are disclosed."

This patent serves as the cornerstone of a joint portfolio of intellectual property for myriad shock, vibration and motion control products developed by Techno-Sciences Inc. and the University of Maryland's Smart Structures Laboratory.

UMD AND TECHNO-SCIENCES INC. AWARDED US PATENT

The University of Maryland (UMD) and Techno-Sciences Inc. (TSi) were awarded a utility patent on November 23, 2010 by the United States Patent and Trademark Office, entitled "Fluid-Driven Artificial Muscles as Mechanisms for Controlled Actuation," as U.S. Patent Number 7,837,144 with inventors Dr. Curt Kothera, Benjamin K.S. Woods (G), Dr. Jayant Sirohi (Ph.D.'03), Prof. Norman M. Wereley, and Dr. Peter Chen (Ph.D.'96). Drs. Sirohi and Chen are Ph.D. graduates of the Dept. of Aerospace Engineering, while Mr. Woods is currently a Ph.D. candidate. The abstract for the patent, comprising 16 claims is as follows.

"A fluid contact surface actuation system for a vehicle, including a first fluid contact surface constructed and arranged to act against a first fluid passing over the first fluid contact surface; and a first fluid actuator coupled to the first fluid contact surface to move the first fluid contact surface between a first position and a second position to enable control of the vehicle in a predetermined manner, the first fluid actuator having a first resilient bladder that receives a second fluid such that pressure of the second fluid moves the first bladder between a contracted configuration and an expanded configuration."

This patent was reduced to practice by developing and fabricating trailing edge flap actuation systems based on pneumatic artificial muscles for a UH-60 helicopter blade section (figure 1), and a Bell 407 blade section (figure 2) in the Smart Structures Laboratory, and then tested in the Glenn L. Martin Wind Tunnel, both at the University of Maryland. These

systems were developed by a team of Dr. Wereley's graduate students, in collaboration with engineers at Techno-Sciences Inc. (Beltsville MD).

Dr. Peter Chen (Ph.D.'96), Vice President of Advanced Technology Development at Techno-Sciences Inc., stated that "this patent represents another positive outcome of a series of key collaborations, between Techno-Sciences Inc. and the University of Maryland's Smart Structures Laboratory, that seek to develop and commercialize revolutionary technologies for next generation rotorcraft systems."

This patent is another in a joint portfolio of intellectual property for myriad of shock, vibration and motion control products developed by Techno-Sciences Inc.'s Aerospace Division and the University of Maryland's Smart Structures Laboratory.



Figure 1: UH-60 scale blade section with trailing-edge flap



Figure 2: Bell 407 retro-fit blade with trailing-edge flap

ACTIVE CRASH PROTECTION SYSTEM TEAM WINS 2011 AHS JENSEN AWARD

The Alfred Gessow Rotorcraft Center's Smart Structures Laboratory and the rest of its partners in the Active Crash Protection System Development Team were awarded the 2011 Harry T. Jensen Award by the American Helicopter Society for an outstanding contribution to the improvement of vertical flight aircraft reliability, maintainability, and/or safety through improved design brought to fruition during the preceding year.

During 2010, the Boeing-led team was successful in bringing a new set of technologies to Military Rotorcraft through a series of experiments and demonstrations. These new technologies greatly increase the effectiveness of rotorcraft crash protection systems and significantly improve rotorcraft crash survivability. Congratulations to everyone at the Smart Structures Lab for their contribution to rotorcraft safety!



ALUMNUS IS A KEY DESIGNER FOR SIKORSKY X2TD



The Sikorsky X2TD flew for the first time on August 27, 2008 (pictured) and set the unofficial speed record on Sept. 15, 2010. (Photo by A. Bagai)

Building a helicopter that can fly 100 mph faster than current production models, with increased maneuverability, endurance and high-altitude performance, has earned a team of Sikorsky Aircraft Corp. engineers, including Clark School alumnus Ashish Bagai, the prestigious Robert J. Collier Trophy—one of aviation's highest honors. The Sikorsky X2 Technology Demonstrator™ (X2TD) will, according to the company, change the way helicopters operate, delivering higher speeds and radically improved performance in medical, search and rescue and military applications, while maintaining the efficient hovering and low-speed attributes of conventional rotor-wing aircraft. Bagai was responsible for the aerodynamic design of the craft's main rotor blades, a key element in its success.

An aerodynamicist who is principal engineer for advanced design at Sikorsky, Bagai obtained his bachelor's, master's and doctoral degrees ('90, '92, '95) at the Clark School's Department of Aerospace Engineering (AE) and worked in

the department's Alfred Gessow Rotorcraft Center. He cites as a primary mentor his advisor, internationally recognized rotorcraft aerodynamics expert and Minta Martin Professor of Engineering J. Gordon Leishman, plus Professors Alfred Gessow, James Baeder, Roberto Celi and Inderjit Chopra.

"I had the privilege of attending one of the finest schools for rotary-wing education and research," Bagai states. "It brought very significant advantages: use of some of the best research facilities, unlimited access to information, and exposure to and interaction with world-class experts. Faculty members were constantly pushing new areas of research and then rolling their findings into the curriculum. Ultimately, it was the capability of calculated independent thinking fostered by the Clark School that helped lead to the X2TD rotor design."

Meeting the Design Challenge
In September 2010, the X2TD flew at a speed of 290 mph (250 knots) in level flight, an unofficial helicopter speed record. Achieving high speed, while maintaining or improving capabilities such as high-altitude flight and maneuverability in confined spaces, was the key objective for the co-axial, pusher-propeller-assisted X2TD.

Because the X2 does not require the retreating blades to produce lift at high speeds, he continues, "the design problem differs from what is required for a single rotor helicopter or for conventional, articulated coaxial or intermeshing rotors. One must design a fundamentally new rotor blade that will achieve speed but also

provide performance capabilities." Characteristics of Bagai's novel design include non-uniform planform, positive and negative twist gradients and a complex distribution of modern airfoils and thicknesses. Bagai's design benefitted from the knowledge gained from many years of related work, as well as many contributions by Sikorsky colleagues. "I drew on the guidance of exceptional people here



I am very fortunate to be part of this team."

Bagai notes that he is not the only Terp within Sikorsky. "We have a small Clark School 'mafia' here," he says. "Michael Torok, Clifford Smith, Andreas Bernhard, Daniel Griffiths, Nickolas Tuozzo, Vineet Sahasrabudhe, David Matuska, Christopher Jones and James Wang are among many AE alums who have worked here, past and present."

For more information, see: Ashish Bagai, Sikorsky Aircraft Corporation, Stratford, Conn., "Aerodynamic Design of the X2 Technology Demonstrator™ Main Rotor Blade," Proceedings of the 64th Annual Forum of the American Helicopter Society, 2008.

at Sikorsky, gentlemen who provided years of experience and in-depth understanding and were only too happy to encourage and support the effort.

PROF. SANNER AND FORMER ADVISEE WIN ASCE BEST PAPER AWARD

Associate Professor Robert Sanner and his former student advisee C. Glen Henshaw (M.S. '99, Ph.D. '03) received a best paper award from the American Society of Civil Engineers (ASCE) for "Variational Technique for Spacecraft Trajectory Planning" which was published in the ASCE Journal of Aerospace Engineering in July of 2010.

The work is derived from Henshaw's Ph.D. thesis. He now works as a senior engineer in the Center for Space Technology at the Naval Research Laboratory in Washington DC, where he leads the NRL's FREND (Front-end Robotics Enabling Near-term Demonstration) project, developing state of the art autonomous rendezvous and docking systems for satellites not pre-designed for servicing.

The award was presented at the ASCE Earth and Space Conference in March.

PINES, PUREKAR WIN BEST PAPER AWARD

Clark School Dean Darryll Pines and his former student advisee Ashish Purekar (B.S. '97, M.S. '00 and Ph.D. '06, aerospace engineering) received a best paper award in structural dynamics and control from the American Society of Mechanical Engineers (ASME) for "Damage Detection in Thin Composite Laminates Using Piezoelectric Phased Sensor Arrays and Guided Lamb Wave Interrogation," which was published in the *Journal of Intelligent Material Systems and Structures* in July of 2010.

The work is derived from Purekar's Ph.D. thesis. He now works at TechnoSciences Corp., a Clark School spinoff company.

The award was presented at the ASME Smart Materials, Adaptive Structures and Intelligent Systems Conference this past September.

ALUMNI NOTES

Michael Hirtle (1972) was recently featured on Inventor's Digest's "Got Invention Radio" where he discussed his work at Hasbro in Product Acquisition and Inventor Relations worldwide. Since graduating with a BS from UMD, Hirtle went on to get his MS in Aeronautics and Astronautics from Stanford. Since then Hirtle has worked on inventing new toys for companies including Fisher-Price, Tyco and Mattel, the last where he specialized in the design of flying toys.



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www.facebook.com and search for "The Department of Aerospace Engineering at UMCP."

FIRST PLACE: NASA'S 2010 EXPLORATION SYSTEMS MISSION DIRECTORATE MOONTASKS COMPETITION

The NASA competition encourages students to design tools and instruments needed for future human and robotic exploration of the moon. Student projects tackle real problems required for successful lunar missions such as navigation in the darkness around the Moon's south pole, sample retrieval and on-site analysis and astronaut recovery and transport back to outpost.

This year's winning team is comprised of students from the University of Maryland's Space System Laboratory and Arizona State University. The team won first place for the design, fabrication and testing of the RAVEN astronaut assistance rover. The award consists of summer internships, to be filled by Kevin Buckley from UM and Lauren Puglisi from ASU, who are working with the teams developing systems for the NASA Desert RATS testing in September. Faculty advisors were Dave Akin and Mary Bowden.

AIAA STUDENTS PARTICIPATE IN USA ENGINEERING EXPO

Graduate (G) and Undergraduate (UG) students from the AIAA Student Chapter in the Department of Aerospace Engineering at the University of Maryland supported AIAA outreach efforts at the USA Science and Engineering Expo on

the National Mall on October 23 and 24, 2010. This outreach activity by students of the AIAA National Capital Section was undertaken to support AIAA's outreach efforts for K-12 students, as well as the general public.

Thousands stopped by the AIAA booth to learn about the physics of flight, especially the forces of lift, drag, weight and thrust. Students demonstrated trailing edge vortices using threads, stall, and "drag races" using diecast models of sports cars versus SUVs, where the vehicle with the greatest drag was pushed by the air flow faster and, so, won the race.

GREG GREMILLION RECEIVES L-3 GRADUATE FELLOWSHIP

Greg Gremillion has been selected to receive an L-3 Graduate Fellowship for the 2010-2011 academic year! In July 2010, L-3 Communications gave a gift of \$1 million over three years to the A. James Clark School of Engineering to benefit students through scholarships, fellowships and student program support. The award includes a \$25,000 stipend, \$1000 to fund travel to conferences, and a five-credit tuition waiver. An additional \$4000 in discretionary funds and \$5000 to support an undergraduate researcher to work with Gremillion.

FIRST PLACE: 27TH ANNUAL AMERICAN HELICOPTER SOCIETY (AHS) STUDENT DESIGN COMPETITION

The AHS competition challenges students to design a vertical lift aircraft that meets specified requirements, and promotes student interest in vertical flight technology. The first- and second-place teams are awarded a cash stipend and two members of the winning team are invited to the AHS Annual Forum and Technology Display to present the details of their proposal.

The winning team from the Clark School's Alfred Gessow Rotorcraft Center, included student team members:

- Rajan Sharma
- David Mayo
- Ben Berry
- Graham Bowen-Davies
- Vincent Prosbic
- Ananth Sridharan
- David Pfeifer

Faculty advisors

- Inderjit Chopra
- J. Gordon Leishman
- VT Nagaraj



ENAE100 STUDENTS DISPLAY THE FINISHED PRODUCT AND A VIDEO OF THE PROJECT THEY WORKED ON WITH DR. DEREK PALEY.



CHRISTINE DOEREN, AN AEROSPACE ENGINEERING FRESHMAN, AND PROFESSOR MARY BOWDEN IN ATTENDANCE AT THE ENAE100 POSTER PRESENTATION SESSION.



A GRADUATE STUDENT WHO WORKED CLOSELY WITH THE ENAE100 X-HAB PROJECT GROUP, UNDER THE GUIDANCE OF PROFESSOR DAVID AKIN, INFLATES THE FINAL PRODUCT.

TWO AERO STUDENTS AWARDED NSF GRADUATE RESEARCH FELLOWSHIPS

Morgane Grivel and Jessica Jones, graduating seniors, have been awarded NSF Graduate Research Fellowships. The NSF Graduate Research Fellowship Program (GRFP) recognizes and supports outstanding graduate students in NSF-supported science, technology, engineering, and mathematics disciplines who are pursuing research-based master's and doctoral degrees at accredited United States institutions.

Fellows benefit from a three-year annual stipend of \$30,000 along with a cost of education allowance for tuition and fees in the amount of \$10,500, opportunities for international research and professional development, and the freedom to conduct their own research at any accredited U.S. institution of graduate education they choose.

After graduation, Jessica plans to enter the Aerospace Engineering PhD program at the University of Michigan, Ann Arbor. She will be studying coupled, nonlinear aeroelasticity and flight dynamics for high-altitude, long endurance vehicles with Dr. Carlos Cesnik.

Morgane, a University Honors and Aerospace Honors student, is in the aeronautics track (with a minor in Spanish language and cultures). She has worked for Dr. Alison Flatau on synthetic jet actuator testing and has designed, built, and maintained interactives for the National Air and Space Museum as an intern. She is also a Clark School Ambassador and is the president and co-captain of the University of Maryland women's rugby club. Morgane Grivel, and aerospace undergrad was featured in a Washington Post article about the rise of popularity in women's rugby.



ANDREW BECNEL AWARDED NDSEG FELLOWSHIP

University of Maryland Aerospace Engineering graduate student, Andrew Becnel, was awarded a prestigious National Defense Science and Engineering Fellowship to support three years of Ph.D. research. His proposal, Crew Protection Strategies for Manned Spacecraft During Launch and Landing, was selected by the Air Force Office of Scientific Research from among more than 2,000 competitive applications in diverse fields of interest to the Department of Defense.

Becnel earned his B.S. in Mechanical Engineering at the Louisiana State University, where he was their top graduate, earning the Tau Beta Pi Senior of the Year (2008), and graduating with Mechanical Engineering Honors. While an undergraduate student, he was the holder of a National Merit Scholarship (2003-2007), a Centennial Scholarship (2003-2007) and Pegues Scholarship (2003-2007). He successfully completed the Engineer-in-Training examination in Mechanical Engineering for the State of Louisiana. Becnel has been a graduate research assistant under Prof. Norman Wereley in the Smart Structures Laboratory at the University of Maryland since 2008. Becnel has been working on adaptive energy absorbers for crew protection systems, and will continue this work under NDSEG support.

"I'm really excited and honored to be given the support to pursue research that I'm passionate about and work on something that I think holds real promise in opening up access to space for the broader public. The opportunity to approach this challenge with a wide perspective, instead of focusing on a narrow element is really unique and could only happen with the kind of support the NDSEG fellowship offers," said Becnel. "I definitely think the expertise and experience of the faculty and researchers that I already work with in the Aero department played a big role in me receiving this fellowship."

Congratulations to Andrew for receiving the NDSEG Fellowship!

AEROSPACE STUDENTS EARN ACCOLADES AT AIAA MID-ATLANTIC STUDENT CONFERENCE



2011 AIAA Region 1-MA Student Conference award recipients (from left to right): Ryan Robinson (BS'09, MS), Erica Hocking (MS), Teju Jarugumilli (BS '11), Alexander Leishman (BS'11), Robert Vocke (BS'09, MS).

Twenty undergraduate and graduate aerospace engineering students from the Dept. of Aerospace Engineering at the University of Maryland (UMD) competed in the AIAA Region 1-MA (Mid-Atlantic) Student Conference held on April 8-9, 2011, at the University of Virginia in Charlottesville. Four additional universities were represented including Old Dominion University, Penn State University, Virginia Tech, and University of Virginia. Forty-two students presented their research to a panel of judges from industry that selected First, Second and Third Place in five categories: Masters, Undergraduate, Team, Outreach and Other Topics. All winners were awarded certificates and cash prizes from AIAA for their efforts. University of Maryland student who were recipients of awards are listed below. Go Terps!

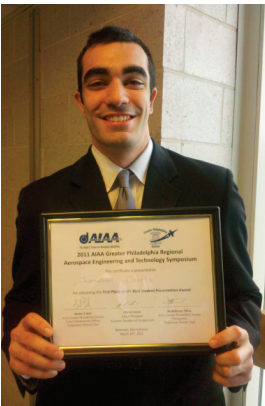
Masters:

- Second Place - Mr. Robbie Vocke: Modeling, Design, and Construction of a Servo Type Actuator Using Miniature Pneumatic Artificial Muscles

Undergraduate:

- Second Place - Mr. Teju Jarugumilli: Understand the Effect of Number of Blades and Rotor Configuration On MAV-Scale Cycloidal Rotor Performance
- Third Place - Mr. Alex Leishman: Experimental Validation of Wind Tunnel Estimation Using a Micro-helicopter Community Outreach:
- Second Place - Ms. Erica Hocking "Other Topics:"
- First Place - Mr. Robbie Vocke: Morphing Aircraft: A Revolution in Aerodynamic Adaptation
- Second Place - Mr. Ryan Robinson A History of Pneumatic Muscles and their Aerospace Applications

GEERTS EARNS FIRST PLACE AT 2011 AIAA REGIONAL SYMPOSIUM IN PHILADELPHIA



On March 25, at the 2011 AIAA Greater Philadelphia Regional Aerospace Engineering and Technology Symposium Mr. Jonathan Geerts, a senior in aerospace, was awarded

First Place for his presentation. Geerts' presentation was entitled "Establishing a Nusselt Number Correlation for Small IC Engine Cylinder Head Heat Transfer." This research was conducted under the advisement of Prof. Christopher Cadou.

2011 VERTICAL FLIGHT FOUNDATION SCHOLARSHIP

Ten University of Maryland Aerospace students were awarded the prestigious 2011 Vertical Flight Foundation Scholarship. There were 60 applicants for this year's scholarships and the Selection Committee chose the top applicants in each category to receive awards. The VFF award winners were honored at the AHS 67th Annual Forum & Technology Display banquet which take place on Wednesday, May 4, 2011 at the Virginia Beach Convention Center in Virginia Beach, Virginia at 7:00 p.m.

The UMCP Aerospace Department winners are:

- B.S. Category:
- Ms. Elena Shrestha
 - Mr. Sean Peterson Symon
- M.S. Category:
- Ms. Erica Grace Hocking
 - Mr. Graham Bowen-Davies
 - Ms. Elizabeth Alice Weiner
- Ph.D. Category:
- Mr. Ryan Michael Robinson
 - Mr. Benjamin Otto Berry
 - Mr. Andrew Becnel

- Mr. Chen Friedman
- Mr. Anish Sydney

Congratulations to all of the award recipients!

THREE UNDERGRAD AERO STUDENTS AWARDED L-3 SCHOLARSHIPS

Three Aero students received scholarships from L-3 Communications through the A. James Clark School of Engineering.

Li Peng Lian and Elena Shrestha each received an L-3 Communications Corporation Scholarship for \$4150, and Harrison Chau received an L-3 Communications Corporate Partner Scholarship for \$1000. Li, Elena and Harrison attended L-3 Day, the first of several L-3 Communications events each semester, on March 3rd, 2011.

L-3 has pledged a \$1 million dollar gift to the Clark School over three years, benefiting students in many ways. The gift established L-3 Graduate Research Fellowships and other scholarships. Approximately \$300,000 of this funding was given to the Clark school for the first year. It will support diversity programs, student organizations, competitions, and the Clark School Corporate Partners Program.

The funds will also support the Women in Engineering Program and the Center for Minorities in Science and Engineering, along with student teams like TerpsRacing and Robotics@Maryland.

CORE LAB WINS AT 2011 SAMPE

Regional Student Symposium Aerospace engineering students from the Composites Research (CORE) Laboratory were awarded accolades at the 2011 SAMPE Baltimore-Washington Regional Student Symposium hosted by Prof. Marc Zupan and held on February 9, 2011, at the University of Maryland, Baltimore County (UMBC). Students from the University of Maryland at College Park, University of Delaware, the University of Maryland at Baltimore County, and University of West Virginia, presented their research in composite materials and competed in poster and oral presentation categories.

Mr. Shane Boyer (UG’11) earned First Place in the Poster Presentation category for his paper and presentation entitled "Chord Morphing Wing Utilizing Composite Sandwich Structures and Pneumatic Artificial Muscles." Mr. Boyer is currently a senior in the Aerospace Engineering Honors Program and a Vertical Flight Foundation Fellow.

Mr. Andrew Becnel (MS’10) earned first place in the Oral Presentation category for his paper and presentation entitled “Magnetorheological Fluid Composites for Crashworthiness Applications in Helicopters.” Mr. Becnel is currently a doctoral student and NDSEG Fellow. Norman M. Wereley, Techno-Sciences Professor and Associate

Chair, is the research advisor for both students.

Mr. Boyer and Mr. Becnel were both awarded certificate plaques, and a cash prize of \$500 for their efforts.

CONGRATULATIONS TO THE SPRING CLASS OF 2011!

B.S.

Ajibulu, Olukayode A
Alberding, Cassandra Michelle
Alexander, Evan Thomas
Alvarado, Oscar E
Ashkanazy, Julia Rebecca
Avadikian, Eric Krikor
Bounitch, Alexander
Boyer, Shane Michael
Boyland, Kevin A
Breitwieser, Jayne J
Canan, William James
Ciarleglio, Constance Antoinette
Croxford, Alastair Mark
Daneshvaran, Navid
Deal, Justin M
Devan, Michael P
Fean, Tyler G
Geerts, Jonathan Simon
Goharian, Kion K
Grivel, Morgane Grivel Anne Marie
Harrington, Forester Leslie

Hawkins, A'Arika Genelle
Henely, Sean P
Huie-Spence, Christopher Joseph
Jarugumilli, Tejaswi
Johanson, Robert Tomos
Jones, Jessica Renee
Kaler, Zachary Price
Kan, Yin-Chiu
Kimball, Andrew Alan
Knister, Simon Russell
Kowalchek, Jake Paul
Langis, Daniel Paul
Levinson, Andrew Saul
Lilly-Salkowski, Tyler
Makogon, Vladimir (Stavnychyi)
Marsh, Caitlin Marie
Mason, Kyle J
Mattern, Daniel
McDermott, Christopher Thomas
McGlory, Clare Margaret
McKay, Lauren Elizabeth
Moran, William F
Nguyen, Thuythao Minh
Niemczyk, Daniel Scott
Niles, Nathaniel P E
Opatola, Ogunniyi Michael
Papavizas, Michael P
Parker, Colin Michael
Paszinski, Kevin Bruce
Patel, Anuj Navin
Payne, Nicholas S
Pearl, Adam Timothy
Robinson, William Cutler

Sacks, Lia
Sakofs, Matthew Evan
Sanni, Olatunde B
Sassoon, Aaron M
Sharma, Rajan
Sherman, Stephen G
Stopak, Jacob Thomas
Taillie, Darren G
Tessa, Liliane Lowe
Van, Anh-Duc
Vettori, Robert Louis
Walsh, Mark J
Warren, David H
Weiner, Elizabeth Alice
Westermeier, Ross M
Wiemann, Ryman Victor
Wu, Louis S
Zhao, Zhen

M.S.

Aguilera Munoz, Camilo
Becnel, Andrew C.
Billingsley, David
Bradshaw, Heather
Cooper, Bradley T.
Douglas, Darryl A.
Gremillion, Gregory M.
Juhasz, Ondrej
Kalra, Tarandeep
Mirvis, Adam
Singh, Harinder J.
Thomas, Sebastian
Wakha, Celestine K.
Waters, Daniel F.
Wilson, Andrew H.

Ph.D.

Beerman, Adam F.
Greenwood, Eric
Mao, Min



DEAN'S GRADUATE RESEARCH AWARDS ANNOUNCED

DEAN DARRYLL PINES ANNOUNCED THE WINNERS OF THE 2011 DEAN'S DOCTORAL RESEARCH AWARD AND THE DEAN'S MASTER'S RESEARCH AWARD COMPETITIONS. THE AEROSPACE DEPARTMENT WAS REPRESENTED IN BOTH CATEGORIES:

PRANAY SESHADRI WAS AWARDED FIRST PLACE AND \$1,500 IN THE MASTER'S CATEGORY FOR HIS WORK UNDER THE ADVISEMENT OF PROFESSOR INDERJIT CHOPRA. HIS WINNING PAPER WAS ENTITLED, "AERODYNAMICS AND CONTROL TOWARDS A BIOMIMETIC HOVERING FLAPPING WING VEHICLE"

BRANDON BUSH WON THIRD PLACE AND \$500 FOR HIS RESEARCH AND PAPER ENTITLED, "COMPUTATIONAL STUDY OF THE FORCE PRODUCTION MECHANISMS OF FLAPPING-WING FLIGHT." BRANDON'S RESEARCH WAS CONDUCTED UNDER THE GUIDANCE OF HIS FACULTY ADVISOR, PROFESSOR JAMES BAEDER.

DEAN PINES CREATED THE DEAN'S DOCTORAL AND MASTER'S STUDENT RESEARCH AWARD COMPETITIONS TO GIVE TOP CLARK SCHOOL DOCTORAL AND MASTER'S STUDENT RESEARCHERS SPECIAL RECOGNITION THAT WILL BE VALUABLE IN LAUNCHING THEIR CAREERS, AND TO SHOW ALL STUDENTS THE IMPORTANCE OF HIGH QUALITY ENGINEERING RESEARCH. STUDENTS SUBMITTED THEIR WORK THROUGH COMPETITIONS AT THE DEPARTMENT LEVEL. MEMBERS OF THE CLARK SCHOOL BOARD OF VISITORS SERVED AS JUDGES FOR THIS COMPETITION.

In Memoriam

Clark School aerospace engineering graduate student Alexander Brown perished in a boating accident on May 12, 2011 near Hampton Roads, VA.

Alex Brown worked at the National Institute of Aerospace (NIA) as a Graduate Research Assistant with the University of Maryland. He originally came to NIA in July 2008, shortly after completing his undergraduate studies at the University of Maryland. He was awarded a Masters Degree in December 2010 and stayed to pursue his Ph.D. in Aerospace Engineering.

His work was innovative and involved using small synthetic jet arrays to control and modify the boundary layer on wings. In this role he worked in collaboration with the Physics and

Controls Branch at NASA Langley. In short, he was part of a forward-thinking team exploring ways to make the next generation of aerospace vehicles more efficient and safer. Alex was recently awarded the NIA Martin L. Drews Scholarship for his outstanding research and leadership.

Alex was well known for his energy and great leadership potential. He was optimistic and upbeat, even under intense pressure, he radiated the positive feelings that created resonance. Alex Brown knew that coming together was just a beginning, that staying together was progress, and working together created success. He inspired others through courage and hope and encouraged others to continue the quest for success and innovation. Alex Brown was a leader who leaves behind him the conviction and the will to carry on.

"Alex was well known for his energy and great leadership potential," said Clark School Dean Darryll Pines. "He will be deeply missed."

More details about Alex's work, as well as a memorial scholarship in his name can be found at the following sites:

- The Department of Aerospace Engineering website – <http://www.aero.umd.edu/about/alex-brown-scholarship.html>.
- The Morpheus Laboratory website - <http://www.morpheus.umd.edu/people/brown-alex.html>.



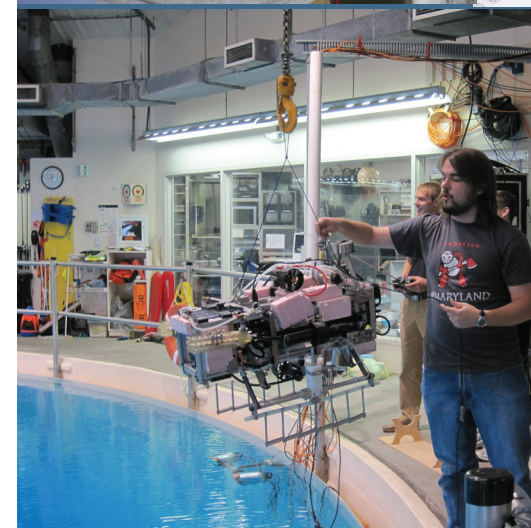
EACH YEAR THE DEPARTMENT HOSTS A PICNIC TO JUMP START THE SCHOOL YEAR. STUDENTS (NEW AND RETURNING), FACULTY AND STAFF CAN MINGLE BEFORE THE "REAL WORK" BEGINS. PICTURED IS PROFESSOR AKIN ENJOYING THE EVENT.



JESSICA JONES, AN AEROSPACE SENIOR, AND JOSEPH SENERCHIA, AN ELECTRICAL ENGINEERING SENIOR, REPRESENT THE CLARK SCHOOL AS AMBASSADORS FOR ROBOTICS DAY AT MARYLAND.



JUSTINE LI AND LINA CASTANO ARE PICTURED AT PARKLAND MIDDLE SCHOOL, AN AEROSPACE MAGNET SCHOOL THAT IS PARTNERED WITH UMCP'S DEPARTMENT OF AEROSPACE ENGINEERING. JUSTINE, LINA AND ZOHAIB HASNAIN (NOT PICTURED) ATTENDED THE PARKLAND OPEN HOUSE EVENT TO GENERATE ENTHUSIASM AND INTEREST IN AEROSPACE ENGINEERING AT THE SCHOOL WHICH SERVES STUDENTS FROM SIXTH THROUGH EIGHTH GRADE.



AEROSPACE GRADUATE STUDENTS DEMONSTRATE ONE OF THE MANY PROJECTS ON DISPLAY AT THE ANNUAL ROBOTICS DAY.

