


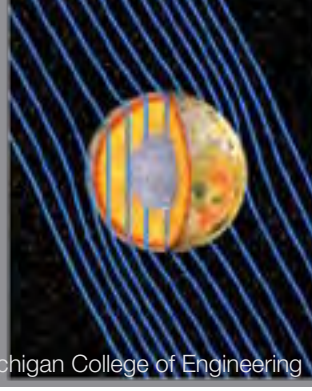

Daily Planet

University of Michigan College of Engineering

SUMMER-FALL 2011

The Department of Atmospheric, Oceanic and Space Sciences Newsletter

Meet the new AOSS Chair

Jim Slavin joins us from Goddard Space Flight Center

New AOSS Chair, James Slavin, officially started his tenure September 1, but has connections going back to his days at UCLA. "As a UCLA graduate student on the Pioneer Venus mission I learned much from AOSS Professor Emeritus Andy Nagy, who led that mission's science team and served as a role model to so many of us." More recently, as the Lead Magnetospheric Investigator on the MESSENGER Mission to Mercury, he has worked closely with the AOSS MESSENGER Fast Imaging Plasma Sensor Team, led by Prof. Thomas Zurbuchen.

Professor Slavin was hooked on space science as a ten year old when he saw the first pictures of the Martian surface coming down from Mariner 4's July 1965 flyby on television, "…live from the Von Karman Auditorium of the Jet Propulsion Laboratory in Pasadena…" He knew that he wanted to "see" the solar system. With the focus of a youth, he began investigating and gathering data about what it would take to become a space scientist. A pamphlet from the American Astronomical Society (AAS), sent by snail-mail in the proverbial "self-addressed, stamped envelope", provided him with "directions" for becoming a scientist (or at least "an astronomer"). Much to the surprise of his family and friends, he faithfully followed the AAS instructions to a BS in Physics from Case Institute of Technology (1976), a PhD in Space Physics from UCLA (1982), and a staff scientist position at JPL (1983).

He later followed his wife to the East Coast where she became a university professor in Aerospace Engineering at West Virginia University. He found work at NASA Headquarters as the Discipline Scientist for Magnetospheric Physics (1987) before being recruited by the Goddard Space Flight Center in Greenbelt, Maryland. At Goddard, he soon became Head of the Electrodynamics Branch, focused on upper atmosphere, ionospheric and magnetospheric research. Professor Slavin came to see the great value in bringing together solar, upper atmosphere, magnetospheric, and interplanetary physics under one roof where the challenges of major cross-disciplinary scientific problems relating to solar variability, space weather, and cosmic plasma physics could be undertaken.

> ***"I'm greatly looking forward to joining in the many activities and opportunities that make this department a world-leader in Earth, Planetary and Space."***

Professor Slavin has served or is presently serving as a Science Investigator on a large number of Heliophysics and Planetary Science missions including the on-going WIND, Cluster, and MESSENGER missions and the Magnetospheric MultiScale and BepiColombo missions launching later this decade. He is the author or co-author of more than 300

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New AOSS Faculty

Jason Gilbert
Assistant Research Scientist

PhD, MS, Atmospheric and Space Sciences, AOSS
BS, Physics and Astronomy, Brigham Young University

Dr.Gilbert was most recently a postdoctoral Research Fellow in AOSS. Dr. Gilbert's research area is space hardware/instrumentation, specifically ion optics and mass spectrometry. He also has an interest in solar magnetic fields and pickup ions and works in the AOSS Solar and Heliospheric Research Group. Dr. Gilbert is also the Co-founder of Mobile Sign Language Systems (MSignS), which is a system that translates sign language into speech and vice versa using cell phone technology. MSignS was featured in the Spring 2007 issue of the Daily Planet. He is also an American Sign Language interpreter. Dr. Gilbert is a member of the NASA Proposal Science Review Panel for the Planetary Instrument Definition and Development Program (PIDDP).

Derek Posselt
Assistant Professor

PhD, Atmospheric Science, Colorado State University
MS, BS, Atmospheric Science, University of Wisconsin-Madison

Professor **Posselt** has been an assistant research scientist in AOSS since 2007. Prior to joining U-M he had a postdoctoral fellowship at NASA Goddard Space Flight Center. His new position was established through the Provost Interdisciplinary Junior Faculty Cluster Hire Initiative. His research examines the effect of changes in the Earth's climate system on precipitating cloud systems at scales traditionally reserved for the study of weather. He is using nonlinear ensemble-based data assimilation techniques to assess information content of cloud remote-sensing observations and to quantify uncertainty in model cloud parameterizations. He is a member of the American Meteorological Society and the American Geophysical Union, and was a member of the AMS Satellite Meteorology and Oceanography Committee.

AOSS Faculty Accolades

AOSS Professor **John Barker** will become a member of the College Executive Committee this September. The appointment, which runs through August 2014, was approved by the U-M Board of Regents this summer.

AOSS Research Scientist **Steve Bougher's** MRO Accelerometer Science Team received the JPL NASA Public Service Group Achievement Award for "Successful analysis of the MRO accelerometer data, providing new insight into the trends and variation of upper atmosphere density." The award is a prestigious NASA award that is presented to a number of carefully selected teams who have distinguished themselves by making outstanding contributions to the NASA mission.

AOSS Assistant Professor **Christiane Jablonowski** recently co-authored a new book, "Numerical Techniques for Global Atmospheric Models, Lecture Notes in Computational Science and Engineering". The book surveys recent developments in numerical techniques for global atmospheric models and is based upon a collection of lectures prepared by leading experts in the field. Additional information about the book as well as purchase information is available at the publisher's web site: http://www.springer.com/mathematics.

In what is slated to be the first of several articles commemorating the five-year anniversary of the launch of the CloudSat satellite, AOSS Assistant Professor **Derek Posselt's** publication, "CLOUDSAT adding a new dimension to a classical view of extratropical cyclones" was featured on NASA's Earth Observatory web site. The article was originally published in the Bulletin of the American Meteorological Society.

AOSS Professor **Ricky Rood**, with colleague Christine Shearer from the UC-Santa Barbara Center for Nanotechnology in Society, published an article in earthzine entitled, "Changing the Media Discussion on Climate and Extreme Weather". The authors suggest that an improved discussion of climate change requires, "initiating and addressing media inquiries regarding weather and climate in ways that make it more difficult for scientific uncertainty to be misrepresented or misunderstood. Specifically, redirecting media questions away from yes-no, weather-climate change, natural-anthropogenically changed dichotomies, and instead highlighting the shortcomings of such a question, opens up space to more meaningfully discuss the relationship between climate change and weather."

AOSS Professor **Thomas Zurbuchen** was recently elected to the Ann Arbor Spark board of directors. Spark was established to facilitate business expansion and location in the Ann Arbor Region. Thomas, who is also the College of Engineering Associate Dean for Entrepreneurship, has worked closely with Spark for numerous years.






Connecting Kenya to the World

The E-MAGINE PROJECT evolved from AOSS Assistant Research Scientist Darren McKague's IMAGINE project. Dr. McKague is advising the current group of students who travelled to Kenya in June to develop a solar powered, cell phone-based Internet system for rural Kenya. The following article by Rayza Goldsmith, Michigan Daily Staff Reporter, ran April 11, prior to the team's departure.

A group of University students is working on sending balloons to high altitudes, though these balloons aren't for gazing at beautiful landscapes.

The students are part of the high-altitude balloon teams in the College of Engineering, which are experimenting with using the balloons to extend the availability of the Internet to rural areas and disaster zones.

Students enrolled in AOSS 583 – a space systems design class taught by Dr. McKague – are involved in the balloon technology efforts. The dozen students in the class, as well as other Engineering students, participate in the teams, which experiment with the basics of ballooning and aiming to use ballooning to expand the availability of mobile technology. The students will be launching the balloons later this week.

"Starting in the fall of 2010, the 583 group looked at balloons from a more top-level perspective of how do we use these to do something novel and cool and what came out of that was the Internet on balloon platforms," said Rackham student Kevin Drumm, who is taking AOSS 583.

"We're being funded by Google to try to create Internet that's mobile, so this could be used for disaster relief … but (also) later on to address rural areas so they can have the ability to have Internet without costly architecture on the ground," Hasan said.

Rackham student Alex Bogatko, an AOSS student involved with the balloon teams, said many universities enjoy the "educational benefit" of allowing their students to experiment with ballooning, but do not usually expand these projects beyond various trials.

"All what children need is to be mentored, encouraged and the rest is possible."

— Dr. Halima Mwenesi

"We're trying to push beyond that. Using balloons to make Internet access more widespread has great potential," Hasan said.

Launching balloons after natural disasters, such as the tsunami in Japan last month or the earthquake that hit Haiti in January 2010, would give victims temporary access to cell phone communication, Hasan said.

As a part of their experiments, the balloon teams perform a series of launches. In addition to AOSS 583, or the Floating Point Operation, the High Altitude Solutions Team is an integral part of the launches. The HAS Team is responsible for operations that help launch the balloons, find the balloons when they land and track the balloons while they are in the air.

There are a variety of balloon materials used for different conditions and length of flights, according to Drumm. The teams use latex balloons, which typically last an hour and a half to two hours, and are about 10 to 15 feet in diameter before launching. The balloons then expand to about 30 feet after being launched, though some differ in size. The team hopes to use super pressure balloons in the future, which are used by NASA and last longer than other types.

Even without some of the more sophisticated balloon designs, Drumm said it would be possible to launch balloons to provide Internet access where many people are currently without it, like Japan due to the recent earthquake. It will only be a few more years until the technology can be used on a larger scale, according to Drumm.

On the Web

Learn more about E-Magine at:

http://michiganemagine.org

This is an excerpt from the blog of Rama Mwenesi, student director of the E-MAGINE team.

By the end of our trip we had managed to go above and beyond some of the goals we had initially set out to accomplish while in Kenya. We managed to meet with numerous educators, from primary and high school teachers, to the Chancellor and Vice Chancellor of Meru University of Science and Technology in order to better understand the challenges educators in underserved and off-the-grid locations faced, and also to discuss the potential impact of E-MAGINE. We managed to strengthen our ties with our collaborators Arid Lands Information Network and also engage a host of other NGOs. By the end of our "supply chain investigation," we were able to source 90% of the components needed to build the system locally and what was even more exciting to know was that 'had we have had an extra working-day in the capital we would have been able to find 100% of the components!' The best part of the trip for me was when we were literally out in the middle of nowhere, on top of a hill conducting connectivity tests and our Chief Engineer Jonas Degnan confirmed that our full system would work!

Overall, we had an absolutely fantastic time in Kenya and are truly grateful to all of our sponsors and supporters who helped make the trip a success! We are also glad to have shared the experience with U-M and the world at large through this blog, and going back to Ann Arbor now we will be mapping out our next steps from here, expanding our team, and seeking more support to send us and our systems back to Kenya and other parts of the world to really make a difference!

Pictured above is Darren McKague, E-Magine faculty advisor, Jonas Degnan, E-Magine chief engineer, and Rama Mwenesi, E-Magine student director

The United States Postal Service issued a new Forever stamp in May 2011 featuring the MESSENGER spacecraft. On-board MESSENGER is the SPRL/AOSS built instrument, FIPS (Fast Imaging Plasma Spectrometer). The image indicates where FIPS is located on the spacecraft.

A "Toast" to Tamas as he leaves office

At the final chair meeting of his tenure, Tamas Gombosi was recognized for his many achievements by AOSS Professor and CoE Associate Dean for Entrepreneurship Thomas Zurbuchen.

"Oh, I thought it was a roast, not just a toast…

In any case, I want to thank Tamas for his work within AOSS and the College as a whole. His loyalty to Michigan, his drive to excellence and the positive impacts of meticulous analyses and solutions to so many challenges, big and small, will stay with us many years to come.

As you know, I run entrepreneurial programs and I have been advising Tamas on his new startup, a consulting service for department chairs and other university administrators. It's called "find-the-loophole.inc".

Department chairs, if your accounting and reporting system is different from that of AOSS, you are leaving money on the table, perhaps 5-15%. That's the leap AOSS took in student credit hours and other value metrics when Tamas started as AOSS chair. He is amazing at this – he will analyze contracts and know them better than the people who wrote them.

For a modest consulting arrangement, Tamas will deploy his toolbox of tricks for you and your department and you will see what I am talking about!

Kidding aside – one of my hitherto most important committee assignments was to the group that proposed Tamas as a chair to AOSS, a recommendation the Dean followed.

We were in a situation that administrators call "exciting" – and, as I am learning now, this is not a good thing. Speaking in a metaphor – AOSS was like a sailboat at sea. Half of the crew was arguing with each other, while the other half slept below deck. That would have been fine, if it was not for two issues

There was a leak in the boat and, yes, a storm was coming.ß

What happened next is nothing short of a class in "change management" applied to AOSS. It was fun to watch…

The first step was to wake up the crew… Let me just say, the headcount of AOSS went down for a while before it came back up to its current state. Then, it was about establishing communication between various parts of the department. Tamas moved his office right across the building and bought an espresso machine to lure people into it – if you wanted espresso it meant going into his office, which usually meant conversing about one thing or another. Third, it was about stopping the bleeding. And, finally, it was about setting the sails and moving in a direction the department understood and bought into.

It's a few years later now and it is obvious that AOSS is a better department today than what it was when he came onboard.

There are a few things we won't forget about Tamas…

First and foremost, his 30-dimensional activity report. Most processes in nature are significantly simpler than this!

Second, his jokes are legendary. Some of them are funny. Others sting or some feel more like diving head first into cow-dung or hitting yourself on the head with a hammer. We should not be too surprised about this. It all made sense after I learned that there is no expression in Hungarian for the phrase: "political correctness".

But, primarily, it is Tamas' loyalty for this University and this College, his commitment to excellence and for his people. He does not do things half way. Tamas was and still is about creating unquestioned success.

And, that's why we are all excited to see what he will do next.

Thanks, Tamas. It's time to enjoy your growing family.

Ann Arbor area high school students win first AOSS science award

Brett Garwood and Shea Holman of Dexter High School and Suraj Jaipalli and Eva Koester of Ann Arbor Huron High School were named Atmospheric, Oceanic and Space Sciences 2011 Book Award winners for their academic and research accomplishments in the Earth and Space Sciences. Teacher Cheryl Wells chaired the Dexter High School selection committee and teacher Don Yeatts chaired the committee at Huron High School. The Award included a copy of Dr. James Hansen's new book on climate change, "Storms of my Grandchildren". Dr. Hansen heads the NASA Goddard Institute for Space Studies.

AOSS initiated this annual award to recognize outstanding area high school students who have demonstrated academic and research excellence in science and engineering and to encourage students to study the Earth and Space Sciences.

AGU FALL MEETING 2011
San Francisco, California, USA | 5-9 December

Meet us at AGU 2011

Mark your calendars for Wednesday, December 7, 6:00 — 8:00 PM in the Bayview/Union Square Rooms of the Grand Hyatt San Francisco. The Grand Hyatt San Francisco is at the corner of Stockton and Sutter Streets on Union Square and the Bayview/Union Square Rooms are on the 36th floor. Please let other AOSS alumni and friends know about the event.

Stop and visit the AOSS booth in the Academic Showcase — in the Poster Hall of Moscone Center South — look for the Michigan flag.

New Grants

March - May 2011

Principal Investigators are listed first followed by Co-Is

Jeremy Bassis, Anthony England, Mark Flanner, An Energy Balance and Supra-Glacial Runoff Model for the Greenland Ice Sheet, $527,851, NASA

Stephen Bougher, Venus Express Participating Scientist Program: SPICAV Investigation to Address Upper Atmosphere Dynamics, $50,000, Southwest Research Institute

Charles Edmonson Jr, HVPS Fabrication Support to Battel Engineering Supplement 3, $32,000, Battel Engineering, Inc

Richard Frazin, Advance Statistical Methods for Exoplanet Detection, $50,000, NAS

Tamas Gombosi, Michael Combi, Kenneth Hansen, Martin Rubin, Valeriy Tenishev, U. S. Rosetta Project for Phase E, Rosina Instrument - Supplement FY11 - FY13, $182,628, NASA-JPL

Xianglei Huang, Proposal for Participation in the Science Definition Team for the CLARREO Mission, $442,323, NASA

Carolyn Kuranz, Imaging X-ray Thomson Scattering for Omega Radiation-Hydrodynamic Experiments, $297,471, Los Alamos National Security, LLC

Michael Liemohn, Aaron Ridley, Collaborative Research: GEM: Investigation of UT Dependence of Magnetic Storm Strength, $120,000, NSF

Mark Moldwin, UM-JPL GPS Receiver Development for Atmospheric and Space Sciences Cubesat Missions, $52,700, NASA-JPL

Derek Posselt, Collaborative Research: Dual-polarimetric radar data assimilation research for enhanced initialization of moist convective systems, $109,609, NSF

Nilton Renno, RASC-AL Team Competition 2011, $5,875, National Institute of Aerospace

Aaron Ridley, High Altitude Balloon Platform for Education of Next Generation Engineers, $21,670, NASA-JPL

Valeriy Tenishev, Michael Combi, Kenneth Hansen, The Exosphere of Mercury and its Interaction with Solar Wind, $290,000, NASA

Highlight on Young Scientists

Thermospheric effects of lower atmospheric small-scale gravity waves

Erdal Yiğit, an AOSS research fellow, recently contributed to the Climate and Weather for Sun-Earth System II (CAWSES-II) newsletter. His work is bridging the two sides of the department by looking at the effects of upward propagating waves from the lower atmosphere on the thermosphere and ionosphere. His essay was carried as a "Highlight on Young Scientists".

As a PhD student at the University College London, I experienced great exposure to gravity waves (GWs) in Fall 2007 when I was visiting Alexander S. Medvedev at the Max Planck Institute for Solar System Research in Katlenburg-Lindau.

While working on GWs and their parameterizations in atmospheric models, I noticed how challenging it is to bridge the communication gap between lower and upper atmospheric scientists. However, this communication is necessary, as small-scale GWs are generated in the lower atmosphere and can propagate into the thermosphere above the turbopause and the study of their effects thus requires expertise in different areas.

Historically, GW parameterizations have been designed to incorporate the effects of unresolved GWs in middle atmosphere models, thus they typically

lacked appropriate mechanisms to attenuate waves in the thermosphere. Having extended a GW parameterization that is based on the earlier works of Alexander S. Medvedev to the thermosphere [Yiğit et al., 2008, J. Geophys. Res.], it was for the first time possible to physically account for GW dissipation up to the upper thermosphere.

My modeling studies with the extended GW scheme demonstrated that GWs produce significant dynamical effects in the thermosphere up to F2-layer altitudes [Yiğit et al., 2009, Geophys. Res. Lett.], competing with ion drag. Also, GWs produce appreciable thermal effects [Yiğit and Medvedev, 2009, Geophys. Res. Lett.], cooling the upper thermosphere by more than 150 K/day. These studies suggest that the GW effects should be considered in the momentum and energy budget studies of the upper atmosphere and interaction between the lower and upper atmospheric communities is of great importance for better understanding atmospheric vertical coupling.

AOSS Adjunct Professor **Tim Wallington** received the Ford Motor Company Dr. Haren Gandhi Research & Innovation Award in recognition of his scientific research and technical leadership providing a sound technical basis for corporate sustainability strategy and national and international policy on climate change, alternative fuels, and advanced refrigerants. The award was presented on June 27 by Bill Ford (Executive Chairman, Ford Motor Company) at the annual Research & Advanced Recognition Event in the Ford Motor Company Research and Innovation Center in Dearborn.
Wallington has played a leading role within Ford's Sustainability and Environmental Science community and has also had a major impact within the academic community, as he has co-authored more than 400 research papers and four books which have gathered more than 10,000 citations.

Melting ice on Arctic islands a major player in sea level rise

by Nicole Casal Moore

Melting glaciers and ice caps on Canadian Arctic islands play a much greater role in sea level rise than scientists previously thought, according to a new study led by AOSS Research Fellow Alex Gardner.

The 550,000-square-mile Canadian Arctic Archipelago contains some 30,000 islands. Between 2004 and 2009, the region lost the equivalent of three-quarters of the water in Lake Erie, the study found. Warmer-than-usual temperatures in those years caused a rapid increase in the melting of glacier ice and snow, said Alex. The study was published online in Nature on April 20.

"This is a region that we previously didn't think was contributing much to sea level rise," Gardner said. "Now we realize that outside of Antarctica and Greenland, it was the largest contributor for the years 2007 through 2009. This area is highly sensitive and if temperatures continue to increase, we will see much more melting."

Ninety-nine percent of all the world's land ice is trapped in the massive ice sheets of Antarctica and Greenland. Despite their size, they currently only account for about half of the land-ice being lost to oceans. This is partly because they are cold enough that ice only melts at their edges.

The other half of the ice melt adding to sea-level rise comes from smaller mountain glaciers and ice caps such as those in the Canadian Arctic, Alaska, and Patagonia. This study underscores the importance of these many smaller, often overlooked regions, Gardner said.

During the first three years of this study, from 2004 through 2006, the region lost an average of 7 cubic miles of water per year. That increased dramatically to 22 cubic miles of water–roughly 24 trillion gallons–per year during the latter part of the study. Over the entire six years, this added a total of 1 millimeter to the height of the world's oceans. While that might not sound like much, Gardner says that small amounts can make big differences.

In this study, a one-degree increase in average air temperature resulted in 15 cubic miles of additional melting.

Because the study took place over just six years, however, the results don't signify a trend.

"This is a big response to a small change in climate," Gardner said. "If the warming continues and we start to see similar responses in other glaciated regions, I would say it's worrisome, but right now we just don't know if it will continue."

The United Nations projects that the oceans will rise by a full meter by the end of century. This could have ramifications for tens of millions of people who live in coastal cities and low-lying areas across the globe. Future tsunamis and storm surges, for example, would more easily overtop ocean barriers.

To conduct the study, researchers from an international array of institutions performed numerical simulations and then used two different satellite-based techniques to independently validate their model results. Through laser altimetry, they measured changes in the region's elevation over time. And through a technique called "gravimetry," they measured changes in the Earth's gravitational field, which signified a redistribution of mass–a loss of mass for glaciers and ice caps.

The paper is called "Sharply Increased Mass Loss from Glaciers and Ice Caps in the Canadian Arctic Archipelago." The research was funded by the Natural Sciences and Engineering Research Council of Canada, the Alberta Ingenuity Fund, the European Union 7th Framework Program, and the Canadian Foundation for Climate and Atmospheric Sciences.

Other collaborators are with the University of Alberta, Scripps Institution of Oceanography, the University of Oslo, the Royal Netherlands Meteorological Institute, the Alaska Department of Natural Resources, the Geological Survey of Canada, Trent University, Westfield State University and the Campbell Scientific Canada Corp.

AOSS student member of winning team

The International Community for Auditory Display recently honored a team led by AOSS doctoral student Robert Alexander with its Outstanding Achievement Award for the paper "Audification as a Diagnostic tool for Exploratory Heliospheric Data Analysis". Robert is working with the Solar and Heliospheric Research Group; Professor Thomas Zurbuchen is his advisor.

Robert's, whose research lies at the intersection of technology and creativity, is working to construct software interfaces for exploring scientific data in new ways. The core of his research lies in data sonification with the Solar Heliospheric Research Group (SHRG). Sonification is a process through which any kind of non-auditory data is translated as sound. The SHRG is transforming space data into the sonic realm so that they can gain a new perspective, and begin to ask new questions. Robert related that "as a media artist and electroacoustic composer, I've pushed for over a decade to create new tools for self expression. This has generated a keen awareness of the extent to which the creative process can be colored by technological tools. The SHRG is very innovative and forward thinking … [and] is extremely inspiring to work with."

Other honors and achievement awards Robert has earned for his work include the 2011 NASA-Harriett G. Jenkins Pre-doctoral Fellowship Project (JPFP) Award; International Community for Auditory Display: Outstanding Achievement Award; Yahoo! Boost Award; University of Michigan Dean's Named Fellowship 2010-2011; and a Rackham Summer Research Grant.

After graduation, Robert is interested in advancing the field of auditory data analysis. He also hopes to build a larger bridge between the arts and sciences, and to continue rigorously exploring his own creative capabilities.

Giving back to her hometown school

AOSS doctoral student Gina DiBraccio, returned to the Manor Elementary School in Fallsington, PA and spent time with students as part of their study of space. Gina's advisor is AOSS Professor Thomas Zurbuchen.

Gina, who holds a dual BS degree in Physics & Astronomy and Business Administration from the University of Pittsburgh, has a co-op position at NASA's Goddard Space Flight Center that is allowing her to trade back and forth between working and finishing her PhD. Her projected graduation date is 2013.

Gina usually takes "a few months out of the year to continue my research at NASA Goddard. I work in the Geospace Physics Lab, which is one of four labs in the Heliophysics Division. Currently my title is Atmospheric and Space Science PhD student/trainee in the Heliophysics Division. Once I

graduate, I will be a Research Scientist, or more specifically, a Space Plasma Physicist specializing in Magnetospheric Physics. My thesis is based on Mercury's interaction with the Sun, including data analysis from the MESSENGER spacecraft, which is currently orbiting Mercury."

[Excerpted from an article by Manor Elementary School teacher Marie Benner for the Pennsbury School District newsletter.]

High school students launch model rockets from the North Campus Diag as part of a presentation by graduate students in the Department of Atmospheric, Oceanic and Space Sciences to demonstrate principles related to propulsion, and to expose students to the field of engineering. More than 70 high school students were on campus Sunday-Tuesday for College 101, organized by the Center for Educational Outreach. They engaged with faculty, staff and students from a variety of academic departments and participated in college preparation activities. (Photo by Rachel Boswell)

The reigning champions of the North American Solar Challenge will compete in the 1,800-mile World Solar Challenge across the Australian outback October 16-23. The U-M team, which includes AOSS meteorology student Jordan Feight, has been around for two decades, has won the US race six times and finished third in the global contest four times. This year they're competing against 31 other teams from across the globe. You can follow their progress at: http://solarcar.engin.umich.edu

continued from page 1

scientific articles concerning the solar wind interaction with planets and comets, the structure and dynamics of planetary magnetospheres, and magnetospheric substorms. Professor Slavin supervised seven postdoctoral fellows while at NASA Goddard Space Flight Center and has frequently participated in organizing scientific meetings and editing of various journals and monographs. He is a recipient of two NASA Medals for Exceptional Achievement for his scientific contributions to space science and his leadership of space missions as a Project Scientist, respectively. He was also selected for a University of California Regent's Lectureship in Space Physics in 2006.

The reasons given by Professor Slavin for his move to AOSS are simply that he is still following the spirit of the AAS pamphlet and seeking opportunities for continued development as a scientist and a member of the science community. "AOSS will serve these personal goals by allowing me to teach the subjects that I have dedicated my career to and to share the excitement of Earth, Planetary and Space Research and Exploration with the next generation." He also hopes that the College of Engineering and AOSS will benefit from his NASA experience as a leader and manager while still allowing him the time to carry out his research program.

When asked what he would have done if he hadn't pursued a career in space science, what would he have pursued, he quickly answered "Psychology. Next to space plasmas, I find people's minds the most puzzling objects in the universe." A stimulating and perhaps very appropriate combination of interests for his new role in AOSS.

Researchers test promise of Great Lakes wind power

by Paul Gargaro

This month, University of Michigan researchers will embark on a three-year feasibility analysis of offshore wind energy harvesting on the Great Lakes.

The $2.7 million study – a partnership led by the U-M's Michigan Memorial Phoenix Energy Institute (MMPEI) and Grand Valley State University's Michigan Alternative and Renewable Energy Center (MAREC) – will initially launch roughly four miles off the coast of Muskegon where team members will anchor a large research buoy to measure the wind high above the Lake Michigan surface. The buoy will be relocated to other sites on the lake during the study.

"We're using hard science and the latest technology to provide real answers about what's possible from an engineering, environmental and economic standpoint," said Guy Meadows, director of the U-M's Ocean Engineering Laboratory and a professor in the departments of Atmospheric, Oceanic and Space Sciences and Naval Architecture and Marine Engineering.

Meadows and a team of U-M researchers from the College of Engineering and School of Natural Resources and Environment will study the nature of Lake Michigan's offshore wind and weather, the structural effects of wind and icing on a turbine system, the potential environmental impact and issues related to site placement.

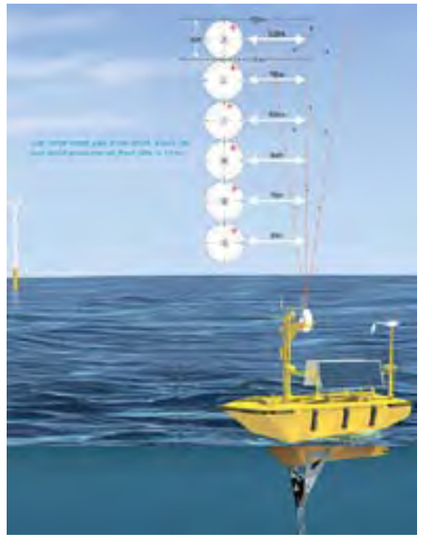
Key to their research is the nearly six-ton WindSentinel buoy/research platform, purchased with grant funds by GVSU from AXYS Technologies in British Columbia, Canada. WindSentinel uses an advanced Vindicator® laser sensor developed by Virginia's Catch the Wind, Inc. that can measure wind speed and properties up to 150 meters above the water level, or roughly the height of a large, commercial wind- turbine tower.

"This is the first time this advanced technology will be deployed on the Great Lakes," said Arn Boezaart, MAREC director.

WindSentinel will transmit its data to a shore station for preliminary evaluation by researchers from Grand Valley State's Padnos College of Engineering and Computing. From there, the data will be forwarded to the U-M team for further analysis.

Meadows said the U-M team also will use underwater vehicles to explore the environment below the surface, including the lake floor. The submersibles, capable of extracting samples from the lakebed, are part of a set of environmental monitoring devices, including eight surface buoys that the Ocean Lab regularly deploys throughout the Great Lakes.

"The Wind energy project ties in very nicely with our ongoing analysis of how wind and waves affect the Great Lakes coastline," Meadows said, noting that the Ocean Lab works closely with the National Oceanic and Atmospheric Administration, sharing a research craft, R/V Laurentian, which is docked in Muskegon and likely will be used to tow WindSentinel into place this fall.



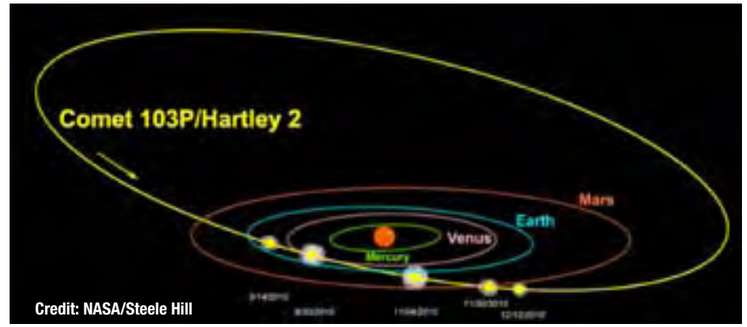
The six-ton WindSentinel buoy/research platform will measure the wind high above the Lake Michigan surface. Photo by Axis Technologies Inc. Click the image to see a larger photo.

While wind power is clean and virtually limitless, questions remain over its practicality and desirability for commercial development. It's estimated that 300 turbines are required to generate the same amount of electricity created by a mid- size coal fired plant. Offshore wind farms also pose challenges of energy storage and transfer to shore, as well as siting in potentially deep water.

"This study provides an unprecedented opportunity to answer many questions we all have about offshore wind energy and help responsibly guide its potential development in the region," said MMPEI Director Dennis Assanis.

The MMPEI/MAREC collaboration will also include research on bird and bat flight patterns by scientist from the Michigan Natural Features Inventory of the Michigan State University Extension. The wind assessment research is supported by grants from the U.S. Department of Energy, the Michigan Public Service Commission, We Energies of Wisconsin and the Sierra Club.

Dr. Combi watches a comet fading away



On Nov. 4, 2010, Comet Hartley 2, a small comet not even a mile in diameter, became the focus of two NASA spacecraft, giving comet researchers such as AOSS Research Professor Michael Combi a close-up view of a comet fading away.

NASA's EPOXI spacecraft came within 450 miles of Comet Hartley 2, which was also observed from the Solar and Heliospheric Observer (SOHO), better known for its observations of the sun. Together, the two returned data about what appears to be an irregular comet, belching chunks of ice and losing water at a surprisingly fast pace.

"By combining EPOXI's direct imaging with several months of SOHO data, we had a rare chance to see a comet in the process of shedding off large amounts of water," says Dr. Combi. Dr. Combi has an international reputation in cometary science and is known around U-M by his car license plate: “DRCOMET”.

His findings about Comet Hartley 2 appeared in the June 10, 2011 issue of the Astrophysical Journal Letters. "Comets always lose water as they heat up during the approach to the sun, but this was much more than usual. Something pretty dramatic happened in those weeks."

Caption: On September 30, 2010, water production on Comet Hartley 2 — as represented by the hydrogen cloud surrounding the comet seen by SOHO — jumped by a factor of two and half in a single day. (Comet and cloud size are not to scale.)

Understanding the composition and behavior of comets intrigues scientists because they are some of the first objects that formed around our sun some 4.5 billion years ago and they’ve evolved little since. These chunks of ice, rock, and frozen gas hold clues to what existed in those early days of the solar system's formation, says Combi. So he uses an instrument onboard SOHO called SWAN – for Solar Wind ANistropy – to observe how water streams off of comets.

SWAN has collected data on nearly one hundred comets, so when Combi and his colleagues learned EPOXI was destined to get a closer view of Hartley 2, they pored over old data from that comet's most recent approach in 1997. They compared this to SWAN's 2010 observations from September to December 2010.

Surprisingly, the comet's water production in 1997 was three times the amount of water put out in 2010. "We've analyzed multiple comets with short periods like Hartley 2 on repeated trips around the sun," says Combi. "But none of them has shown such a drastic change from one close pass by the sun to the next."

"Analysis of all this data on Hartley 2 is just beginning," says Combi, "So it will be awhile before we figure out all that's happening. But we have here an example of an unusual comet. We don't know if this one had odd behaviors or some different kind of composition – but maybe we'll start seeing things like this, perhaps even in hindsight, in other comets."

Aerosols affect climate more than satellite estimates predict

by Nicole Casal Moore

Aerosol particles, including soot and sulfur dioxide from burning fossil fuels, essentially mask the effects of greenhouse gases and are at the heart of the biggest uncertainty in climate change prediction. New research from AOSS Professor Joyce Penner shows that satellite-based projections of aerosols' effect on Earth's climate significantly underestimate their impacts.

The findings were published online the week of August 1 in the early edition of the Proceedings of the National Academy of Sciences.

Aerosols are at the core of "cloud drops" – water particles suspended in air that coalesce to form precipitation. Increasing the number of aerosol particles causes an increase in the number of cloud drops, which results in brighter clouds that reflect more light and have a greater cooling effect on the planet.

As to the extent of their cooling effect, scientists offer different scenarios that would raise the global average surface temperature during the next century between under 2 to over 3 degrees Celsius. That may not sound like a broad range, but it straddles the 2-degree tipping point beyond which scientists say the planet can expect more catastrophic climate change effects.

The satellite data that these findings poke holes in has been used to argue that all these models overestimate how hot the planet will get.

"The satellite estimates are way too small," said Joyce Penner, the Ralph J. Cicerone Distinguished University Professor of Atmospheric Science. "There are things about the global model that should fit the satellite data but don't, so I won't argue that the models necessarily are correct. But we've explained why satellite estimates and the models are so different."

Penner and her colleagues found faults in the techniques that satellite estimates use to find the difference between cloud drop concentrations today and before the Industrial Revolution.

"We found that using satellite data to try to infer how much radiation is reflected today compared to the amount reflected in the pollution-free pre-industrial atmosphere is very inaccurate. If one uses the relationship between aerosol optical depth---essentially a measure of the thickness of the aerosols---and droplet number from satellites, then one can get the wrong answer by a factor of three to six."

These findings are a step toward generating better models, and Penner said that will be the next phase of this research.

"If the large uncertainty in this forcing remains, then we will never reduce the range of projected changes in climate below the current range," Penner said. "Our findings have shown that we need to be smarter. We simply cannot rely on data from satellites to tell us the effects of aerosols. I think we need to devise a strategy to use the models in conjunction with the satellite data to get the best answers."

The paper is called "Satellite-methods underestimate indirect climate forcing by aerosols." The research is funded by NASA.

On the Web

You can read the abstract at:

http://tinyurl.com/3blqn2d

Meet GUStO

Meet the new AOSS Graduate and Undergraduate Student Organization (GUStO)–formerly the AOSS Graduate Student Organization (GSO). We are students who believe that AOSS is a community and that our social and academic experience as members is up to us. The role of GUStO is to provide opportunities that will further build and maintain community, foster student-faculty liaison, and encourage initiative from all members of the community–students, faculty, and staff alike.

Alex Bryan
(ambrya@umich.edu)

Beginning in the 2011-2012 academic year, GUStO will offer new opportunities for undergraduate and graduate students in career development, academic aid, department involvement, and social interaction. We will invite faculty members to host workshops on topics in AOSS ranging from applying to graduate school to finding a post-doc position, from budgeting and proposal writing to refereeing a paper, and many more. Weekly seminar speakers from a wide range of careers, both academic and non-academic, will be invited to participate in open forums for students to learn about other career options in their field. Student-student mentoring will be available for undergraduates, pre-candidate graduate students, and foreign students, including application assistance, study groups and mock orals for the qualifying exam, as well as a resource network where students can offer their expertise in a specific course, programming language, or technical skill to other students.

As students reaping the benefits of a quality education and academic experience, we firmly believe that giving back to the department, the college, and the university is important. GUStO will encourage enthusiastic student volunteers to assist with recruitment events and prospective student visits. Outreach programs will provide opportunities for students to volunteer to serve others and get the local community excited about our science. Student volunteers will also attend faculty meetings, contribute to the development of the qualifying exam, and serve on leadership for the Michigan Geophysical Union annual conference. Department apparel will be sold to improve department representation at conferences and other professional events. Our foremost goal, as GUStO leaders, is that students take sincere pride in being an AOSS student, such that their pride would be apparent and attractive to prospective students and other institutions.

Shannon Curry
(smcurry@umich.edu)

Julie Feldt
(jfeldt@umich.edu)

GUStO will continue to provide social events for students in an effort to build and maintain the community. At the beginning of every academic year, we will host a "welcome BBQ" for new and current students to meet, greet, and get to know each other. A wide variety of social events will be offered throughout the year, including tailgating for Michigan football games, intramurals, holiday parties, and more. Every year will close with an end-of-the-year fellowship banquet to recognize student achievements over the past year and bid farewell to graduating students.

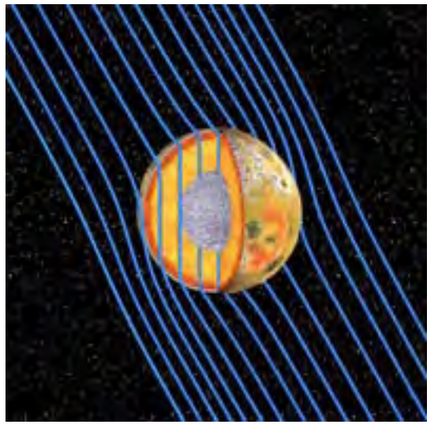
That's GUStO–an organization of student leaders serving their fellow community of AOSS students, faculty, and staff. Though specific events may change year to year to adapt to the changing needs of students, our goals will always stay the same. In order to become self-sustaining, GUStO is seeking enthusiastic student and faculty volunteers to get involved. Let us know what you would like to see in the 2011-2012 academic year. Contact any one of your GUStO representatives: Julie Feldt (jfeldt@umich.edu), Alex Bryan (ambrya@umich.edu), Shannon Curry (smcurry@umich.edu), or Rachel Kroodsma (rakro@umich.edu).

Rachel Kroodsma
(rakro@umich.edu)

AOSS researchers' work in Science

The journal Science recently published the work of AOSS Assistant Research Scientist Xianzhe Jia and Research Professor Margaret G. Kivelson and others on the interior structure of Jupiter's moon Io. The report, Evidence of a Global Magma Ocean in Io's Interior, details evidence of a subsurface ocean of molten or partially molten magma beneath the surface of Jupiter's volcanic moon Io.

The finding is the first direct confirmation of such a magma layer at Io and explains how Io can be the most volcanic object in the solar system. Besides the volcanoes on Earth, Io's volcanoes are the only other known active magma volcanoes in the solar system. Io produces about 100 times more lava each year than all the volcanoes on Earth.



The scientists utilized magnetometer data collected by the Galileo spacecraft, which was launched in 1989 and began orbiting Jupiter in 1995. Unexplained signatures appeared in magnetic field data from Galileo flybys of Io in October 1999 and February 2000. After a successful mission, the spacecraft was intentionally sent into Jupiter's atmosphere in 2003.

"During the final phase of the Galileo mission, models of the interaction between Io and Jupiter's immense magnetic field, which bathes the moon in charged particles, were not yet sophisticated enough to understand what was going on in Io's interior," said Xianzhe Jia.

While Earth's volcanoes occur in a few hotspots like the "Ring of Fire" around the Pacific Ocean, Io's volcanoes are distributed all over its surface. A global magma ocean under about 20 to 30 miles (30 to 50 kilometers) of Io's crust helps explain the moon's activity. Io's volcanoes were discovered by NASA's Voyager spacecraft in 1979. The energy for the volcanic activity comes from the squeezing and stretching of the moon by Jupiter's gravity as Io orbits the largest planet in the solar system.

Recent work in mineral physics showed that "ultramafic" rocks – kinds of rock that are igneous in origin and, on Earth, believed to be derived from the mantle – become highly capable of carrying electrical current when melted. Tests showed that the signatures detected by Galileo were consistent with a rock like lherzolite, an igneous rock found in places like Spitzbergen, Sweden, that is rich in silicates of magnesium and iron. The magma ocean layer on Io appears to be more than 30 miles (50 kilometers) thick, making up at least 10 percent of the moon's mantle by volume. The blistering temperature of the magma ocean probably exceeds 2,200 degrees Fahrenheit (1,200 degrees Celsius).

ALUMNI OBITUARY

Erdogan Baran (BSEAA '63), May 1, 2011
A.J. Terry Brown, Jr. (BSMTL '52), January 29, 2011
J. Robert Bjork (BSEAA '48), February 23, 2011
Robert A. Howland (BSEAA '48), February 15, 2011
Fletcher N. Platt, Sr. (BSEAA '38), March 24, 2011
Frederick Bloetscher (BSEAA '47), June 6, 2011
Robert S. Lipton (BSEAA '64), July 7, 2011
Carl Anthony Reber (PhD '73), July 7, 2011

Jan Beltran: Outstanding Staff AOSS Member

"If I'd known I was getting an award, I would have been at the staff luncheon!" So stated this year's recipient of the 2011 AOSS Outstanding Staff Award. For the students, faculty and staff who have worked with Jan over the year's, there was no better testament of her dedication to the care and attention she brings to the office every day than the fact she missed the luncheon to take care of an emergency at the office!

Jan, who has been keeping AOSS/SPRL faculty and students organized for almost 20 years, has proven many times over that there is no one more dedicated to the faculty and students in her cluster. In fact, there is a waiting list of people who would jump at the chance to have her work for them (a misnomer if ever there was one).

Comments from her nominators are indicative of the appreciation expressed about the dedication and high level of responsibility she brings to her job:

"In many ways, the role of administrative assistant is to make things run smoothly, so you can concentrate on other aspects of your job – Jan really takes this task to heart, and makes life much easier. She handles the details that are often missed."

"It is fortunate that awards, such as this one, exist to honor people like Jan, and allow those of us who depend upon staff members like her to realize what an essential role they play in our work lives on a daily basis."

"It's been a joy to work with Jan. She's fun but super efficient in all she does, and as reliable as a 1970s Bell Telephone. She just works."

Congratulations Jan.

Alumni Notes

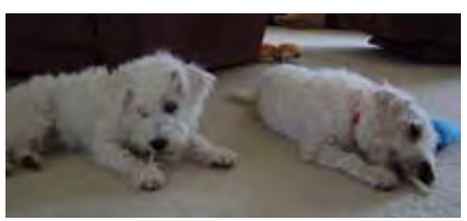
The National Academy of Television Arts and Sciences has awarded AOSS Alumnus **Paul Gross** his fourth Emmy in the past seven years. Paul was honored for his live reporting from the site of last year's Dundee, MI tornado, as well as for his live reports and his station campaign encouraging people to buy NOAA Weather Radios. Since the campaign began (it continues this year), more than 10,000 weather radios have been purchased. Paul is also excited to report that his book, *Extreme Michigan Weather: The Wild World of the Great Lakes State* (the first book ever written just about Michigan's weather) is well into its second printing and nearing a third.

AOSS Happenings

Liang Zhao (former graduate student with Prof. Zurbuchen) and Cheng Zhou (former postdoc with Prof. Penner) are very happy to announce the birth of their beautiful baby boy, Luke Yiyang Zhou, pictured here with happy big sister Liana. Luke was born on Saturday, June 25, weighing in at 7lbs 15.6 oz.

Emily Wheeler (WCC nursing student) and Evan Oswald (GSRA with Prof. Rickie Rood) were wed on January 7, 2011 in Ann Arbor, and on July 21, Leyland Richard Oswald was born at 6 lbs, 9 oz. Evan says, "It turns out having a baby is a good excuse to stay out of the heat! Our family wants to extend our thanks to the AOSS family for all they've done for us."

Meet Linus (red collar) and Shroeder. These two big-eyed beauties joined AOSS SPC Rick Baker this past June when they were five months old. "I picked them up from a shelter in Niagara Falls, Ontario. Puppy-hood is another version of childhood as evidenced by the non-morning person, Rick, getting up at 5:00 AM each morning to meet his puppies needs!



AOSS Births Decaplets + 2

Twelve ducklings and a proud momma (not pictured) laid claim to the Space Research Building courtyard pond on May 18, 2011. When they were old enough – but before they tried to learn how to fly – the ducklings and Momma Mildred (Milli to her friends and helpers) were successfully moved to the BIG pond at the Music School. Since Milli walked right into the carrier, we're pretty sure she's done this before, probably as one of our former clutches. It's really nice to see that at least one of our "progeny" is still flying.

2011 MGU Meeting

Congratulations to everyone who participated and organized yesterday's exception MGU Annual Meeting. It is wonderful to see John Barker's recommendation of an event to showcase students work become such a success – to the point where MGU has outgrown the FXB Atrium!

This year's AOSS student winners were:

First Place (tie) ($750 each)

Hui-Wen Chuang, *Simulated atmospheric bridge across tropical ocean basins and its sensitivity to seasonal evolution in current and future climate regimes*

Advisor: Xianglei Huang

Yoichi Shiga, *A Framework for Expanding the In-Situ CO2 Monitoring Network for North America*

Advisor: Anna Michalak

Third Place ($250)

Dan Gershman, *A New Operating Mode for the Spaceborne Quadrupole Mass Spectrometer*

Advisors: Bruce Block, Martin Rubin, Thomas Zurbuchen

Student Choice ($100)

Guangxing Lin

Advisor: Joyce Penner

AOSS Student Organizing Committee

Alex Bryan
Gina DiBraccio
Rachael Kroodsma
Yuni Lee
Catherine Walker
Micah Weberg
Prof. John Barker (Advisor)
Sandra Pytlinski (Staff Member)

AOSS Judges

Jeremy Blassis
Xianzhe Jia
Allison Steiner
Shasha Zou

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http://www.youtube.com/umaoss

On our Blog:
http://tinyurl.com/3c6k9eb

AOSS Celebrates 2011 Graduates

AOSS held their first graduation celebration for students that graduated in academic year 2010-11 on Friday, April 29. Family and friends joined AOSS faculty and staff as they gathered to honor AOSS students who have graduated this year.

Successful Dissertation Defenses

Amanda Susanne Brecht, PhD, Atmospheric and Space Science, *Tracing the Dynamics in Venus' Upper Atmosphere*, Stephen Bougher, Chair

Manish Mehta, PhD, Atmospheric and Space Science, *Plume-Surface Interactions due to Spacecraft Landings and The Discovery of Water on Mars*, Nilton Renno, Chair

Sidharth Misra, PhD, Atmospheric and Space Science, *Development of Radio Frequency Interference Detection Algorithm for Passive Microwave Remote Sensing*, Christopher Ruf, Chair

Dalal Najib, PhD, Atmospheric and Space Science, *The Interaction of Fast Flowing Plasma with Non-Magnetized Solar System Bodies: A New 3D Multi-fluid MHD Model of Mars and its Applications*, Andrew Nagy and Gabor Toth, Co-Chairs

Paul Aaron Ullrich, PhD, Atmospheric and Space Science, *Atmospheric Modeling with High-Order Finite-Volume Methods*, Christiane Jablonowski, Chair

Yiqun Yu, PhD, Space and Planetary Physics, *On the Regulation of the Geospace System by Solar-Wind/IMF Discontinuities and Ionospheric Outflow*, Aaron Ridley, Chair

Liang Zhao, PhD, Atmospheric and Space Science, *On the Structure of Streamer-stalk Wind: in Situ Observations, Theory and Simulation*, Lennard Fisk and Thomas Zurbuchen, Co-Chairs

2011 graduates who attended the first AOSS graduation celebration.
BACK ROW, left to right: Ashwin Yerasi (MS/MEng), Paul Ullrich (PhD), Kevin Drumm (MS/MEng), Dalal Najib (PhD), Carole Dufour (MS/MEng), Gavin Chensue (BSE), James Gawron (BSE), Amanda Brecht (PhD), Alex Montgomery (Geological Sciences student), Joshua Robinson (MS/MEng), Alex Bogatko (MS/MEng)
FRONT ROW, left to right: Vijay Patel (MS/MEng), Dara Fisher (BSE), Jon O'Kins (MS/MEng), Laura O'Connor (BSE), Joshua Kahn (MS/MEng), Brian Kerby (MS/MEng)

Master of Engineering

Vidya Sagar Reddy Avuthu
Alex Nicholas Bogatko
Kevin Michael Drumm
Colin Lewis Eaton
Bradley Allen Freyberg
James Edward Grohoski III
Cole Thomas Heckathorn
Michael Simpson Heywood
Joshua Glenn Kahn
Daniel Francis Kelly
Catherine Charlotte Keys
Brian Michael Kirby
Tristan James Kreutzberg
Ryan William Kurkul
Jon Marc Dabao O'Kins
Vijay Patel
Joshua Randall Robinson
Fernando Antonio Saca
Emmanuel Konstantinos Tsaparikos
Paul Scott Webb
Ashwin Reddy Yerasi

Master of Science

Carole Dufour
Julie Ann Feldt
Jessica Leigh Grosso
Chuan-Yuan Hsu
Meng Jin
Weiye Yao

Bachelor of Science in Engineering

Katheryn Elizabeth Bryant
Gavin Dunston Chensue
Ellen K. Dankert
Dara Ruth Fisher
James Henry Gawron
Lee Michael Marcoux
Laura Jean O'Connor
John Leonard Orlowski
Matthew Kaimiike Quitiquit
Yilu Wang