Daily Planet

University of Michigan College of Engineering

SPRING 2012

The Department of Atmospheric, Oceanic and Space Sciences Newsletter

INSIDE

Faculty Accolades 3
Slavin Honored 5
Students at JPL 10
Griffin Retires 12
Student Happenings 14
From the Archives 18

The newest Mars rover, Curiosity, is scheduled to join rovers Opportunity and Spirit on the Mars surface August 5, 2012. AOSS and SPRL are watching the journey closely because of the involvement in the space mission by many of our faculty, staff, engineers and students.

Professor Sushil Atreya, who helped conceive of the MSL mission, is a lead scientist and co-investigator on the Mars Science Laboratory's cornerstone instrument, the Sample Analysis at Mars. He will be involved in the study of climate evolution and the search for organics – the building blocks of life.

Professor Nilton Renno is a co-investigator on the Rover Environmental Monitoring System, which is the mission's weather station, and will be involved in monitoring Martian weather and assessing whether the environmental conditions are suitable for life. During the 2008 Mars Phoenix mission, Renno was the first to theorize that the globules photographed on the lander's leg were actually beads of liquid saltwater. Liquid water is an essential ingredient for life.

Space Physics Research Lab engineers built the computer controls of the Sample Analysis at Mars instruments that Atreya will utilize.

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New Grants

October 2011 - February 2012
Principal Investigators are listed first followed by Co-Is

Sushil Atreya, *Atmospheric Composition and Hazes in Saturn's Ring-Shadowed North as Revealed by Cassini, $46,200, NASA-JPL; Scientific Exploration of Jupiter with Juno-Jupiter Polar Orbiter / Phase E,* $80,077, NASA-SWI
Jeremy Bassis, *CAREER: Bound to Improve - Improved Estimates of the Glaciological Contribution to Sea Level Rise,* $572,085, NSF
Stephen Bougher, *VEX Participating Scientist Program: SPICAV Investigation to Address Upper Atmosphere Dynamics,* $32,878, NASA-SWI
Michael Combi, *Using Hubble to Measure Volatile Abundances and the D/H Ration in a Bright ToO comet,* $15,000, NASA-Space Telescope Science Institute
Paul Drake, *Collaborative Research in Hydrodynamics and Radiation Hydrodynamics at High Energy Density, $367,330, DOE; Concept Development for Astrophysically Relevant Turbulence on NIF,* $70,000, DOE
Charles Edmonson Jr, *Mars Organic Molecule Analyzer (MOMA) Electrical/Electronic Subsystem Development (PR3),* $149,679, NASA
Tamas Gombosi, Xianzhe Jia, *Interdisciplinary Scientist (IDS) for the Cassini Interdisciplinary Magnetosphere and Plasma Investigation: MO&DA Efforts, Solstice Mission FY12 Supplement,* $120,000, NASA-JPL
Tamas Gombosi, *Mobile Weather Exhibit Supplement,* $14,815, NSF
Margaret Kivelson, *Cassini Magnetometer Investigation (MAG) Support FY12, $35,000,* NASA-JPL
Carolyn Kuranz, *Imaging scattered x-ray radiation for density measurements in hydrodynamics experiments on the National Ignition Facility,* $70,000, DOE
Enrico Landi, Richard Frazin, *Differential Emission Measure Determination in 3D using AIA data, $308,240, NSF*
Susan Lepri, *The Solar Orbiter Heavy Ion Spectrometer Phase B Bridge,* $192,886, NASA-SwRI
Ward (Chip) Manchester IV, *Interaction of ICMEs with Mars Atmosphere and Ionosphere and Its Implications for Atmospheric Loss,* $65,283, NASA-UCO
Joyce Penner, *Development of an Atmospheric Climate Model with Self-Adapting Grid and Physics-Supplement,* $28,300, DOE
Derek Posselt, *Development of Cloud and Precipitation Property Retrieval Algorithms and Measurement Simulators,* $50,000, DOE-UT
Nilton Renno, *MSL Science Operations: Supporting REMS, the Atmosphere and Environment Theme Group and the Overall Science Planning,* $495,702, NASA-JPL
Aaron Ridley, Erdal Yigit, *Space Debris Elimination,* $37,696, NASA
James Slavin, *Fast Imaging Plasma Spectrometer (FIPS) in Support of the Energetic Particle and Plasma Spectrometer (EPS) Investigation for the MESSENGER Mission to Mercury: Phase E* $183,000, NASA-Carnegie Institution of Washington
Gabor Toth, *SHINE: Understanding the Impact of Non-MHD Effects on The Coronal Mass Ejection Dynamics in the Inner Heliosphere,* $40,388, NSF-Boston University
Thomas Zurbuchen, Jason Gilbert, *Delta-doped Electron Multiplying CCDs for Particle Imaging and Photon Counting Yr 3,* $70,000, NASA-JPL

AOSS Faculty Accolades

Professor **Sushil Atreya** was appointed to the prestigious Committee on Astrobiology and Planetary Sciences (CAPS) of the National Research Council, National Academy of Sciences. The prime functions of CAPS will be to act as the organizing committee for future studies in the areas of astrobiology and planetary science and to monitor implementation of the recommendations contained in the Vision and Voyages planetary science decadal survey recommendations and in the reports drafted under the aegis of COEL and COMPLEX.

Assistant Professor **Jeremy Bassis** received the National Science Foundation 2012 Faculty Early Career Development (CAREER) Award for his project "CAREER: Bound to Improve – Improved Estimates of the Glaciological Contribution to Sea Level Rise." The NSF CAREER Award supports junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research.

Associate Research Scientist **Enrico Landi** has been selected to receive the University of Michigan College of Engineering Kenneth M. Reese Outstanding Research Scientist Award for 2011-2012. The Reese Award is given to non-tenure track faculty "who have demonstrated sustained excellence in research and related scholarly activities." Dr. Landi received the award for his outstanding contributions to our understanding of the physics of the solar atmosphere as revealed through UV, EUV, and soft X-ray spectroscopy and his leadership in the development of the CHIANTI spectral code, a widely used solar community research tool for the interpretation of spectroscopic observations.

Associate Research Scientist **Susan Lepri** became the first female AOSS space flight instrument PI when she took over as Principal Investigator for the Solar Orbiter Heavy Ion Sensor (HIS). Built for the European Space Agency's (ESA) Solar Orbiter mission, HIS will measure density, velocity, and temperature of the solar wind within approximately 21 million miles from the Sun to help forecast space weather and investigate conditions in the inner heliosphere. Solar Orbiter is expected to launch in 2018.

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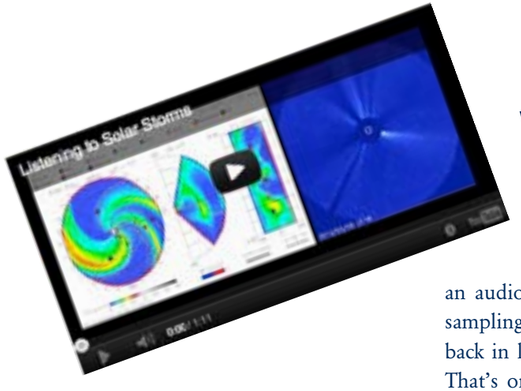


What does a solar storm sound like?

It's a "sonification" of measurements from two spacecraft during the most recent storm. Thanks to Robert Alexander (AOSS doctoral student of Prof. Zurbuchen and a member of the Solar and Heliospheric Research Group) you can find out in a new video, which was created from "sonifying" data from solar storm activity from two spacecraft into sound.

Alexander is a composer with a NASA fellowship to study how representing information as sound could aid in data mining.

For this project he used data from U-M's Fast Imaging Plasma Spectrometer (FIPS) instrument on NASA's MESSENGER spacecraft at Mercury, as well as from NASA's Solar and Heliospheric Observatory, which is about 1 million miles from the Earth.

To sonify the data, he began by writing 90 hours' worth of raw information to an audio waveform. But in its original sampling rate of 44,100 hertz, it played back in less than a quarter of a second. That's one of the benefits of sonifying data. You can zip through days' worth of information in an instant. To make sense of it, in this case, he had to run it through additional algorithms and find the right playback speed.

"This approach is changing the timescale for us," said Jim Raines, a lead mission operations engineer in the Space Physics Research Lab. "It's really interesting to hear it."

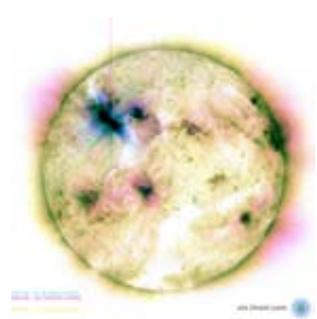
Sonification is the process of translating information into sound. It is used in Geiger counter radiation detectors, which emit clicks in the presence of high-energy particles. It's not typically used to pick out patterns in information, but scientists in the AOSS Solar and Heliospheric Research Group are exploring its potential in that realm. They're looking to Alexander to make it possible.

"Robert is giving us another research tool," Raines said. "We're used to looking at wiggly-line plots and graphs, but humans are very good at hearing things. We wonder if there's a way to find things in the data that are difficult to see."

Alexander has been developing this technique for several years. Late last year, his approach led to a new discovery. In some cases, it turns out, carbon ions reveal more information than oxygen ions about the regions of the sun where solar wind originates. Alexander's ear picked up on this possibility when he was listening to harmonics in different types of data from NASA's Advanced Composition Explorer satellite.

With this technique, he hopes to build a bridge between science and art.

"For a while, movies were silent and people just accepted that that's the way it is," Alexander said. "There's all this high res footage of what's happening on the surface of the sun, and it's silent. I'm creating a soundtrack."



Expect one solar storm a month

Michigan Engineering recently recorded AOSS Professor Tamas Gombosi talking about solar storms.

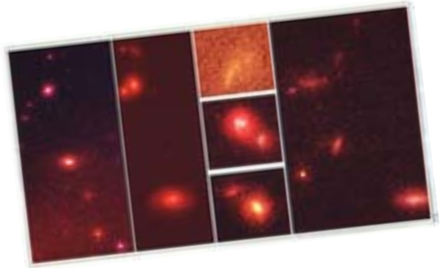
"We can expect an average of one solar storm per month over the next few years," says Gombosi. Gombosi is director of U-M's Center for Space Environment Modeling, which developed the prediction model that NASA uses. Space weather forecasting is where Earth weather forecasting was 20 or 30 years ago, Gombosi said. At this point, scientists can give a few hours notice of approaching coronal mass ejections from solar storms,but they are working to give more warning. Power grid-related issues caused by solar storms could cost trillions of dollars when you count the costs of fixing damage to the grid.

Slavin Elected AGU Fellow

AOSS Chair, Professor **James Slavin**, was named a 2012 American Geophysical Union Fellow. To be named an AGU Fellow is an honor given to those who have made exceptional scientific contributions and acknowledges their eminence in the Earth and space sciences. Professor Slavin was recognized for "fundamental contributions to the understanding of the solar wind interactions with the planets and the structure and dynamics of the Earth's magnetosphere."

Slavin has served or is presently serving as a Science Investigator on 19 space science missions including the Cluster, Space Technology 5, MESSENGER, Magnetospheric MultiScale, and BepiColombo missions. During his 30 years with NASA, he served as director of the Heliophysics Division at NASA Goddard, has held leadership positions in the Electrodynamics Branch and in Magnetospheric Physics at NASA Headquarters in Washington, and was a planetary scientist at NASA's Jet Propulsion Laboratory, Pasadena, Calif. Slavin is now a professor at the University of Michigan and chair of the Department of Atmospheric, Oceanic and Space Sciences Department.

2012 AOSS/SPRL Staff Anniversaries

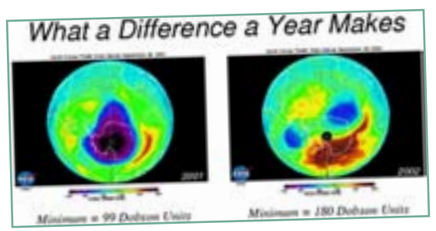


This year five staff members are celebrating "decadal" length of service anniversaries. Lead Research Engineer Ryan Miller will celebrate his 20th anniversary at the University on June 29, 1992. Other not-so-significant events on that day were:

- Two earthquakes, one measuring 7.4, hit southern California
- Hubble Space Telescope Sky Survey Reveals Embryonic Galaxies

Four staff members began their U-M careers in 2002. Robb Gillespie, Senior Mechanical Technician in SPRL, started on January 2; Melissa Terwilliger, Data Security Analyst, began at U-M on April 8; Senior Administrative Assistant and Assistant to the Chair Kristi Hansen joined AOSS on May 23; and Rachel Long, our new HR Coordinator, started at the University on September 30. 2002 events of interest:

- The number one song on January 2 was "How You Remind Me" by Nickelback.
- A UFO was sighted over Virginia on January 2.
- USA Today ran a story, "Self-help from 10 Geniuses" on April 8.
- On May 23, the birthday bash for the Brooklyn Bridge was canceled.
- On May 23, we all got our first look at Netscape 7.0.
- Hurricane Lili battered the Cayman Islands on September 30.
- September 30 also saw the Antarctic ozone hole split in two.



A galactic magnetic field in a lab proves astrophysical theory

by Nicole Casal Moore

Editor's Note: AOSS Professor Paul Drake's collaborative work into how the magnetism of the universe got started, which was published in the January 26, 2012 issue of Nature, caught the attention of several prominent news services, including MSNBC, Discovery News, Space.com, and Cosmos Magazine.

Why is the universe magnetized? It's a question scientists have been asking for decades. Now, an international team of researchers including a University of Michigan professor have demonstrated that it could have happened spontaneously, as the prevailing theory suggests.

"According to our previous understanding, any magnetic field that had been made ought to have gone away by now," said Paul Drake, the Henry S. Carhart Collegiate Professor of Space Science and a professor in physics at U-M. "We didn't understand what mechanism might create a magnetic field, and even if it happened, we didn't understand why the magnetic field is still there.

"It has been a very enduring mystery."

With high-energy pulsed lasers in a French laboratory, the researchers created certain conditions analogous to those in the early universe when galaxies were forming. Through their experiment, they demonstrated that the theory known as the Biermann battery process is likely correct.

Discovered by a German astronomer in 1950, the Biermann process predicts that a magnetic field can spring up spontaneously from nothing more than the motion of charged particles. Plasma, or

charged particle gas, is abundant in space.

Scientists believe that large clouds of gas collapsing into galaxies sent elliptically shaped bubbles of shockwaves through the early universe, touching off flows of electric current in the plasma of the intergalactic medium.

Anyone who has built an electromagnet in middle school science class is familiar with this concept, Drake said.

"If you can make current flow, you make a magnetic field," Drake said.

The question in astrophysics was what could have generated the current. This experiment demonstrated that such asymmetrical shockwaves could do the job.

The results, Drake said, aren't particularly surprising. But it's important for scientists to test their theories with experiments.

"These results help strengthen the understanding that we've taken from our interpretation of astrophysical data," Drake said. "And understanding the universe and most definitely the origin of life is one of the great human intellectual quests."

The paper is titled "Generation of scaled protogalactic seed magnetic fields in laser produced shock waves." Other co-authors are from the University of Oxford, Rutherford Appleton Laboratory, Laboratoire pour l'Utilisation de Lasers Intenses, the University of Strathclyde, the University of California-Los Angeles, the University of York, the Institute of Laser Engineering at Osaka University, Lawrence Livermore National Laboratory and Wolfgang-Pauli-Strasse. The work is funded by the European Research Council, Laserlab-Europe, the Science and Technology Facilities Council, and the Engineering and Physical Sciences Research Council of the United Kingdom.

Out of Thin Air: The Art of Climate and Weather Modeling

Originally posted by the U-M Office of Research Cyberinfrastructure

Crunched out of data by computational methods – and soon to be rendered with visualization software on Flux – **Derek Posselt's** climate and weather models reveal how changes in the earth's global mean temperature can influence the weather where you live.

The challenge in this field, says Posselt, an AOSS assistant professor, is now regional. While scientists have developed a good knowledge base of global trends, Posselt is interested in fine-tuning that information down from scales that are thousands of kilometers wide to those as small as 10 meters. These "local scales" are where clouds and rain form, influenced by feedback mechanisms that scientists don't yet fully understand. "That's my entrée into high-performance computing (HPC)," says Posselt. "We can use HPC to represent a wide range of those scales – both the large scales that drive change, and the local scales that respond." It's a fast evolving process: since clouds constantly change, the data generated by models comes at both high time and space resolutions.

To recreate the astonishing complexity of clouds in the global climate system, Posselt keeps track of more than 50 different model output variables, using data sets that describe factors like thermodynamics, fluid flow, radiation, vegetation, cloud droplets, ice crystals, and others. Models are initialized using observations of the real world, simulations are run, and the output is compared and combined with more observations to infer the state of the system. All models have some degree of uncertainty associated with assumptions made in the representation of clouds and rainfall. To fine-tune the model, Posselt chooses sets of cloud parameters that scientists know to be important but are unconfirmed by empirical data. He checks their observed ranges in the literature and solves a large inverse problem where he estimates the sensitivity of all the parameters together.

Working with a model that is sensitive to so many different variables has its own challenges. "When you try and map a change in one parameter to a change in the output, it's tremendously difficult to understand what that relationship looks like – there has to be an intermediate way. What I'm looking for now are ways to reduce the dimensionality of the system and the computational burden while preserving the realism of what we're looking at."

Posselt hopes that soon he will have a new way of visualizing his models: he is experimenting with using visualization software, VisIt, on Flux. "People have been producing the same sorts of plots for decades – line, contour, etc. – on their desktop. If they have a gigantic dataset, they'll buy a bigger desktop workstation with more RAM – even if it takes forever to generate one contour plot. People don't have a good understanding of the power of distributed visualization tools…. But as a faculty member, you also have so little flex time [to learn new software] that you'll keep using the same tools. This is a fairly big hurdle for people." For assistance, Posselt has been working closely with Brock Palen at the CAC to verify that he can use VisIt on his data. Visualization of the large datasets he is using requires rendering to be split over 96 cores on Flux. His next step is to ensure that his data can be geo-referenced to a map of the earth's surface. He is also exploring the possibility of viewing his results on the MIDEN (formerly known as the Cave) at the UM3D Lab in the Digital Media Commons. "We're excited to see what we can do with distributed visualization that we couldn't do with one processor."

SPRL technician is a pilot and amateur radio operator

by Zach Bucholtz University Record intern

Photo by Scott C. Soderberg, U-M Photo Services

Whether it's building radios in his free time or flying a small airplane around the state of Michigan, Dave Boprie's personal interests have enhanced his career.

An amateur pilot and self-described "radio enthusiast," Boprie, a senior electronics technician at the Space Physics Research Laboratory on North Campus, uses his skills to build components for space research instruments, often working with NASA.

His interests in radio, in particular, have served him well in his position with the university. When the Department of Atmospheric, Oceanic and Space Sciences hosted antennae from the Department of Electrical Engineering and Computer Science, EECS 430 GSIs asked Boprie to help set up experiments and work with their students.

Boprie, who has multiple associate's degrees from Washtenaw Community College and has been building radios since he was 8 years old, says he has learned a lot from students.

"I want to say thanks to all the students who I've been privileged to work with," he says. "They have taught me so much engineering over the years. Some students have come up with new and interesting ways to approach a problem or project."

Boprie, who is licensed by the FCC, also has built small radios but spends most of this radio time sending and receiving communications, sometimes from across the planet. He's also a member of the student amateur radio club at U-M –W8UM.

"The challenge of it is to use the least amount of power to communicate with another person," he says. "(And) there is always the challenge of picking out a weak signal from the other side of the planet and making sense of it."

Boprie also has been a member of the Michigan Flyers, a club for amateur pilots, for the past 10 years. He flies small powered aircraft, usually twice a month.

"A couple of my relatives are professional pilots, so I've always been around airplanes," he says. "I feel safer in my small airplane than I do in my car or my bicycle."

With his job at the Space Physics Research Laboratory, Boprie works with a team of engineers and technicians to build hardware components (and occasionally entire instruments) used to study outer space. Often, his laboratory works to build parts for NASA.

Boprie has worked on instruments that have been sent to study Mars and Saturn, and sometimes the satellites for which he builds parts are ground-based or high-altitude balloons.

He has traveled to Antarctica to support a NASA/U-M balloon project, and also served in the Air Force, where he was stationed in Grand Forks, N.D.

"After three polar trips, the coldest place I ever lived was North Dakota," he says.

That might come as a surprise, considering he once spent the night in an igloo in Antarctica. One of his missions there was to prepare in case an airplane made an emergency landing over the continent, and he went through a survival school to learn relevant skills, including how to build an igloo.

Boprie also has an interest in protecting the Earth as much as possible. A graduate of nearby Willow Run High School, he lives in Ypsilanti with his wife, Martha, who works in the Division of Nephrology at the university. She has encouraged her husband to ride his bicycle whenever possible.

"We try to be good stewards of our natural resources," he says, adding his family is the only one in the neighborhood that uses a push-reel mower to cut the lawn.

Opportunity for a vision: climate/atmospheric science retreat

Back row: Xianglei Huang, Jim Slavin, Joyce Penner, John Boyd, Chris Ruf, Nilton Renno, Tony England, Guy Meadows, Jeremy Bassis, Darren McKague, and Ricky Rood. From row: Mary Anne Carroll, Perry Samson, John Barker, Christiane Jablonowski, Aaron Ridley, Allison Steiner, Roger De Roo, Mark Flanner, Kristi Hansen. The meeting was facilitated by Diana Kardia of the Kardia Group, LLC.

On February 11-12, 2012, the Climate/Atmospheric branch of the Department of Atmospheric, Oceanic and Space Sciences and some members of the Space faculty retreated to the Kellogg Hotel and Conference Center in East Lansing to escape the fragmenting interruptions of the daily grind and focus on trying to come to a clear vision of the goals of the group, and to find ways to share that vision outside the group.

Toward that goal, four teams were created:

1. A project team tasked with identifying a "grand challenge" science focus to unify and energize the group's science and collaborations.
2. A curriculum change team to refocus the undergraduate and Masters degrees.
3. An outreach team tasked with articulating the group's mission and identifying strategies to communicating it.
4. A synthesis/steering team to aid communications between the other three teams and keep them focused, and to coordinate with departmental leadership.

The research carried out (primarily) on the east side of the Space Research Building can make a difference in people's everyday lives. They already have, and will continue to find ways to more accurately predict the climate, predict the environmental impact of people's actions, and help them figure out what they can do differently to minimize risk. By seeking a better understanding of the dynamical processes of the Earth and planets, as well as the interactions between land and the atmosphere above it, these researchers can help people put this knowledge to use to improve their lives.

At least they can, if they can get their findings out past the jargon stuffed pages of scientific journals and into the minds of the guys and gals who step out of their garages on a Saturday, gaze up at the puffy white clouds, and wonder if today is the day to spread that fertilizer on their lawns.

Photographing the solar system

AOSS CSEM Programmer Jeff Kopmanis is staying up late these days, taking photographs of the solar system. He took great photographs of planets over Easter weekend. On Friday night, despite turbulent upper air, Kopmanis captured a video tour of the full moon. The turbulence creates a shimmering effect on camera.

The photo to the right is from a film Kopmanis took April 2. "I picked out the images from the movie one-by-one based on their computed image quality before starting any processing. Each frame individually looked like a throw-away, but the software allows you to pick images based on quality analysis, and by racheting the minimum quality up, you reduce the number of frames, but you also increase the quality."

You can view more photographs on the AOSS Facebook Page. [**http://www.facebook.com/umaoss**]

AOSS students carry out missions at JPL

by Sheila Pursglove

Nine AOSS students – seven from the AOSS MEng Space Engineering program, one in MSE Aerospace Engineering, and one studying for a PhD in Aerospace Engineering – spent two January days at JPL in Pasadena working on two space mission concepts with JPL engineers and scientists.

The first project, CajunSat, is a low cost mission focusing on the coastal regions of Louisiana to monitor tidal zone changes (land/ocean fraction change and land vegetation growth monitoring). "This mission allows scientists to assess the impact of regional and global climate change on the Mississippi delta region, a key region economically for the area and a leading indicator for global climate change as it impacts sea levels and coastal zone erosion," says Space Engineering advisor and Assistant Research Scientist Darren McKague, who led the group.

The second project, DUST – Distributed Universal Satellite Technology System – is a system to provide low cost constellations of reconfigurable, modular small satellite constellations for scientific and public outreach purposes. This low-cost architecture allows a wide range of customers (from scientists to primary and secondary educators to the general public) to fly projects in a distributed network of small satellites in a cost effective manner. "This increased access to space allows for innovations in science as well as spurring increased interest in space missions amongst the general public," McKague says.

The work at JPL focused on exploring the feasibility of each project, including scoping out project costs, key risks, key markets and customers, and developing plans for next steps in securing funding to fly the missions. "The goal was to identify opportunities that UM and JPL could compete for together to further each mission as well as our common goal of flying interesting, relevant space missions," McKague says.

Students were given access to professional expertise to develop their missions. "This helped not only the mission, but more importantly it helped the students see how mission ideas are developed in to flight opportunities," McKague says.

Day One started with presentations from students on their mission concepts; Day Two wrapped up with summaries of the results of the on-site studies and the next steps for the missions. "It was very noticeable how much both the mission concepts and the way in which the students spoke about their missions in general had matured in just two days," McKague says. "That's what I most enjoy – seeing the tremendous increase in the level of maturity on behalf of the students in the way they approach developing space missions. That's exactly what our program is all about."

When these students leave U-M, their success will depend upon how well they are prepared to deal with real-world problems in their chosen field, McKague says. "As an educator, I want to give them the best possible chance at success. Giving them this type of hands-on real-world project work is a huge part of that."

This was McKague's first trip to JPL with students. "We've often had one or two JPL engineers come to U-M to help with hands-on projects, but this is the first time taking the students to them instead. We'll do it again next year –we're already lining up new missions for the next round, all of which – like last year – come from the students themselves."

"IT'S ONE OF THE FEW PROGRAMS THAT PRODUCES TOP QUALITY ENGINEERS"

When starting a career there are often a few gaps between how things worked in class and how they work in the real world. The AOSS MEng program fills those gaps by asking industry experts to propose projects for student teams.

"I try to bring an industry perspective to what they teach students," says Bob Fiete, MEng advisory board member and chief technologist for Exelis Inc.

"It sounded like a great way to give students real-world challenging problems," says William Blackwell, representative from the Massachusetts Institute of Technology Lincoln Laboratory.

Lincoln Laboratory proposed the SpiCOLI (Spinning CubeSat Ocean/Land Imager) project. Students were asked to investigate which geophysical measurements are possible utilizing the 6U CubeSat form factor. Team leader Michael Munoz says their project challenged them because "there was a lot of back and forth, going back to the drawing board."

For example, when selecting a spin up actuator, the SpiCOLI students had to choose between a commercial off the shelf wheel, custom wheel, or magnetic torquers. After weighing pros and cons of each, the students chose magnetic torquers because they are commercially available and could achieve the desired spin rate.

The project challenges go beyond engineering.

"The hardest thing for me being team leader is to understand the working dynamics of a group of people," says Charles Galey, team leader for DUST (Distributed Universal Satellite Technology). Galey says the experience taught him about scheduling and funding.

Industry experts recognize that AOSS MEng students are prepared to start a career. "It's one of the few programs that produces top quality engineers," says Andrew Driesman, MEng board member and program manager for the Johns Hopkins University Applied Physics Lab space department.

AOSS MEng in Space Engineering Advisory Board

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Battel Engineering

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John Crawford
Jet Propulsion Laboratory

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Applied Physics Laboratory

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Kartik Ghorakavi
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Michael Lindsay
NASA Ames

James Munger
Northrop Grumman

Carlos Niederstrasser
Orbital Science Corp.

Fun for kids and adults alike

Want some fun and help build some excitement for Curiosity's landing on Mars? Why not send a postcard to Spirit, the Mars rover that hasn't been heard from in more than two years while its twin rover Opportunity has recently awoke from its annual hybernation period.

To send Spirit a postcard, visit: [**http://beamartian.jpl.nasa.gov/spiritpostcards**]

HR Era Ends as Griffin Greets Retirement

by Deborah K. Eddy

For nearly 46 years, the first stop for confused, eager, semi-lost, or raring to go SPRL/AOSS newbies was Sue Griffin. Over the years Sue mastered HR – even as U-M insisted on rolling out change after change after change. She was there to guide each of us through the processes making us functioning parts of the University of Michigan ... and got us paid!

For Sue it began in December 1965 when she worked for Phil Brooks in the Research Administration Building, what is now ORSP. Though Sue and Phil parted ways for a time, as Sue followed her husband to Texas then Korea, she, like so many others, was drawn back to the University in October 1969. By that time Mr. Brooks had moved to the Space Physics Research Lab, working as assistant director under George Carignan. "I was looking for a job," Sue recalls, "they had one open, and when I came in Phil told Marti [Moon] to hire me."

photos courtesy of Marti Moon

Sue began as a secretary, with no idea as she started helping with, then took over, the hiring of students and staff for SPRL, just how her job would eventually evolve to be totally subsumed by the challenging intricacies of human resources. SPRL was growing, demanding more and more staff, engineers, and technicians, and Sue discovered she was a natural at the job of welcoming and orienting everyone to their new positions. "[HR] wasn't a title, it was just part of my job, but it kept growing as SPRL grew ... I really liked it," she said.

In those years, SPRL was the place to be. "The people, the things we were doing. Putting instruments together almost literally with what we now call rocket tape" [a.k.a. duct tape].

"People would bring in their TVs from home and we would put them in the lab or in a conference room. And we got to listen to the launches and everybody cheered.

"It was a grand time in space research. Not just in the Lab, but also in space research … and the Christmas parties were legendary. So many people, so much food, and they were all in the building. The majority of people participated, and that was just a really great time. SPRL was a lot of fun to work in."

This March, we gathered in the AOSS lounge to thank Sue for her many, many years with the department and to express how much she has meant to us. AOSS Chair Jim Slavin pointed out all the changes Sue has survived in her 45+ years: eight SPRL directors and eight department chairs ("Sue, was it something I said that made you decide to retire?"), two departmental name changes, students who have returned as faculty, building additions, mimeographs to desktop computers, etc. etc. etc.

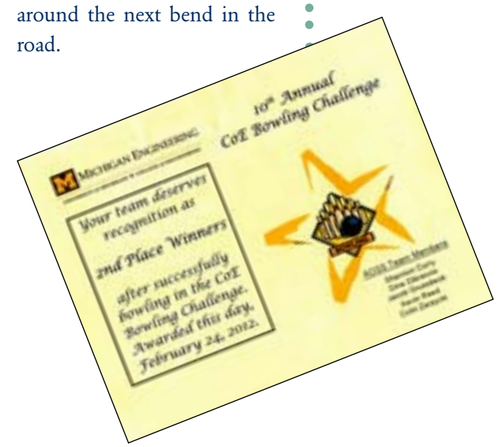
George Carignan, AOSS Research Scientist Emeritus and Sue's first boss in SPRL, wondered how they had managed to surround themselves with so many attractive young women, and how they managed to get any work done. "Sue Griffin was prominent among those lovely young women and it is gratifying to see that she has maintained her beauty right up until today."

Lorelle Meadows (CoE Director of Academic Programs), speaking for herself and her husband, AOSS Professor Guy Meadows, said what a blessing Sue was when she (Lorelle) was a new AOSS student. She still uses the recipe for bran muffins that Sue shared with her. Andy Nagy said Sue was so nice, he couldn't think of anything embarrassing to "roast" her about. And Bill Kuhn agreed, Sue is ever so nice. However, he advised, don't mess with her plants.

While the smile of new HR Coordinator Rachel Long is greeting AOSS newbies it will be forgiven and understood if Sue's grin is now a bit wider and a bit more relaxed, as she looks across the table at husband Bill over a leisurely brunch and dilly-dallies a while before deciding what she feels like doing that day – albeit with lots of memories and a bit of nostalgia.

Sue and Bill have some time before packing up for their next great adventure; before they gather their tent and their new hiking poles and set off to see the USA (though not in a Chevrolet).

And Sue can be assured that those who hustle through the SRB will now and then pause as they pass room 2207 or gaze into the courtyard searching for baby ducks, and smile as they wonder what Sue is striding past or discovering around the next bend in the road.



Reische moves to Iowa

On January 18, AOSS Finance Manager Aimee Reiche embraced familial solidarity and left the department for the wilds of Grinnell, Iowa, where he husband Jim is now vice president for communications at Grinnell College.

Aimee, who started with AOSS in the JGR office in October 1999, moved to be the administrative assistant for Tamas Gombosi and Andy Nagy's group in January 2001, and in the spring of 2003 moved to research administration for the CSEM group, eventually taking on more faculty members. And, when Tamas moved into the AOSS Chair position, Aimee added assistant to the chair duties until relinquishing that role in 2005.

Aimee says she "was lucky to end up in such an...interesting place."

We miss you Aimee. Good luck!

WHEN IT RAINS, IT POURS

Following the retirements of Bobbi Walunus in 2011 and Sue Griffin this year, we have three more retirements to announce. Professor Guy Meadows, who started his U-M career in 1977, will be retiring on May 29. After 26 years, AOSS Graduate Student Services Coordinator Margaret Reid will be retiring and Bob Lundgren, SPRL Lead Research Engineer, will also be leaving to enjoy the life of leisure. Margaret and Bob will be retiring on June 29.

Be on the look-out for more retirement parties fun in the next Daily Planet.

AOSS Student Accolades

AOSS meteorology students have been members of previous Solar Car teams as weather forecasters, but in a first, AOSS meteorology undergraduate **Jordan Feight**, has been selected as the Race Manager for the 2011-2012 U-M Solar Car Team. Since its establishment in 1990, the team has built 11 vehicles, won the American Solar Challenge six times, placed third in the World Solar Challenge four times and is recognized as the most successful team in North America. Jordan will be managing the Quantum Solar Car Team this summer as it competes in the latest American Solar Challenge: a 1600 mile route starting in Rochester, NY on July 14 and ending in St. Paul, MN on July 21.

AOSS junior **Christopher Koh** earned third place in an Arts @ Michigan photography contest. The As I See It competition focused on travel. Koh's winning photograph, Good Luck Exploring the Infinite Abyss, was taken at the Los Angeles Airport.

Recent graduate **Emily Potter**, with her team partner Public Health MS student Jessica Lai, won a new business model competition for "Yo Mama packed it," a healthy food delivery service for students. Emily was an MEng in Space Engineering student.

Three Outstanding Student Paper Awards

Shannon Curry, **Gina DiBraccio** and **Dan Gershman** were selected by the Space Physics & Aeronomy Section of the AGU to receive Outstanding Student Paper Awards. The papers were presented in December at the 2011 AGU Fall Meeting

Winning Presentations:

Shannon: *Model comparison of oxygen ion loss at Mars* (Advisor: Mike Liemohn)

Gina: *MESSENGER observations of magnetopause structure at Mercury* (Advisor: Jim Slavin)

Dan: *Observations of interstellar helium pickup ions in the inner heliosphere* (Advisor: Thomas Zurbuchen)

Recent AOSS Alumnus, Dr. **Kevin Reed,** is the first U-M student selected for the American Geophysical Union (AGU) Congressional Science Fellowship.

Reed says his year-long fellowship, located in Washington, DC, is "completely open ended. I won't be doing research at all. I'll be a typical staffer with science as my specialty."

Although there are no guarantees, Reed hopes to get into an office that's interested in climate change.

Reed received his BS in physics from the U-M, and says he was attracted to AOSS for graduate school because of his "interest in studying atmospheric science. I wanted something policy relevant."

He says one of the benefits of being an AOSS student was the ability to travel often. "It broadened my view of the field," Reed says.

During his travels, Reed was happy to come from a school everyone knew.

"It's huge, it's well-known around the world. Even in Peru – when I traveled there – people knew about the University of Michigan."

When he completes his fellowship, Reed says he plans to "return to research."

AOSS 2012 Student Award Winners

Doctoral student **Dan Gershman**, received the Richard and Eleanor Towner Prize for Distinguished Academic Achievement, presented to the outstanding graduate student in each degree program.

A native of Cheltenham near Philadelphia, Dan earned his BS in Electrical and Computer Engineering from Cornell University, with a minor in Mechanical Engineering, before joining the Maize and Blue.

"U-M/AOSS seemed like a place that had a lot of different strengths in space research, with opportunities to interact and learn from a variety of researchers and scientists, not just those focused on space," he says. "It turns out that was 100 percent true!"

"I think the most challenging but also the most exciting and rewarding aspect of this field is taking only a few measurements from a spacecraft a million miles away and trying to learn something new about the solar system."

Over the last few years Dan has volunteered at 826Michigan in various capacities ranging from tutoring to leading writing workshops for local students, and in 2010 received a Volunteer of the Month award.

"I love 826Michigan, it's the best place ever," he says. "This past summer, fellow AOSS grad student Kristen Mihalka and I organized a series of writing workshops about space featuring a special guest AOSS scientist for each one. We got such great participation, support, and enthusiasm from the department and faculty – it really made me proud to be a part of it."

Beth McBride, received the Distinguished Achievement Undergraduate Award, presented to the outstanding undergraduate in each degree program.

A native of Rochester Hills, Michigan, Beth had set her sights on a career in engineering, but didn't know what field she wanted to study.

"I've always been passionate about the environment, and I wanted to be able to make a difference in the world somehow. AOSS seemed to be a good combination of my goals and passions.

"I couldn't be happier ... I've loved the size of the department, with smaller class sizes and a lot of interaction with professors, and I've been able to have such a broad education."

Beth took courses in policy, dynamics and modeling, and was exposed to many different problem-solving methods. She supplemented her education with German classes including courses in German for Engineers and a Sculpture and Welding Course taught in German.

Beth is co-president of the U-M American Meteorology Society Student Chapter, a member of the Undergraduate Student Advisory Board (USAB) , and serves as Director of Strategic Planning and Resources for the Society of Women Engineers.

After interning this summer at Intel Corporation in the Environmental Health and Safety Department, Beth will return as a student in the AOSS Applied Climate MEng program. "I'm honored to receive this award, and I'd like to thank those who nominated me," she says.

Ninth Annual MGU Symposium

"I've always been excited about space in general so when I had the opportunity to study it, I jumped at it," **Gina DiBraccio** said.

DiBraccio, an AOSS doctoral student, earned first place among AOSS students at the 9th annual Michigan Geophysical Union student research symposium. Her presentation was: *MESSENGER Observations of Magnetopause Structure at Mercury*. She said her research shows that the effects of the sun on Mercury's planetary field are much more intense compared to the effects on Earth's planetary field.

The event was held on Friday, April 13, 2012. AOSS professor John Barker started the annual symposium. "The idea is that the students do pretty much everything, and they do a very good job with that," Barker said.

Carlos Di Stefano earned second place for his work: *Proton Diagnostic Performance in Laser-Driven Hydrodynamics*.

David Wright earned third place for: *Sensitivity of Lake-Effect Snowfall to Lake Ice Cover in the Great Lakes Region*. "We saw that removal of ice impacted the placement of snow, and the lake temperature impacts the intensity of snow," Wright said.

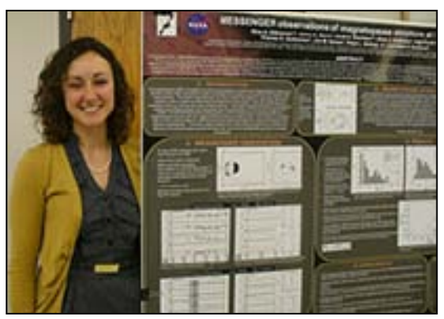
AOSS students **Xiangyun Zhang** and **Alex Bryan** were honored as finalists.

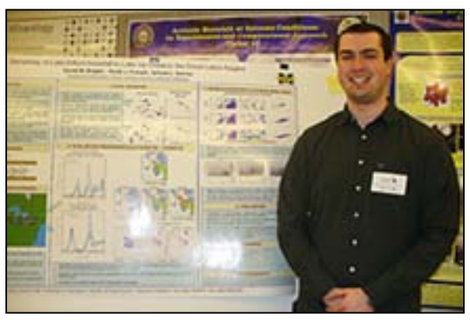
'12 MGU AOSS STUDENT ORGANIZING COMMITTEE

Alex Bryan
Gina DiBraccio
Rachael Kroodsma
Zhenguang Huang
Prof. John Barker
Sandra Pytlinski

'12 MGU AOSS JUDGES

Mark Flanner
Mark Gardner
Enrico Landi
Mark Moldwin
Bart van der Holst





Putting the "O" in AOSS

Students conduct research aboard the R/V Laurentian

by Sheila Pursglove

Nineteen AOSS seniors and grad students from Professor Brian Arbic's AOSS/EES 421 class in Applied Ocean Physics joined Arbic and AOSS Professor Guy Meadows on a March weekend ship cruise aboard the Research Vessel Laurentian from the Great Lakes Environmental Research Laboratory fleet.

The group left U-M on Friday, March 23 and spent the night onboard a ship in Muskegon harbor. The research cruise left the dock at 8 a.m. the following day, returning to dock at 4:00 PM, after which the group drove back to Ann Arbor.

"It was a long two days," Meadows says. "The students all did very well – and no sea sickness. I was very proud of their conduct on the government vessel."

The 80-foot, 129-ton steel-hulled vessel went 6 km offshore from Muskegon, where the water was 40 meters deep. Thankfully Mother Nature cooperated, even if a mysterious target on the bottom of the lake did not.

"It was great on Saturday and calm. It got bad after the students left and caused cancellation for the next research effort, which was mine," Meadows says. "I like the student ship cruises to be as realistic as possible – students were given the mission of locating a target on the bottom of Lake Michigan that previously appeared on a Side Scan Sonar image last fall."

The students were responsible for organizing all aspects of the research vessel cruise to accomplish that goal. Tools at their disposal included a digital side scan sonar, remotely operated vehicle with video camera, imaging sonar and articulated arm. The ship has an assortment of cranes and winches for deploying instruments and sampling gear including Conductivity/Temperature/Depth sensor (CTDs), bathythermographs (BTs), Niskin bottles for collecting water samples, gravity and piston corers, and grabs. Students conducted all standard oceanographic sampling, such as biology, bottom sediments, and water samples, in the 488-square-feet of wet and dry labs that offer equipment for processing chemical, physical, and biological samples.

"Michigan is known for intense technical preparation," Meadows says. "Students also need real world experiences to place their studies in context.

"They always find it's not as easy as it looks – even knowing where the previous contact was located, it was still impossible to find, even with the most advanced underwater search tools available. It's a humbling experience!"

Meadows tries to offer this experience for student every year. "It's just too valuable of an experience to pass up."

Arbic is thankful that Meadows offered to take the students out on a research cruise this year. "I went on three research cruises as a graduate student and view them as an important part of my education. As a modeler I think it's important to get a sense of how measurements are made at sea," he says. "I agree with Guy that trips like this are too valuable to pass up, and I hope to make a trip like this part of the course next year and beyond."

From the *Daily Planet* Archives: The Clauer Curse

September 1992, Vol. 7, No. 8: Clauer's Curse by Stephen Quigley

Statistics...Ha! What do they really prove? This I ask myself as I sit in fear, waiting.... waiting. And I write this little bit of script with the expressed hope of belaying that fear...hope that exposure might cause fate (in the guise of Dr. C. Robert Clauer?) to steel away and leave me alone.

Yes...Dr. C. Robert Clauer...mild-mannered scientific research intellect, or scheming, heartless brute equipped with the mystic powers of a hobgoblin???...the question asked now by one of the few remaining students of the good doctor who has not yet come to bodily harm. I don't know the answer.

The facts: Over 66% of Dr. Clauer's students have had nasty "accidents" within the past several months.

May 7, 1992: Mike Weiler (undergrad research assistant) injured his knee (torn cartilage) while playing basketball. He was in a cast and required crutches for 4 weeks.

May 22: Scott Egbert (undergrad research assistant) injured his ankle (torn ligaments) while playing basketball. He too required a cast and crutches for 4 weeks.

June 21: Marie Cooper (graduate student) nearly drown twice, injuring her fingers, experienced hypothermia, and received second degree burns requiring a hospital visit during a rafting trip in Colorado. Physical and mental recovery took nearly two weeks.

July 1: Bob Sitar (graduate student) had his leg broken during a snowmobile accident on the desolate ice of Greenland. Guess who the uninjured driver was. Bob required surgery, a metal rod inserted down through the very marrow of his bone, and is to this day, recovering with the aid of crutches and the emotional support of his fellow classmates.

Coincidence, or curse? A questions that has baffled ancient men for eons when dealing with the awesome powers of nature, and one that rears its ugly head now in the learned halls of the Space Research Laboratory. I don't know the answer to this question either, and being the scientist that I am, I refuse to look for the voodoo dolls and other paraphernalia that some less skeptical friends beg me to seek out and destroy. My more mathematical friends, too, offer little in the way of comfort. Some of them argue the evidence portends impending doom, while others cite the same data as proof of my near complete safety from imminent harm. Nevertheless, they all seem to be keeping their distance. They always seem to have something else to do when I mention lunch out or a movie at my place, and they keep pointing out the fact that six "bystanders" were thrown out of Marie's raft ("into the rushing water and jagged rocks below!") during her unfortunate incident.

But what'a a guy to do? Is there a pattern to discern from the order of the accidents? Indeed, does Dr. Clauer have any past history of student/worker mishaps? My own queries failed to turn up any evidence concerning the latter [It seems that all official records concerning the good doctor's previous employees (alive or dead) have disappeared, and coworkers at his prior work sites (San Francisco, Krakatau, and Mt. Saint Helens) refused to comment], and the former (a pattern) seems open to discussion. There is a good correlation between the time of "accident" and the injured party's birthdate (75% occurrence within a few weeks of each), but patterns can also be seen concerning status, time hired, level of intelligence, and financial security. Either way, I'm one of the last in line for "The Curse". In fact, with the not-so-surprising departure of student worker Tony Castelletto (to another (safer?) faculty member in the same department), there are only two uninjured students left in the employ of this Clauer Being. One, Paul Miller (graduate research assistant) has an upcoming birthday that looms, like the sword of Damocles, dangerously close at hand (Sept. 21) -- dreadfully coincidental with the autumnal equinox and all its sacrificial rites! Yet he seems completely unperturbed, even comfortable, with the aforementioned events and analyses. Perhaps he's just one of those total skeptics - a pure scientist, or perhaps he knows something that I don't. Could this be a conspiracy of Twilight Zone proportions? Has some money changed hands!!?

No Matter. All I have to say is that my birthday is in December; that my respect for Dr. Clauer is immense [I absolutely love the man, the scientist, and the boss. I could practically kiss the ground that he walks on (and may have to do so if he required it)]; and that my skydiving plans have been put on hold. Aside from that, I wipe the sweat from my brow and shake my fist at the statistics of possible fate. "Do your worst!"

AOSS Happenings

Vicki and Jason Gilbert (AOSS Asst. Res. Scientist) are proud parents -- again. Ella Jane Gilbert was born on April 12, 2012, at 7:34 pm, 7 lbs and 19 inches long. Ella Jane's sister and two brothers had big grins too.

Grampa Tamas introduces us to Leah Madeline Gombosi, born January 10, 2012, at 6 lbs 6 oz and 19.75 inches to proud parents Alison and Zoltan Gombosi.

Please greet Ethan Henry Pawlowski, brand new son of Lindsay and Dave Pawlowski (former AOSS Adjunct Asst Prof, now with EMU). Ethan came into this world at 2 a.m. on April 25, 2012.

Mark Flanner and his wife Katie are excited to announce the arrival of Adela Cecile Flanner. "She was born at 7 lbs 1 oz on her due date, December 5 at 3:29 am (demonstrating punctuality clearly received from her mother)."

Youna and Paul Ullrich (AOSS Postdoc with Christiane Jablonowski) are happy to announce that on March 31, 2012, at 1:35 pm, their son Addison Ferenc Ullrich arrived to the world! He came in at a hefty 7 lbs 9.3 oz and 22 inches long. Dad says Addison has been quite inquisitive since his arrival.

Brook Lupi, daughter of AOSS Administrative Assistant Barb Lupi, was featured on Detroit's Channel 7 Action News February 11, 2012 in her amazing leap for the goal during a Little Ceasar's Under 16 hocky game. See the entire clip at: http://www.youtube.com/user/wxyztvdetroit#p/u/2/5FbawJJi5jc

ALUMNI OBITUARIES

Captain Glenn H. Brink (BSEAA '39), December 25, 2011
Daniel J. Clarke (BSEAA '41), November 7, 2011
William A. Dart (BSMTL '50), December 2, 2011
Milton Fishman (BSEAA '48), October 27, 2011
Howard Justin Ide (BSEAA '39), October 20, 2011
Charles R. Isleib (BSMTL '48), January 27, 2011
Donald W. Kuite (BSEAA '48), January 13, 2012
Frederick Bishop Sleator (BSEAA '43), December 30, 2011
Henry S. Wolanski Sr. (BSEAA '47), January 7, 2012

Did you know ...

Since the 1960s, environmental studies have been a part of Atmospheric, Oceanic and Space Sciences. Research in the '70s led to the identification of chlorofluorocarbons as a danger to the ozone layer.

http://aoss.engin.umich.edu/pages/aoss/aohistory

AOSS and SPRL faculty, students, engineers and staff are involved in more than 14 active space missions, including the Mars Science Laboratory, Cassini-Huygens Mission to Saturn/Titan,and the MESSENGER Mission to Mercury.

http://aoss.engin.umich.edu/pages/space_missions

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Enclosed is my gift of $_____ for the Thomas M. Donahue Memorial Student Fund.

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Daytime Phone ( ) _____ Email _____

Please do not send acknowledgment note to the Thomas M. Donahue Family.
(The amount of your gift will remain confidential.)
Make check payable to: University of Michigan

Questions? Contact Mary Nehls-Frumkin at maryln@umich.edu

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