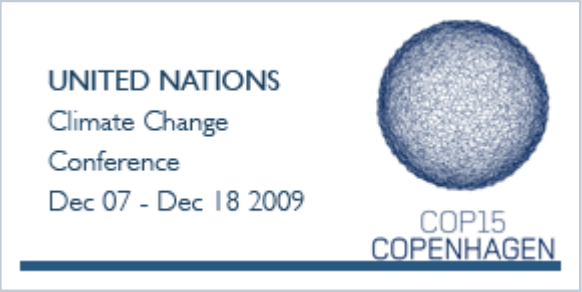
University of Michigan
College of Engineering
MichiganEngineering
Atmospheric, Oceanic and Space Sciences

Daily Planet

WINTER 2009

The Department of Atmospheric, Oceanic and Space Sciences Newsletter

U-M delegation attending UN Climate Change Conference



AOSS Professor Richard Rood and the Graham Environmental Sustainability Institute Director Don Scavia were the force behind the University of Michigan's receiving "Observer Organization" status for the United National Climate Change Conference in Copenhagen, December 7 – 18, 2009. This is the 15th "Conference of Parties" (COP15), but the first time U-M has been granted an official designation. A delegation of more than 40, led by Professor Rood, are attending the summit.

At the conference, world leaders will gather to discuss climate policy on a global scale. There will be representatives from more than 192 countries, including President Barack Obama, who plans on attending the Conference during the first week. While most observers have said a binding global-warming accord will most likely not be reached, the talks could be the first step in negotiating a replacement for the Kyoto Protocol.

"It will be interesting for the students to see how messy it is to solve these global problems," said Professor Rood. "It's not just about science, or business, energy or the population. It's a matter of defining paths towards solutions that take into consideration all of the variables."

"I'll be interested to see how hard science fits into this broader policy picture," says Ahmed Tawfik, one of two AOSS third-year doctoral students who are part of the delegation. "It will be

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On the Web

The U-M delegation is blogging about the debate from Copenhagen at:
http://aoss.engin.umich.edu/cop15
The U-M COP15 delegation is interested in receiving comments on the blog.
You can also follow them via Twitter at:
http://twitter.com/umcop15
Or Facebook at:
http://www.facebook.com/umaoss

DAILY PLANET **is published by:**

Atmospheric, Oceanic and Space Sciences
University of Michigan
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Ann Arbor, MI 48109-2143

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New AOSS Faculty

Carolyn Kuranz

Assistant Research Scientist

PhD, Applied Physics, University of Michigan
MS, Applied Physics, University of Michigan

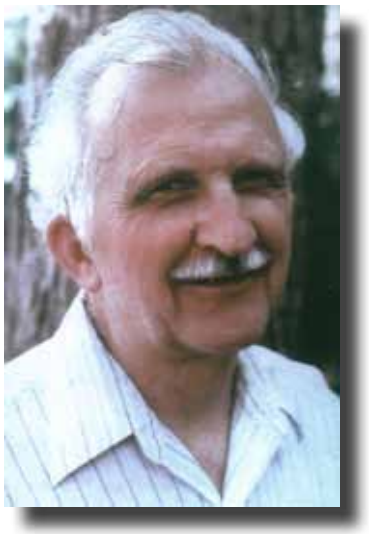
Dr. Kuranz successfully defended her thesis in April 2009 right here in AOSS. Professor Drake, her thesis advisor, tells us Professor Krasny brought three of his students to watch the defense and see "what they should aspire to." Dr. Kuranz specializes in high-energy-density physics, laboratory astrophysics, hydrodynamic instabilities, plasma physics, and radiation hydrodynamics. She is currently a member of the DoE CRASH center led by Professor Drake. She is a member of the American Physical Society, the American Astronomical Society, the Omega Laser User's Group, and the Trident Laser User's Group. In 2007 she organized the Agfa Film Workshop at the University of Rochester with attendees from the University of Michigan, the University of Rochester, and Los Alamos National Laboratory.

AGU 2009 Fall Meeting

You're Invited ...

To the annual AOSS-Geological Sciences Alumni/Friends Reception at the AGU Fall Meeting, **Wednesday, December 16, 6:00 – 8:00 PM in the Westin St. Francis Hotel's Tower Salon**. Please forward the invitation to AOSS alumni and friends. Stop and visit the AOSS booth, in the Academic Showcase – in **Moscone Center South** again between the exhibitors and the posters – look for the Michigan flag.

In Memoriam:
Frederick L. W. Bartman
AOSS Emeritus Professor



AOSS Emeritus Professor Frederick Bartman died Monday, October 26, 2009, in Chelsea, Michigan after a long illness. He was born in Milwaukee on July 22, 1919.

Prof. Bartman began his Michigan career in 1948 as a research engineer in the High Altitude Research Laboratory. He was a member of one of the early post-World War II research teams using rockets to investigate the upper atmosphere when little was known about that layer of the atmosphere. By 1960 his research focused on measuring atmospheric infrared radiation and the reflecting properties of the Earth (its "albedo") using high-altitude balloons launched near Sioux Falls, South Dakota. The High Altitude Lab's specially outfitted bus tracked these gigantic, multistory balloons. Into the 1970s, Prof. Bartman participated in seminal studies of infrasound from meteor trails. He and fellow researchers demonstrated that sub-audible sound waves from meteors entering the upper atmosphere could be detected, and then used to remotely infer temperatures and winds in the upper atmosphere. His subsequent research centered on the measurement and computer modeling of the Earth's radiation budget.

Working his way through the University of Wisconsin, Fred Bartman graduated in 1941 (B.S., Electrical Engineering) and immediately began working at Westinghouse Electric Corporation. While at Westinghouse, he earned his master's degree in electrical engineering at Stevens Institute of Technology in 1945 by attending night school. Later in 1945 he enrolled at Princeton University to take graduate courses in physics. In 1948 Frederick Bartman and his family moved to Willow Run, as he began his career as an aeronautical research engineer at the University of Michigan.

Dr. Bartman received both his MA in mathematics (1951) and his Ph.D. in meteorology, and instrumentation and control engineering (1967) from U-M. Director of the High Altitude Engineering Laboratory from 1970 to 1980, he was also acting chair of the Department of Atmospheric and Oceanic Sciences in 1973-1974. He was honored with a departmental Outstanding Teacher Award for the 1984-85 academic year and was featured in Ken Macrorie's 1984 book "Twenty Teachers."

Dr. Bartman and his wife Merlee raised four children in Ann Arbor, and he treasured his home, family, lifelong Ann Arbor friendships and educational contacts from more than 40 years of university life. In lieu of flowers, contributions in Prof. Bartman's memory may be made to AOSS or Arbor Hospice in Ann Arbor. On Sunday, November 15 a celebration of Fred's life was held at the Michigan League.

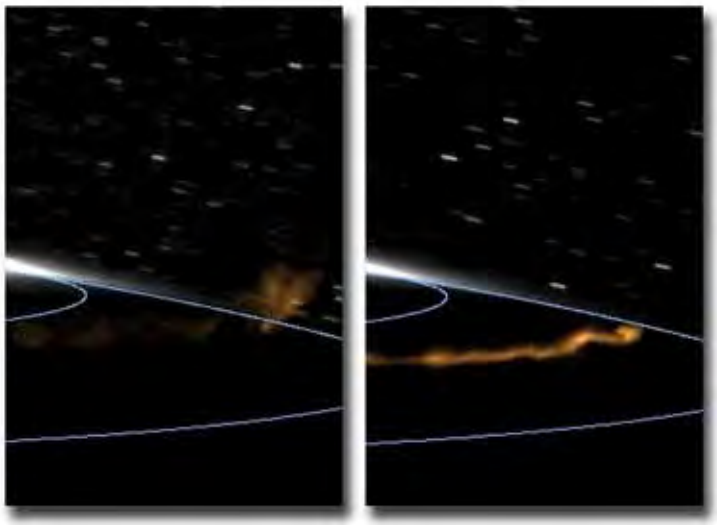
ALUMNI OBITUARIES

David F. Dunkle (BSEAA '48), September 16, 2009
John R. Edelberg (BSEAA '43), 2009
William E. French (PhD '65), September 16, 2009
Edmund A. Guzewicz (BSEAA, '40) August 6, 2009
Kenneth Joel King (BSMO '67), May 7, 2009
Jeffrey L. Marcinowski (BSEAS, '91), July 25, 2009
Millard R. Newland (BSEAA '30) August 8, 2009
Garth Parker (BSE '42), July 6, 2009
Joseph F. Proctor (BSE '42), October 18, 2009
Eric P. Tibbert (BSAOS '70), September 23, 2009

Cassini captures ghostly dance of Saturn's northern lights

In the first video showing the auroras above the northern latitudes of Saturn, Cassini has spotted the tallest known "northern lights" in the solar system, flickering in shape and brightness high above the ringed planet.

"I was wowed when I saw these images and the curtain," said AOSS Chair Tamas Gombosi, who chairs Cassini's magnetosphere and plasma science working group. "Put this together with the other data Cassini has collected on the auroras so far, and you really get a new science."



An aurora, shining high above the northern part of Saturn, moves from the night side to the day side of the planet in this movie recorded by Cassini.

The images show a previously unseen vertical profile to the auroras, which ripple in the video like tall curtains. These curtains reach more than 1,200 kilometers (750 miles) above the edge of the planet's northern hemisphere. Auroras occur on Earth, Jupiter, Saturn and a few other planets, and the new images will help scientists better understand how they are generated.

"The auroras have put on a dazzling show, shape-shifting rapidly and exposing curtains that we suspected were there, but hadn't seen on Saturn before," said Andrew Ingersoll of the California Institute of Technology in Pasadena, who is a member of the Cassini imaging team that processed the new video. "Seeing these things on another planet helps us understand them a little better when we see them on Earth."

Auroras appear mostly in the high latitudes near a planet's magnetic poles. When charged particles from the magnetosphere – the magnetic bubble surrounding a planet – plunge into the planet's upper atmosphere, they cause the atmosphere to glow. The curtain shapes show the paths that these charged particles take as they flow along the lines of the magnetic field between the magnetosphere and the uppermost part of the atmosphere. The height of the curtains on Saturn exposes a key difference between Saturn's atmosphere and our own, Ingersoll said. While Earth's atmosphere has a lot of oxygen and nitrogen, Saturn's atmosphere is composed primarily of hydrogen. Because hydrogen is very light, the atmosphere and auroras reach far out from Saturn. Earth's auroras tend to flare only about 100 to 500 kilometers (60 to 300 miles) above the surface.

The speed of the auroral changes in the video is comparable to some of those on Earth, but scientists are still working to understand the processes that produce these rapid changes. The height will also help them learn how much energy is required to light up auroras. Ultraviolet and infrared instruments on Cassini have captured images of and data from Saturn's auroras before, but in these latest images, Cassini's narrow-angle camera was able to capture the northern lights in the visible part of the light spectrum, in higher resolution. The movie was assembled from nearly 500 still pictures spanning 81 hours between Oct. 5 and Oct. 8, 2009. The images were originally obtained in black and white, and the imaging team highlighted the auroras in false-color orange. The oxygen and nitrogen in Earth's upper atmosphere contribute to the colorful flashes of green, red and even purple in our auroras. But scientists are still working to determine the true color of the auroras at Saturn, whose atmosphere lacks those chemicals.

On the Web

The new video and still images are online at: http://www.nasa.gov/cassini

2009 AOSS *Alumni of the Year* Chris Bedford

As the founder of Sailing Weather Services, Chris Bedford, AOSS 2009 Alumni of the Year, spends a lot of time on the water and couldn't be happier. "When contemplating a career in the field of applied meteorology, it's important to keep a wide view on where you may end up in the future as technology, needs, and scientific knowledge expand." The BS in meteorology that Chris earned in 1986 has taken him around the world. Chris is respected worldwide for his experience and expertise in marine and coastal meteorology. He is a veteran of seven America's Cup, three Volvo Ocean Race/ Whitbread, and four US Sailing Olympic campaigns.

In his September lecture before a packed audience in the SRB auditorium, Chris described his work as a meteorological consultant to the world's best competitive sailors. He recalled his path from launching PIBALs on Michigan's North Campus to providing design, weather, and optimum route advice to Olympic gold medal winners, around the world race champions, America's Cup teams, and crews sailing high-performance yachts capable of over 900 nautical miles per day.

On the Web

To watch Chris Bedford's lecture, "From Balloons to Billionaires: Calling the weather shots for the world's best sailors", go to: *http://inst-tech.engin.umich.edu/media/index.php?sk=aoss-seminars&id=6268*

New Grants

Natalia Andronova, *Comparing MERRA with other Models and Reanalysis Systems Using 2-D Principle Component Analysis*, $176,921, NASA

Sushil Atreya, *To the Depths of Venus: A Comprehensive Exploration of Atmospheric Dynamics and Chemistry On our Sister World FY09-FY14*, $355,552, NASA

Stephen Bougher, *Structure and Dynamics of the 60-120 km Region on Mars, $30,000, NASA*

Michael Combi, *Cometary Hydrogen Observations in the SOHO / SWAN Archive*, $331,193, NASA; *Research Experiences for Undergraduates (REU) Undergraduate Research Participation Site at the Space Physics Research Laboratory*, $651,456, NSF

Michael Combi, **Stephen Bougher**, **Valeriy Tenishev**, *The Effects of Mars' Exosphere on Its Global Environment*, $495,000, NASA

R. Paul Drake, *Center for Experimental Astrophysics Research (CLEAR)*, $2,250,000, DoE

Charles Edmonson Jr, *HVPS Fabrication Support to Battel Engineering Supplement 1*, $10,000, Battel Engineering, Inc.; *Lunar Atmosphere and Dust Experiment Explorer (LADEE) Neutral Mass Spectrometer (NMS) Digital and Analog Electronics Phase B/C/D Electronics Development Effort*, $2,048,569, NASA; *MAVEN NGIMS Risk Reduction Support*, $23,954, NASA

Lennard Fisk, Liang Zhao, *Analysis of the Current Unusual Solar Minimum*, $30,000, NASA

Tamas Gombosi, *Interdisciplinary Scientist (IDS) for the Cassini Interdisciplinary Magnetosphere and Plasma Investigation: MO & DA Efforts, Extended Mission: FY10 Kivelson supplement*, $35,000, NASA-JPL

Xianglei Huang, Derek Posselt, *Optimal Blending of EOS Observations, Goddard Cumulus Ensemble Model, and MERRA Reanalysis: Towards a Benchmark Database for Testing Cloud Parameterizations*, $773,168, NASA

Janet Kozyra, *Investigating the Threshhold for Superstorms*, $626,091, NSF

Michael Liemohn, Stephen Bougher, *Collaborative Research: Global Response of the Martian Thermosphere to Energetic Pickup Ions*, $50,000, NSF

Ward Manchester IV, *Simulating CME-Driven Shocks and SEP Acceleration*, $419,513, NASA

Mark Moldwin, *Properties of ULF Waves at the Plasmapause*, $410,859, NASA

Andrew Nagy, *The Interaction of Fast Flowing Plasmas with Non-magnetic Solar System Bodies*, $30,000, NASA

Derek Posselt, *Improved Representation of Diurnal Precipitation Patterns in the NASA GEOS 5 General Circulation Model*, $583,210, NASA

Nilton Renno, *A Prototype System for Electrical and Meteorological Measurements in Convective Vortices*, $83,110, NSF; *Scarlet and Blue Design Challenge 2009: Personnel Carried Improvised Explosive Devices*, $50,003, Arinc, Inc.; *University of Michigan Investigation in Support of the MSL Rover Environmental Station (REMS) for 2009*, $58,746, Centro de Astrobiologia

Aaron Ridley, Dennis Bernstein, *Understanding the Thermospheric and Ionospheric Response to Solar Flares*, $547,427, NASA

Aaron Ridley, Darren De Zeeuw, Janet Kozyra, *VxO for Heliosphysics Data: The Virtual Model Repository*, $825,620, NASA

Aaron Ridley, *Polar Experiment Network for Geospace Upper-Atmosphere Investigations - PENGUIn: Interhemispheric Investigations along the 40 Magnetic Meridian*, $811,897, NSF; *Understanding the Asymmetric Thermospheric Response to Polar Driving*, $366,724, NSF

Christopher Ruf, Sidharth Misra, *Development of Radio Frequency Interference Mitigation Algorithms for the Aquarius and SMAP Spaceborne Radiometers (Year 2)*, $30,000, NASA

Perry Samson, *Evaluating Online Metacognition Tools for Use in Large Classrooms*, $149,857, NSF

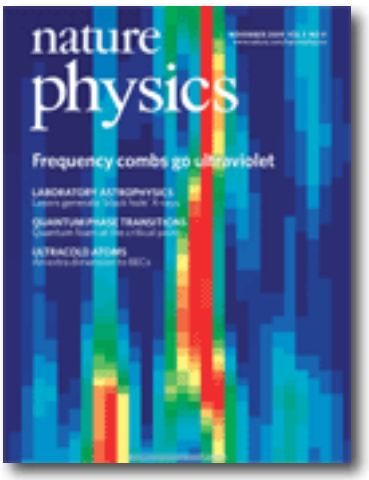
Allison Steiner, *Collaborative Research: Facilitating Career Advancement for Women in the Geosciences Through Earth Science Women's Network (ESWN)*, $59,919, NSF

Thomas Zurbuchen, L Guo, *Miniaturized Particle Sensors Enabled by Nanograting Technology*, $623,264, NASA

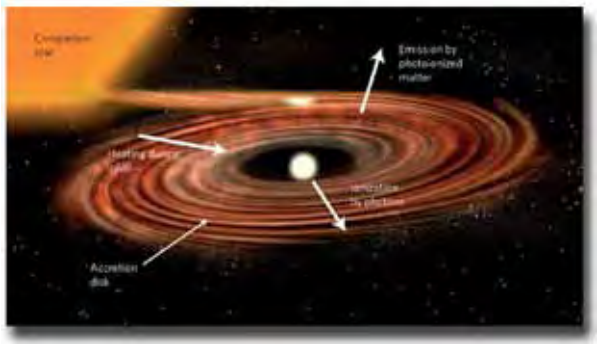
Thomas Zurbuchen, Daniel Gershman, *New Operating Mode for a Quadrupole Mass Spectrometer*, $30,000, NASA

Thomas Zurbuchen, *3-Dimensional Interchange Reconnection: Theory and Applications in Solar and Heliospheric Physics*, $30,000, NASA; *Ions From Mercury: Magnetosphere, Sputtering and Transport*, $30,000, NASA

Drake argues for growth of emerging scientific field



In "Plasma astrophysics: How to see a black hole", AOSS Professor, and Director of the Center for Radiative Shock Hydrodynamics (CRASH), Paul Drake presents an argument for the continued growth of scientific endeavors in the field of high-energy-density laboratory astrophysics (HEDLA) as a method to further our knowledge of the Universe. The article was published in the November 2009 issue of Nature Physics.



Matter flows from the companion into the accretion disk around the black hole and then is heated as it falls inwards. The emission from the hottest, innermost material photoionizes the material in the accretion disk. We can observe the emission from this photoionized matter. (Adapted from an image courtesy of P. Marenfeld and NOAO/AURA/NSF.)

In the abstract, Drake states, "One way to collect data about black holes is to analyze the X-rays emitted from the surrounding plasmas heated to extreme temperatures by the flux of photons flowing into them. The use of intense lasers to recreate these conditions in the lab provides a potentially valuable tool for understanding what these data mean."

HEDLA research uses laboratory devices that produce high-pressure, ionized matter to recreate events or conditions that naturally occur in the Universe, on a much smaller scale. In the article, Drake goes on to say, "Beyond its contribution to understanding black holes (strong gravity) discussed above, HEDLA research has the potential to contribute to our understanding of the nature of dark energy, the operation of cosmic accelerators, the origin of the heavy elements, and exotic states of matter."

On the Web

The full article is online at:

http://www.nature.com/nphys/journal/v5/n11/full/nphys1448.html

AOSS Undergraduate Meteorology: The camera, the chase and beyond

What can the AMS Student Chapter do for you?

by Deborah K. Eddy

What can you do with a meteorology degree if you don't fancy standing in front of a camera or chasing a tornado? Perhaps delving into the wacky world of instrumentation that makes those TV weather folks look so smart. Or finding out why folks living on the west side of Michigan have to replace their snow shovels every year while those on the east side browse the broom aisle of Lowe's. Why was the house on one side of the street flattened by the storm while the house on the other side went untouched? You could figure out the forces involved, and improve the odds of all the homes coming through the next storm intact. Does digging into thousand-year-old ice and finding thousand-year-old air and the critters who lived in it warm your bones? Or do cameras actually turn you on, and the pull of a tornado is your version of a swirling cloud of chocolate bliss?

You can meet others who share your goals and passions by seeking out the AOSS Student Chapter of the American Meteorological Society. This active group of undergrads gathers about once a month for formal meetings, and more often informally. The formal meetings are a place where the seasoned students share what they've learned about weather research, about how to craft a resumé that could lead to that coveted summer internship with NOAA (National Oceanic and Atmospheric Administration), and about what workshops are worth the time and money. They can also provide information on which graduate schools are the place to study the topics you are interested in. The informal meetings might involve a showing of *Twister* – with appropriate dissection, critiquing, and gaffaws.

AOSS Alumni gathering at the 2009 Annual AMS Meeting: from left, back row, Chris Wiess, Joe Merchant, Brad Charboneau, Derek Posselt, Dave Wright. Middle row: Rachael Fitzhugh, Jen DeHart, Rachel Kroodsma, Colene Haffke, Greg Jenkins, Frank Marsik. Seated: Bruce Baker and Stan Solomon.

If you have a natural bent for fund raising, the Student Chapter of the AMS would be thrilled to have your help in raising money to send as many members as possible to the Annual AMS Conference. In 2010, the conference will be held in Atlanta, GA, and so far the group has commitments from AOSS, the CoE Student Affairs Office and WISE (Women in Science and Engineering). But more funds are needed. I hear a bake sale is being planned.

The AMS Conference is a superb place to learn what opportunities are available in meteorology, and leaders in the field provide research presentations. The 2010 conference will include sessions on what was learned from VORTEX2. Companies parade the newest instrumentation and are eager to discuss what they are working on. The weekend before the main meeting, the student conference presents a career fair where attendees get a chance to see what jobs are out there. Multiple opportunities exist for attendees to network

On the Web

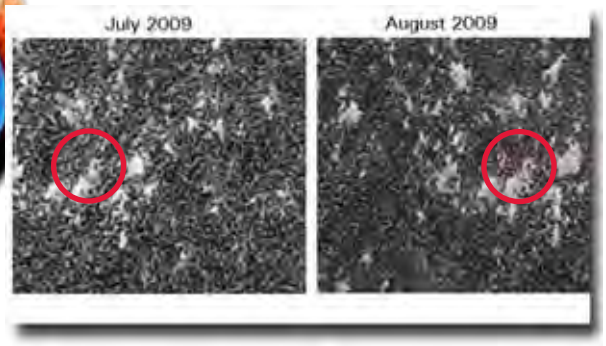
More information about the AOSS undergraduate program and the meteorology concentration can be found on the web at:
http://aoss.engin.umich.edu/pages/undergraduate

with other students, members of industry, and accomplished AMS researchers and faculty – definitely worth the time and effort to raise money for many of our students to attend.

Back on home ground, the AMS Student Chapter is working to build AOSS by helping update the department's Facebook and Twitter pages. As Erin Kashawlic, Student Chapter cochair, says, they "want to help get the word out to students – especially undergraduates, of the meteorological persuasion and otherwise, that AOSS is a department worth checking out."

For more infomation on the AOSS Student Chapter of the AMS, contact Erin Kashawlic at eakashaw@umich.edu.

Phoenix News



The High Resolution Imaging Science Experiment (HiRISE) camera on NASA's Mars Reconnaissance Orbiter captured winter images of NASA's Phoenix Mars Lander surrounded by dry-ice frost on Mars. AOSS Professor Nilton Renno, a Co-Principal Investigator on the Phoenix Mars mission, was one of the first to identify liquid saltwater droplets on the Phoenix Mars Lander.

On the Web

More information about the liquid saltwater on Mars is available at:
http://www.ns.umich.edu/htdocs/releases/story.php?id=7041

Information about Professor Renno is at:
http://www.ns.umich.edu/htdocs/public/experts/ExpDisplay.php?ExpID=1107

Information about the Mars Phoenix Mission is at:
http://phoenix.lpl.arizona.edu/index.php

AOSS Faculty Accolades

Mark Moldwin has been appointed Editor-in-Chief of Reviews of the AGU publication *Geophysics*.

The Spring 2209 issue of the Daily Planet highlighted the story about possibly finding liquid water on Mars, a theory put forth by AOSS Professor **Nilton Renno**. Since that time, he has been lead author on two additional papers about the possibility of liquid water on Mars. The papers, both published in the *Journal of Geophysical Research*, are: "Possible physical and thermodynamical evidence for liquid water at the Phoenix landing site" and "Stability of liquid saline water on present day Mars."

Thomas Zurbuchen received one of five University Faculty Recognition Awards. The awards are given early in the career of those faculty members who have demonstrated substantive contributions to the university through achievements in scholarly research and/or creative endeavors; excellence as a teacher, adviser and mentor; and distinguished participation in service activities of the university.

Students and faculty developing new thruster technology

by Sasha Tandlich, College of Engineering, Marketing and Media Intern

A new electrostatic thruster technology is being developed at the University of Michigan. The technology, known as a Nanoparticle Field Extraction Thruster (or NanoFET), can be developed to do a number of things but one of the main goals is to use it to propel small satellites.

"The thruster works with the help of micro- and nanoparticles housed in a particle reservoir. It uses constant pressure and vibrations to send particles up to an electrically grounded particle sieve. A high voltage accelerating gate creates an electric field that shoots the particles out, creating thrust," said AOSS Professor Brain Gilchrist, who, along with Professor Alec Gallimore are the project's lead investigators along with Tom Liu who is the senior PhD student on the project.

There are currently two student groups on campus, M-Cubed and Radio Aurora Explorer (RAX), working on nanosatellite technology. In the future, the NanoFET team hopes to collaborate with these groups to test the NanoFET technology in space. Both Professors Gilchrist and Gallimore, along with other faculty are advisors to the student groups.

Beyond its use in space, there are also potential terrestrial applications for NanoFET. It is hoped that one day, NanoFET technology can be used to accelerate small particles for biomedical applications such as drug delivery through the skin rather than being injected with a syringe. Another other possible applications may be high-fidelity "nanoprinting".

Because of the project's many applications, students from various departments within the College of Engineering are collaborating, including AOSS, Aerospace, EECS, MSE, and Chemical Engineering.

What separates NanoFET from similar research at other institutions is that Michigan researchers are using solid particles as the propellant. While other researchers are working with charged liquid droplets and ions from liquid metal, Michigan's approach is unique. "Because we're using solid nanoparticles, the device provides a lot of thrust for the amount of power that we're putting in. We're having a very efficient propulsion system," said Prof. Gallimore.

Last June, members of the ZESTT (Zero-g electrostatic thruster testbed) engineering team were able to test the M-1 thruster prototype in a space-like environment as part of NASA's Reduced Gravity Education Flight Program in Houston. Students ran experiments during parabolic flight, experiencing microgravity for 20 seconds at a time. The team is working on the M-2 prototype, using what they learned on the flight to improve the technology.

Gallimore believes that NanoFET should be ready for flight testing within three to five years. "If we get it funded, we're at a very aggressive three-year timeline. By about 2012-13, we will have hardware that's ready for flight testing," he said.

AOSS NanoFET students

Theresa Biehle	**cubesat platform**
Harvey Elliot	**microgravity team**
Ryan Kurkle	**cubesat platform**
David Maiden Mueller	**cubesat platform**
Shane Moore	**cubesat platform**
John Orlowski	**microgravity team**

continued from page 1

interesting to see how climate model output/analysis is applied to legislative and policy discussion; how policy makers adapt the language from humble science to hardened policy and what is lost in the translation."

Ahmed is working with AOSS Assistant Professor Allison Steiner on understanding the feedbacks between the atmosphere and biosphere for both chemistry and climate. They are working on determining how changes in the land surface impact regional climate, and how the spatial scales of model representations of the land surface affect climate.

Kevin, whose advisor is AOSS Assistant Professor Christiane Jablonowski, is concentrating on modeling of idealized tropical cyclones, the impact of African dust and climate change on tropical cyclones in the Atlantic ocean and the policy impacts of climate change. He is also enrolled in the Science, Technology, and Public Policy Program through the Gerald R. Ford School of Public Policy.

"Observer" is one of four attendee designations: Parties (governments), UN System (UN bodies, agencies, related orgs) Observer (NGOs, IGOs) and Press. The Convention allows the intergovernmental and the civil society organizations duly admitted by the Conference of the Parties to observer the sessions of the Convention and the Kyoto Protocol.

The World Meteorological Organization (WMO), the United Nations Environment Programme (UNEP) and the International Council of Scientific Unions (ICSU) organized the First World Climate Conference held in 1979. The Intergovernmental Panel on Climate Change (IPCC) was established in 1988 and published its first report on the state of the global climate in 1990. The first Conference of the Parties (COP1) was held in Berlin in 1995. The Kyoto Protocol, now better known than the COP Conferences, was adopted by COP3 in 1997. In 2007, the IPCC, with former Vice President Al Gore, were awarded the Nobel Peace Prize. The IPCC members receiving the award included AOSS Professor Joyce Penner and Research Scientist Natasha Andronova.

"It is my opinion that we must focus on doing those things that build the base for the future," said Professor Rood. "One of the reasons that the problem appears intractable is that there is so much focus on the long-term reduction goals."

The Spring issue of the Daily Planet will include an article by Kevin and Ahmed about their trip to Copenhagen.

HOW DID THE STUDENTS GET TO COPENHAGEN?

The University's official designation of Observer didn't come with travel or lodging funding. It was up to the students to raise the money to cover their travel costs in Copenhagen. Much credit goes to the students and faculty for beating the bushes to raise the funds in a very short window of time — less than four weeks. And many thanks go to the sponsors who are supporting this tremendous educational opportunity.

- **U-M College of Engineering**
- **CoE Department of Atmospheric, Oceanic and Space Sciences**
- **CoE Department of Civil and Environmental Engineering**
- **CoE Design Science Interdisciplinary Program**
- **Frederick A. and Barbara M. Erb Institute for Global Sustainable Enterprise**
- **Graham Environmental Sustainability Institute**
- **U-M Rackham School of Graduate Studies**
- **Gerald R. Ford School of Public Policy Science, Technology and Public Policy Program**
- **U-M Office of the Provost**
- **Jeff Masters, Weather Underground**

U-M COP15 Students

Katie Bush	*School of Public Health*
Anjuli Figueroa	*Civil & Environmental Engineering*
Amrita Kumar	*School of Natural Resources & Environment*
Aubrey Parker	*Chemical Engineering*
Kevin Reed	*AOSS*
Ahmed Tawfik	*AOSS*
Merry Walker	*CoE Energy Systems Program*
Katie Whitefoot	*CoE Design Science Program*

AOSS Happenings

Allow me to introduce Wyatt James Gilbert, born to Jason and Victoria Gilbert on September 29, 2009, at 9:53 pm, weighing in at 8 lbs, and 20.5 inches.

Please welcome Isabella King, born November 21, 2009, at 12:10 AM, to Michelle and proud papa John King (AOSS Maintenance Mechanic). Isabella joined us at 7 lb, 15 oz and 19.5 inches. John has a second reason to celebrate. On October 9, 2009, he and Michelle were joined in marriage in Toledo.

On July 4, 2009, at the Guilford Yacht Club in Guilford, Connecticut, AOSS graduate student Manish Mehta wed Kasha Benton, a medical student at Drexel University College of Medicine. Manish tells us "This was the happiest day of my life."

Sandee Hicks sent us this photo of a top fuel dragster from the Norwalk, Ohio, Halloween Classic.

"I'm finally in a picture! Another racer sent this to me. Usually, I'm the one taking them. Our friend Brian (Carson) is in the dragster, then from the right his twin brother Bruce (Carson), Bruce's girlfriend Michelle (McNutt), me (Sandee Hicks, AOSS Communications Assistant and Undergraduate Student Services Maven), another friend Keith (Armardo) and Bill (Hicks, Sandee's husband)."

Can you see Sandee? She's the blonde in the middle!

AOSS Family Album

Halloween 2009 at AOSS: left to right Melissa Terwilliger, a.k.a. Goth Bunny; Faye Ogasawara, a.k.a. Green Hornet; Bryan White, a.k.a. Bryan White; Debbie Eddy, a.k.a. Ninja Warrior; Darren Britten-Bozzone, a.k.a. Mummy Bunny.

And Sandee Hicks with her happy Halloween friend.

Avery and Augustin, daughter and son of AOSS Asst. Res. Scientist Sue Lepri, wonder "Why did they put us in these crazy critters?"

Time to Get Your Whimsy On (Reader participation)

Peppering the walls of the Space Research building are posters that say (among other things) that "This building is protected by AEDs." Use your imagination and send in your suggestions as to what "AEDs" might stand for. For example, "Apes, Elephants, and Dogs", or "Atmospheric Elliptical Detonators." Be creative, but keep it clean (this is after all a family page), and send your suggestions to aossnews@umich.edu. The winner will receive an AOSS cap, to keep those whimsical thoughts warm and fuzzy. The decision of the judges is final.

Alumnus receives Baldwin Award

Modeling the Space Environment System: Magnetospheric Composition, Radiation Belts, and Mercury's Magnetosphere

On October 8, 2009, AOSS Alumnus Alex Glocer returned to receive the 2009 Ralph B. Baldwin Award. One of the award requirements is to deliver a lecture, which occurred on the same day. Pictured above from the left: Alex receiving his Baldwin award from AOSS Chair Tamas Gombosi. Tamas, Alex and Mr. and Mrs. Dana Baldwin, son and daughter-in-law of Ralph Baldwin. Tamas and AOSS Research Scientist Gabor Toth were co-chairs of Alex dissertation committee, for which Alex received his award. Alex is currently a postdoctoral fellow at NASA'sGoddard Space Flight Center, Greenbelt, MD.

Did you know that in 1854 the first engineering faculty member purchased U-M's original meteorological instruments?

Did you know that engineering was part of LS&A until 1895?

These are just a couple of the interesting historical facts about AOSS and SPRL that you'll find in, "Atmospheric, Oceanic and Space Sciences / Space Physics Research Laboratory: 1837 – 2003". This mini-history of AOSS and SPRL contains some little-known facts in addition to well-known information and it's just the beginning of a larger project. Over time, we'd like to build an AOSS/SPRL history web site where documents, stories and images can be archived, accessed and built upon.

On the Web

The document is available online at:
http://aoss.engin.umich.edu/files/pages/history_online.pdf

Panel: Moon too expensive

In late October, the independent "Review of U.S. Human Spaceflight Plans Committee," otherwise known as the Augustine Panel, released its much anticipated final report. While the 157-page report includes a vast amount of information and discussion about US Human Spaceflight, the gist of the report is in the first paragraph of the Executive Summary, "The U.S. human spaceflight program appears to be on an unsustainable trajectory. It is perpetuating the perilous practice of pursuing goals that do not match allocated resources. Space operations are among the most demanding and unforgiving pursuits ever undertaken by humans. It really is rocket science. Space operations become all the more difficult when means do not match aspirations. Such is the case today."

SUMMARY OF PRINCIPAL FINDINGS

The Committee summarizes its principal findings below. Additional findings are included in the body of the report.

The right mission and the right size: NASA's budget should match its mission and goals. Further, NASA should be given the ability to shape its organization and infrastructure accordingly, while maintaining facilities deemed to be of national importance.

International partnerships: The U.S. can lead a bold new international effort in the human exploration of space. If international partners are actively engaged, including on the "critical path" to success, there could be substantial benefits to foreign relations and more overall resources could become available to the human spaceflight program.

Short-term Space Shuttle planning: The remaining Shuttle manifest should be flown in a safe and prudent manner without undue schedule pressure. This manifest will likely extend operation into the second quarter of FY 2011. It is important to budget for this likelihood.

The human-spaceflight gap: Under current conditions, the gap in U.S. ability to launch astronauts into space will stretch to at least seven years. The Committee did not identify any credible approach employing new capabilities that could shorten the gap to less than six years. The only way to significantly close the gap is to extend the life of the Shuttle Program.

Extending the International Space Station: The return on investment to both the United States and our international partners would be significantly enhanced by an extension of the life of the ISS. A decision not to extend its operation would significantly impair U.S. ability to develop and lead future international spaceflight partnerships.

Heavy lift: A heavy-lift launch capability to low-Earth orbit, combined with the ability to inject heavy payloads away from the Earth, is beneficial to exploration. It will also be useful to the national security space and scientific communities. The Committee reviewed: the Ares family of launchers; Shuttle derived vehicles; and launchers derived from the Evolved Expendable Launch Vehicle family. Each approach has advantages and disadvantages, trading capability, life-cycle costs, maturity, operational complexity and the "way of doing business" within the program and NASA.

Commercial launch of crew to low-Earth orbit: Commercial services to deliver crew to low-Earth orbit are within reach. While this presents some risk, it could provide an earlier capability at lower initial and life-cycle costs than government could achieve. A new competition with adequate incentives to perform this service should be open to all U.S. aerospace companies. This would allow NASA to focus on more challenging roles, including human exploration beyond low-Earth orbit based on the continued development of the current or modified Orion spacecraft.

Technology development for exploration and commercial space: Investment in a well-designed and adequately funded space technology program is critical to enable progress in exploration. Exploration strategies can proceed more readily and economically if the requisite technology has been developed in advance. This investment will also benefit robotic exploration, the U.S. commercial space industry, the academic community and other U.S. government users.

Pathways to Mars: Mars is the ultimate destination for human exploration of the inner solar system; but it is not the best first destination. Visiting the "Moon First" and following the "Flexible Path" are both viable exploration strategies. The two are not necessarily mutually exclusive; before traveling to Mars, we could extend our presence in free space and gain experience working on the lunar surface.

Options for the human spaceflight program: The Committee developed five alternatives for the Human Spaceflight Program. It found:

- Human exploration beyond low-Earth orbit is not viable under the FY 2010 budget guideline.
- Meaningful human exploration is possible under a less constrained budget, increasing annual expenditures by approximately $3 billion in real purchasing power above the FY 2010 guidance.
- Funding at the increased level would allow either an exploration program to explore the Moon First or one that follows the Flexible Path. Either could produce significant results in a reasonable time frame.

On the Web

The full report is available online at:

http://www.nasa.gov/offices/hsf