

Daily Planet

WINTER 2006

The Department of
Atmospheric,
Oceanic and Space
Sciences Newsletter

Message from the Chair

Tamas Gombosi

A Different Department

The first issue of the revitalized Daily Planet, Winter 2004, outlined a “new” AOSS. The issue explained some of the changes that were taking place in the Department. These changes included:

- New department chair
- New Earth System Science and Engineering undergraduate program
- New Space Engineering SGUS Program
- New education partnership with the Jet Propulsion Laboratory
- First endowed scholarship: the Dale Brandon Undergraduate Scholarship Fund

“The department has a strong and viable vision for its future, which it is pursuing with vigor and determination.”

– 2005 External Review Committee

The department faculty members were “determined not to live in our past, but to build upon our stellar reputation as we move through today into a robust and exciting future. A future where AOSS graduates will continue to impact science and engineering, whether it’s the complex

systems of the Earth or the complex systems of the Universe.”

Now, four years into the mission, through the hard work of AOSS faculty, staff and students, the department is doing well. It has sometimes been challenging, but we have been successful in refocusing upon our numerous strengths to build a stronger department. The transformation required the dedication of the entire AOSS community – and it was recognized last year when the department went through an external review.

A Different Department: Education

One of the biggest changes has been the impact of AOSS faculty members on educating a new generation of scientists and engineers. Three years ago the department took a risk by completely revamping the undergraduate degree and beginning to talk about “science-driven engineering,” a phrase highlighting the AOSS approach to its educational programs: looking at the whole system, not just a component.

Since the fall of 2004, AOSS undergraduate student enrollment has increased 140% and graduate student enrollment has increased 95% – evidence that the new program did fill a void. In the process of building the program, the department also created a particular niche of providing hands-on, practical classes for students across the entire College.

The department’s renewed SGUS/MEng program has generated considerable attention

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AOSS Accolades



Cheri Champoux has been selected as a member of the CoE Research Stewardship Group. The Group is charged with improved CoE sponsored research stewardship at the college and unit levels. Specific tasks include conceptualizing and creating reports that identify exceptions, assist in financial project management and oversight, and provide an overview of research activity within a unit.

A Scientist and a Writer



Professor Ricky Rood, who joined AOSS in the fall of 2005, spends his time immersed in atmospheric science and in creative writing. Professor Rood recently supplied us with a list of some of his writings that have been published online.

To give you a sample of his “non-scientific” writing, here is the beginning of *My Father's Tomatoes: There is powerful love in this fruit.*

“Occasionally there is a summer when spring never quite ends. Rather than hot, dry days broken by sporadic afternoon rain, the parching sun stays out in the Atlantic. Week after

<i>My Father's Tomatoes</i>	http://www.bayweekly.com/year06/issuexiv24/leadxiv24_4.html	<i>Bay Weekly</i>	2006	Vol. 14
<i>John McLean</i>	http://ecurrent.com/fpc/2006/john06.shtml	<i>Current Magazine (Online)</i>	2006	
<i>Christmas at the 7-Eleven</i>	http://www.bayweekly.com/year05/issuexiii51/reflectxiii51.html	<i>Bay Weekly</i>	2005	Vol. 13
<i>The Keeper</i>	http://www.afsa.org/fsj/julaug04/Rood.pdf	<i>Foreign Service Journal</i>	2004	Vol. 81
<i>Consort</i>	http://www.bcc.ctc.edu/english/Arnazella.htm	<i>Arnazella</i>	2004	
<i>Relics</i>	http://www.humanities.uci.edu/faultline/	<i>Faultline</i>	2003	Vol. 12
<i>Seamless</i>	http://www.umuc.edu/nmusic/seamless.html	<i>Night Music</i>	1998	

week, winds roll from the southeast to the northwest and back again. It rains with the rolls, and the winds hide the heat. Instead of rotting, squash grow bigger and more than anyone can ever remember. The stifling heat that makes the rot, encourages the borers, never comes.”

Len Fisk Recognized by University

Thomas M. Donahue Distinguished University Professor of Space Science



From the *University Record*

One of the most accomplished and influential scientists at the University, Lennard Fisk, the Thomas M. Donahue Professor of Space Science, CoE, is a world-renowned theorist recognized for incisive ideas and innovative theories that form the framework for understanding many important

processes in the solar system. His more than 180 publications in refereed journals have introduced new ideas and concepts to create an understanding of the atmosphere of the sun and its extension into space to form the heliosphere. In recognition of his outstanding contributions, he was elected to the National Academy of Sciences in 2003. Fisk also has received many other honors for his research. He is an elected member of the International Academy of Astronautics (IAA) and a foreign member of Academia Europaea, the pan-European academy for the arts, sciences and letters; a fellow of the American Geophysical Union; and recipient of the IAA Basic Science Award and the Space Science Award of the American Institute for Aeronautics and Astronautics.

Fisk's early work on anomalous cosmic rays is an example of how his research has had a far-reaching impact in space sciences. The theory he and colleagues developed has successfully explained a set of anomalous features of cosmic ray flux, an accomplishment that has changed the way the scientific com-

munity views the dynamic processes occurring in the solar system. Before joining the faculty in 1993, Fisk had a distinguished career as a science administrator. From 1987-1993 he served as the NASA associate administrator for the Office of Space Science and Applications, where he was responsible for NASA science programs, including astrophysics and planetary exploration; earth science and space physics; life and microgravity science; and the institutional management of the Jet Propulsion Laboratory and the Goddard Space Flight Center. NASA awarded Fisk its highest honor, the Outstanding Leadership Medal and the Distinguished Service Medal.

UNIVERSITY OF MICHIGAN STANDARD PRACTICE GUIDE 201.91

In addition to having achieved the rank of Professor at the University, each faculty member who is appointed as a Distinguished University Professor must be recognized nationally and internationally for scholarly achievement in his or her field of study, for having broad scholarly interests, for originality as a scholar, and for superior teaching skills.

At U-M Fisk has been dedicated to promoting good teaching and exposing students to the intricacies of the nexus of science, engineering and public policy. Since stepping down as department chair he has developed three new courses. He is an effective lecturer whose talks contain a mix of scientific details, policy analysis, pointed challenges to students and contextual levity. Fisk's career has brought the University national and international recognition.

Message from the Chair

CONTINUED FROM PAGE 1

from employers. The program allows students to fulfill the requirements for both a Bachelor of Engineering and a Masters of Engineering in five years. With the newest ESSE faculty members building collaborations that are broadening the opportunities for AOSS atmospheric students and with the department being one of the pre-eminent centers for studying space weather, AOSS has maintained its established world-class PhD program.

A Different Department: Research

Since the mid-90s, AOSS has been building its reputation in the field of space weather simulations. Today the department is known both as a leader and an innovator in this field. Through the Center for Space Environment Modeling and other faculty researchers, research funding is well balanced with sponsors such as NASA, NSF, the Air Force Office of Scientific Research (AFOSR) and the Department of Energy.

The advancement in space weather was built upon the blocks of space physics research conducted in AOSS for many decades. Data collected and analyzed about solar wind composition, the earth's ring current, etc., by the Solar Heliospheric Research Group and the Magnetospheric-Ionospheric Science Team have been invaluable in this endeavor. Involvement in operating missions, such as Ulysses, which is circling the Sun's polar cap, ACE, TIMED/TIDI, and STEREO, which will use 3-D technology to provide a "global" picture of the Sun, as well as the Magnetospheric MultiScale (MMS) mission, will continue the stellar work of AOSS researchers for many decades into the future.

The area of planetary research within the department remains highly regarded and stable. AOSS faculty and student researchers are involved in both the planning and the science of many planetary missions including the Cassini-Huygens Mission to the Saturnian system, the Mars Express and Mars Science Laboratory, the Jupiter Polar Orbiter (Juno), the Venus Express, MESSENGER Mission to Mercury, and the Rosetta Mission to Comet 67P/Churyumov-Gerasimenko.

AOSS faculty researchers are drawing together different areas of climate change research to begin building a more complete picture of climate forcing and its effects on the climate. Included in the research is the development of sensor and sensor support hardware, analysis of ground, airborne and satellite observations

made by remote sensing instruments. Over the past two years, AOSS has hired five new instructional faculty members to form a "supercritical" team of climate researchers. The goal of the research team is to develop and form collaborative efforts across the University. In particular, the faculty members have been concentrating on building a relationship with the Graham Environmental Sustainability Institute and the Erb Institute.

A Different Department: Space Physics Research Laboratory

AOSS has made a strong effort to re-energize SPRL, following two years of intense review by both internal and external review committees. As announced in the last issue of the Daily Planet, AOSS Professor Chris Ruf was appointed the new director and SPRL is focusing on rapid space instrument prototyping and new instrument concepts. In addition, SPRL is involved in developing the Mars Science Laboratory's Sample Analysis at Mars (SAM) instrument and is increasing its participation in CoE student projects.

A Different Department: Infrastructure

AOSS has been transformed from top to bottom – including a return to being a financially stable department. Old accounts have been cleared and balanced, duties and expectations have been reshuffled, and student support has been increased. In the process, attitude and morale have improved as well as communications both inside and outside the department.

A Different Department: Communications

During the departmental reassessment, it was realized that few outside the Space Research Building knew what "Atmospheric, Oceanic and Space Sciences" really was – was it science – was it engineering – was it just research – was education involved – was it still interesting to alumni. It was clear that AOSS needed improved communications both internally (within the College and the University) and externally, with alumni, agencies, industry and science communities.

Since 2003, AOSS has invested in:

- A booth and reception at the annual AGU meeting
- The *Daily Planet*, published three times a year
- High-profile speakers for the annual Nelson Spencer Lecture
- The Thomas M. Donahue Memorial Student Fund

"The department continues to have a strong, diverse and exciting research program that is evolving to address leading-edge questions in atmospheric, planetary and space sciences."

– 2005 External Review Committee

- Increased involvement in CoE recruiting events
- A stronger relationship with the CoE External and Corporate Relations Offices

All of these endeavors have resulted in positive strides toward robust connections with alumni, corporate sponsors, friends of AOSS, and students. The challenge for the department is to continue this trend.

A Different Department: Impact

One area on which the department did not need to focus was the impact of faculty members in both science and policy. AOSS researchers are regular contributors to the most prominent peer-

"The department has many internationally prominent senior faculty doing excellent work and publishing well in each of the main thematic areas, representing broad and diverse excellence in scholarship and research."

– 2005 External Review Committee

reviewed publications, such as Science and Nature with a number of their papers among the most cited in atmospheric, planetary and space sciences. With this influence comes a responsibility to the scientific community to guide national and international discussions on policy.

In addition to chairing the NRC Space Studies Board and being a member of the National Academy of Sciences, the University of Michigan has honored Len Fisk with the Thomas M. Donahue Distinguished University Professorship of Space Science. Also this year Sushil Atreya became a Fellow of the American Association for the Advancement of Science, Tamas Gombosi chair of the NASA Living with a Star Targeted Research and Technology Program Steering Committee and Michael Liemohn chair of the NASA Geospace Management Operations Group.

Others are continuing their professional service as follows:

- International Academy of Astronautics Members
 - o Sushil Atreya
 - o Len Fisk
- American Geophysical Union Fellows
 - o Len Fisk
 - o Tamas Gombosi
 - o Janet Kozyra
- American Physical Society Fellow
 - o Paul Drake
- American Meteorological Society Fellow
 - o Ricky Rood

A Different Department: Fluid not Static

The process of refocusing brought out the need to continually review and refine AOSS programs. It is vitally important to AOSS students, faculty and the industry that the educational program remains at the leading edge of atmospheric, planetary and space science/engineering.

With this in mind, AOSS has:

- Established a curriculum committee to continually review and refine our classes
- Increased the number of student advisors
- Supported our student groups
- Increased our attention to the needs of our students

A Different Department: Scholarships

Following the establishment in 2003 of the Brandon endowed undergraduate scholarship, three additional scholarships have been created. In 2004, following his death, the Thomas M. Donahue Memorial Student Fund was funded through the generosity of the Donahue Family and many faculty, alumni and students.

This year, Professor Emeritus Paul Hays and his wife Ruth established the first AOSS undergraduate scholarship, which will award \$5,000 annually to a declared AOSS student. (See the Summer/Fall 2006 Daily Planet for more details <http://aoss.engin.umich.edu/DailyPlanet/0806-dp.pdf>). Most recently, The Weather Underground, Inc., the first Internet weather site that was started by AOSS Associate Chair Perry Samson and the 2006 AOSS Alumni of the Year Jeff Masters, is establishing a \$5,000 per year undergraduate scholarship for AOSS undergraduate meteorology students. More on this scholarship will be in the Spring 2007 issue of the Daily Planet.

A Different Department: New Opportunities and Trends

The mission of AOSS is to be a world-renowned department for the study of the atmosphere and space as components of a complex integrated system, a department that is known for the quality of its research and education and for its essential role in the mission of the College of Engineering.

"AOSS is unusual in that it is a science department within an engineering college. This gives the department many unique research opportunities."

– 2005 External Review Committee

CONTINUED ON PAGE 6

Message from the Chair

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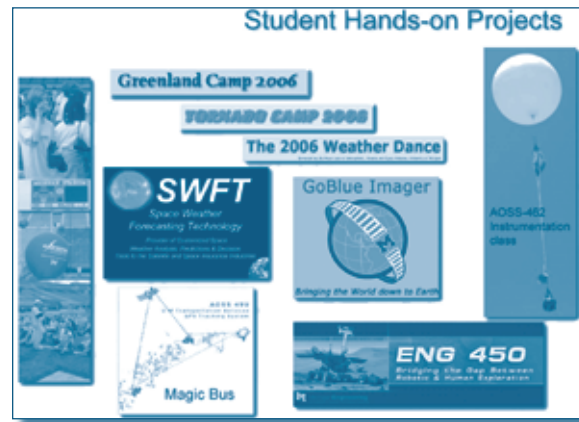
The goals of AOSS are:

- To make a meaningful contribution to the educational mission of the College of Engineering
- To be recognized as foremost in the College of Engineering for the quality and quantity of its research, relative to our size
- To be a world-class academic unit in a broad range of space and global environmental activities

Four years ago the AOSS faculty took a long, hard look at the department's future, determined changes were needed and agreed upon a "Shared Vision" as the guideline. It has served us well and we continue to adhere to its principles as we strive to continually meet our goals. The department learned that in this quickly changing world, it is important to remain fluid, able to take advantage of new opportunities and trends as they arise. Thus, with five new atmospheric science faculty, a synergistic and collaborative climate-change team is emerging

within the department and, with the tools and talent already in place, AOSS can be the trailblazing institution in developing space weather forecasting technologies.

These research opportunities bring educational opportunities as AOSS students will continue to be surrounded by leading-edge research and will be afforded the chance to work on many "real world" projects, giving them a rare level of experience when they graduate. Faculty members are committed to providing AOSS students with as many hands-on student projects as possible, both in and out of the classroom. Planning is underway for annual summer camps, such as the Tornado and Greenland Camps, as is planning for a state-of-the-art collaborative engineering environment classroom that will allow remote lectures and collaboration with scientists and engineers.



AOSS is committed to taking advantage of its unique strengths and to changing and adapting as needed to be a "world-renowned

department for the study of the atmosphere and space as components of a complex integrated system that is known for the quality of its research and education and for its essential role in the mission of the College of Engineering."

You're Invited ...



AOSS and the College of Engineering will recognize Joyce Penner as the Aksel Wiin-Nielsen Collegiate Professor of Atmospheric Sciences with a lecture and reception Thursday, January 4, 2007, 3:30 PM in the SRB Auditorium. A reception will follow.

Professor Penner was honored with the title of Collegiate Professor last year by the College of Engineering. Aksel Wiin-Nielsen was the first chair of the newly reorganized Department of Meteorology and Oceanography beginning in 1963. Collegiate professorships are bestowed selectively to faculty members who have attained a significant stature in their careers.

2006 AOSS Alumni of the Year

This year's recipient of the AOSS Alumni of the Year was Dr. Jeffrey Masters, a co-founder and Director of Meteorology of the Weather Underground. On October 27 he delivered the Alumni Lecture, entitled "The Hurricane Season of 2006" to a packed SRB auditorium. Prior to his AOSS lecture, he spoke to more than 150 undergraduates in Prof. Perry Samson's "Extreme Weather" course.

Dr. Masters, who grew up in suburban Detroit, received his B.S. and M.S. degrees in Meteorology in 1982 and 1983, respectively. After graduating he became a "Hurricane Hunter" with the National Oceanic & Atmospheric Administration's Aircraft Operations Center. After an "eventful" flight into Hurricane Hugo, he returned to AOSS in 1990 to pursue his doctorate. Soon afterwards his advisor, Professor Perry Samson, mentioned that he could use some real-time weather information for class. Dr. Masters



volunteered to look into parsing the data via the NSFNet and then deliver it via a Telnet session. It was a success and when Hurricane Bob hit in 1991, the number of users jumped from 100 to more than 80,000.

Jeff's "experiment" evolved into The Weather Underground. Using advanced technology,

the company monitors weather conditions in more than 60,000 U.S. and international cities, using that data to provide weather information to millions of web users around the world.



THE WEATHER UNDERGROUND FUNDS AOSS SCHOLARSHIP

AOSS is pleased to announce the Weather Underground Undergraduate Scholarship, which will be awarded annually to an AOSS undergraduate of junior standing.

"We need new graduates in atmospheric science who understand the key issues in climate change and can communicate these issues to the general public," said Dr. Jeff Masters. "We're excited to help and encourage AOSS students through a scholarship."

"It is wonderful to have our graduates come back and help another generation of scientists," said Tamas Gombosi. "AOSS is grateful to the Weather Underground for its commitment to our students and the department."

More information about the scholarship will be in the next issue of the Daily Planet.



On the Web

Listen to a podcast of Dr. Masters' lecture at:

<http://samson.engin.umich.edu/podcast102/AOSS%20102%20Podcast/D9399B62-599D-4856-8485-E26C38B01D34.html>

Alumni Notes

Elizabeth Siegel, '06, BE

Has accepted a position as a Meteorologist with AMEC Weather in Newfoundland, Canada. AMEC Earth & Environmental is a professional engineering, geotechnical, and materials company doing business in more than 40 countries – AMEC Weather is a sector which provides operational meteorology services to terrestrial and marine clients in the maritime provinces. Liz says, “I am eager for the challenge of forecasting in Newfoundland, an island known for its heavy snows and intense storms. It is a unique place rich with Irish tradition and culture. Newfoundland is home to more moose than people; icebergs and puffin are a usual sight along the coast. While the majority of the province is marked with mountainous terrain, the city of St. John's is a thriving yet quaint city. I am very enthusiastic about this opportunity and the adventure ahead.”

Oliver Hass, '98, MEng

Went on to receive his law degree and has worked as a lawyer of the Paris bar. In 2004 he joined the Franklin Law Firm in Paris where his practice focuses on technological matters (such as the Internet, telecommunications, Information Technology projects) as well as intellectual property (mainly copyright), for both advice (contracts and consultations) and litigation. “It is very interesting to have a scientific background when tackling the legal issues of a technological project, as it allows a better comprehension of the project itself, as well as of the approach of the technical people involved in it (very often persons with an engineering background).”

“It is with great sadness that I hear that Dr. Kuhn is retiring, but with much happiness that this remarkable man is being honored with a symposium. He is one of my all-time favorite instructors (at any level of education), and a tremendous human being. I very much would like to contribute to the symposium.”

— Paul Gross

Send us your remembrances of Professor Bill Kuhn who will be retiring in 2007.

Keep in touch and Keep informed

Don't forget to send us your email address so you can stay up to date on all of the happenings in AOSS. Send your contact information to AOSS-Friends@umich.edu and we'll be sure to send you the next issue of the *Daily Planet*.

SUCCESSFUL DISSERTATION DEFENSE: SEPTEMBER 2006

Elena Adams, *Titan's Thermal Structure, and the Formation of a Nitrogen Atmosphere*, September 7, 2006, Sushil Atreya, chair.

New Grants

(Only AOSS Principal Investigators are listed)

Sushil Atreya, *Cassini-Huygens Aerosol Collector Pyrolyzer Science Support FY07*, \$114,000, JPL/NASA; *Juno Science Support Phase B Activities*, \$62,191, SRI/NASA; *MARS Express Planetary Fourier Spectrometer Investigation (Phase E) FY07 FY08*, \$254,554, JPL/NASA

Stephen Bougher, *Titan Thermospheric General Circulation Model: An Update*, \$24,000, NASA

Stephen Bougher, Nilton Renno, Aaron Ridley, Gabor Toth, *A Mars Whole Atmosphere Climate Model: Development and Applications*, \$673,078, NSF

C. Robert Clauer, *Supplemental Request: Polar Experiment Network for Geospace Upper-atmosphere Investigators (PENGUIn) - A New Vision for Global Studies*, \$38,875, NSF

Roger De Roo, *Real-Time Digital Receiver Rapid Prototyping*, \$33,219, EMAG Technologies, Inc./DOD

Charles Edmonson Jr, *Sample Acquisition at Mars (SAM), Phase B/C/D/E Support Contract Through October 1, 2009*, \$2,457,539, NASA

Lennard Fisk, *Predicting the Heliosphere*, \$349,052, NSF

Lennard Fisk, Tamas Gombosi, Gabor Toth, *The Comprehensive Corona and Heliosphere Model (CCHM)*, \$820,000, NSF

Lennard Fisk, Thomas Zurbuchen, *The Origin and Composition of the Solar Wind and Interstellar Pickup Ions Using Data from the Solar Wind Ion Composition Spectrometer (SWICS) on the Ulysses Mission*, \$618,000, JPL/NASA

Brian Gilchrist, *Scalable Flat-Panel Nanoparticle MEMS/NEMS Propulsion Technology for Space Exploration in the 21st Century, Phase 2*, \$399,924, USRA/NASA

Tamas Gombosi, Kenneth Hansen, *Interdisciplinary Scientist (IDS) for the Cassini Interdisciplinary Magnetosphere*

and Plasma Investigation: Mission Operations and Data Analysis (MO&DA) Efforts, \$175,000, JPL/NASA

Christiane Jablonowski, *CMG Collaborative Research-Freedom from Coordinate Systems, and Spectral Accuracy with Local Refinement: Radial Basis Functions for Climate and Space-Weather Prediction*, \$59,824, NSF; *Coupling an Adaptive-Grid Finite-volume Dynamical Core to CAM3 Physics Parameterizations*, \$25,000, DOE

Susan Lepri, *3D Space Environment*, \$9,995, JPL/NASA

Rick Niciejewski, *Supplement Request FPI Optical Station in Support of the C/NOFS (Communications/Navigation Outage Forecasting System) Satellite Program (Supplement to ATM-0518855)*, \$20,988, NSF

Joyce Penner, *Aerosol Measurement and Processing System*, \$80,000, JPL/NASA

Nilton Renno, *Aerosols-Climate Interactions: Development and Tests of a Dust Lifting Model*, \$434,580, NSF; *Plume-Ground-Soil Interaction Study Due to Pulse-Modulated Descent Engines at Low Ambient Pressure*, \$24,000, NASA

Aaron Ridley, Darren De Zeeuw, Tamas Gombosi, Janet Kozyra, Michael Liemohn, Igor Sokolov, Gabor Toth, *Collaborative Research: The Community Whole Magnetosphere Model (CWMM)*, \$305,000, NSF

Christopher Ruf, *Hurricane Imaging Radiometer (HIRad) Unmanned Aerial Vehicles (UAV) Prototype: Phase 1 Development*, \$190,444, University of Alabama/NASA; *Juno Science Support Phase B Activities*, \$13,596, SRI/NASA

Thomas Zurbuchen, *Spacecraft Optimization: Coupling Trajectory, Propulsion, and Power Systems FY 2007*, \$24,000, NASA

The annual AOSS Alumni Reception at the AGU Fall Meeting will again be held in conjunction with the U-M Geological Sciences Department. To lessen conflicts with AGU evening events, it has been moved to Tuesday, December 12, 6:00 – 8:00 PM in the Westin St. Francis Hotel's Tower Salon, the location of the 2005 reception.



Please extend the invitation to AOSS alumni and friends who may not receive the *Daily Planet*. Don't forget to visit the AOSS booth in the Academic Showcase on the Moscone Center West third floor – look for the Michigan flag.



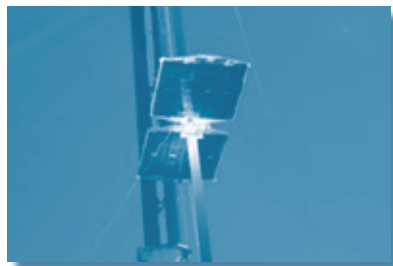
S3FL:

Student Space Systems Fab

Housed in AOSS – Bringing Science and Engineering Together

Students from AOSS, Aerospace and EECS have garnered more accolades for S3FL.

In the Space Elevator Games 2006, the S3FL MClimber Team made history as the first team to ever successfully reach the top of the 200-foot space elevator ribbon (and descend by itself). The climb was made on the first day, when wind conditions made the 200-ft ribbon oscillate wildly, and all other teams opted not to go. This was the second year of the NASA sponsored 5-year competition to develop technologies capable of building a space elevator. The MClimber team competed in the Beam Power Challenge. In this year's competition there were no winners selected, although the organizers viewed the competition as a success because of the advances made by the student teams.



TEAM MEMBERS

Julie Bellerose	Andrew Lyjak
Brian Baca	Mathew Marcucci
Kristen D'Anna	Jun Rong Ong
Paul Frick	Dheeraj Sanka
Cameron Haag	Joel Schweitzer

QUICK FACTS FROM ELEVATOR.2010: A PROJECT OF THE SPACEWARD FOUNDATION

- The Space Elevator is a thin ribbon, with a cross-section area roughly half that of a pencil, extending from a ship-borne anchor to a counterweight well beyond geo-synchronous orbit.
- The ribbon is kept taut due to the rotation of the earth (and that of the counterweight around the earth). At its bottom, it pulls up on the anchor with a force of about 20 tons.
- Electric vehicles, called climbers, ascend the ribbon using electricity generated by solar panels and a ground based booster light beam.
- In addition to lifting payloads from earth to orbit, the elevator can also release them directly into lunar-injection or earth-escape trajectories.
- The baseline system weighs about 1500 tons (including counterweight) and can carry up to 15 ton payloads, easily one per day.
- The ribbon is 62,000 miles long, about 3 feet wide, and is thinner than a sheet of paper. It is made out of a carbon nanotube composite material.
- The climbers travel at a steady 200 kilometers per hour (120 MPH), do not undergo accelerations and vibrations, can carry large and fragile payloads, and have no propellant stored onboard.
- Orbital debris are avoided by moving the anchor ship, and the ribbon itself is made resilient to local space debris damage.
- The elevator can be made larger by using itself to carry more ribbon pieces into place. There is no limit on how large a Space Elevator can be.

On the Web

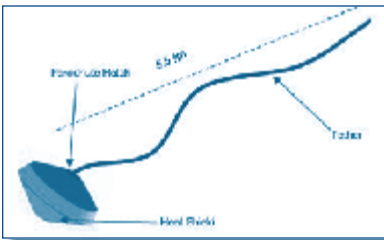
For more information about Elevator.2010 visit:
<http://www.elevator2010.org/site/primer.html>
<http://www.elevator2010.org/site/team.html?101>

abrication Lab

er

S3FL MISSION:

"To provide practical hands-on interdisciplinary experience for students through the design and development of exciting aerospace projects as part of their overall academic preparation."



Undergraduate Team Space – New Decelerator System for Capsules Reentering from Deep Space. The students designed a *Tethered Re-Entry Decelerator System (TREDS)*.

In the annual American Institute of Aeronautics and Astronautics (AIAA) Student Design Competition, a group of ten S3FL students took third place in the

Finally, the paper, *The Student Space Systems Fabrication Laboratory: An Approach to Space Systems Engineering Education*, received the Best Paper Award at the summer conference of the American Society for Engineering Education.

TEAM MEMBERS

Gerasimos Houppis – AOSS Student Employee
David Williams – 2005 AOSS Summer REU student
Rafael Ramos – AOSS GSRA
Catlin Garcia
Danny Lau
Nathan N. Meredith
Colin Miranda
Shane Moore
Martin Pietraszkiewicz
Richard Prasad
Jeffrey Schloemer

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Peter Washabaugh
Nilton Renno

On the Web

To read the paper, visit the web at:
<http://www.asee.org/acPapers/code/getPaper.cfm?paperID=10737>

What can be done?

Global Climate Change: From Kyoto To Ann Arbor
A panel discussion
Sponsored by the President's Office



As part of the President's Office *Ethics in Public Life Initiative*, AOSS Professor Ricky Rood participated in a panel discussion on *Global Climate Change: From Kyoto to Ann Arbor* on November 15. The event, held in the Michigan Union, also included, as panelists, Ann Arbor mayor John Hieftje and Andrew Hoffman, Holcim Professor of Sustainable Enterprise, Ross School of

Business and School of Natural Resources.

The forum focused on the action by corporations, state governments, local governments, and others to ensure the effectiveness of the Kyoto Treaty: what are they doing, what motivates them to act, what ethical and other responsibilities motivate their actions, and the challenges they face.

An Inconvenient Truth
The movie and panel discussion
Co-sponsored by AOSS



On October 16, AOSS and the Erb Institute for Sustainable Global Enterprise sponsored a showing of the movie, *An Inconvenient Truth*, and a panel discussion. AOSS Associate Chair, Perry Samson was one of four panelists who led an energized and informative discussion on what is and what can be done to mitigate the effects of climate change. Joining him were Rosina Bierbaum, Dean, School of Natural Resources and Environment and Vice-chair of the United Nations Scientific

Expert Group on Climate Change; Barry Rabe, Professor of Public Policy, Ford School of Public Policy and Professor of Environmental Policy, School of Natural Resources and Environment; and Andrew Hoffman, Holcim Professor of Sustainable Enterprise, Ross School of Business and School of Natural Resources.

The event, designed to spark discussion and debate on campus, elicited the accompanying editorial from the *Michigan Daily* (reprinted with permission).

On the Web

Copies of Prof. Rood's presentation are available online
PDF file: http://aoss.engin.umich.edu/events/06-07_events/06-Ethics_Climate_Change.pdf
and
PowerPoint: http://aoss.engin.umich.edu/events/06-07_events/06-Ethics_Climate_Change.pdf

From the Daily: An inconvenient vacuum University should unite environmental initiatives

A public screening of *An Inconvenient Truth* last Monday at the Michigan League presented attendees with a more accessible version of what scientists have been asserting for years - global warming is real and the world has to take action now to slow its progression. But it was the panel discussion following the viewing that was most enlightening, revealing what is missing from the movement for environmental reform. The discussion between students and faculty showed there's a lot happening on campus to promote energy conservation and alternative energy, but each effort remains independent from the others. In order to maximize the impact of so many groups' efforts, greater coordination is needed to enable them to pool their ideas and resources.

That panelists on Monday included faculty from across the University - professors from the Ross School of Business, the School of Public Policy, the School of Natural Resources and the College of Engineering - demonstrates the many facets of conservation and alternative energy. The assortment of University initiatives and student groups is equally diverse, with each organization taking a different approach to roughly the same goal. The

College of Engineering has reinvented the Phoenix Project, an effort launched after World War II to find peaceful uses for atomic energy. Now it's the Phoenix Energy Institute, aimed at uniting engineering organizations behind the common goal of developing alternative energy sources. On the other end of campus, the Business School and the School of Natural Resources have teamed up to develop a joint degree program in global sustainable enterprise. Business models and public policy applications are as important now to the effort as innovation and design, because only through business savvy and political clout will clean energy sources become attractive to those who can invest in such projects.

But what is largely missing is any coordination between these encouraging initiatives. The University can enable better communication between different projects around the campus. In the same way the Phoenix Institute is meant to unite engineering projects, a campuswide endeavor could unite the many different elements of the environmentalist cause, strengthening its influence.

The same enthusiasm for environmental causes is growing on a state level, but as at the University, politi-

cians have failed to fully seize the opportunity to make Michigan a leader in alternative energy. Cities like Ann Arbor are working to diversify their energy portfolios. Even some Metro Detroit churches have been promoting fossil fuel conservation via solar panels and windmills and educating parishioners about global warming.

It's not just tree-huggers who are going green: Alternative energy is attracting supporters from every field for its potential benefits to Michigan's economic growth and national security. Politicians on both sides of the aisle have paid tribute to the wonders of alternative energy, but the government has remained sluggish in taking concrete action beyond a few subsidies and tax breaks that fail to offset the help the government gives oil companies. Any politician who truly picks up this cause as his own would not only strengthen his own poll ratings but would also help the country by giving alternate energies political clout. With public support and political power, as well as constantly improving technology, clean energy will be transformed from a hippie's dream to a practical solution to many of our country's problems.

Hollywood has nothing on AOSS

It seems that right along with Hollywood, AOSS is experiencing a baby boom of its own. Since last February, two children and two grandchildren have been born to AOSS staff and faculty. In order of “age before beauty” – as all babies are beautiful – here are the newcomers.



Zachary Jarels was born on February 22. Sue Griffin, AOSS HR Coordinator is the proud grandmother. Zachary's parents are Laura and Jesse Jarels.



Katie Marsik was born on August 12. She is pictured with her big sister, Hannah, and her Mom, Theresa. Associate Research Scientist Frank Marsik is the very proud Dad.



Student Services Associate Margaret Reid is the proud grandmother of Nolan Jacob Pepper, who was born October 24 to Lisa and Chad. Holding Jacob is his big sister Alexandria.



IT Support staffer Bryan White, his wife Ally and daughter Mirren welcomed baby sister Madeline Rose on October 30. Mirren is holding her little sister.

At least one more grandchild is expected before the end of the year – if you're at AGU, see which faculty member has the biggest grin!

Did you know...

SPRL has a rich history of space instrument fabrication, starting in the 1940s with the Langmuir Probes that were ejected from sounding rockets to measure electron temperatures and densities in the ionosphere. SPRL engineers are currently working on SAM, the Sample Analysis at Mars instrument suite that is part of the Mars Science Laboratory, with a 2009 planned launch date.

Since 1969, SPRL engineers have built 39 different space instruments. To track the changes from then until now, over the next few issues of the *Daily Planet*, we're going to include the instrument names, mission web sites for more information and some images of the satellites used to carry these instruments into space. Here are instruments 1 through 16.

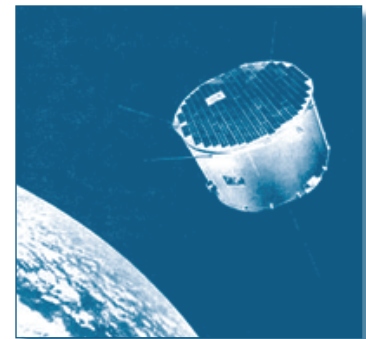
YEAR	INSTRUMENT DESCRIPTION	MORE INFORMATION
1969	NASA/Orbital Geophysical Observatory F (or 6 or VI) Mission; Electron Density and Temperature Probe instrument (1)	http://nssdc.gsfc.nasa.gov/database/MasterCatalog?sc=1969-051A
1970	CRS-NASA/San Marco-3 (or C) Mission; Omegatron instrument (2)	http://nssdc.gsfc.nasa.gov/database/MasterCatalog?sc=1971-036A
1972	NASA-Republic of Germany AEROS-A Mission; Neutral Atmosphere Temperature instrument (3)	http://nssdc.gsfc.nasa.gov/database/MasterCatalog?sc=1972-100A
1973	NASA Atmosphere Explorer Mission-C (or Explorer 51, or AE-C); Neutral Atmosphere Temperature instrument, Neutral Atmosphere Composition instrument, Visible Airglow Photometer instrument (4, 5, 6)	http://library01.gsfc.nasa.gov/cgi-bin/gdprojs/search.pl
1974	NASA-Republic of Germany AEROS-B Mission; Neutral Atmosphere Temperature instrument (7)	http://library01.gsfc.nasa.gov/cgi-bin/gdprojs/search.pl
1975	NASA Atmosphere Explorer Mission-D (or Explorer 54, or AE-D); Neutral Atmosphere Temperature instrument, Neutral Atmosphere Composition instrument, Visible Airglow Photometer instrument (8, 9, 10)	http://nssdc.gsfc.nasa.gov/database/MasterCatalog?sc=1975-096A
1975	NASA Atmosphere Explorer Mission-E (or Explorer 55, or AE-E); Neutral Atmosphere Temperature instrument, Neutral Atmosphere Composition instrument, Visible Airglow Photometer instrument (11, 12, 13, 14)	http://nssdc.gsfc.nasa.gov/database/MasterCatalog?sc=1975-107A http://nssdcftp.gsfc.nasa.gov/spacecraft_data/ae/aa_general.txt
1978	NASA Pioneer Venus mission; Orbiter Electron Temperature Probe, Orbiter Neutral Gas Mass Spectrometer (15, 15)	http://nssdc.gsfc.nasa.gov/database/MasterCatalog?ds=PSFP-00095 http://ael.gsfc.nasa.gov/venusIndex.shtml



#1: Orbiting Geophysical Observatory



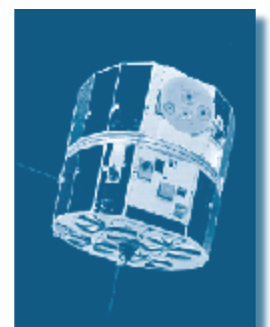
#2: San Marco 3



#3 & 7: AEROS



#15 & 16: Pioneer



#4, 5, 6, & 8-14: Explorer



Make a Michigan Difference Today

Your tax-deductible gift to AOSS will provide opportunities for students and keep our programs strong. AOSS strives to offer our students the best possible educational and research opportunities. Your gift to the Department will enable us to make awards to AOSS students who have financial need, are outstanding students or have exemplified exceptional leadership and character. The Department has been working hard to make the recently established Thomas M. Donahue Memorial Student Fund an endowment that will benefit AOSS

students for years to come. We are very close to the goal and would encourage you to be a part of a long-lasting endeavor to assist others in their academic endeavors.

Please use the form below to make a Michigan Difference today.

Thomas M. Donahue Memorial Student Fund

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

Name(s) _____

Address _____

City _____ State _____ Zip Code _____

Daytime Phone () _____ Email _____

Please do not send acknowledgment note to the
Thomas M. Donahue Family.
(The amount of your gift will remain confidential.)

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