Daily Planet

SLIMMER/FALL 2005

The Department of

Atmospheric,

Oceanic and Space

Sciences Newsletter

WANTED: 50,000—75,000 Scientists & Engineers

by Lennard Fisk, Chair, National Space Studies Board (reprinted with permission)

Over the past few years, the space community has recognized a growing issue: the retirement of scientists and engineers who joined the industry in its infancy during the 1960s. With the announcement of the President's initiative to have human space travel to Mars by 2030, a brighter light has been shone on this growing deficiency.

In the July National Space Studies Board Newsletter, NSSB Chair and AOSS Professor Len Fisk's "Message from the Chair" put forth the argument that the current relationship between NASA and universities is the antithesis of what is needed to fill the growing need for scientists and engineers.

The *Daily Planet* is reprinting Prof. Fisk's editorial in an effort to advance discussion in this area and to further understanding of the difficulties universities face in meeting the needs of the future.

- Tamas Gombosi, AOSS Chair

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Each of the columns that I have written to date has dealt with an issue of immediate concern to the space program, usually triggered by some recent event that altered the purpose of the space program, or the balance among its various aspects, or its leadership. We are presently at a brief lull in the action. At the Subcommittee level, Congress has passed appropriations for NASA that are essentially equal to the President's request, although there are some concerns and differences in the details. The new NASA Administrator, Mike Griffin, has made statements that are very supportive of science, particularly with regard to the breadth and balance of science that is to be pursued. However, the statements will become reality only when the FY2007 budget is developed this fall. There are rumors of many leadership changes in NASA, which will have a profound effect on science, but these will have to await the 12th of August, which is when the new Administrator can make such changes.

It seems appropriate then to use this column to discuss an issue of long-term importance to the space program. Indeed it is among the most significant issues for determining our future success: the workforce. Where will the space program obtain the workforce to execute the ambitious goals we have and how and where will they be trained?

The fact that the future workforce is an important issue should not be a surprise. The civilian space program began with a bang in the early 1960s. Starting from essentially nothing in the late



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University of Michigan 1521C SRB 2455 Hayward Street Ann Arbor, MI 48109-2143

(734) 763-7305 (734) 615-4645 fax aossnews@umich.edu

Daily Planet on the web at http://aoss.engin.umich.edu/DailyPlanet/

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Tamas I. Gombosi

Associate Chair for Academic Affairs

Perry J. Samson

Newsletter Editor

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AOSS Accolades

Faculty

Michael Combi has been selected to serve on the Search Advisory for the new College of Engineering Dean. The Committee will provide an unranked slate of candidates by early 2006.

Tamas Gombosi has been selected to serve on the University Russel Awards Advisory Committee; he will serve through 2008. The Russel Award is conferred annually to an associate or assistant professor or instructor to recognize distinguished scholarship and/or creativity and conspicuous ability as a teacher.

Student

Benjamin J. Lynch received the American Geophysical Union Solar Physics Section Outstanding Student Paper Award for his presentation, *3D Numerical Simulations of the Breakout Mode*, at the 2005 Joint Assembly.

Alumni

Yuei-An Liou, '96 PhD

--- Received an outstanding research award from National Central University of Taiwan, where he is a professor, for outstanding academic performance. He also serves as Council Advisor to the Atomic Energy Council, Executive Yuan of Taiwan, and as Consultant to the National Applied Research Laboratories and

Director of Science Research Division of National Space Organization. Dr. Liou is a Member of the *GPS Solutions*



Editorial Advisory Board and serves as Guest Editor for the Special Issue of "GPS Radio Occultation (RO) Experiments" of GPS Solutions. Listed in Who's Who in the World, he was a recipient of three annual NSC research awards and is a member of the American Geophysical Union, the American Meteorological Society, the International Association of Hydrological

Sciences, and a senior member of the Institute of Electrical and Electronics Engineers, Inc.

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*.

2nd in RASC-AL Competition

The Michigan Mars Rover Team, coached by AOSS Prof. Nilton Renno, took second place in the undergraduate category at the 2005 – Forum, a venue that gives student design teams an opportunity to present revolutionary design projects to peers and representatives from NASA and industry. The six-member AOSS Team were: Christine Kryscio, Erick Nytko, Chad Rowland, Frantisek Sobolic, Matt van Kirk, and Ilya Wagner



Pictured from left: Frantisek Sobolic, Ilya Wagner, Prof. Nilton Renno, Christine Kryscio, and Eric Nytko

RASC-AL (Revolutionary Aerospace Systems Concepts – Academic Linkage) is an initiative of NASA and the Universities Space Research Association. NASA hopes to foster communication among young, innovative minds and, in the process, harvest concepts and technologies that will one day lead to new opportunities for NASA research and programs.

Teams descended on the May 22 - 25 event in Cocoa Beach, FL, with projects that addressed technology research in a number of areas. The AOSS team presented its project, titled *Universal Chassis for Modular Ground Vehicles*. To evaluate each design project, a panel of judges from NASA, industry and academia used a combination of written, oral and outreach criteria. In the addition to the student-team presentations, the RASC-AL Forum included technical presentations from NASA, industry

1st in CanSat Competition

A team of Student Space Systems Fabrication Laboratory (S3FL) students took first place in the CanSat undergraduate category held June 3 in

California. SPRL is home to the S3FL and AOSS Prof. Brian Gilchrist was one of the team advisors.



The competition, which is sponsored by the American Astronautical Society, American Institute of Aeronautics and Astronautics, National Space Grant Consortia and Universities Space Research Association, was started to give students the opportunity to be involved with the end-to-end life cycle of a complex engineering project – from conceptual design, through integration and test, and concluding with operation of the system. Most space-related competitions are only for paper designs.

As part of the undergraduate category, the U-M team's mission was to design and build a CanSat (can satellite) that would "determine its maximum altitude, range distance from deployment to landing, the direction of travel using any combination of sensors, and measure temperature to +/-1 degree Centigrade at least once every 10 seconds during flight." The team's winning entry was a pop can-sized satellite made of carbon fiber with plywood end caps, and a payload consisting of pressure and temperature sensors and a telemetry system.

Members of the S3FL winning team were Ashley Smetana, project chief engineer, Aaron Pigeon, Jeremy Hollander, Jean Kongpin, Adebimpe Lawal, Selina Pan, Mustafa Rangwala, Carolina Sierra, and David Williams. Contributing to the Team were Nate Osborn, Scott Rudolph, Colin Sprinkle, Sean Burley, Jenny Son, and Matt McKeown. Graduate Student Advisors were Rafael Ramos, Tom Liu and in addition to Prof. Gilchrist, the team was advised by Pete Washabaugh, Aerospace Assoc. Prof.

AOSS Women Honored with Collegiate Professorships

Joyce Penner Named Aksel Wiin-Nielson Collegiate
Professor of Atmospheric Sciences



rofessor Joyce Penner as been honored as the ew Aksel Wiin-Nielson Collegiate Professor of Atmospheric Sciences, so amed for the first Chair of the newly reorganized Department of Meteorolgy and Oceanography eginning in 1963. Collegiate professorships re bestowed selectively o faculty members who ave attained a a sigificant stature in their areers.

Prof. Penner received

a BA in mathematics from the University of California at Santa Barbara and MS and PhD degrees in Applied Mathematics from Harvard University. Prior to joining the AOSS faculty in 1996, she was a physicist at the Lawrence Livermore National Laboratory. Her research interests include improving treatment and understanding of gas/aerosol interactions in the atmosphere, climate and climate change and climate model development and interpretation. She has been a Fellow of the American Geophysical Union since 1999 and serves on numerous panels and advisory boards addressing global change and climate issues. Prof. Penner is the author or co-author of over 200 refereed journal articles, book chapters and committee reports and has delivered lectures and papers around the world.

Janet Kozyra Named George Carignan Collegiate Research Professor

Janet Kozyra has received the Office of the Vice President for Research's prestigious named Collegiate Research Professorship Award. She will hold the named title of the "George Carignan Collegiate Research Professorship." The award, which is conferred at the most once per year, recognizes "exceptional scholarly achievement and impact on advancing knowledge



along with the exceptional ability to convey the excitement and significance of scholarship and creative activities to the educated public."

Prof. Kozyra, who received both her MSE and PhD through AOSS, is being recognized for her innovative research, world renowned standing in the international magnetospheric community, and her tireless commitment to science education and public outreach. She has also successfully launched the careers of several graduate and post-doc students who are now leading scientists in the community.

ADVANCE Grant Supported Women in Department

In 2001, the University received a grant from the National Science Foundation to improve the opportunities and circumstances of tenure-track women faculty in basic science and engineering fields. A key component of the five-year NSF ADVANCE program was the "Departmental Transformation Initiative." Through a competitive process, selected departments received funding for activities that would improve recruitment and retention of women faculty in science and engineering and improve the institutional climate.

AOSS received funding for a series of seminars and mentoring sessions with women scientists. For each visit, we scheduled lunches, group discussions and individual meetings for AOSS students and the visiting scientist. All who attended and participated commented on

how much they benefited from these interactions.

Visiting scientists who were in residence three to four days were:

- Fran Bagenal, Professor of Astrophysical & Planetary Sciences, University of Colorado
- Barbara Finlayson-Pitts, Professor of Chemistry, University of California-Irvine
- Ann Sprague, Sr. Research Associate, University of Arizona, Lunar & Planetary Laboratory
- Margaret Tolbert, Professor of Chemistry and Biochemistry, University of Colorado-Boulder

We also had the pleasure of hosting Margaret Kivelson (National Academy of Sciences and Professor, Planetary Science, UCLA) as a "Mentor in Residence" in November 2003 and twice in 2005 (January and April) with great success. The 2005 visits were for two weeks and have been a highlight of the program.

AOSS found the ADVANCE Program very beneficial to faculty, students and staff – male and female, as it led to a better understanding of what it means to be a "woman" scientist.



Prof. Margaret Kivelson during her "Mentor in Residence" stays in AOSS.

Weather Knowledge Vital for Win

AOSS Student Strategic Member of U-M Solar Car Team

The College of Engineering solar car Team MomentUM finished first in the North American Solar Challenge this past July, and AOSS was well represented – Prof. Brian Gilchrist was one of the team advisors and AOSS student Matt Trantham provided the team with critical weather forecasting.

This is the fourth championship for the U-M team, more than any other university, who competed against 20 other teams this year. The next step is the World Solar Challenge that starts September 25 in Darwin, Australia and ends October 2 in Adelaide, Australia. The world event will include 23 university and industry challengers from around the world.

Having lost their lead coming into Winnipeg, the weather and Matt became crucial members of Team MomentUM. "Matt had a HUGE responsibility on the team. Weather was a significant factor of strategic importance!" said Prof. Gilchrist

"Really for us to recoup the lead, out of Winnipeg we encountered some very strong winds," said



Team MomentUM and their winning solar car before leaving Michigan for the North American Solar Challenge. The Team worked on the car for two years



Team MomentUM's solar car crossing the finish line in Calgary just 12 minutes before the University of Minnesota after 2,500 miles with a speed limit of 65. Photo by Stefano Paltera/NASC.

Michael Brackney, project manager. "Our strategy pushed that to the edge and we pushed in front of all the other vehicles."

The 2,500-mile North American race, which began in Austin, Texas and ended in Calgary, is the longest NASC to date, traveling through six states, three provinces and two countries. MomentUM's final time was 53 hours and 59 minutes. Second place was University of Minnesota with a time of 54 hours and 11 minutes.

The students on Team MomentUM have been designing, fine-tuning and promoting the car for two years. The contest was sponsored by the U.S. Department of Energy (DOE), Natural Resources Canada, DOE's National Renewable Energy Laboratory, TransAlta, University of Calgary, CSI Wireless, AMD, and Manitoba Transportation and Government Services.

In the next issue of the *Daily Planet*, we'll have an interview with MomentUM team member and AOSS student Matt Trantham.

Additional information about the Team, the NASC race and the World Challenge can be found at:

http://www.engin.umich.edu/solarcar

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Second Annual Nelson Spencer Lecture



AOSS was pleased to host US Congressman Vernon Ehlers of Grand Rapids as the second annual Nelson W. Spencer lecturer on March 25, 2005. He began his sixth full term in January 2005, returning to the "Science Committee, where he serves as the Chairman of the "Subcommittee on Environment, Technology and Standards." During his tenure on the Science Committee, he has rewritten the nation's science policy and introduced the National Science Education Acts aimed at reforming our nation's K-12 science, mathematics, engineering, and technology education.

Congressman Ehlers, who is the first research physicist to serve in Congress, spoke to a full Boeing Auditorium crowd on, "A Physicist's Perspective: Is Capitol another Planet?"

Among the areas the Congressman touched upon, were:

- The need to develop a national strategy for aerospace workforce recruitment, training and cultivation.
- Is a human mission to Mars in the best interests of science or the fiscal well-being of the country? Will exploration come at the cost of science?
- Servicing of the Hubble Telescope, the stewardship of which the Congress-

man believes is the smartest investment in the US space research programs, was not included in the budget request.

- Science, technology, engineering and mathematics education is vital to meet the requirements of future jobs. The US must prepare children for a technical workplace and produce the needed scientists and engineers.
- Government and industry depend on universities working on the research frontiers to meet future needs. Finally, the Congressman urged everyone to participate and become involved at all levels of policy-making.

Going to be at the AGU
Fall Meeting? Look for
the AOSS Exhibit — stop
by and say hello!

continued from page 1

1950s, an American workforce of over 400,000 was assembled at the peak of the Apollo program in the mid-1960s. Students were encouraged to pursue careers in space. Those of us who were in high school when Sputnik was launched were both fascinated by the opportunities of space and drawn by a national imperative to serve our country by pursuing careers in space. After Apollo, however, the funding for civilian space declined, and it has remained at an essentially constant

Unless we are expecting to have the workforce trained overseas, the research universities of the United States must provide the needed scientists and engineers.

level since the early 1970s. Those of us who got in early have enjoyed successful careers, and during our prime there was relatively little need to replace us. Now we are getting old. Whether all of us are as bold as we were in our youth, or as bold as we will need to be to execute our future in space, is questionable. And while there is no mandatory retirement in the US, mortality eventually catches up with all of us.

We will probably not send humans to Mars for 30 years. Certainly the first generations of space scientists and engineers will be gone by then, and also so will many who are now in the prime of their careers. There is no plan to sprint to Mars as in Apollo, but it is not hard to imagine that on this 30-year time horizon, we will need 50,000 to 75,000 new scientists and engineers that we currently do not have.

It would be nice to think that someone in the NASA leadership is worrying about the workforce issue and doing something positive to ensure that the required workforce will be available. Unfortunately, that does not seem to be the case, as is evidenced by the fact that so many recent actions have been detrimental to creating the required workforce. I am not suggesting that these actions are malicious, only shortsighted; it is the law of unintended consequences at work.

Unless we are expecting to have the workforce trained overseas, the research universities of the United States must provide the needed scientists and engineers. At the graduate level, this training must involve participation in forefront research. Even at the undergraduate level, the training should involve hands-on experience with actual space projects. The most pressing future need will be for engineers and scientists who are able to develop hardware, and thus their training will

be meaningful only if the faculty of their university is also involved in the development of space hardware.

Regrettably, almost every recent procurement action by NASA has been detrimental to university participation in hardware programs. For example consider the following:

It has become increasing costly to develop a competitive proposal for participation in a NASA flight mission, and the costs are beyond the resources available to universities. They

> have no bid-and-proposal budgets and no profit that can be applied, and proposal preparation is not an allowable overhead expense.

Many NASA missions, particularly the smaller ones, are selected as a complete mission with a single PI who can, in principle, come from a university. However, with the exception of a few powerhouse universities,

most academic research groups do not have the infrastructure to manage an entire mission. These groups are then dependent on having friends at other universities or in NASA centers to participate. It is not the NASA procurement process that determines their selection, only the alliances they can build.

In the past, the development time for space instrumentation was longer and allowed for development of new technology. Universities used these longer missions to replenish their technology base and to update their infrastructure. Now missions have a limited development time and a highly constrained budget, with the consequence that effectively no new technology can be introduced. Where then do universities develop new technologies to remain competitive? There are some programs for developing new technologies, but they are limited.

NASA is currently imposing management requirements on how flight hardware is to be developed, with the belief that this will result in fewer failures. Many of these new processes run counter to the way university groups have learned to develop hardware, and have enjoyed considerable success in doing so. Even worse, the technical evaluation of proposals by NASA can penalize universities, in the belief that they are not able to execute NASA management processes. The result is a competitive disadvantage for universities compared to NASA centers and other national laboratories.

Universities have their own aging problem. The distinguished faculty members who established competitive experimental groups are retiring and need to be replaced by younger faculty. Yet in today's competitive environment, it is very

difficult for a young faculty member to be selected for flight hardware or to have anything to show for the effort when it is time to seek tenure.

Balloon and sounding rocket programs have long been the mainstay of university research and graduate training. These programs are now inadequately funded for this

It is not surprising then that the number of university space research groups capable of building space hardware is dwindling. A professor can produce only so many graduate students. If the number of active groups is limited, the production of graduate students is limited, and the pipeline will be inadequate to meet the national need.

Even a vigorous human exploration program to Mars will not capture the national attention as Apollo did. Once again, it will be the universities that have the important role.

NASA does have an education program. However, it has focused primarily on K-12 education. This is fun stuff. It is good for NASA's image. It may even increase the number of students who will pursue careers in science and engineering. It is unlikely, however, to do anything to ensure the required workforce for space. The numbers required to pursue space exploration might seem large, ~75,000, but they are still small

compared with the nation's output of scientists and engineers. The question, then, is not how many students pursue careers in science and engineering but rather how many will devote their careers to space. There is no national imperative this time. Even a vigorous human exploration program to Mars will not capture the national attention as Apollo did. Once again, it will be the universities that have the important role. They can lure students who have already decided on careers in science and engineering into the excitement of space, in particular by offering research opportunities for undergraduates.

At the beginning of the space program, NASA recognized the need for a strong university involvement. The agency encouraged university participation through research and technology grants and significant hardware opportunities. The result was an impressive infrastructure that trained the current workforce, developed innovative technology, and performed outstanding research. That infrastructure is currently being allowed to decay. Yet there is a pressing need now to rejuvenate the workforce. Our future will depend on.

Let us hope that some enlightened NASA leadership will recognize that the principal impediment to success in space is the lack of a trained workforce, and that they move aggressively to ensure that it will be available. And let us hope that the agency's leadership will attack this problem in a coordinated way, recognizing that there are many aspects – from the health of the university infrastructure to NASA procurement practices – that must be addressed.



AOSS staff members again prove they'll go to any length (or curl) to get the job done! **Pictured are Lana Murphy** and Robert Taylor who went above and beyond expectations recently as the cabinet in the second floor lounge underwent a thorough cleaning prior to repainting. The cabinet now displays some of the Department's meteorological instruments.

New AOSS Faculty

Richard B. Rood has joined AOSS as Professor with tenure. Prof. Rood is a leader of Earth system science and climate research. He has a very broad range of research interests extending from climate modeling to data assimilation, and to atmospheric chemistry. His research has had significant impact on climate modeling, stratospheric and tropospheric chemistry modeling, data assimilation, and high performance scientific computing. He pioneered the introduction of modern numerical techniques into atmospheric modeling, and is coauthor with S-J Lin of the seminal 1997 paper that resulted in the so-called Lin-Rood finite-volume dynamical core. This development is at the heart of the emerging generation of climate and weather models, and the paper revolutionized climate modeling.

Prof. Rood's work in data assimilation and the detection of temperature trends led the World Meteorological Organization to bestow the prestigious Norbert Gerbier-Mumm International Award upon him in 2003, and he was elected Fellow of the American Meteorological Society in 2004.

Prof Rood earned an undergraduate degree in physics from the University of North Carolina, and MS and PhD degrees in meteorology from Florida State University. Very early in his career he worked in plasma physics, giving him a unique and unifying perspective that is very important in AOSS. **Natalia Andronova** has joined AOSS as a Research Scientist. Dr. Andronova was raised and educated in Leningrad (St Petersburg) and has a very broad education involving mathematics, geosciences, and psychology. She came to the US in the early 1990s and soon joined the Atmospheric Science Department at the University of Illinois.

Dr. Andronova's research interests include global and regional climate change, the interactions between climate and chemical composition of the atmosphere, the sensitivity and feedbacks in the climate/chemistry system, the response of the climate/chemistry system to different radiative forcings both of natural and anthropogenic.

Current she is focusing her research on using a range of models from a simple climate model to a complicated 3D climate/chemistry model to detect and attribute climate change to different causal factors on different spatial and temporal time scales and to use statistical methods for interpretation and estimation of feedbacks and climate sensitivity.

Obituaries

Larry H. Brace

The second Director of SPRL, died August 28, 2005 at St. Agnes Hospital in Baltimore. Mr. Brace, who was 76, earned his BS degree in physics from U-M and also completed graduate work in physics, mathematics and astronomy. He was an internationally known scientist, publishing papers and contributing to books on planetary ionospheres and techniques for measuring them.

He left SPRL in 1960 to join Goddard Space Flight Center, where he was an astrophysicist and also head of the planetary atmospheres branch and the principal investigator on 15 satellite experiments designed to study the ionospheres of Earth and Venus. He received Goddard's Exceptional Performance Award and the NASA Medal for Exceptional Scientific Achievements for his work. He was a member of the science teams for the Atmosphere Explorers, ISIS international satellites, Dynamics Explorers and the Pioneer Venus mission.

Upon his retirement from Goddard in 1990, he rejoined SPRL as a member of

the research faculty, retiring from the University in 2001. Mr. Brace returned to AOSS/SPRL last spring when he participated in the Thomas M. Donahue Memorial Symposium.

His wife, Patricia Ann Brace, three children and five grandchildren, survive him. Contributions in honor of Mr. Brace may be made to the Benevolent Care Fund, Charlestown Retirement Community, 713 Maiden Choice Lane, Catonsville, MD 21228.



Pictured at the Thomas M. Donahue Memorial Symposium are Larry Brace, Dr. Stephen Bougher, AOSS faculty member, and Dr. Ernest Fontheim, AOSS research scientist emeritus.

AOSS Faculty Featured in Nature and Science ... Again

Publication in the respected journals *Nature* and *Science* is recognition many scientists never receive. AOSS faculty, on the other hand, are featured regularly in both publications. With this issue, three pieces by five faculty members appear in *Nature* and *Science*.

Prof. Joyce Penner's paper, "The Cloud Conundrum" was accepted by *Nature* for publication in the journal's "News and Views" section. Prof. Penner's paper addressed the issue of accounting for the effects of small particles in Earth's atmosphere. She asserts that, while this is one of the "great uncertainties in projecting global warming ... progress is nonetheless be-



ing made with this fiendishly complex problem."

The February 2005 *Science* included papers by Chair Tamas Gombosi, Assistant Research Scientist Kenneth C. Hansen, Prof. Hunter Waite and

Assistant Research Scientist Stefan Scherer. Prof. Gombosi and Dr. Hansen wrote a "Viewpoint" entitled "Saturn's Variable Magnetosphere," in which they discussed results of the data sent back from the Cassini spacecraft. The results are proving to be surprising and insightful.

The paper by Prof. Waite and Dr. Scherer (and additional scientists) reported on the detection of ions in the vicinity of Saturn's A ring by the Neutral Mass Spectrometer (INMS

– an instrument built by SPRL engineers). Titled, "Oxygen Ions Observed Near Saturn's A Ring," states that the INMS data show there is an ionosphere associated with the A ring.



Phillip A. Brooks

Phillip A. Brooks

78, former Assistant Director of SPRL, died August 22, 2005. He was born in Brattleboro, VT and graduated from the Catholic University of America with a BS degree in Electrical Engineering. Mr. Brooks was employed in the U.S. Senate, the Departments of Agriculture and Interior, the War Production Board and later, in a professional capacity, with the U.S. Navy Bureau of Aeronautics where he participated in the early development (1950- 1960) of guided missile systems.

Following this, Mr. Brooks was employed at the Bendix Aviation Corp, Systems Division in Ann Arbor prior to joining the College of Engineering in 1960. In 1992 he retired and subsequently moved to Hilton Head, SC. He is survived by his wife Audrey (Bunny), two children, three step-children, three grandchildren and three step-grandchildren. Memorials may be made to the Palmetto Health Hospice of Bluffton, PO Box 1857, Bluffton, SC 29910, or the Hilton Head Humane Association, PO Box 21790, Hilton Head Island, SC 29936.

Over the summer the University of Michigan News Service issued the following press release featuring AOSS faculty members.

Experts Available to Discuss Michigan's Ozone Smog

by Laura Bailey

The University of Michigan has several experts who can discuss the ozone and other smog issues.

Ozone smog is formed on hot, sunny days from pollutants emitted by cars, trucks, and power plants, said Sanford Sillman, research professor in the U-M Department of

Atmospheric, Oceanic and Space Sciences (AOSS). Recent unhealthy levels of smog in Michigan were due to the warm and sunny conditions, and to pollutant emissions in Michigan and in neighboring states, Sillman said.

Ozone smog and particulates have been linked to a variety of respiratory ailments, including coughing and shortness of breath in sensitive individuals and the possibility of long-term lung damage.

Ozone also causes damage to agricultural crops and to forests.

The following experts in atmospheric, oceanic and space sciences are available to discuss causes of ozone pollution and possible repercussions of Michigan's recent unhealthy levels of ozone:

Sanford Sillman, research scientist, can discuss atmospheric measurements and what they mean to the environment. He can be reached at (734) 763-4217 or sillman@umich.edu.

Perry Samson, associate chair of AOSS, can talk about regional scale transport and deposition of air pollutants. He can be reached at (734) 763-6213 or samson@umich.edu.

Frank Marsik, assistant research scientist in synoptic and air pollution meteorology, can discuss processing of pollutants

by clouds; and the measure and study of boundary layer aerosols. He is a former forecast/broadcast meteorologist. He can be reached at (734) 763-5369 or marsik@umich.edu.

Jerry Keeler, professor in environmental health sciences and geological sciences, can talk about measurements and modeling of transport and the fate of pollutants in the environment; air surface fluxes of contamination; and urban air quality. He



Photo Courtesy of the NWS Collection: John Neande, Photographer

can be reached at (734) 647-3670 or jkeeler@umich.edu.

Mary Anne Carroll, professor and director of the Program for Research on Oxidents: Photochemistry, Emissions and Transport (PROPHET), can talk the relationship between forests, the ozone and atmospheric pollutants. She is currently at the U-M Biological Station conducting atmospheric research and can be reached at (231) 539-8791 or mcarroll@umich.edu.

Faculty Positions in AOSS

AOSS is currently conducting a national search to fill two faculty positions as described in the following posting.

The Department of Atmospheric, Oceanic and Space Sciences (AOSS) at the University of Michigan is seeking applications for two tenured or tenure-track faculty positions. One position is to be filled with a candidate specializing in Earth System Science and Engineering (ESSE), and one position is to be filled with a candidate in Space Science (including Planetary Science).

Research interests of our ESSE faculty include: global climate change (emphasizing modeling of atmospheric and aerosol chemistry), regional and urban air pollution, chemical kinetics, radiative transfer, remote sensing, aerosol-cloudclimate interactions, and atmospheric dynamics. In addition, AOSS faculty are developing high-resolution computational models for advanced climate simulation and are extensively involved in observations of the Earth from space. They utilize optical measurements from the Upper Atmosphere Research Satellite and the TIMED satellite, from the MODIS and MISR instruments. microwave measurements from the TOPEX/Poseidon, Jason-1 and Wind-Sat satellites, and data from the Total Ozone Mapping Spectrometer in studies of ozone measurements. AOSS also participates in field campaigns, designing and integrating instruments on balloons, aircraft and sounding rockets to study the dynamics and composition of the atmosphere and the space environment.

The successful ESSE candidate should have a broad and clear vision for developing observational, theoretical and/or computational modeling approaches for understanding the behavior of the coupled Earth System.

Research interests of our Space Science faculty include: solar-heliospheric physics, magnetospheric physics (including planetary magnetospheres), magnetosphere-ionosphere coupling, aeronomy and planetary atmospheres (including atmospheres of small bodies and planetary satellites). AOSS faculty members are engaged in observational, theoretical and computer simulation studies. Over the last six decades faculty and staff of AOSS and its Space Physics Research Laboratory have designed, built, flown and analyzed more than 100 rocket experiments and nearly 40 space instruments. AOSS/SPRL instruments are on the way to, or have visited, all planets of the solar system except Pluto.

The successful Space Science candidate will be expected to work with other space science faculty in AOSS and at the University and establish an independent research program.

We seek candidates who will provide inspiration and leadership in research and contribute actively to teaching, and are especially interested in candidates who can contribute, through their research, teaching, and/or service, to the diversity and excellence of the academic community. The University of Michigan is responsive to the needs of dual career couples.

To apply, please send an electronic copy of your curriculum vitae, statement of research accomplishments and goals, and the names and contact information of five references to Ms. Susan Griffin (sgriffin@umich.edu). For further information, please go to: http://aoss.engin.umich.edu.

Informal inquiries may also be made to: Tamas Gombosi, Professor and Chair, Department of AOSS, email: tamas@umich.edu.

Reviews of applications will begin October 1, 2005 and will continue until the position is filled.

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Atmospheric, Oceanic & Space Sciences College of Engineering 1521C Space Physics Building 2455 Hayward Street Ann Arbor, MI 48109-2143

IN THE NEXT DAILY PLANET

- A talk with Matt Trantham, AOSS student member of Team MomentUM
- What has FIPS been doing since
 MESSENGER was launched to Mercury
 last summer.
- The team was away, so AOSS took over the Big House
- Pictures from the AOSS Alumni Reception at the AGU Fall Meeting

THE AOSS DAILY PLANET IS PUBLISHED THREE TIMES A YEAR: WINTER, SPRING/SUMMER AND FALL.

You're invited to the AOSS

Alumni Reception at The American Geophysical Union Fall Meeting

Wednesday, December 7, 2005 6:00 - 8:00 PM

Westin St. Francis Hotel, Elizabethan Room D San Francisco, California