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Senator Barbara Mikulski Meets With Dr. Weiler to Get Update on NASA/GSFC and Vows Support for JWST

By Alana Little

Maryland is full of champions. Think Kimmie Meissner, Figure Skating World Champion and Olympian; think the University of Maryland Lady Terrapins, the 2006 NCAA Championship winners; and, think Senator Barbara A. Mikulski, Maryland United States Senator and a long-time Goddard Space Flight Center champion. Senator Mikulski has been fighting for her state, and for GSFC, for many years. On Thursday, March 23, she once again visited Goddard to get an update on the important activities taking place on Center, so that she can make sure business thrives at one of the largest concentrations of engineering and high-tech jobs in Maryland.

Senator Mikulski last visited Goddard in August of 2005 for Maryland Congressional Day, where she spoke of her pride in the Center for its work on "Return to Flight." For this most recent visit, Senator Mikulski was briefed on the broad range of missions GSFC has been involved in, ranging from communications satellites that have supported human space flight since Apollo, to Earth science missions, space science missions and GSFC's role in developing more instruments on planetary missions than any other organization in the world.

Senator Mikulski said that she feels having a balanced program of science and human space flight is very important and emphasized the necessity for partnerships between the Center and the university community to form strategic alliances that are mutually beneficial. In speaking with the Senator, Dr. Weiler emphasized the importance of in-house missions and stressed that GSFC plays a critical role in mission management because of Goddard's end-to-end mission management experience.

Dr. Weiler also spoke to the Senator about engaging senior members of the Constellation program about the possibility of using capabilities at Greenbelt and Wallops to support the Exploration program. Senator Mikulski was enthusiastic about the prospect of potential Constellation work at Wallops and Greenbelt and also noted her support for broad-band capability along the eastern shore, including Wallops.

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Caption: Senator Mikulski, Paul Carliner, (Senator Mikulski's office) and Dr. Ed Weiler, along with Murzy Jhabvala (GSFC) viewing the JWST micro shutter demonstration.

Photo credit: Chris Gunn

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Cover caption: Maurice Henderson, Education Outreach Coordinator of Hydrospheric Processes and Goddard's showcasing "Science on a Sphere"

Photo Credit: Chris Gunn

GoddardView Info

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Managing Editor: Trusilla Steele

Editor: Alana Little

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Senator Barbara Mikulski Meets With Dr. Weiler to Get Update on NASA/GSFC and Vows Support for JWST

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Dr. Weiler briefed Senator Mikulski on the status of a host of Goddard missions, including JWST, HST, the Solar Terrestrial Probes program, Living with a Star, GPM, LRO, Glory, and LDCM. Senator Mikulski expressed her interest in and support of JWST-which Dr. Weiler noted, "would be the legacy to the next generation much in the way Hubble is for today's generation." He explained that JWST will look beyond the limits of Hubble to find the first galaxies that formed in the early Universe and it will enable wide-ranging research by thousands of astronomers. Senator Mikulski said she would continue to fight to make sure JWST receives the President's budget. The Center's collaboration with NOAA on GOES N and GOES R and APL was also highlighted during the briefing.

After the meeting with Dr. Weiler, Senator Mikulski took a tour of the Test and Integration Facilities to view the two STEREO spacecraft prior to shipment. Members of the APL and GSFC STEREO team were present to answer questions. APL and Goddard partnered on the STEREO mission and will also be collaborating on an upcoming Mars Scout proposal. Senator Mikulski also had the opportunity to interact with Dr. Murzy Jhabvala, Chief of the Detector Lab and see a micro shutter demonstration of technology which will be used on JWST.

Senator Mikulski spent an entire morning at GSFC getting an update on GSFC missions and initiatives and discussing with Dr. Weiler the challenges that lie ahead for the Center's civil servant and contractor workforce. All agreed that it is vital for NASA to have ten healthy centers. Senator Mikulski left late in the morning, armed with all she needed to once again do battle for a healthy NASA in the coming months. ■



Photo credit: Chris Gunn

Caption: Annette Dalbow and Ed Reynolds of (APL) with Lil Reichenthal, Mike Kaiser, and Jim Adams of (GSFC) view the Integration and Test Facilities with Senator Mikulski.

NASA Enters Agreement To Attract High-Tech Companies to Maryland

By Nicole Quenelle

Officials from the National Aeronautics and Space Administration (NASA) have entered into an agreement with Maryland's Department of Business and Economic Development (DBED) to attract high-technology companies to the state. Also designed to foster growth of new technology start-up companies with skills specific to NASA's technology needs, the agreement enables collaboration between NASA Goddard Space Flight Center (GSFC) and DBED. The mutually beneficial agreement will help bolster economic growth in the state while helping to support NASA's numerous missions.

According to GSFC officials, the agreement will help supplement the Center's research skills by facilitating technical exchanges with local organizations to study new aerospace trends, methods, and challenges that may benefit NASA missions. "DBED can certainly help us bolster the skills and expertise at Goddard by bringing technology collaborators with similar research interests to the state," said Nona Cheeks, Chief of GSFC's Office of Technology Transfer (OTT). And by leveraging local technical labor and education resources, GSFC may also strengthen its strategic technical advantage.

Maryland's DBED stands to reap significant benefits from the agreement as well. With a strong interest in stimulating local economic growth, DBED can leverage collaboration with GSFC

to demonstrate educational, financial, and business resources that technology companies require. "We can help each other," said Cheeks. "DBED can help us find scientists in industry that may help us further our missions. And at the same time, by demonstrating the need for those researchers in Maryland, we can help DBED meet some of its economic milestones."

To achieve these goals, the agreement calls for the two organizations to collaboratively develop outreach programs, workshops, and other meetings related to GSFC's technology needs. GSFC will also provide DBED with information related to its facilities and technological expertise that will be of interest to technology companies. In turn, DBED will facilitate collaboration between GSFC researchers and regional labs, as well as academic and business organizations, to develop joint technology ventures.

The agreement was facilitated by GSFC's OTT, a goal of which is to transfer technology into and out of NASA for use in the space program and beyond to benefit industry and other organizations.

For more information about Goddard's technology transfer program, visit: <http://techtransfer.gsfc.nasa.gov>. ■

SOS at the GSFC Visitors Center

By Amy Pruet

Normally, if an SOS could be traced to Goddard's Visitor Center it would be alarming, but not this time because the SOS is not a distress call but Goddard's newest exhibit, titled Science On a Sphere (SOS).

This mesmerizing visualization system developed by the National Oceanic and Atmospheric Administration (NOAA) uses computers and video projectors to display animated data on the outside of a suspended, 6-foot diameter, white sphere. Four strategically placed projectors work in unison to coat the sphere with data sets such as "3-D surface of the Earth and Nighttime Lights," "Moon and Mars" and "X-Ray Sun." Goddard's senior media producer Michael Starobin, along with video editor Vicky Weeks, the Conceptual Image Lab, and the Scientific Visualization Studio essentially re-wrote the rules for how to use the sphere. The result is a new presentation that's likely to be distributed to the seven other SOS exhibits located throughout the U.S. The team's first movie titled "Footprints," consists of a visually rich presentation where "the Earth appears in a variety of guises, from depictions of the biosphere to planetary views of city lights at night to dramatic examinations about the science of hurricane formation. Other moons and planets make exciting appearances too, with special presentations of Mars and Earth's moon," according to Michael Starobin.

The SOS technology was created by Sandy McDonald in 1998 for NOAA, but this new production at Goddard has dramatically evolved the state of the art. "Footprints" is the world's first fully produced video production developed for the Sphere.

Built as a vehicle for education and public outreach programs, SOS targets three audiences, SOS benefits an informal audience of walk in visitors and scheduled event participants. Through the innovative exhibit, the general public is introduced to an innovative perspective of science by way of a new multimedia avenue.

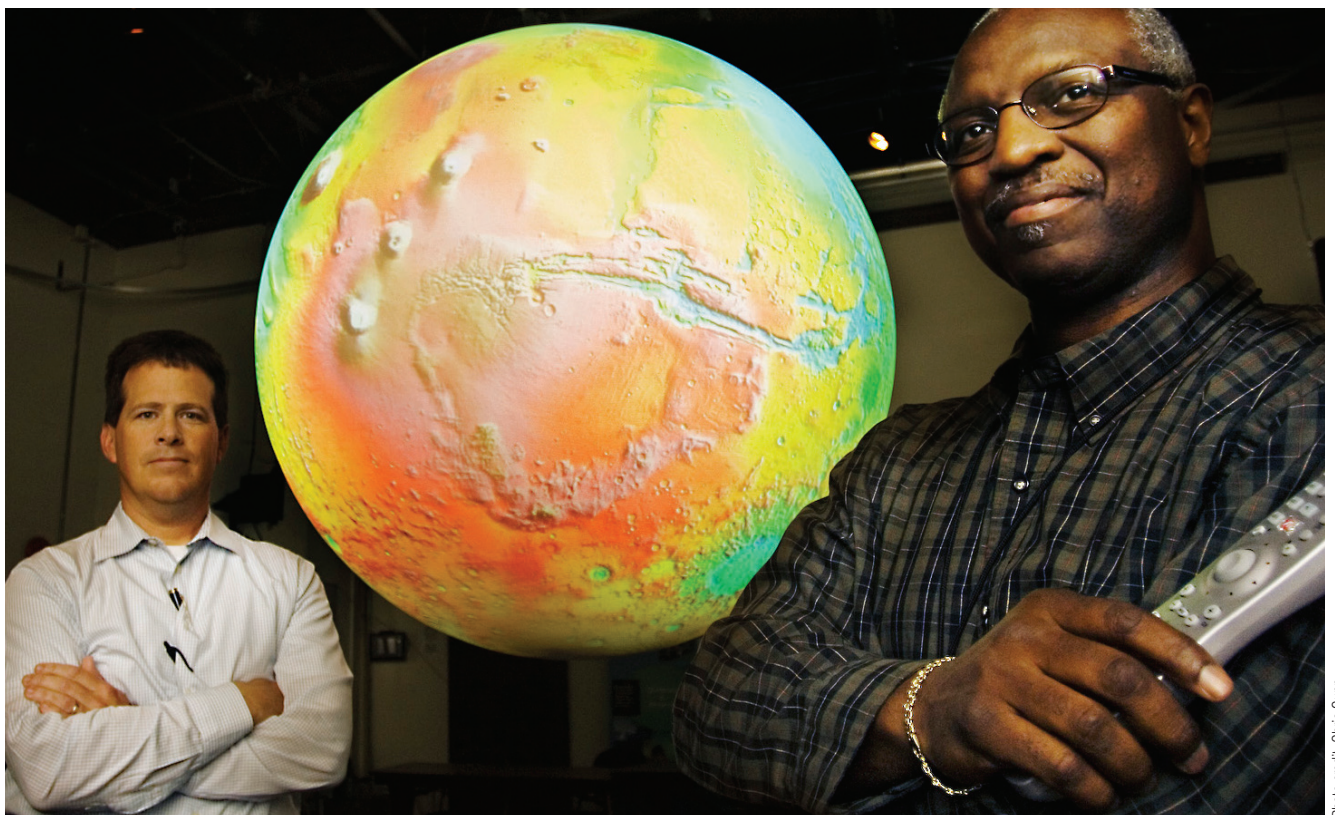
Second, beginning this fall, the SOS will be a part of formal education as local science teachers incorporate SOS into their curriculum and students will perform scheduled group work before visiting a science center with an SOS, participate in a structured activity on the day of their visit, and then follow the activity with additional exercises at their schools.

Finally, SOS will be used by science professionals as a platform to share their work with the science community and eventually formal education. Scientists can bring in data sets to be projected on the sphere or they can partner with Goddard TV to develop a program for formal education. It is Goddard's goal to see the SOS exhibit benefit as many individuals as possible, such as the 2000 sixth graders who visited GSFC for the May 4 Space Day event. SOS will play a significant role in other upcoming events such as a proposed lecture series to be held four to five times this summer.

"The Science On a Sphere Exhibit will be another way Goddard's community will benefit from NASA experience and information," says Maurice Henderson, Education Outreach Coordinator of Hydrospheric Processes and Goddard's science manager of SOS.

All employees and Goddard's local community are encouraged to check out the Center's newest exhibit, Science On a Sphere. Currently, each Saturday and Sunday the VC will show "Footprints" on the 1/2 hour, beginning at 12:30, 1:30, 2:30 and 3:30 pm.

For more information on SOS, or if you are a researcher and would like to explore how your data can be incorporated into SOS demonstrations, contact VC Manager Carmel Conaty at Carmel.A.Conaty@nasa.gov, or by phone at 301 286-7996. ■



Caption: Dave Himes, NOAA forecast systems software developer for SOS and Maurice Henderson, science Manager of SOS.

Photo credit: Chris Gunn

Walter Reed Rehabilitates Soldiers Returning from Iraq with Device Based on NASA Technology

By Nicole Quenelle

Walter Reed Army Medical Center in Washington, D.C., has begun using the Secure Ambulation Mode (S.A.M.) physical therapy device to help rehabilitate patients with spinal cord or traumatic brain injuries. A product of Enduro Medical Technology (East Hartford, Conn.), S.A.M. is based on technology developed at NASA Goddard Space Flight Center (GSFC). Enduro donated the S.A.M. unit to Walter Reed to facilitate rehabilitation for military patients, including soldiers returning home from service in Iraq.

"We felt S.A.M. would be an ideal fit for Walter Reed because it makes the rehabilitation process less taxing on both the patient and the medical staff," said Enduro's president Ken Messier. According to Messier, S.A.M. allows patients to stand or walk—partially weight bearing, full weight bearing or non-weight bearing—whether they have a sense of balance or not. "It allows them to be up in a standing position without having three or four therapists having to help them stand," explained Messier. "So it gets the patient up sooner in the rehab process without a fear of falling and without an injury to the patient or staff members."

At Walter Reed, the device is being used to help patients with a variety of traumatic injuries to the spinal cord and brain. According to Messier, one active military patient who was wheelchair-bound for two years due to a thoracic spinal cord injury is now up and walking with S.A.M. "When we first put him in the walker, he was up and going for 25 minutes," explained Messier. "He's

now walking for up to 25 minutes every day and even using S.A.M. to perform exercises to strengthen his leg muscles."

Developed at GSFC, the patented technology behind S.A.M. includes an earlier model walker device and a cable-compliant joint mechanism. Unlike a fixed joint, which can move in only one or two directions, NASA's compliant joint allows subtle movement in six directions with variable degrees of stiffness. Enduro licensed both patents from NASA and added the joint mechanism to the walker's harness, enabling greater flexibility in the walker's use and creating a commercially viable product. The licensing was facilitated by GSFC's Office of Technology Transfer, a goal of which is to transfer technologies developed for the space program to other industries for broader use.

The donation of S.A.M. to Walter Reed was made possible with support from The Henry M. Jackson Foundation for the Advancement of Military Medicine (HJF). HJF is a nonprofit organization that provides a resource link between military medicine organizations and private industry. "I commend Enduro for donating its medical devices to help with rehabilitation efforts at Walter Reed," said HJF's president John Lowe. "We're very glad to be able to facilitate this collaboration, which provides additional resources for the treatment of our military personnel."

More information about the NASA GSFC technology used in Enduro's S.A.M. device is available at: <http://techtransfer.gsfc.nasa.gov/SAM-video.html>
More information about GSFC's Office of Technology Transfer is available at: <http://techtransfer.gsfc.nasa.gov> ■

NESC Academy Announces Course on Satellite Attitude Control Systems

By Shannon Verstynen

The NASA Engineering and Safety Center (NESC) Academy is announcing its fourth course titled, "Satellite Attitude Control Systems: Learning from the Past and Looking to the Future with Cornelius Dennehy and Colleagues." This course will be held June 27-29, 2006 at the University of Maryland at College Park. In this three-day course, Mr. Dennehy and his colleagues will reveal the lessons learned through their years of practical experience and will discuss current and future issues in satellite attitude control systems. Registration for this class will open May 15, 2006. Please visit the Academy website to register. You must be a U.S. citizen and NASA employees and contractors will be given preference. Enrollment is limited to 30. There are five additional slots available to qualified University students and faculty.

Mr. Dennehy will share his expertise in the field of satellite attitude control systems (ACS) with a new generation of engineers. This course features a historical timeline, case studies, problem-solving activities, and guest speakers. It will address topics in areas including system engineering processes,



applying global positioning to satellite navigation, ACS system integration and multivariable control systems.

Cornelius Dennehy currently serves as the NESC Discipline Expert for guidance, navigation and control (GN&C). He has been the assistant chief for technology in the GN&C division at Goddard Space Flight Center for six years. His principal areas of expertise and interest include spacecraft attitude determination and control system design, space platform controls-structures interaction modeling, simulation and analysis and the infusion of technology into future missions.

The NESC Academy was established to capture, share and preserve the lifetimes of experience and knowledge of NASA's senior scientists and engineers; guide the next generation of NASA scientists and engineers as they develop expertise in technical problem solving; and foster interest in NASA careers. NESC, the National Institute of Aerospace (NIA) and CIBER partner work collaboratively to design, develop and deliver the three-day classroom experiences led by selected NDEs. For more information on the NESC Academy, please visit www.nescacademy.org. ■

Center Set to Roll-Out a New Learning Management System

By Sherry Tharpe

SATERN — the System for Administration, Training, and Educational Resources for NASA — is NASA's new Learning Management System. It offers web-based access to training and career development resources and will be your one-stop shop for on-line, on-site and off-site training opportunities.

Why is NASA implementing SATERN?

SATERN is an e-Government initiative supporting the President's Management Agenda. The implementation is a joint effort between the NASA Office of Human Capital Management and the Office of the Chief Information Officer. SATERN is expected to improve Agency services and reduce costs through more effective management of training and career development activities and by consolidating several current learning management systems including SOLAR and AdminSTAR, into a single integrated system.

SATERN is designed to improve consistency and efficiency in training operations through the implementation of standard training processes across the Agency and online access to consolidated training information.

What will SATERN do for me?

SATERN provides all employees with a one-stop approach to managing NASA training and career development activities. Through SATERN, you will be able to:

- Easily identify required training
- Launch available online courses
- Search course catalogs for opportunities
- Submit training registration requests
- Record your training history
- Generate personalized training reports

Within SATERN, all approvals will be routed electronically, and you will be able to check the status of your enrollment from your desktop. In addition, SATERN will send e-mail reminders to you on all scheduled training.

What if I am a supervisor?

As a supervisor, you will be able to use SATERN to approve training requests, assign training, view employees' training reports, and manage their training requirements. Because it is a comprehensive, end-to-end system, SATERN will make it easier for supervisors to guide the career development of their employees.

What will I need to do differently?

Because SATERN is an Agency-wide system for learning management, employees will notice some training-related changes and will need to follow some new, simple processes. All employees need to be aware of the following changes:

- After the SATERN implementation, you will use SATERN to launch online courses and enroll in onsite and offsite training (both NASA and outside vendor courses).
- A new form (NF-1735) will be used by all NASA employees for external training requests such as conferences and educational programs. The NF-1735 will be completely integrated into SATERN in the near future. Until that is complete, employees can access this new form (which replaces the GSFC 17-117) at <http://ohcm.gsfc.nasa.gov/DevGuide/Policy/enroll.htm>

When will SATERN be implemented?

The functionality of SATERN will be implemented in phases. The initial phase will be implemented in May 2006 and will replace the current legacy systems. Future phases will be rolled out over time and will provide additional function such as career planning, individual development plans, and competency management.

For more information on SATERN, contact: Sherry Tharpe at Sheron.L.Tharpe@nasa.gov or 6-6533 or Pam Guzzone at pam.guzzone@nasa.gov or 6-9145. ■

New and Improved Antimatter Spaceship for Mars Missions

By Bill Steigerwald

Most self-respecting starships in science fiction stories use antimatter as fuel for a good reason — it's the most potent fuel known. While tons of chemical fuel are needed to propel a human mission to Mars, just tens of milligrams of antimatter will do (a milligram is about one-thousandth the weight of a piece of the original M&M candy).

However, in reality this power comes with a price. Some antimatter reactions produce blasts of high energy gamma rays. Gamma rays are like X-rays on steroids. They penetrate matter and break apart molecules in cells, so they are not healthy to be around. High-energy gamma rays can also make the engines radioactive by fragmenting atoms of the engine material.

[The NASA Institute for Advanced Concepts \(NIAC\) is funding a team of researchers working on a new design for an antimatter-powered spaceship that avoids this nasty side effect by producing gamma rays with much lower energy.](#)

Antimatter is sometimes called the mirror image of normal matter because

while it looks just like ordinary matter, some properties are reversed. For example, normal electrons, the familiar particles that carry electric current in everything from cell phones to plasma TVs, have a negative electric charge. Anti-electrons have a positive charge, so scientists dubbed them "positrons."

When antimatter meets matter, both annihilate in a flash of energy. This complete conversion to energy is what makes antimatter so powerful. Even the nuclear reactions that power atomic bombs come in a distant second, with only about three percent of their mass converted to energy.

Previous antimatter-powered spaceship designs employed antiprotons, which produce high-energy gamma rays when they annihilate. The new design will use positrons, which make gamma rays with about 400 times less energy.

The NIAC research is a preliminary study to see if the idea is feasible. If it looks promising, and funds are available to successfully develop the technology, a positron-powered spaceship would have a couple advantages over the existing plans for a human mission to Mars, called the Mars Reference Mission.

"The most significant advantage is more safety," said Dr. Gerald Smith of

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New and Improved Antimatter Spaceship for Mars Missions

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Positronics Research, LLC, in Santa Fe, New Mexico. The current Reference Mission calls for a nuclear reactor to propel the spaceship to Mars. This is desirable because nuclear propulsion reduces travel time to Mars, increasing safety for the crew by reducing their exposure to cosmic rays. Also, a chemically-powered spacecraft weighs much more and costs a lot more to launch.

The reactor also provides ample power for the three-year mission. But nuclear reactors are complex, so more things could potentially go wrong during the mission. "However, the positron reactor offers the same advantages but is relatively simple," said Smith, lead researcher for the NIAC study.

Also, nuclear reactors are radioactive even after their fuel is used up. After the ship arrives at Mars, Reference Mission plans are to direct the reactor into an orbit that will not encounter Earth for at least a million years, when the residual radiation will be reduced to safe levels. However, there is no leftover radiation in a positron reactor after the fuel is used up, so there is no safety concern if the spent positron reactor should accidentally re-enter Earth's atmosphere, according to the team.

It will be safer to launch as well. If a rocket carrying a nuclear reactor explodes, it could release radioactive particles into the atmosphere. "Our positron spacecraft would release a flash of gamma-rays if it exploded, but the gamma rays would be gone in an instant. There would be no radioactive particles to drift on the wind. The flash would also be confined to a relatively small area. The danger zone would be about a kilometer (about a half-mile) around the spacecraft. An ordinary large chemically-powered rocket has a danger zone of about the same size, due to the big fireball that would result from its explosion," said Smith.

Another significant advantage is speed. The Reference Mission spacecraft would take astronauts to Mars in about 180 days. "Our advanced designs, like the gas core and the ablative engine concepts, could take astronauts to Mars in half that time, and perhaps even in as little as 45 days," said Kirby Meyer, an engineer with Positronics Research on the study.

Advanced engines do this by running hot, which increases their efficiency or "specific impulse" (Isp). Isp is the "miles per gallon" of rocketry: the higher the Isp, the faster you can go before you use up your fuel supply. The best chemical rockets, like NASA's Space Shuttle main engine, max out at around 450 seconds, which means a pound of fuel will produce a pound of thrust for 450 seconds. A nuclear or positron reactor can make over 900 seconds. The ablative engine, which slowly vaporizes itself to produce thrust, could go as high as 5,000 seconds.

One technical challenge to making a positron spacecraft a reality is the cost to produce the positrons. Because of its spectacular effect on normal matter, there is not a lot of antimatter sitting around. In space, it is created in collisions of high-speed particles called cosmic rays. On Earth, it has to be created in particle accelerators, immense machines that smash atoms together. The machines are normally used to discover how the universe works on a deep, fundamental level, but they can be harnessed as antimatter factories.

"A rough estimate to produce the 10 milligrams of positrons needed for a human Mars mission is about 250 million dollars using technology that is currently under development," said Smith. This cost might seem high, but it has to be considered against the extra cost to launch a heavier chemical rocket (current launch costs are about \$10,000 per pound) or the cost to fuel and make safe a nuclear reactor. "Based on the experience with nuclear technology, it seems reasonable to expect positron production cost to go down with more research," added Smith.

Another challenge is storing enough positrons in a small space. Because they annihilate normal matter, you can't just stuff them in a bottle. Instead, they have to be contained with electric and magnetic fields. "We feel confident that with a dedicated research and development program, these challenges can be overcome," said Smith.

If this is so, perhaps the first humans to reach Mars will arrive in spaceships powered by the same source that fired starships across the universes of our science fiction dreams. ■

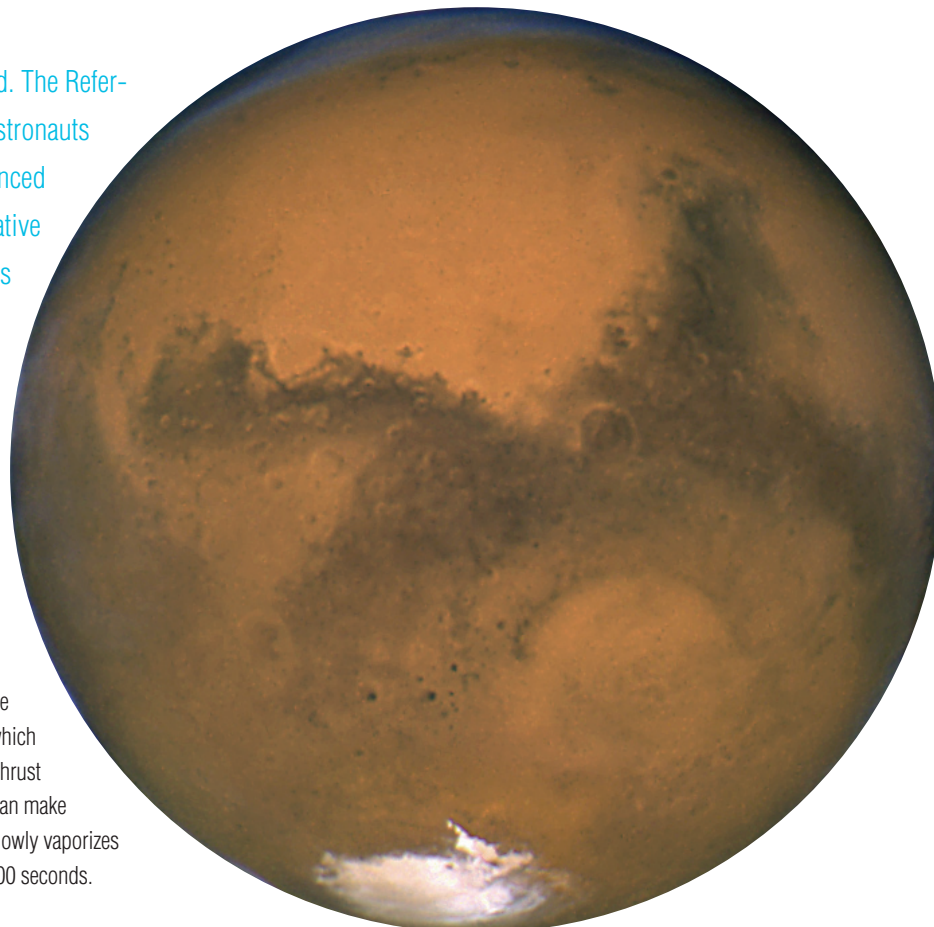


Photo credit: NASA

Caption: Hubble's closest encounter with Mars August 2003.

Maryland Orchestra and Young Students Create Cosmic Symphony

By Alana Little and Michelle Jones

Mix together, astronomy and physics, combined with classical and modern music and what do you get? A headache? Not on your life! On Saturday, April 29, 2005, Maryland middle school students along with the University of Maryland Symphony Orchestra joined to put on “An Orchestra’s Guide to the Universe,” an out of this world performance that incorporated astronomy and physics in conjunction with classical and modern music. Sound interesting? One attendee thought the effect was “thoroughly unique and exhilarating.”

The concert, took place at the DeKelbourn Concert Hall of the Clarice Smith Performing Arts Center, University of Maryland. The entire 5th and 6th grade classes from Berwyn Heights Elementary School in Berwyn Heights, Md., were the featured performers. The program, part of a year long endeavor that uses music to teach science, is funded in part by a NASA education grant awarded to Washington-based composer Arthur Bloom and Dr. Ilana Harrus of NASA Goddard Space Flight Center in Greenbelt, Md.

“These kids are brimming with excitement,” said Harrus, an astrophysicist. “In their science class, they’ve explored new concepts, such as black holes and Einstein’s theory of general relativity, and now they’ll be on a stage singing about it all.”

The concert is the first in an ongoing partnership in which middle school students collaborate during an entire school year with established musicians and scientists and ultimately perform with a professional-level orchestra. The score, written by Bloom, incorporates science concepts using a curriculum developed by Bloom, teachers at Sidwell Friends School and graduate student Erin Godfrey from the Department of Applied Psychology and Public Policy at New York University.

A chorus of more than 100 students performed a large number of roles, including “stars” that competed in a reversed American Idol-type competition with hopes of becoming “people.”

“The children have been enthusiastic to learn about science and performing,” said Margaret Strohecker, a science teacher at Berwyn Heights. “Under the direction of Tiffany Papanikolas, the music teacher, and Pat Carmody, our school Arts Focus coordinator, the program has energized the fifth and sixth grade students in a unique learning experience that goes beyond basic science.”

NASA images from different space missions projected in the concert hall as the music progressed. Harrus provided technical assistance to ensure scientific accuracy of the performance and worked in the classroom with the school children. Bloom guided the artistic direction. The performance enters the imagination of a child who takes the otherwise normal orchestra concert on a fantastic, multimedia trip through the universe, said Bloom.

Bloom is the founder and head of Renovation In Music Education, or RIME, a nonprofit organization that helps young people, arts organizations and communities succeed through innovative arts partnership programs. Following the premiere, RIME hopes to replicate the concert curriculum nationally.

Seed money for the program came from NASA’s Initiative to Develop Education through Astronomy and Space Science (IDEAS) Grant Program, a component of the NASA Mission Science Directory E/PO Strategy administered by the Space Telescope Science Institute in Baltimore. Additional funding was provided by the National Endowment for the Arts.

The concert was part of Maryland Day festivities on the University of Maryland campus.

For additional information please visit:
<http://www.abloom@rimemusic.org>



Caption: At the Clarice Smith Performing Arts Center, James Ross conducts the University of Maryland Symphony Orchestra and the 5th and 6th grade classes from Berwyn Heights Elementary School in the world premiere of “An Orchestra’s Guide to the Universe,” composed by Arthur Bloom with space imagery provided by NASA. The event was part of Maryland Day festivities.

Photo credit: Laura Mertens

Contractor Selected to Chill Instrument for JWST Mission

By Pam Sullivan

NASA recently selected Northrop Grumman Space Technologies of Redondo Beach, Calif. to develop a super-frigid mechanical helium cryocooler for the Mid-Infrared Instrument (MIRI) on the James Webb Space Telescope.

The award concludes a five-year development program which yielded ground-breaking advances in cryocooler technology. "This selection marks a major milestone for the mission," said James Webb project manager Phil Sabelhaus. "We now have all of our major industrial partners under contract."

A large sunshield will super cool the observatory to just 40 Kelvin, which is minus 388 degrees Fahrenheit. However, the MIRI detectors will need to operate at even colder temperatures. That's where the cryocooler takes over, absorbing heat from the instrument, enabling the detector temperature to drop to a mere six degrees above absolute zero. Operating at this chilly temperature will allow the MIRI to detect room temperature heat emitted by stars, galaxies and other objects in deep space.

MIRI will achieve nearly a hundred-fold increase in sensitivity over the current infrared observing champion – the Spitzer Space Telescope. Scientists using MIRI will be able to study how galaxies give birth to stars, how planets formed and how planets evolved to create the conditions for life.

NASA's Jet Propulsion Lab in Pasadena, Calif., will develop the instrument, along with a European consortium. MIRI is scheduled for delivery to NASA Goddard Space Flight Center in Greenbelt, Md., in 2010 where it will be installed into the James Webb Integrated Science Instrument Module. The module is one of three major elements that make up the observatory's flight system. The other two elements are the Optical Telescope Element and the Space Support Modules.

Goddard manages the James Webb Space Telescope project for NASA. Launch is currently scheduled for 2013.

For more information about the JWST, visit the following Web site:
<http://www.jwst.nasa.gov/> ■

Virginia Space Flight Academy Launches 2006 Camp Plans

By Bob Marshall

If you know a child that is interested in how rockets and spaceships fly, aerodynamics, micro gravity, astronaut training, extraterrestrial travel and the role of radar, weather and robotics, Virginia Space Flight Academy is the place for them to be, and the Eastern Shore of Virginia for their parents to vacation this summer!

The Virginia Space Flight Academy has begun accepting registrations for 11-15 year old students to experience the fun and excitement of weeklong residential programs. Academy camps are conducted at NASA Wallops Flight Facility on Virginia's Eastern Shore near Chincoteague Island, VA. The Academy is supported by the Eastern Shore Regional Partnership, the Mid-Atlantic Regional Spaceport, Mid-Atlantic Institute for Space and Technology, NASA, NOAA and the U.S. Navy.

At Space Flight Adventure Camp, young space enthusiasts are involved in a host of exciting, hands-on and minds-on experiences. In addition to building and launching their own model rockets, young space explorers engineer and conduct a simulated rocket launch from an actual NASA mission control room while seated behind computer consoles with individual headsets. Returning to the program this year, are activities which make use of robotics kits and flight simulators.

Virginia Space Flight Academy offers students a wonderful and truly unique opportunity to enjoy a week-long, fun filled summer camp experience, combined with educational field trips to operational NASA, NOAA and U.S. Navy facilities. Typical trips are visits to NASA's Vehicle Assembly Building, Range Control Center, Radar Sites, Launch Pads, Aircraft Hangers, the NOAA Command and Data Acquisition Station and the U.S. Navy Aegis Training Center. During these outings, government personnel explain the functions of the facilities and educational background required to be employed there, thus giving students insight into career development opportunities. Robert Marshall, Executive Director stated "I know of no other camp in the United States that has the capability to visit as many actual operational facilities!" Another unique aspect of our program is its small size. This past summer 8 one week camps were conducted with enrollment limited to the first 28 paid students and, for all practical purposes, all sessions were sold out. Geared primarily for students from the Mid-Atlantic Region of the U.S., the 2005 camp included students from Massachusetts, Rhode Island, Wisconsin, New Jersey, Florida, Texas, New Hampshire, and Washington State!

Eight camps, for 11-15 year old coed students, will be held beginning June 18 thru August 13, 2006. Each camp begins on Sunday afternoon and ends on Friday at 2 p.m. Tuition for each camp is \$645, which includes double occupancy housing, meals, transportation while at camp, a workbook, T-shirt, and all instructional materials. For 2006 registration is limited to the first 34 students that apply for each weekly session therefore early registration is suggested.

More information on Space Academy 2006 offerings can be had by telephoning the Academy toll free at **866-757-7223**, e-mail at **spaceacademy@intercom.net** or visit the web site at **www.VaSpaceFlightAcademy.org** for additional information and online registration.

NASA Earth Science Exhibits Open in Smithsonian Museum

By Rob Gutro

Two new exhibits, "Atmosphere: Change in the Air" and "Arctic: A Friend Acting Strangely," opened on April 15 for public viewing at the Smithsonian National Museum of Natural History in Washington, D.C. The exhibits are part of the museum's "Forces of Change" series, which features scientific data from NASA and other agencies on the Earth's changing climate.

Scientists from Goddard contributed movies, interactive computer data, and stunning satellite images to launch the two exhibits.

"Atmosphere: Change in the Air" focuses on the Earth's atmospheric composition and chemistry. In this exhibit, the latest results from NASA's Aura satellite, the third in series of large Earth-observing satellites, are featured.

Ernest Hilsenrath, atmospheric scientist at NASA Headquarters, said, "The 'Atmosphere' exhibit highlights the research NASA is conducting to better understand the connection between atmospheric composition and climate change. We hope this exhibit will enhance the public's awareness of how unique our atmosphere is and the impact humans can have on our global environment."



Caption: Dr. Ernest Hilsenrath of NASA Headquarters, being interviewed by a reporter.

Visitors can learn about these changes through several movies. The first movie takes the viewer from space through the solar system, highlighting the atmospheres of each planet. It ends on Earth in Washington, D.C. with a zoom in to the National Mall. The second movie is a lighthearted description of oxygen's tendency to oxidize, or react with other molecules, which is how fires, rust and the ozone in air pollution are generated. Ground-level ozone also acts as an oxidizer and is harmful to human and ecosystem health. A third movie takes the viewer on a journey over 20 years to see how the ozone hole over Antarctica has changed.

The exhibit features an interactive computer, where visitors learn how changes in oxygen, carbon dioxide and ozone amounts can affect the Earth. Visitors see how carbon dioxide and ground-level ozone are associated with fossil fuel combustion and affect the air we breathe. Ozone near the Earth is a pollutant and a component of smog. Ozone high in the atmosphere protects life on Earth from the sun's harmful ultraviolet radiation. Amounts of this ozone have been in decline due to the release of ozone-destroying chemicals.

Satellite images from NASA's Aura satellite show visitors how pollution travels around the world. The images show how great dust storms crossing the Atlantic and Pacific oceans can affect air quality far from their sources. The exhibit also includes specimens from the museum's paleobiology and meteorite collections.

NASA and the National Oceanic and Atmospheric Administration (NOAA) both contributed information to "Arctic: A Friend Acting Strangely," the second exhibit in the "Forces of Change" gallery. This exhibit shows how a changing climate has affected Arctic temperatures, sea ice and area life.

Much of the data and material for the images were provided by scientists at NASA and those in academia whose research is supported by NASA. "Satellite capabilities provide an important perspective for understanding how the Arctic is changing," said Dr. Waleed Abdalati, head of the Cryospheric Sciences Branch at Goddard, who reviewed materials for the exhibit. "By providing new views of the entire Arctic against the backdrop of the larger Earth system, we provide a new appreciation and context for how this cold and remote region fits into the global picture."

NOAA offered support for the exhibit and worked closely with the Smithsonian Institution to frame the content and develop specific topics and materials. The exhibit also explores how changes in the Arctic are monitored by scientists and polar residents. Visitors will see the challenges scientists face while working in extreme conditions and some of the technology that helps gather critical data to monitor changing conditions.

Visitors see objects from the Smithsonian's anthropology collections, photographs, scientific data such as the Arctic temperature record from 1900 to the present day, and a 2-3 minute video, "Eyewitness to Change." The video takes visitors to the Inuit community of Sachs Harbour in the Canadian Arctic. Residents discuss climate changes and how they have affected their lives. The exhibit is also funded in part by the National Science Foundation.

The museum gave reporters an advance look at the exhibit on April 11. During that event Dr. Philip Decola and Dr. Ernest Hilsenrath, two scientists from NASA Headquarters and Grey Hautaluoma from NASA Headquarters Public Affairs answered reporter questions.

For the museum's link to the "Atmosphere" exhibit, please visit on the Web: <http://www.mnh.si.edu/exhibits/atmosphere/>

For the museum's link to the "Arctic" exhibit, please visit on the Web: <http://www.mnh.si.edu/exhibits/arctic/> ■

Eclipses: One of Nature's Most Awesome Phenoms

By Alana Little



Photo credit: Chris Gunn

Caption: Fred Espenak.

There is no “Eclipse department” at NASA. There is however, one guy who is a dedicated researcher, fund raiser, photographer and envelope licker. That guy is Fred Espenak.

Since the early 1990's, Goddard Astrophysicist Fred Espenak has been working with the International Astronomical Union to provide the world with the most precise eclipse predictions that science will allow. Fred publishes his predictions in a series of NASA publications that focus on upcoming total eclipses of the Sun. His findings are also posted on the NASA Eclipse Home Page that contains information on past and future solar and lunar eclipses. Adding information to the site is ongoing and is extremely important not only as a research tool but as an educational outreach resource as well. “The public is fascinated by eclipses. Everyone enjoys viewing one so this makes eclipses an ideal outreach opportunity,” said Espenak.

Described on Fred's personal eclipse website as “the most spectacular event in all of nature,” solar eclipses present the only ground-based opportunity to study the elusive atmosphere surrounding the Sun. The solar corona has a temperature of about 2 million degrees Celsius while the Sun itself is only 6,000 degrees Celsius. Scientists are still puzzled by this mystery so they seek out the few brief minutes of the total eclipse to make detailed observations of the corona.

This super-heated plasma is strongly influenced by the Sun's magnetic field. It is a million times fainter than the Sun's disk and can only be seen during the darkness of totality. Scientists studying the corona also want to detect the “direction and velocity of ions in the corona to gain insight into the solar wind.” This stream of particles extends out into space and reaches Earth where it affects satellites, telecommunications, the upper atmosphere, and astronauts. Careful measurements and experiments during total eclipses can lead to a better understanding of the Sun and to help unravel the connections between the Sun and Earth. Espenak's detailed predictions, maps and tables allow scientists world-wide to make the most of each rare total eclipse.

The most recent total solar eclipse took place on March 29, 2006 and was viewed around the globe via a NASA web-cast from Turkey. It was part of Sun-Earth Day, which is celebrated every year to help everyone better understand how our Sun interacts with the Earth and other planets. This year's theme, “Eclipse: In a Different Light” showed how eclipses have inspired people to observe and understand the Sun-Earth-Moon system.

The next total eclipse is on August 1, 2008 and will be visible from northern Canada, Greenland, Russia, Mongolia and China. Espenak is preparing the next NASA bulletin for this eclipse but he worries that this kind of work falls between the cracks of major research funding opportunities at Headquarters. He is continually searching for resources so that he can continue his work.

In any case, you can be sure that Fred will be somewhere in the Moon's shadow during the summer of 2008.

To learn more about solar eclipses please visit:

sunearth.gsfc.nasa.gov/eclipse

Or www.mreclipse.com

For a replay of the 2006 eclipse web cast from Turkey please visit:

www.nasa.gov/eclipse ■

Photo credit: Fred Espenak

Employee Spotlight:

AETD Thomas J. Budney Award Presented by Orlando Figueroa, Director of Applied Engineering and Technology, GSFC

“I would like to recognize two of our colleagues, Phil Ward and Jim Lanzi, who were recently selected to receive the “AETD Thomas J. Budney Award for Engineering Integrity.” This award is presented in memory of Tom Budney for his engineering excellence and innovation, personal integrity, and passionate dedication to our missions, and to the lasting influence he had on others in space flight. This award is AETD’s highest recognition for AETD civil servants and contractors who best exhibit the qualities of engineering integrity. It recognizes individuals who championed an engineering alternative point of view or dissenting opinion which was effectively communicated with professionalism and persistence and resulted in a change in technical direction of a project or activity or a value-added re-examination of that direction. One of the objectives in creating this award was to make it clear we value highly people who go the extra mile to get the right thing done in the face of indifference, intransigence, or active opposition. We consider them role models and hope you will, too.”

The formal award presentation was made in the presence of the award-ees peers and colleagues in their home work setting. The award itself consists of an etched plaque and a cash award. The nominations are peer nominations and the winners selected by a panel including the previous winners of the Budney Award and chaired by Tom McCarthy, the AETD Chief Engineer. The award is not given unless the panel agrees that the nominees are highly worthy against all criteria.

Phil Ward and Jim Lanzi (Code 598W) are both being recognized for their work on the Range Safety Analysis for the ULDB Test Flight Mission that occurred during the summer of 2005. At that time the Balloon Project Office was planning to launch an ULDB test balloon from Fort Sumner, New Mexico. Phil Ward was representing Code 500 at the planned Mission Readiness Review where a summary presentation of flight safety was delivered. Phil’s assessment of the presentation was that a proper safety analysis had not been conducted, including the use of standard balloon statistical reliability as a basis for the reliability for the new design structure. The program representative when confronted with this assessment responded with a counter position stressing the importance of getting these test flights conducted (cost, schedule, future funding) and conveyed a concern that other balloon flights may be in jeopardy if subjected to such rigorous analytical scrutiny.

Phil carried this response back to his Branch Head where they decided to take this issue to the Suborbital Projects Independent Technical Authority (ITA). As a result, line management and the ITA representative were contacted.

With the project on notice, Jim Lanzi joined the effort with Phil and confirmed the opinion that the approach used to establish the reliability of the test structure was flawed. The analysis had assumed a proof tested structure whereas the existing test structure had not been proof tested. This fact along with the history of test failures associated with the various components of this design, led Jim and Phil to assign a reliability of “zero” to the test structure. This flaw in the analysis directly resulted in a risk to the public that was not properly accounted for in the assessment for flight. Upon further investigation, additional questions were raised on the method used to calculate over-flight CE. This team determined that outdated population data were being used and that casualty mitigation assumptions were also not applicable.

At this point in time, Jim began to pursue additional research on Land-scan database information. Jim proceeded to generate a new CE tool that properly accounted for population distribution using the latest data and incorporated historical balloon and payload descent dispersion data as well as the new assigned reliability of the test structure. The new results indicated that the accepted CE figures were not met in significant portions of the planned over-flight area and that changes to the flight plan needed to be made.

Both Phil and Jim participated in multiple directorate level discussions and despite significant challenges by management, maintained a firm, defensible and well grounded technical position with safety of the public as their number one priority. The outcome of their efforts was that significant changes were made to the planned flight corridor for the Fort Sumner ULDB mission. In addition, the tool developed during this effort is now in use by Code 803 (Range Safety Office) for subsequent balloon test flight analysis.

Did You Know?

Memory Foam:
Shock-absorbing “temper foam” was first developed to cradle astronauts from the intense g-forces during spacecraft liftoffs. It is now used in bedding.

“I hope you will join me in congratulating Phil and Jim and thanking them for what they did and what they continue to bring to our mission in NASA and for our Nation.”