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LRO Propulsion System Begins Integration and Testing

By Natalie Simms

A team of Goddard engineers is putting the finishing touches on the propulsion subsystem that will be integrated onto the Lunar Reconnaissance Orbiter (LRO). The propulsion system provides the velocity increment for orbit insertion and helps keep the reaction wheels—which keep the spacecraft properly oriented—from saturation.

This goal would not have been met without the expertise of the team members working on this project. The team behind the scenes includes Chuck Zakrzewski, Lead Propulsion Engineer; Dr. Eric Cardiff, Lead Propulsion Hardware Engineer; and Mark Fiebig, Lead Propulsion Integration and Test Engineer.

Dr. Cardiff has supported several missions, including the Laser Interferometer Space Antenna (LISA), the Global Precipitation Measurement (GPM) mission, and more recently, the Solar Dynamic Observatory (SDO). Now, as Lead Propulsion Hardware Engineer for LRO, Dr. Cardiff manages all propulsion hardware. In reference to his work on the propulsion system he says, “It will be a chance to demonstrate that Goddard can innovate and produce a propulsion system very quickly and demonstrate how practical, efficient, cost-effective, and more importantly, it is a product of superior quality.”

The bulk of the propulsion hardware originated from the *Hubble* Space Telescope Robotic Vehicle (HRV) servicing and deorbiting mission, which was decommissioned in 2005. This LRO propulsion system, made up of 2 propellant tanks and 12 monopropellant thrusters, has multiple objectives. Cardiff explains that, “once we leave the Earth’s atmosphere, bound on a trajectory to the Moon, then you actually have to enter orbit and that is what our propulsion system will be used for.” Once LRO orbits the Moon, it is the propulsion system that will help maintain the orbital altitude. The propulsion system is also used to reduce some of the momentum that will be built up on the spacecraft.

The team is partially finished with the integration and testing of the system. Comprehensive performance tests are being conducted for all four modules to ensure every component and parameter is correct, the leak rates are still in specification, and the response times for valves are acceptable. Fiebig says in summary, “we are currently welding and testing component modules, performing tank thermal and electrical integration, and assembling the orbit insertion thruster deck. We will soon be integrating the propellant tanks, orbit insertion thruster deck, attitude control thrusters, and component modules with the main deck and cylinder.”

Stay tuned as the LRO project makes further developments in its spacecraft bus design, which is the hardware component that makes up the support functions for its operation.

Visit the LRO Web site at <http://lunar.gsfc.nasa.gov> for more information on the mission. ■

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Cover Caption: *Modern Marvels* cameraman prepares to film the lab in Bldg 6 Room E78

Image Credit: *Bill Hrybyk*

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The History Channel's *Modern Marvels* Program Visits Goddard to Explore Aluminum Super Polish Technology

By Alana Little



Photo credit: Bill Hrybyk

Caption: Charles Fleetwood, Optical Technician (seated), demonstrates aluminum super polish technology to the Modern Marvels film crew.

The History Channel describes its *Modern Marvels* program as “celebrating ingenuity, invention, and imagination brought to life on a grand scale. The *Modern Marvels* program tells the fascinating story of the doers, dreamers, and sometime-schemers that created everyday items, technological breakthroughs and man-made wonders.” One of those technological breakthroughs—aluminum super polish technology—comes from none other than NASA Goddard Space Flight Center.

This celebrated technology called “precision aluminum optics,” uses diamond turning and polishing with a special compound to achieve a smooth surface. Mirrors fabricated using this process are lighter, less expensive, and more thermally stable than aluminum mirrors plated with electroless nickel.

Modern Marvels producer Savas Georgalis and his film crew visited the Optics Lab in Building 5 on May 18, to interview Optical Technician Charles Fleetwood from Code 551 who walked the crew through an aluminum super polishing demonstration where a piece of aluminum went from a rough piece of metal to a highly polished, reflective surface.

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How it Works

According to researchers in Code 551, this revolutionary process for precision optical polishing of bare aluminum results in unprecedented smoothness of the optic. Goddard's process begins by using a single-point diamond turning machine. Grinding cannot be used on bare aluminum—it leaves behind particles that scratch the surface during polishing.

Diamond turning alone typically will not produce mirror quality. Additional polishing is required to achieve the needed smoothness for low-scatter, high-quality, bare aluminum optics.

Goddard's process uses a special compound to polish the mirror to a super smooth finish. This compound not only offers excellent lubricating qualities, but it also contains suspended particles, which are extremely hard and small, making the compound ideal for mirror polishing.

Why This Method is Better

The major benefit of this innovative process is the ability to make pure aluminum mirrors. Aluminum optics is less expensive and lighter than optics made from other pure materials. By enabling the fabrication of high-quality aluminum mirrors, Goddard's process can dramatically reduce component fabrication cost while improving the performance of the optical system. The previous method of nickel plating aluminum optics had drawbacks. Plating faults would ruin the optic, and the bimetal thermal characteristics of nickel over aluminum were poor, which was problematic for space and other applications with dramatic temperature swings. Plus, the nickel plating process was much more expensive than creating aluminum optics.

This technology is part of NASA's Innovative Partnerships Program (IPP) Office, which seeks to transfer technology into and out of NASA to benefit the space program and U.S. industry. NASA invites companies to consider licensing the Aluminum Super Polishing Process technology (GSC-14147-1) for commercial applications.

Benefits:

- Low weight: Mirrors made from aluminum are lightweight.
- Thermally stable: Bimetal thermal characteristics of nickel over aluminum are poor. Pure aluminum mirrors offer excellent thermal stability.
- Low cost: Plating aluminum surfaces with electroless nickel significantly adds to the cost of the optic.
- Smooth surface: Goddard's process yields 5-angstrom flat and spherical mirrors and 10-angstrom aspherical mirrors, which are ideal for high-quality mirrors.

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Get Ready to Explore the Heart of the Sun

By Stuart Clark, European Space Agency (ESA)

Scientists may have at last found a way to explore the heart of the Sun with the detection of a special type of wave generated deep in the solar interior. The heart, or core, of the Sun is the location of the Sun's nuclear furnace, where fusion reactions power the sunlight that supports almost all life on Earth.

The Solar and Heliospheric Observatory (SOHO) spacecraft may have glimpsed these waves in the form of ripples on the Sun's surface. Analysis of the ripples will reveal details about the hidden core of our central star. Such information contains clues about how the Sun formed, 4.6 billion years ago. The subtle waves reveal themselves as a minuscule ripple in the overall movement of the solar surface. "Solar astronomers have been searching for this kind of signal since the 1970s," notes NASA's Joe Gurman, U.S. Project Scientist for SOHO.

The waves, called "g modes," are driven by gravity and provide information about the deep interior of the Sun. They are thought to occur when churning gas below the solar surface plunges even deeper into our star and collides with denser material, sending ripples propagating through the Sun's interior and up to the surface. It is the equivalent of dropping a stone in a pond.

Unfortunately for observers, these waves are badly degraded by their passage to the solar surface. By the time g modes reach the exterior, they are little more than ripples a few meters (yards) high. To make matters more difficult, the g modes take between two and seven hours to rise and fall just once. So astronomers are faced with having to detect a swell on the surface that rises a meter or two over several hours.

Now, however, astronomers using the Global Oscillation at Low Frequency (GOLF) instrument on SOHO think they may have caught glimpses of this behavior. Instead of looking for an individual ripple, they looked for the signature of the cumulative effect of a large number of these ripples. By analogy, imagine that the Sun was an enormous piano playing all the notes simultaneously. Instead of looking for a particular note (middle C for instance), it would be easier to search for all the Cs, from all the octaves together.

In the piano, their frequencies are related to each other and in the Sun, one class of g modes are separated by about 24 minutes. "So that's what

we looked for, the cumulative effect of several g modes," says Rafael A. García, of the Management of Sciences of Matter (DSM)/DAPNIA Service d'Astrophysique,* France.

They combined 10 years of data from GOLF and then searched for any hint of the signal at 24 minutes. They found it. "We must be cautious, but if this detection is confirmed, it will open a brand new way to study the Sun's core," says García.

Until now, the rotation rate of the solar core was uncertain. If the GOLF detection is confirmed, it will show that the solar core is definitely rotating faster than the surface.

The rotation speed of the solar core is an important constraint for investigating how the entire Solar System formed, because it represents the hub of rotation for the interstellar cloud that eventually formed the Sun and all the planets, asteroids, etc., around it. The next step for the team is to refine the data to increase their confidence in the detection. To do this, they plan to incorporate data from other instruments, both on SOHO and at ground-based observatories.

"By combining data from other SOHO helioseismology instruments and ground-based helioseismology networks, we hope to improve this detection and open up a new branch of solar science," says García.

SOHO is a cooperative project between the European Space Agency and NASA. ■

Caption (Background image): This is an artist's concept of the SOHO spacecraft exploring the center of the Sun. In reality, the spacecraft does this indirectly, by analyzing ripples on the solar surface that come from the deep interior.

Image credit: ESA and NASA.

*The Service of Astrophysics

Merging Two Powerful Software Tools to Create a One-of-a-Kind Exploration Capability

By Lori Keesey

Under this partnership made possible by NASA's Partnership Seed Fund program, Goddard Space Flight Center is integrating the Integrated Lunar Information Architecture for Decision Support (ILIADS), software, a geospatial information system (GIS) it developed for lunar applications, with Questus™, a management and planning software tool developed by United Space Alliance (USA) for Space Shuttle operations. The integration will result in a new decision-making application that NASA can use to plan and carry out future robotic and crewed missions to the Moon.

Benefits of Technology Transfer

- The resulting ILIADS-Questus software product will allow mission planners to directly apply scientific data gathered from remote-sensing satellites and other sources to select potential landing and habitat sites.
- Ultimately, the tool will support human exploratory trips on the lunar surface later in the next decade.
- USA can commercialize the new product, particularly in its work developing NASA's next-generation transportation system, the Crew Exploration Vehicle (CEV).
- As private companies increase their participation in lunar exploration, they too will need access to scientific data and decision-making tools afforded by ILIADS, its facilities, and the system's associated scientific expertise. The integrated software will meet those needs, providing an additional revenue stream for the company.

About United Space Alliance

USA is a world leader in space operations, with extensive experience in virtually all aspects of the field. Headquartered in Houston and employing 10,000 people in Texas, Florida, and Alabama, USA is applying its broad range of capabilities to NASA's Space Shuttle, *International Space Station*, and Constellation programs, as well as to space-operations customers in the commercial and international space industry sectors.

Technology Origins

Using internal research and development funding, Goddard technologists modified commercial off-the-shelf GIS software typically used in terrestrial applications to design an integrated tool suite useful for lunar exploration. ILIADS gives users access to three-dimensional lunar crater scenes, topographic contour maps, surface distance and elevation measurements, *in situ* resource and hazard maps, as well as historical mission data and other useful data sets.

USA also used its own internal resources to develop Questus, which combines three software programs that the company developed for space operations. The toolkit offers a variety of functions that will help mission-operations personnel to more efficiently find and retrieve information, schedule daily astronaut activities, and carry out robotic operations. Questus is scheduled for beta testing following the *International Space Station Expedition 15* mission in March 2007. The full-up program—Questus 1.0—will be available for CEV systems in July 2008.

Finding a New Use

NASA planners and decision makers must be able to process, analyze, display, and manipulate all types of environmental information about the Moon to ensure the success of the Agency's lunar exploration program. Such an all-in-one decision-making and planning tool currently does not exist. Goddard is modifying ILIADS so that its server, server interface, and data sets are available to Questus in a standard format. Meanwhile, USA is modifying Questus to support ILIADS's lunar environmental data. With these modifications, including a continuous zoom-and-pan function, users will be able to visually specify geographic areas on the Moon and quickly retrieve more specific data about that area.

The Transfer Process

Goddard and USA developed their software tools independently. From consultations with Goddard's Innovative Partnerships Program Office, both realized that their tools could become more powerful and have wider application if they were integrated. In 2006, NASA selected the collaboration for its Partnership Seed Fund and provided additional resources for the partners to integrate these two software systems under their respective internal research and development investment programs. The Partnership Seed Fund, which NASA introduced in 2006, is designed to encourage joint-development partnerships between its organizations, private industry, and others.

Looking Ahead

Goddard and USA expect to complete the integration of ILIADS and Questus in time for the Lunar Reconnaissance Orbiter (LRO), a Goddard-led mission that will spend a year mapping the Moon after its launch in 2008. With the new capability, exploration mission planners will get faster, more efficient access to LRO data, which they can then use to plan and carry out subsequent missions to the Moon, including crewed lunar operations. ■

Mac and PC Guys, Move Over! Goddard Employees Perform in Spoof of Popular TV Commercials

By Nancy Pekar

The actors in the ubiquitous “Get a Mac” advertising campaign could learn a thing or two from Goddard’s own John Degnan and Peter Shirron.

The two are featured in a parody of the well-known “I’m a Mac and I’m a PC” television commercials, which pit the stuffy, overly uptight PC against the hipper, more nimble Mac. But instead of personifying the virtues of one computer system over another, Degnan and Shirron dramatize the consequences of when innovators fail to file a “New Technology Report,” or NTR when they develop a new technology.

“I saw the Mac/PC ads on TV and I loved them,” said Nona Cheeks, Director of Goddard’s Innovative Partnerships Program (IPP) Office, which is responsible for both transferring Goddard-developed technologies to industry, academia, and others, as well as for finding external partners with whom Goddard innovators can collaborate to develop technologies needed for specific space missions.

“I started thinking of ways I could capitalize on the concept to drive home my own message. I wanted to use humor to educate people about the importance of NTRs and how this simple process could result in royalty revenue and awards to the innovator and assurance that Goddard always protects its competitive position in the award of new work,” she added.

Those who saw the spoof at its debut at the 15th Annual NTR program in May, say she and her team succeeded—so much so in fact that NASA Headquarters has distributed the commercials to other NASA IPP offices to help them educate their own employees about the benefits of NTR filing and tech transfer. The piece also is now included in tech transfer training sessions, which the IPP office sponsors to familiarize civil servants and contractors with the policies and procedures related to tech transfer.

In the three-vignette series, Goddard engineer Shirron portrays the knowledgeable yet unassuming NTR. NTR gets fame, fortune, and even a glamorous “partner company,” played by Barbara Lambert, an SGT, Inc., employee and veteran of Goddard’s Music and Drama (MAD) group.

Degnan, a retired Goddard employee now employed by Sigma Space Corp., plays the befuddled yet pompous “Idea” whose creator failed to file an NTR. The oversight costs Idea money and notoriety and embroils him in a relationship with a dishonest “partner,” who happens to be a woman played by Dan Carrier of Orbital Sciences Corp. “She” ends up stealing everything he has. Without patent protection, Idea is reduced to tears, though comforted in the thought that he still could be mentioned in *NASA Tech Briefs*.

The IPP Office’s Darryl Mitchell and Asia Proctor and Goddard’s Patent Chief Bryan Geurts all have supporting roles.

Although four of the actors have performed previously on the stage, no one had any on-camera experience. It didn’t show. “It was great working with these people,” said Nancy Pekar, an IPP Office contractor who wrote and directed the commercial. “They were patient, cooperative, and really well prepared”—important attributes given the fact that she had a small budget with which to work. Shooting began on April 17 in the Building 8 auditorium and wrapped up in just 4 hours.

Since the commercial’s official unveiling, a couple of the actors already have experienced the “15 minutes of fame” coined by artist Andy Warhol. “Somebody came up to me just the other day and said, ‘Hey, you’re Idea,’” Degnan said.

For Cheeks, who wanted to be creative in educating employees about the necessity of filing NTRs, the reaction couldn’t be any better. “Yes, employees are required to file NTRs, but that doesn’t mean we can’t have fun educating them about it. I’m pleased with the way it turned out.”

To see the commercial, employees can either go to <http://ipp.gsfc.nasa.gov/NTR-ad-video.html> (you must have Windows Media Player), or, better yet, attend the IPP Office’s next training session scheduled for August 16 at Wallops and November 15 at Goddard.

For more information about either training session, contact Dale Hithon at 301-286-2691 or Dale.L.Hithon@nasa.gov, or visit <http://ipp.gsfc.nasa.gov/NWS-Tech-training.html>. ■

Modern Marvels Program Visits Goddard

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- Consistent quality: Plating electroless nickel onto aluminum can result in faults that preclude using the optic. Goddard's process consistently yields a high-quality surface and form.

During the *Modern Marvels* filming, Orlando Figueroa, Director of the Applied Engineering and Technology Directorate, answered questions about Goddard's use of aluminum in mission hardware such as the *James Webb Space Telescope* (JWST).

He explained that a telescope's sensitivity, or how much detail it can see, is directly related to the size of the mirror area that collects light from the cosmos. A larger area collects more light to see deeper into space. "We've reached the limit as to what the *Hubble* Space Telescope (HST) can do in space, we are looking to learn how farther regions of space can be explored and JWST will allow us to do that. JWST will allow us to look at a very faint thermal signal that will show us where some stars dated." He continued saying that highly polished aluminum mirrors such as those used on JWST represent a "new era in mirror design that allows us to create a very lightweight segment."

According to the JWST Web site (<http://jwst.gsfc.nasa.gov/mirrors.html>), a larger mirror area collects more light to see deeper into space. The larger mirror also means JWST will have excellent resolution. That's why the telescope's mirror is made up of 18 mirror segments that form a total area of 25 square-meters (almost 30 square yards), when they all come together. Each of the hexagonal-shaped mirror segments is 1.3 meters (4.26 feet) in diameter, and weighs approximately 20 kilograms (46 pounds). The completed primary mirror will be over 2.5 times larger than the diameter of *Hubble's* primary mirror, which is 2.4 meters in diameter, but will weigh roughly half as much. Each segment is made of aluminum-coated beryllium, one of the lightest of all metals known to man. The challenge was to make the mirrors lightweight for launch, but nearly distortion-free for excellent image quality. JWST will collect light approximately 9 times faster than *Hubble*.

"Without these aluminum mirrors we would have a significant challenge to get JWST off the ground," said Figueroa. "We go out of our way to find materials that are lightweight and will get the job done; to us aluminum is an essential material. Everything from small explorers to larger shuttles is dependent on our use of aluminum. It started with *Sputnik*, which used about 200 pounds of aluminum; now this material is essential."

Figueroa was also asked about NASA's future uses of aluminum and he said that "in the future we are looking into composites of more exotic materials to help get us farther into space."

Stay tuned to the *Goddard View* for information on when the program will air.



NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES)

Supporting research in science and technology is an important part of NASA's overall mission. NASA solicits this research through the release of various research announcements in a wide range of science and technology disciplines. NASA uses a peer-review process to evaluate and select research proposals submitted in response to these research announcements. Researchers can help NASA achieve national research objectives by submitting research proposals and conducting awarded research. This site facilitates the search for NASA research opportunities.

For more information, please visit <https://nspires.nasaprs.com>

Solicitations:

National Space Science and Technology Center Research and Support

Released: 2007-06-22

Proposal Due: 2007-08-03

NSBRI Announcement Soliciting Postdoctoral Fellowship Applications

Released: 2007-06-15

Proposal Due: 2007-08-01

Goddard June–July 2007 Retirees

The following employees have retired after 30 years or more of service to the Federal Government:

Dr. Gregory Clark—June 15, 2007 Code 542

Dr. John Dorband—June 30, 2007 Code 695

Charles Petruzzo—June 30, 2007 Code 595

John Bryan—July 3, 2007 Code 227

Mark Fontaine—July 3, 2007 Code 443

Carolyn Wisenauer—July 3, 2007 Code 588

Thank You For Your Service!

A Night of Science and Wonder at the Unveiling of “Worlds Beyond”

By Laura Spector

The Goddard Visitor Center buzzed with excitement on the evening of June 5, 2007, as local school groups, families, and visitors gathered for the unveiling of the new extrasolar planets exhibition, “Worlds Beyond.”

This artistic installation is a hands-on, interactive exhibit that will be used to educate and stimulate student interest in planetary science and the search for worlds outside our solar system.

The exhibition showcases the first effort of a larger, ongoing educational program, in which groups of local middle school students adopt extrasolar planets and, after learning all they can about the planet, turn that knowledge into a visual representation of their “alien” world.

“Worlds Beyond” was organized by the National Space Society in partnership with the *James Webb Space Telescope’s* (JWST) education effort at Goddard, led by Anita Krishnamurthi, and Goddard Visitor Center Director, Carmel Conaty. The program was sponsored by Northrop Grumman.

George Whitesides, Executive Director of the National Space Society, called the installation, which is arranged around the grounds of the Visitor Center, a “learning landscape.”

The large rocket in the middle of the Visitor Center’s rocket garden symbolizes our solar system and each student project, strategically placed “in orbit” around the rocket, represents an extrasolar planet in the Milky Way galaxy.

To get a sense of the distance of the extrasolar planets from our Sun, Whitesides told the visitors to “imagine that you’re a space ship and you can cruise light-years with each step.”

NASA scientists and engineers were also on hand to interact with students and the public, as well as to provide their unique perspective on the exhibit.

Dr. Jennifer Wiseman, Chief of Goddard’s Lab for Exoplanets and Stellar Astrophysics, described the search for extrasolar planets as detective work. Because scientists do not yet have the capability to directly image planets like the ones in our solar system, they must search for clues that an extrasolar planet exists.



Photo credit: Pat Izzo
Caption: Visual representation of extrasolar planets developed by local middle school students.

These clues, such as the wobbling of a star being tugged by a planet or a periodic drop in the amount of light observed from a star, were studied by the students as part of the educational program.

Here at Goddard, scientists are working with current space telescopes and developing new ones to detect and study extrasolar planets. The *Hubble* Space Telescope has been used to examine the atmospheres of several large extrasolar planets and concepts are being devised for future telescopes to study even smaller, Earth-like planets.

Meanwhile, the eagerly awaited JWST, set to launch in 2013, will play a significant role in studying large, extrasolar planets and the regions around stars where they form. A new model of the JWST was also unveiled at this opening event and will remain a permanent fixture in the Visitor Center.

The theme of extrasolar discovery continued throughout the evening as noted musician Marty Quinn performed a composition inspired by actual scientific data from newly discovered extrasolar planets. Each of the futuristic sounds represented specific information about these planets, such as their size, temperature, or compositional makeup.

As night fell on the installation, the light emitting diode (LED) lights that topped the student projects began to glow; illuminating the grounds with multicolored light that truly brought the “Worlds Beyond” exhibit to life.

To learn more about “Worlds Beyond,” visit:
<http://www.jwst.nasa.gov/worldsbeyond.html> ■

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A Night of Science and Wonder at the Unveiling of "Worlds Beyond"

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Photo credit: Pat Izzo

Caption: Dr. Anita Krishnamurthi, of the Astrophysics Science Division at Goddard, points out features of the JWST on the new Visitor Center model.



Photo credit: Pat Izzo

Caption: Representatives from the Public Affairs Office at Goddard and the National Space Society welcome visitors to the "Worlds Beyond" opening event.



Photo credit: Pat Izzo

Caption: A new exhibit and model of the JWST have taken up permanent residence at the Visitor Center.



Photo credit: Pat Izzo

Caption: As the Sun sets, the students' extrasolar planets began to illuminate the grounds of the Visitor Center, bringing the "Worlds Beyond" installation alive.



Photo credit: Pat Izzo

Caption: Students eagerly raise their hands to answer questions about extraplanetary science, posed to them by Goddard Deputy Director Dolly Perkins.

2007 Goddard Health Fair a Success

By Alana Little

“What are your numbers?” This may sound like a sorry pick-up line from the 1970s but on May 2, 2007, attendees of the Goddard Health Fair, held in the Building 8 auditorium, were all a buzz talking about their blood pressure and body mass index (BMI).

Health Fair Organizers Cathy Cavey; Kimberly McManus, NASA Shared Service Center (NSSC); Shirley Mitchell (Health Unit); Alex Kras and Jan Buxton, Employee Assistance Program (EAP); and Mike Ochraneck (Fitness Center), invited about 25 vendors to Goddard for one day to help enlighten contractors and civil servants alike on the many products and services offered locally to help employees guard and improve their health.

Among the vendors were Beverly Dawkins and Veronica Jenkins from Kaiser Permanente. These women scared the daylight out of anyone who stopped at their table to examine the glass jar full of tar that represents what your lungs take in if you are a pack-a-day smoker. Veronica also talked about the obesity epidemic in America. I asked her why the BMI scale is such a hot tool for measuring obesity and she said the scale is actually outdated, about “20-years old,” but it’s still the best method of measuring where you are on the obesity scale.

May was National Skin Cancer Month and Wayne Heffler and the folks from MDIPA sponsored free Derma Scans to employees. A Derma Scan is an instrument that analyzes the Sun damage to your face. The American Cancer Society estimates that in 2007, there will be 8,110 fatalities, 5,220 in men and 2,800 in women in the U.S. due to melanoma, the most serious form of skin cancer. The Skin Cancer Foundation Web site states that if skin cancer



Caption: Poster advertising the 2007 Goddard Health Fair.

is recognized and treated early, it is nearly 100% curable. Natasha and Melanie from Adventist Health Care administered the scans.

Dave Lutchman and Seyoum Michael, respiratory therapists at the Pulmonary Function Lab, represented Laurel Regional Hospital and gave health fair participants free lung screenings. Seyoum said that the majority of their patients come to them for asthma- and emphysema-related therapy. If you’ve quit smoking recently then getting your lung function checked may be a good idea.

Lashawn from American Screening administered eye exams and next door, the ladies from Rebecca Bitzer & Associates—the Eating and Exercise Experts—gave out free samples of delicious, low-fat, all-natural foods. The company boasts six registered dietitians and offers nutritional counseling to help people with weight loss and managing diabetes.

Weight Watchers was represented by Daphne Caprio and Ellen Kozireski who have a success story of losing over 80 pounds each with the program. Goddard is currently hosting a program for employees and the 34 participants have lost a total of 287.8 pounds so far. Weight Watchers representative Sue Ellen says everyone is welcome to visit a meeting for free. For more information, call Ellen at 301-286-8043 or Daphne at 301-824-5288.

The 2007 Goddard Health Fair was a success and Goddard employees are healthier for the efforts of Cathy Cavey and her team from Code 250. ■

Two of Goddard's Treasured Educators Move On

By D'Arcee Neal and Sallie Smith



Caption: The Queen of England looks on at a workshop held on May 8, 2007 while Lynn (center), leads students in their research activities.

Photo credit: Pat Izzo

A 31-year educational career comes to an end as Carolyn "Lynn" Harden packs her bags and heads south for some well-deserved rest. Harden has worked at Goddard, as part of the Intergovernmental Personnel Act (IPA), as an Education Specialist for the past four years.

Previously, Harden split her time between both DuVal High School in Lanham, Md., and Fairmont Heights High School in Capitol Heights, Md., as a biology teacher, later being promoted to an Aerospace Instructional Coordinator for DuVal, where she drove many of her talented students to an apprenticeship program here at Goddard. After the school decided to cancel the program thereby cutting her position, she was given the opportunity to work as a "Teacher on Loan," with Dr. Bob Gabrys, Chief Education Officer at Goddard.

She was named Goddard's representative for the Educator Astronaut Applicant Screening Panel at Marshall Space Flight Center, where she furiously screened hundreds of applications in search of the next teacher-astronaut. The applicants not participating in the program, were selected to be in the Network for Educator Astronaut Teachers (NEAT), program of which Lynn was named Goddard's point of contact. Currently, she manages 41 contacts across all of the northeast, stretching from Maine all the way down to the District of Columbia. In addition to retiring from her duties for the NEAT program and others, she is also retiring from her position as liaison for the Heliophysics and Planetary Science division at Goddard. Lynn still believes, however, in helping younger students reach the possibility of getting to the stars. She is currently a liaison for Rosemont Elementary School in Baltimore, Md.

Apart from her multiple affiliations within the Goddard network, Lynn is a woman that likes to have a good laugh. "I am ready to retire," Harden smiles as I ask why she's leaving. But, even in retirement, she might not be too far away from her chalkboard. "I may go back to teaching, I might not. But I'll always help people." And that's truly the giving spirit of this marvelous lady. Of her work here at NASA Goddard, she reflects back, claiming she'll miss a lot of really wonderful people she met. And she truly cherishes the time she got to spend with the Queen of England, even if it was only a few seconds of eye contact. ■



Caption: Sallie Smith

Photo credit: Bill Frydyk

Sallie Smith, a treasured Goddard employee who has dedicated her time and talents to NASA for six years is leaving. Sallie is a K-12 science instructor employed through the Teacher On-Loan program here at Goddard Space Flight Center from the Howard B. Owens Science Center. With a combined teaching experience of 20 years, she has brought her immense love of teaching, strong foundation in science, and ability to translate NASA science into experiences for teacher and student audiences.

From her days teaching science in Prince George's County Public Schools, Sallie was invited to Goddard as a teaching intern in 1998 to participate in the Solar and Heliospheric Observatory (SOHO) project. Following that, she was asked to return serving with the International Solar Terrestrial Physics Project, otherwise known as the ISTP, where she worked as a curriculum writer and workshop presenter. In 2001, Dr. Robert Gabrys invited her to work in Education Programs as NASA's liaison for the JASON Project. Sallie's primary responsibility included locating NASA resources from NASA Centers to enhance the yearly JASON Expedition Project Curriculum. The JASON "Mysteries of Earth and Mars," engaged 34,000 teachers and 1.7 million students across the nation in mission science from 7 of the 10 NASA Centers.

One of Sallie's other favorite projects within Goddard was working as Program Education Mission Coordinator for the Goddard Remote Sensing Earth Science Teacher Program (RSESTeP). Teachers nationwide propose ideas for local Earth science missions, and after their acceptance, they arrive at Goddard to receive training in the latest techniques and equipment to be used to implement local Earth science missions important to the local community.

Sallie was also involved with the NASA Living with a Star "Solar Schools" pilot program and served as a science content specialist, coordinating tailored programs to assist teachers in incorporating NASA science applications into student curriculum projects.

"As my Teacher on Loan experience comes to an end, it is very hard to leave NASA however, I'm just grateful, to have had the opportunity to work with [these] extraordinary people. NASA is the most exciting place in the world to work and I'm gonna hate having to watch the news on TV instead of being a part of it." ■

In Memoriam: Dr. Robert S. Cooper

Excerpted from an article written by Patricia Sullivan, *Washington Post* Staff Writer, Tuesday, July 10, 2007; Page B06



Caption: Dr. Robert S. Cooper

Robert S. Cooper, 75, former Goddard Director from 1975–1979, died of prostate cancer July 2 at his home in Easton, Md.

In addition to his time spent at Goddard, Dr. Cooper led the Defense Advanced Research Projects Agency (DARPA) from

1981–1985, testifying repeatedly before Congress on such matters as the Stealth bomber and supercomputers. His job put him in the middle of some of the most contentious political battles of the period, particularly the Reagan administration's Strategic Defense Initiative, popularly known as Star Wars, a ground- and space-based plan to protect the United States from attack by strategic nuclear ballistic missiles.

One of his sons described him as “an engineer’s engineer” who was more interested in solutions than in toeing a political line.

His willingness to speak in forthright terms about Government projects continued after he left the Federal Government. Dr. Cooper criticized the investigation of the Space Shuttle *Challenger* disaster in 1986, saying: “They’re running it like a lawyer would run it. They’re looking for a smoking gun.”

Dr. Cooper was born in Kansas City, Mo., and grew up in Cedar Rapids, Iowa. He graduated from the University of Iowa and then served two years in the Air Force at Eglin Air Force Base in Florida. He received a master’s degree in electrical engineering from Ohio State University in 1958 and a doctorate in electrical engineering from the Massachusetts Institute of Technology (MIT) in 1963. He taught at MIT for nine years and then joined the Defense Department.

Dr. Cooper enjoyed renovating Capitol Hill townhouses, skippering sailboats, piloting small aircraft, skiing, and playing tennis, as well as other outdoor sports.

His marriage to Margaret S. Cooper ended in divorce.

Survivors include his wife, Benita Cooper of Easton; two sons from his first marriage, Jonathan Cooper of Ashburn and James Cooper of Lexington, Mass.; a sister; and five grandchildren. ■

In Memoriam: Barbara Blom

By Natalie Simms



Caption: Barbara Blom memorial held at the Visitors Center on May 19th.

Photo credit: Debbie McCallum

Barbara Blom, assistant to the Deputy Director in the Office of the Director, died on May 12, 2007 from a long bout of breast cancer. Despite her illness, Barbara was determined to fight the battle. Her strength and perseverance allowed her to enjoy as much solace and happiness as she could in her final days.

Deputy Director Michael Ryschkewitsch highly respected and admired Barbara, saying that she was excellent at her job, committed, displayed a strong work ethic and “always exceeded everyone’s expectations.”

“I have never met someone who influenced others in a positive way as much as she did,” said Ryschkewitsch. “She had no choice in the battle she had to fight, but she chose to fight and set an example for us all. I saw her strength and conviction displayed in such a marvelous way, and most importantly, in the way she treated people,” he says. “If we all try to live up to that standard, the world will be a better place. I feel this is Barbara Blom’s legacy to us all.”

“Barb loved being a part of the Goddard family,” said co-worker Sue Pierpoint, who worked with Barbara in the Director’s Office since 2003. She recalls how positive and upbeat a person she was, enjoying people and having fun. “She was always well liked and had many friends here at work.”

Barbara was loved by many and is survived by her son and daughter. She was 54.

The family has requested that donations in memory of Barbara be made to Hospice of the Chesapeake, 445 Defense Highway, Annapolis, MD 21401. ■