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An Observatory is Born

By Rani Gran

The Solar Dynamic Observatory (SDO) reached a major milestone recently when Goddard engineers attached the instrument module to the satellite bus transforming the satellite into an observatory. The instrument module is made up of the structure plus three instruments: the Helioseismic and Magnetic Imager (HMI), the Atmospheric Imaging Assembly (AIA), and the Extreme ultraviolet Variability Experiment (EVE). Together, these instruments will deliver startling images of the Sun that are 10 times better than HDTV.

The goal of the mission is to help scientists zoom in on solar activity, such as sunspots, solar flares, and coronal mass ejections to better understand their causes, thus improving forecasts of solar storms. Bad "space weather" can pose a threat to astronauts in orbit, as well as aircraft crews flying over the poles of Earth—and that's just the tip of the iceberg. Electrical power to our homes, satellite communications, and navigation systems can all be disrupted by magnetic storms triggered by solar activity. SDO will provide a close-up look at these events. ■

Photo credit: Barbara Lambert

Caption: Solar Dynamics Observatory—*Integrating the instrument module to the spacecraft bus.*

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Cover caption: A Goddard engineer lowers the Solar Dynamics Spacecraft bus onto the propulsion module.

Photo Credit: Barbara Lambert

GoddardView **Info**

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GLAST Media Day a Success

By Rob Gutro

NASA's *Gamma-ray Large Area Space Telescope* (GLAST) is presently being tested at the U.S. Naval Research Laboratory in Washington, D.C. as it prepares for a mid-2008 launch. More people know all about the upcoming satellite as a result of a successful Media Day held at NASA's Goddard Space Flight Center, Greenbelt, Md.

On September 19, 2007, the NASA Public Affairs Office held a GLAST Media Day at Goddard to introduce reporters and the world to this upcoming satellite that will open new windows on the universe. Media Day included a Science Writer's Workshop with six scientists on a panel that informed 16 reporters of the satellite, its science, and mission. The event was the culmination of careful planning by the NASA Goddard Public Affairs Office, Sonoma State University, and many scientists on the project. The event also marked the release of the GLAST Science Writers Guide.

The reporters learned the objectives for the GLAST mission, which include:

- Explore the universe's ultimate frontier, where nature harnesses forces and energies far beyond anything possible on Earth;
- Probe some of science's deepest questions, such as what our universe is made of, and search for new laws of physics;
- Explain how black holes accelerate jets of material to nearly light speed;
- Help crack the mystery of stupendously powerful explosions known as gamma-ray bursts; and
- Answer long-standing questions across a broad range of topics, including solar flares, pulsars, and the origin of cosmic rays.

The session was introduced by Dr. Lynn Cominsky, GLAST Press Officer, Education and Public Outreach, Sonoma State University, Calif., who opened up the session with a dynamic video of GLAST being launched into space and being deployed. This video, produced at Goddard's Scientific Visualization Studio by lead NASA-TV producer Liz Smith, can be seen at NASA's GLAST public Web site, http://www.nasa.gov/glast. The Web site was created by Katy Boone and Rob Gutro, with input from many sources.

Cominsky and two other scientists gave an introduction to the science behind GLAST, its mission, and purpose. The others were Steve Ritz, GLAST Project Scientist at NASA Goddard; and Dave Thompson, Anti-Coincidence Detector Lead, and Large Area Telescope (LAT) Multi-wavelength Coordinator. Thompson said, "Gamma rays are the highest-energy form of light, and the gamma-ray sky is spectacularly different from the one we perceive with our own eyes. Gamma-ray vision lets us see so much more!"

Three additional panelists provided information on the status of the mission, and the two instruments. They included Kevin Grady, GLAST Project Manager of Goddard; Peter Michelson, LAT Principal Investigator, Stanford University, Calif.; and Charles "Chip" Meegan, Principal Investigator for the GLAST Burst Monitor from Marshall Space Flight Center, Huntsville, Ala.

The reporters received a media kit assembled in the NASA Public Affairs Office by Rob Garner. Bob Naeye, a senior science writer in Astrophysics at Goddard worked with Rob Gutro, NASA Public Affairs, Lynn Cominsky, and many scientists and partners to create the 48-page GLAST Science Writer's Guide that was included in the media kit. The guide was designed by Ruth Jennings in Code 700 and can also be found at http://www.nasa.gov/glast. Dr. Cominsky also supplied a paper model of GLAST, fact sheet, and many other components for the media kit.

After the formal session ended, the science writers stayed to talk with panel members individually, and were then treated to a viewing of the Goddard Scientific Visualization Studio's film "Footprints" at the Science on a Sphere in the Visitor's Center. That was hosted by the NASA Education Department's John Leck.

Photo credit: Bill Hrybyk

Caption: Reporters gather in NASA-TV's new studio in Building 28 and listen to Dr. Lynn Cominsky and the GLAST panelists.

Most reporters also opted for a 90 minute tour of Goddard, led by Nina Harris of Public Affairs. The tour included the *Lunar Reconnaissance Orbiter*, Spacecraft Systems Development and Integration Facility, Spacecraft Test and Integration Facilities, Buildings 7, 10, and 5, and various speakers.

The news coverage generated by GLAST Media Day was impressive. Associated Press carried the story, which went to countless newspapers, TV and radio outlets, and Web sites. Major coverage also included: Agence France-Presse; *Boston Globe*, CBS News, Fox News, *Los Angeles Times*, MSNBC, *New York Times, Orlando Sentinel, Seattle-Post Intelligencer*, Space.com, WIRED News, WTOP Newsradio, and Yahoo News.

Several other folks behind the scenes assisted in making this media day work smoothly, including Bob Naeye, GLAST Deputy Project Scientist Julie McEnery, Laura Spector, Lynn Chandler, Susan Hendrix, Sarah Dewitt, Patrick Kennedy, Chris Smith, Carmel Conaty, Security's Bob Raimond, and Fritz Ankerman in Transportation.

NASA's GLAST mission is an astrophysics and particle physics partnership, developed in collaboration with the U.S. Department of Energy, along with important contributions from academic institutions and partners in France, Germany, Italy, Japan, Sweden, and the U.S. ■

Monster Storms Erupt on Jupiter

By Bill Steigerwald and Carolina Martinez

As the largest planet in our solar system, Jupiter likes to supersize its stormy weather. Two giant storms erupted on Jupiter from a jet stream blowing at 370 miles per hour in March 2007. The storms exploded in size, growing from 250 miles across to more than 1,245 miles across in less than a day. Ice plumes from the storms towered 20 miles above surrounding cloud tops. The storms disturbed the jet stream and formed in their wake swirling red clouds that spread around the planet.

Researchers hope to use the rare event—it's only been seen twice before, in 1975 and 1990—to reveal secrets buried deep in Jupiter's massive atmosphere.

"Jupiter has lots of hidden secrets—what makes it red in spots, for example—and doesn't give them up easily," said Dr. Amy Simon-Miller of NASA's Goddard Space Flight Center in Greenbelt, Md. "We try to use these events to figure out what's going on." Simon-Miller, a co-author of a paper describing the storms published January 24 in *Nature*, was part of a team observing the storms with NASA's *Hubble Space Telescope*.

One enduring mystery is the depth and power source of the planet's jet streams. The new observations of the twin storms indicate that Jupiter's jets run deep, and are powered by the planet's own heat. "This confirms previous findings by the Galileo Probe when it descended through Jupiter's upper atmosphere in December 1995. Although both regions are meteorologically different, all the evidence points to a deep extent for Jupiter's jets and suggest that the internal heat power source plays a significant role in generating the jet," said Professor Agustín Sánchez-Lavega from the Universidad del País Vasco in Spain, lead author of the *Nature* paper and coordinator of the team.

"We ran computer models of Jupiter's atmosphere to see what conditions produced these storms. Only a deep jet reproduced what we saw," said Simon-Miller. "This jet is too far below the cloud tops to get much sunlight, so it's probably powered by Jupiter's internal heat instead." The models indicate the jet stream extends more than 62 miles below the cloud tops where most sunlight is absorbed.

Amateur astronomers reported disturbances in Jupiter's Northern Hemisphere in March, while the team was observing Jupiter in support of a flyby of NASA's *New Horizons* spacecraft bound for Pluto. *New Horizons* got a boost from Jupiter's gravity, and tested its instruments by observing Jupiter. The team searched archived *Hubble* data and discovered that the storms first appeared March 25.

The team monitored the new eruption of cloud activity and its evolution with unprecedented resolution using *Hubble*, the NASA Infrared Telescope Facility in Hawaii, and telescopes in the Canary Islands (Spain). A network of smaller telescopes around the world also supported these observations. "The infrared images distinguish the plumes from lower-altitude clouds and show that the plumes are lofting ice particles higher than anyplace else on the planet," said Dr. Glenn Orton, from NASA's Jet Propulsion Laboratory, Pasadena, Calif., and second author of the paper.

The storms gradually dissipated over two months. In spite of the energy deposited and the stirring and turmoil generated by the storms, the jet remained practically unchanged when the disturbance ceased, keeping steady against these storms.

The gaseous giant planet Jupiter is 10 times the size of Earth, and its atmosphere is always turbulent. Its circulation is dominated by a pattern of cloud bands alternating with latitude and by a persistent system of jet streams, both of unknown origin.

Understanding these phenomena is important for predicting weather on Earth, where storms are present everywhere and jet streams dominate the atmospheric circulation. In this way, Jupiter represents a natural laboratory where atmospheric scientists study the nature and interplay of the intense jets and severe storms. ■

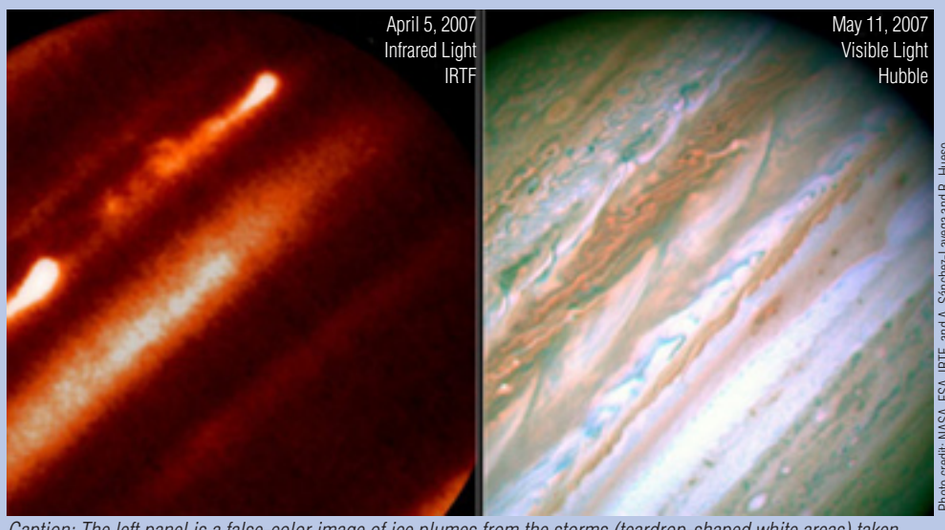

Photo credit: NASA, ESA, IRTF, and A. Sánchez-Lavega and R. Hueso (Universidad del País Vasco, Spain)

Caption: The left panel is a false-color image of ice plumes from the storms (teardrop-shaped white areas) taken with the NASA Infrared Telescope Facility. The right panel, taken with the Hubble Space Telescope, *reveals swirling reddish-brown clouds in the wake of the storms.*

A Smart Design for the Perfect Fit

By Rani Gran

Imagine a wedding dress or a tuxedo that fit the first time you try it on. That's pretty similar to how engineers felt when the *Solar Dynamics Observatory* (SDO) spacecraft bus was lowered onto the propulsion module and it attached on the first try. "It's like lowering a telephone booth over a person," said Gary Davis, SDO Propulsion Subsystem Manager. "The mechanical people made the operation look easy. It's never easy. There are some mechanical things you can never model and predict."

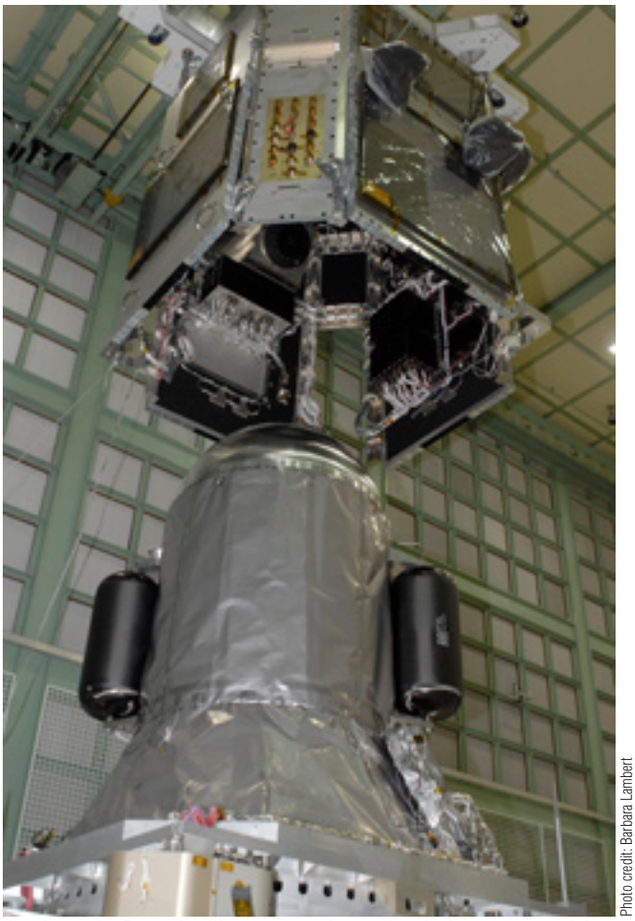

Photo credit: Barbara Lambert

Caption: Solar Dynamics Observatory—*integrating the instrument module to the spacecraft bus.*

For the past year, all of the spacecraft avionics were integrated and tested on a spacecraft bus. The spacecraft bus includes GSFC-built electronics, instrument electronics, as well as other procured components. It has everything required to control the spacecraft and get the data from the instruments to the ground.

During the same time, another Goddard team was building the propulsion module, which includes all the hardware needed to get the spacecraft from the point at which the rocket leaves the observatory, the transfer orbit, to its final orbit. "We built these modules up in parallel to allow us to get more done in a shorter amount of time," said Brent Robertson, SDO Observatory Manager.

This was the first time Goddard engineers built a bipropellant propulsion system. A bipropellant system is a two-tank system with fuel in one tank and oxidizer in another; when the two chemicals mix, they spontaneously combust. The propellant tanks are titanium balloons with the thickness of just 9 sheets of notebook paper, but they can hold 27 times their weight. The main engines use the same technology as the Lunar Landers for the *Apollo* missions. There are 8 smaller attitude control thrusters and one main engine thruster. Four of these attitude control thrusters are backups. If the main thruster goes out, the smaller thrusters will be able to carry out SDO's mission. SDO is a 5 year mission, but the spacecraft will carry enough fuel for at least 10 years.

"There was a lot of anxiety about mating these highly complex modules," said Robertson. "We wanted to avoid any interference that might damage items such as the harness or thermal blankets. We had a well-thought out and documented procedure for this operation."

In a very short amount of time, 30 minutes, engineers and technicians lowered the spacecraft bus onto the propulsion module with surgical precision. "The whole design was smart from the beginning," Davis says. ■

Photo credit: Barbara Lambert

Caption: SDO spacecraft was lowered onto the Goddard-built propulsion system.

Innovative Tools for an Out-of-this-World Job

By Kelesy Paquin

Think of the average handyman who relies on a standard set of tools—screw drivers, socket wrenches, power drills—to get the job done.

When you're working in space however, the average tools just won't get the job done. Our specially trained handymen are astronauts and they need specialty tools to accomplish out-of-this-world tasks. Imagine them trying to do their work while wearing big, bulky pressurized gloves, tightening bolts that are different from any we use here on Earth, while floating weightless in an environment where the temperature can change at least 100° F. in a matter of minutes. This scenario should help you to grasp the difficulties that astronauts face when performing spacewalks, and why custom tools are essential.

The final Shuttle servicing mission to the *Hubble Space Telescope* is fast approaching. Engineers at NASA's Goddard Space Flight Center in Greenbelt, Md. have been working diligently on custom tools that astronauts will need as they undertake necessary upgrades and repairs to the famed observatory.

The Difficulties of Working in Space

"It isn't possible for astronauts to use normal tools from the hardware store because working in space means doing so in a unique environment," said Jill McGuire, Crew Aids and Tools Manager for the *Hubble Space Telescope* Program at Goddard.

"The astronauts have limited mobility in their space suits, so one of the things they have to cope with is hand fatigue due to constantly fighting against the pressure of the suit," McGuire said. "Therefore, we need to build larger tools that have specially designed handles and triggers that make it easier for them to work in their suits."

Another challenge of working in the space environment is the large temperature extremes, which create a need for special materials and lubricants that you can't normally find in a hardware store.

Most of the tools the average consumer uses contain a 'wet' lubricant or oil, which cannot withstand harsh temperature extremes. Goddard engineers use a different technique called 'dry film' lubricant, which allows parts to slide with respect to one another.

This isn't to say that commonly used tools are worthless for servicing missions, as special adaptations can sometimes be done to make them fit for use. In fact, much of the hardware in the astronauts' inventory of custom tools are actually modified versions of common tools, such as sockets and socket extender bars. The rest are designed and built to help the spacewalking astronauts service the unique, one-of-a-kind interfaces and features on the telescope.

It isn't just the tools that receive precise attention to detail, though. "Crew aids" are anything that will help the astronauts get their job done, right down to the bags that are used for collecting and discarding old fasteners. In order to ensure that these tools and crew aids perform as designed, every aspect and detail of the astronauts' spacewalks must be meticulously planned, developed, and tested before venturing into space.

The Need for New Tools

"*Hubble* was originally designed to be serviceable, so there was a set of tools that were developed to meet core servicing needs, but as each mission developed, we did a lot more servicing than we ever imagined would be done to the telescope," said Mark Jarosz, Extra Vehicular Activity (EVA) and Crew Systems Manager at Goddard. "So in order to do those new things—like repairs on the Space Telescope Imaging Spectrograph (STIS) and the Advanced Camera for Surveys (ACS) science instruments—unique tools are needed."

Although *Hubble*'s instruments and components have a designated lifetime, many times they can be repaired, or replaced altogether with newer, cutting-edge technologies.

Following its installation in 1997 during Servicing Mission 2, STIS was used to determine the composition of celestial objects. By assessing the wavelengths of light emitted by distant objects, the spectrograph enabled astronomers to determine the characteristics of these objects. After seven years of operational use, STIS experienced a power supply failure in 2004 and was put into 'safe mode,' meaning that it is switched off but thermally protected. Another valuable instrument in safe mode, ACS, was installed during the most recent servicing mission to *Hubble* in 2002. By using its wide field of view, astronomers were able to study the nature and distribution of galaxies more than ever before, revealing clues about how our universe was formed. In January of 2007, an electrical short caused two of the three cameras housed within ACS to fail. Scientists worldwide are excited about the possibility of regaining the capabilities of these instruments after Servicing Mission 4.

With the addition of these repairs to the mission's manifest, a whole new undertaking was thrust onto Goddard engineers. None of the tools developed for previous missions are suitable for repairing the unique interfaces of STIS and ACS because these tasks require a tool with low torque. Torque is the application of force where there is rotational motion or, more simply, a turning or twisting force. Screws and fasteners can break if the torque on a drill is too high or the speed is too fast, which would cause serious setbacks for repair tasks.

"The two repair tasks we are doing on this mission require removing small screws or fasteners. These must be removed with very low torque. There are about 100 fasteners in one of the tasks, so we are building a space-qualified, low-torque screwdriver to remove them," said McGuire.

Continued on Page 7

Innovative Tools for an Out-of-this-World Job

Continued from Page 6

Photo credit: NASA

Caption: Servicing Mission 4 astronaut Drew Feustel trains with fellow astronauts and Hubble *engineers in the clean room at NASA's Goddard Space Flight Center. He is shown here using a computer controlled power tool, called the Pistol Grip Tool, to install the Wide Field Camera 3 into a high fidelity mockup of the* Hubble Space Telescope.

Because the astronauts are working in space, if nothing else were done to "capture" the screws as they are removed, they would simply float away along with tiny metallic debris that is usually generated when screws are removed from metal. In order to protect *Hubble*'s sensitive interior and help the astronauts contain loose debris, Goddard tool engineers designed a very unique, clear plate that fits over all of the screws. The plate is marked so astronauts can easily identify individual fasteners, and designed so the fasteners and metallic debris will be captured under the plate. "This plate will make the astronaut's job infinitely easier and will totally protect the telescope from potentially harmful debris," said Justin Cassidy, the lead EVA Crew Aids and Tools designer for the *Hubble* Program.

Refining Tool Designs

For every *Hubble* mission, the flight crew plays a key role in helping to develop and refine the tools that will be used on orbit. Dive runs occurring at Johnson Space Flight Center's Neutral Buoyancy Laboratory in Houston, allow astronauts to practice using the tools underwater in what's called a 'Zero G' environment, which simulates the sensation of being in space.

During each of the dive runs, the astronauts rehearse their repair tasks using a full size mock-up of the telescope, which not only provides them practice for the spacewalks, but also gives them a chance to catch any problems they may have with tool design or operation. It's not unusual for a number of redesigns to occur prior to the mission, and missions often go without a hitch because of these on-the-ground tweaks to tool design.

"One of the things critical on any *Hubble* mission is limited spacewalk time," said Jarosz. "Since this is the last scheduled repair mission to *Hubble*, we have to make every task as efficient as possible. And, we want the crew to take full ownership of the designs we come up with so that they're comfortable using the tools."

A Rewarding Career Indeed

"The best part of my job is seeing what the success of our efforts brings back to the public," said McGuire. "Over the years, I've had the opportunity to speak to hundreds of students at various education outreach events. To see the interest and excitement in their eyes when they learn about how astronauts service *Hubble* makes all the hard work worth it." ■

NASA's Next Moon Mission Spacecraft Undergoing Critical Tests at Goddard

By Nancy Jones

NASA's next mission to Earth's closest astronomical body is in the midst of integration and testing at NASA's Goddard Space Flight Center in Greenbelt, Md. *The Lunar Reconnaissance Orbiter*, known as LRO, will spend at least a year mapping the surface of the Moon. Data from the orbiter will help NASA select safe landing sites for astronauts, identify lunar resources, and study how the Moon's environment will affect humans.

Engineers at Goddard are building the orbiter and rigorously testing spacecraft components to ready them for the harsh environment of space. After a component or entire subsystem is qualified, it is integrated into the LRO spacecraft. The core suite of avionics for the orbiter is assembled and undergoing system tests.

"This is a major milestone for the mission," said Craig Tooley, LRO project manager at Goddard. "Our team has been working nearly around the clock to get us to this point. Reaching this milestone keeps us on the path to sending LRO to the Moon later this year."

Various components of the avionics and mechanical subsystem are in the process of going through their qualification program. In many ways, integration and testing is the beginning of the end for those who have spent years working on LRO. After integration, the spacecraft will not be seen again by those who worked so hard on it at NASA Goddard. For them, this begins the process of sending their "child" out into the world, or in this case, to the Moon.

Six instruments and one technology demonstration aboard the spacecraft will provide important data to enable a safe and productive human return to the Moon. The six instruments are scheduled to arrive at Goddard in the coming months for integration.

The spacecraft will ship to NASA's Kennedy Space Center, Fla., in August in preparation for launch. The orbiter, and the Lunar Crater Observation and Sensing Satellite will launch aboard an Atlas V rocket in late 2008. The trip to the Moon will take approximately four days. The LRO initially will enter an elliptical orbit, also called the commissioning orbit. Once moved into its final orbit, a circular polar orbit approximately 31 miles above the Moon, the spacecraft's instruments will map the lunar surface.

Photo credit: Debora McCallum

Caption: Command and Data Handling (C&DH) and flight Power System Electronics (PSE) are on the left. The gimbal control electronics are on the right, and the flight harness is all over the panel.

For more information about the *Lunar Reconnaissance Orbiter*, visit: http://lro.gsfc.nasa.gov. For more information about NASA's exploration program to the Moon and beyond, visit: http://www.nasa.gov/exploration. ■

Adventure at Goddard

By Laura Delgado

On December 11, 2007, instead of heading to the office of Congressman Luis Fortuño on Capitol Hill, where I was an intern, I made my way to Goddard Space Flight Center (GSFC) in Greenbelt, Md. From our arrival at 9:00 am to our departure after midday, Ivelisse Avilés—a Congressional Fellow from the National Institute of Standards and Technology (NIST)—and I were under the care of Nina Harris from GSFC's Office of Public Affairs. Accustomed as she is to orchestrating visits for such dignitaries as Queen Elizabeth II, I was so pleased that Nina took the time to make sure my day at Goddard was unforgettable. In fact, it turned out to be one of the highlights of my time in Washington, D.C.

Our first stop was at one of the main buildings where a panel of GSFC officials discussed space policy with me. Our dialogue took me back to my first science fiction readings, as well as an article I read on space debris that appeared in *The San Juan Star* (one of Puerto Rico's newspapers). These were the seeds of my passion for space policy. Kelly Farrell, Deborah Amato, Harley Thronson, Haydee Maldonado, and Deanna Trask joined us for a lengthy discussion that touched upon the subject of NASA's past and future. One strong piece of advice resonated around the oval-shaped table: there are many ways to achieve my goal and whatever I decide to do from now on will not be a mistake, but one more lesson, one more step on the road to get there.

Photo credit: Laura Delgado

Caption: Edward Packard shows Laura Delgado and Ivelisse Avilés the Spacecraft Test and Integration Facility.

Soon after, we met up with Edward Packard from the Environmental Test Engineering and Integration Branch. He was to take us on a tour of the Spacecraft Test and Integration Facility, as well as the Spacecraft Systems Development and Integration Facility. He was definitely the right person for the job. Ed's enjoyment of what he gets to do every day, his thorough knowledge of what he was showing us, and his ability to impart a lot of information in a comprehensible way was evident. I was amazed to learn about all the projects—most undertaken simultaneously—that Goddard has taken care of since 1959. Ed explained, for example, about some of the robotics projects that have been tested as a result of the *Columbia* accident when NASA was forced to question the risks of human spaceflight. It was a thrill to learn more about the *Hubble Space Telescope*, which has become the source for my ever-changing computer desktop background, and see some of the preparations for its last servicing mission.

Catching a glimpse of the largest clean room in the country, as well as putting on a pair of gloves that were actually used by astronauts during a spacewalk, completed this one-of-a-kind tour.

Before leaving Goddard, we stopped at the Visitors Center and joined Maurice Henderson from the Hydrospheric and Biospheric Laboratory, who led us in a "Journey through the Universe." I had never seen such an impressive projection system with its feature of a globe seemingly suspended in midair, from which the images of four projectors can be enjoyed simultaneously. It was a stunning and powerful way to see the galaxy, the worlds that surround us, and the one in which we live. As the "Earth" rotated in front of me, I stared at my tiny island of Puerto Rico and was blown away by its size in an already small world that hardly takes up any space in the great expanse that is the universe.

I left Goddard Space Flight Center with a clearer view of why I want to get into space policy and why that is my goal for the future. I want to ensure that the people I met that day keep doing what they love and do so well. To me, it goes beyond what one country does in space, but what we all do as mankind. That may be the reason why this college student from Puerto Rico was granted such a fantastic experience at NASA. The people at Goddard excel at their jobs and are eager to impart their passion to all that share the excitement of looking to the stars. ■

Employee Spotlight

David Carter

By Leslee Cork

Photo credit: Pat Izzo

Caption: David Carter.

Deepak Chopra, an Indian medical doctor and writer, once said, "When you live your life with an appreciation of coincidences and their meanings, you connect with the underlying field of infinite possibilities." David Carter of Code 453, embodies the very meaning of this profound quote. David, who is a basketball, football, and baseball coach for the Kettering Largo Mitchellville (KLM) Boys and Girls Club, knows all too well the benefits of appreciating coincidences and their meanings.

As a Satellite Laser Ranging (SLR) Networks Manager for the Ground Networks Project, David has managed to apply experiences from his coaching practices to his managerial role at Goddard. David points out that as a coach, "You have to have patience and creativity and you have to employ strategic thinking." When dealing with 8–11 year old boys (two of which happen to be his sons), you need patience to teach the fundamentals of the game, while providing them ample time to absorb the given information. You have to employ creative teaching mechanisms to make learning more fun. Additionally, strategic thinking is important during the game when you must regroup and devise the most effective strategy to beat your opponent. David clearly appreciates the connection between being a coach and working as a manager at Goddard.

NASA has 8 Satellite Laser Ranging (SLR) stations, local and abroad, which are a part of a 43-station International Laser Ranging community that tracks scientific satellites. David's team uses lasers to measure ranges from ground stations to satellite borne retro-reflectors to the millimeter level for precision orbit determination. David is responsible for ensuring these eight stations are working correctly and are fully operational. Additionally, he manages the budget, administers the contracts that operate the stations, and oversees the work being performed by his team. None of which would be possible without good organizational skills and his guiding virtues of patience, creativity, and strategic thinking.

David has been in this position for 12 years, yet he can vividly recall when he started working for Goddard back in the summer of 1983. While attending University of Maryland Eastern Shore, David landed an internship with the Earth Sciences Directorate. A year later, he converted to a co-op position. During this time, 19 year old David worked on the Agro-Climatic Environmental Monitoring Project, a joint project with Goddard and the United States Agency for International Development (USAID), for installing an early warning cyclone system for the country of Bangladesh and monitoring the amount of snow melt from the Himalaya Mountains. David worked in Bangladesh for 3 months assisting in the installation of the system. In the summer of 1987, David graduated from University of Maryland College Park with a Bachelor of Science degree in mechanical engineering. He began working full-time for Goddard in the fall of that year.

Thinking back on all he's accomplished in his 21 year tenure, David feels his most memorable achievement was about 11 years ago when, as the president of the Goddard Black History Club, he was asked to coordinate a program for Rosa Parks and her youth organization. He gladly accepted the task and arranged an engaging program open to all employees, which included a presentation by retired NASA Astronaut Fred Gregory, a model rocket launch at the Visitor's Center, and a tour of Goddard for Ms. Parks and the forty plus students. Sitting in David's office is a framed photograph of this special moment in his career.

Growing up, we all have dreams of what we want to be in life. As a child, David Carter had a love for math and science, and as he matured that love grew stronger. When the opportunity came for David to work for NASA, he jumped at the chance to work on science experiments and other exciting projects related to space and math. David is one of the lucky few who are able to turn their love and passion into a satisfying career, all while applying the virtues of patience, creativity and strategic thinking. ■

Hildebrand Named American Meteorological Society Fellow

By Michele Jones

Photo credit: Pat Izzo

Caption: Dr. Peter Hildebrand.

Dr. Peter Hildebrand, acting Chief of the Hydrospheric and Biospheric Laboratory and Deputy Director of the Sciences and Exploration Directorate, was recently named a Fellow of the American Meteorological Society (AMS). His induction into the society was recognized at an awards ceremony during the 88th annual meeting, which was held in New Orleans during the month of January.

"I'm just thrilled to be recognized by such a distinguished society," said Hildebrand as he reflected on what this honor meant to him. Hildebrand went on to say, "It really feels good to share this honor with so many others who are highly respected in their fields of study." Hildebrand is 1 of 25 AMS Fellows named this year, and shares the honor with many of his Goddard colleagues who were previously named as Fellows.

When asked why he felt that he had been nominated for such an honor, Hildebrand gave an impressive list of radar remote sensing activities that he had either led or been a part of. Of particular note was his leadership of the Electra Doppler Radar (ELDORA) project at the National Center for Atmospheric Research (NCAR) in Boulder, Colo. ELDORA is an airborne Doppler weather radar that uses rapid scanning technologies to make high resolution observations of atmospheric storms from a fast-moving aircraft. ELDORA remains the most sophisticated airborne Doppler radar; its application has resulted in major advancements in our understandings of tornadoes, hurricanes, winter storms, oceanic convective complexes, etc.

In addition to being an active member of the AMS, Hildebrand is also a member of the American Geophysical Union (AGU), the American Association for the Advancement of Science (AAAS), the Scientific Research Society (Sigma Xi), and a Senior Member of the Institute of Electrical and Electronics Engineers, Inc. (IEEE), and the IEEE Geoscience and Remote Sensing Society.

Hildebrand was nominated by his esteemed colleague, friend, and former Ph.D. thesis advisor, Dr. David Atlas. ■

Russell Receives 2008 Outstanding Scientist Award

By Cynthia O'Carroll

Photo credit: Hampton University

Caption: Dr. James Russell.

On February 1, Virginia Governor Timothy M. Kaine and Science Museum of Virginia Director Richard Conti named Dr. James Russell one of four of the state's Outstanding Scientists and Industrialists of 2008. The honorees were introduced to the General Assembly on Thursday, February 14, and will receive their awards at a banquet at the Science Museum on Thursday, April 17.

Dr. Russell is the Principal Investigator for the Aeronomy of Ice in the Mesosphere (AIM) mission. He is also a Hampton University atmospheric and planetary sciences professor, and Center for Atmospheric Sciences Co-Director. His research has focused on atmospheric science, remote sensing, and satellite data analysis to study properties and processes in Earth's atmosphere. AIM is a satellite mission that studies night shining clouds in Earth's Polar Regions and is the first NASA mission led by a historically black college or university. AIM is a NASA-funded SMall EXplorers (SMEX) mission managed by the Explorers Program Office at Goddard Space Flight Center, Greenbelt, Md. ■

In Memoriam: Bill O'Leary

By John Putman

Photo credit: Jay O'Leary

Caption: William "Bill" O'Leary

Bill O'Leary, head of Goddard's Public Affairs Office from 1962–1985, died on January 14th of congestive heart failure.

As head of the Public Affairs Office, it was Bill's job to sell the space program to the public and the Government. During his tenure, Bill met U.S. Presidents, foreign dignitaries, astronauts, actors, and heads of foreign space programs. He had many brushes with celebrity, from providing a tour of Goddard to the cast of the original "Star Trek" television series, to holding an umbrella for President Richard Nixon.

Bill's career with NASA Goddard spanned the heyday of the first manned space flights, including the *Apollo*, *Gemini*, and *Mercury* missions. It was a high visibility time for NASA in general and Goddard in particular, given its proximity to Washington, DC. Bill's good nature and gift for public speaking made him, "…one of the all-time best ambassadors that Goddard ever had," according to Nina Harris of the Public Affairs Office.

Bill was also tasked with the creation of Goddard's Visitor Center in 1976, for which he closely managed the design and construction. It became, in his son Jay's words, "his baby."

Photo credit: Jay O'Leary

Caption: Bill charming a crowd

After retiring from his official position, Bill continued his ambassadorial activities. He returned to Goddard as a contractor giving VIP tours of the Center. For about 10 more years, he introduced many more visitors to Goddard and its mission.

Bill was a local, having grown up in the Brookland area of Washington, D.C. in the shadow of Catholic University. He graduated from Gonzaga College High School in 1944, and served in the Army Air Forces in Guam and the U.S. mainland during World War II. After the war, he graduated from Georgetown University, where he was on a baseball scholarship as a left-handed first baseman. After graduating, Bill worked for the Central Intelligence Agency (CIA) for 10 years, taught at Our Lady of Good Counsel High School in Wheaton for a year, and then joined NASA in 1962.

Photo credit: Jay O'Leary

Caption: Bill and his son Jay display their championship trophies

Bill's other passion was golf. He played recreationally for years with his Gonzaga alumni association, the 44 Club. He got serious when he teamed with his son Jay (who also works at Goddard) in the Goddard Space Flight Center Pro Duffer Golf League. So serious in fact that they not only won trophies four out of five years, but they won the League championship in 2005. Playing together changed their relationship. "I was lucky to have become friends with my dad. We really became more like best friends over the past few years. He was a warm, friendly kind of guy," Jay recalls.

Bill is survived by Sarah, his wife of 54 years, and his six children: William, Jr., James (Jay), Patrick, Kathleen, Ellen, and Jane; and by eight grandchildren: Allison, Audrey, Augusta, Brendan, Brian, Kevin, Leander, and Sean. ■