National Aeronautics and Space Administration

Goddard View

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Goddard Celebrates Pride Month

By Karen M. Smith

This past June, Goddard's Gay, Lesbian, Bisexual and Transgender Advisory Committee (GLBTAC) joined with the greater Federal community in celebrating Lesbian, Gay, Bisexual, and Transgender Pride Month at the Center, Agency, and Government-wide levels.

As was recently acknowledged through proclamations issued by President Barack Obama and Acting NASA Administrator Chris Scolese, the month of June was officially designated for each of us to recognize and appreciate the many contributions made by members of the GLBT community to the daily fabric of American life. Towards that end, the GLBTAC reached out to the NASA and Federal community in as many ways as possible.

Activities included posting personal videos on the Goddard internal home page (http://internal.gsfc/portal/site/InsideGoddard), hosting an open house for the GLBT community, a panel discussion entitled "Creating an Inclusive Workplace: Everything You Need to Know about Working with a Gay, Lesbian, Bisexual, or Transgender Employee," and sponsoring a Center lecture by author, columnist, and broadcaster Keith Boykin entitled "The Intersection of Sexual Orientation and Race."

The busy month ended on a high note with a Pride Month dinner luau co-sponsored by the Asian Pacific American Advisory Committee. Entertainment was provided by Ho'aloha, a Polynesian music and dance company, which included fire-dancing and Pacific dancers. Also held was a very productive annual meeting with Goddard Center Director, Rob Strain, and GLBTAC champion, Associate Center Director Nancy Abell.

Photo credit: Sharon Wong

Caption: Folks line up to try their hand at Polynesian dance.

All of the events were widely attended by Goddard employees and managers, as well as employees and contractors from the National Security Agency, the National Geospatial-Intelligence Agency, the Department of Housing and Urban Development, the Department of Health and Human Services, the Department of State, and members of the Greenbelt Pride Group.

More information about the GLBTAC and its members can be found at: http://glbtac.gsfc.nasa.gov. ■

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Cover caption: Members of the Goddard Community compete in the balloon toss at Celebrate Goddard Day.

Photo Credit: Bill Hrybyk

GoddardView Info

Goddard View is an official publication of the Goddard Space Flight Center. It is published bi-weekly by the Office of Public Affairs in the interest of Goddard employees, contractors, and retirees. A PDF version is available online at:
http://www.nasa.gov/centers/goddard/news/index.html

Managing Editor: Trusilla Steele

Editor: John Putman

Deadlines: News items for publication in the Goddard View must be received by noon of the 2nd and 4th Monday of the month. You may submit contributions to the editor via e-mail at john.m.putman@nasa.gov. Ideas for new stories are welcome but will be published as space allows. All submissions are subject to editing.

Goddard Community Enjoys Celebrate Goddard Day

By John Putman

On a bright, sunny, and for once not too muggy, July day, the Goddard community celebrated the challenging work and the diverse workforce that reside at NASA's Goddard Space Flight Center.

The celebration began with music. Vince "Slim Tie" Turner played music from across the years on the Goddard Mall, while Mark Branch (a.k.a. DJ Scientific) spun tunes in the Building 8 Auditorium. Diverse food selections were available throughout the day with choices ranging from Jamaican, BBQ, Mexican, Greek, Asian, and soul.

After a rumbling parade of muscle cars and custom motorcycles, an explosive dance performance by Goddard's Gerald Tiqui, and Angela Conley's rendition of the National Anthem, Goddard Center Director Rob Strain opened the festivities with inspiring opening comments. "I believe that one of Goddard's greatest strengths is our commitment to teamwork and innovation, which can only occur if we fully embrace the talents and ideas of every employee. I encourage you to join us and help celebrate the amazing diversity of the Goddard workforce," Strain said.

Photo credit: Debora McCallum

Caption: Gerald Tiqui lights things up.

Employees had opportunities to learn more about the wide range of projects and programs happening at Goddard by visiting the Directorate, contractor, GEWA Club, and Advisory Committee exhibits in the Building 8 Auditorium. The exhibits showcased Goddard's 50th anniversary theme: "Yesterday's Vision, Tomorrow's Reality."

Photo credit: Pat Izzo

Caption: Goddard employees fill the Building 8 Auditorium to learn more about their Center.

Employees also took part in the 15-minute tours that were available throughout the Center. Members of the Goddard community were treated to tours of the fabrication area of Building 5, the Goddard TV Studio in Building 28, the NASA Integrated Service Network (NISN) Mission, Network Operations Management Center in Building 14, the Super Computer Center in Building 28, and the Science on a Sphere system at the Goddard Visitor Center.

Photo credit: Debora McCallum

Caption: Goddard employees get an introduction to the fabrication area of the Building 5 machine shop.

Also on the Mall were activities for Goddard employees. The NASA Federal Credit Union had the NASA Federal Space Trivia Game to test everyone's knowledge about all kinds of trivia from space movies and 1950s pop culture, to the history of Goddard. Faces of Goddard was back this year by popular demand. Employees had their picture taken to be displayed on the 2009 Celebrate Goddard Faces of Goddard poster. The poster will be distributed during the 2010 Celebrate Goddard activities. Besides Goddard clubs being on display, employees also displayed their hobbies at exhibits on the Mall throughout the day.

Afternoon entertainment included a singing performance by Jolyn Nace, a singing/guitar performance by Dale Cole, and a band performance from Blues Connection. Awards were given out to winners of the car and motorcycle show, as well as to the winner of the Goddard 50th anniversary theme contest.

Other events included the competitive balloon toss, won again by Code 700, and the final event—a retrospective fashion show. Volunteer models from the Goddard community rocked styles from the past 50 years.

Celebrate Goddard Day was sponsored by the Diversity Council. Everyone attending seemed to agree that the annual Celebrate Goddard Day event seems to get better and better each year. See more pictures from Celebrate Goddard Day pn Page 6. ■

Astronaut Safety Gets Max Attention

By Keith Henry and Rebecca Powell

NASA's next generation of spacecraft will have the safest-ever astronaut escape system, a modern-day version of the reliable *Apollo* system. Like *Apollo*, the Orion launch abort system will swiftly propel the crew capsule away from the nose of the Ares I rocket and out of harm's way in case of an emergency on the launch pad or during ascent to orbit.

Also—as was the practice at times during development of key *Apollo* elements—while NASA engineers are working on the Orion launch abort system, another NASA team is investigating an alternate launch abort concept.

The alternate system, called Max Launch Abort System, or MLAS, was successfully tested in a simulated pad abort test at NASA's Wallops Flight Facility, Wallops Island, Va., on July 8.

Photo credit: Jim Mason Foley

Caption: NASA helicopter bird's-eye view of Max Launch Abort System flight.

MLAS was named after Maxime (Max) Faget, a *Mercury*-era pioneer. Faget was the designer of the Project *Mercury* capsule and holder of the patent for the "Aerial Capsule Emergency Separation Device," which is commonly known as the escape tower.

The unpiloted test was part of an assessment by the NASA Engineering and Safety Center (NESC) of a potential alternate launch abort system concept that could be used for future piloted spacecraft. The prototype, used in the test to evaluate means to safely propel a spacecraft and its crew from an errant rocket, represents a departure from the tower launch abort system used during *Apollo* launches and retained for the *Constellation* Program. A primary objective of the MLAS test is to provide the NASA workforce with additional direct implementation experience in flight testing a spacecraft concept useful in the Agency's future efforts to design, optimize, and test spacecraft.

The bullet-shaped MLAS concept will not replace the Orion abort system. NASA's Constellation Program has three years toward designing the Orion crew exploration vehicle and the Ares launch vehicles that will return humans to the Moon to live and work. The spacecraft designs are based on the technical principles established during the *Apollo* and Space Shuttle programs, yet incorporate the latest technology to expand the spacecraft's operational flexibility. The Orion launch abort system offers a proven method of pulling the crew out of danger in the event of an emergency on the launch pad or during the climb to Earth orbit.

MLAS is of potential interest because it is theorized to have aerodynamic performance benefits, weight savings, and be relatively simple in some spacecraft applications. Much of the potential gains would be accomplished by eliminating the launch abort tower, which also means eliminating the attitude control motors.

The MLAS demonstration vehicle consists of a full-scale composite fairing, a full-scale crew module simulator, and four solid rocket abort motors mounted in the boost skirt with motor mass simulators in the forward fairing. Test items of interest began at the seven second mark with burnout of the solid motors. The test is a demonstration of unpowered flight along a stable trajectory and MLAS vehicle reorientation and stabilization. The test also includes crew module simulator separation from the MLAS fairing, stabilization, and the parachute recovery of the crew module simulator.

Data from the MLAS pad abort test has the potential to help the Orion Project in several ways. MLAS is the first demonstration of a passively-stabilized launch abort system on a vehicle in this size and weight class. It is the first attempt to acquire full-scale aero-acoustic data—the measurement of potentially harmful noise levels due to the capsule moving through the air at high speeds—from a faired capsule in flight. It is also the first to demonstrate full-scale fairing and crew module separation, and collect associated aerodynamic and orientation data. In addition, data from the parachute element will help validate simulation tools and techniques for Orion's parachute system development.

The NESC, located at NASA's Langley Research Center in Hampton, Va., is an independently funded NASA program that draws on technical experts from across all NASA Centers to provide objective engineering and safety assessments of critical, high risk projects.

Each of the NASA Centers participated in the Agency-wide MLAS effort by providing engineers and technicians, analysts, designers, mission assurance specialists, and/or use of their test facilities. The NASA Sounding Rocket Operations Contract (NSROC), based at Wallops, also provided support.

For images and video of the test firing, visit:
http://www.nasa.gov/centers/wallops/missions/mlas.html.

For more information about NASA's Constellation Program, visit:
http://www.nasa.gov/constellation. ■

Goddard Celebrates Five Decades of Technology Spinoffs

By Dewayne Washington

In honor of Goddard's 50th anniversary, the Innovative Partnerships Program (IPP) Office hosted an evening event to commemorate the decades of Goddard research that has developed into many spin-off technologies.

Attendees of the event, held at the Goddard Visitor Center, learned about and celebrated the role of Goddard technologies in facilitating the creation of cordless tools, insulin pumps, survival kits, improvements to medical imaging, and more. The Maryland Technology Development Corporation recognized Goddard with a resolution of appreciation for 50 years of "Scientific and Engineering Excellence" in the State of Maryland.

Representatives of highly successful products based on Goddard technologies benefiting the space industry and the U.S. economy spoke at the event. Former NASA Deputy Administrator and veteran Shuttle astronaut Fred Gregory reminded attendees that innovation remains critical to NASA's ability to research, invent, and explore. "Those innovations developed for NASA programs have always led the way to technological advances that have strengthened our National economy," Gregory said.

Attendees heard about the 1960s technology for the original space blanket that was developed into a life-saving product that can now be found in emergency kits everywhere. According to Travis Smith of Grabber, Inc., this technology began as a plastic film originally used to improve the reflection of radio signals from NASA balloon satellites.

Greg Moores told the story of how Black & Decker, located in Towson, Md., teamed with Goddard researchers to develop a drill used by *Apollo* astronauts to collect the first lunar soil samples. This technology has created a multibillion-dollar cordless tool industry.

Photo credit: Chris Gunn

Caption: Greg Moores of Black & Decker.

Representing technology from the 1980s, Steve Sabicer of Medtronic MiniMed, Inc. spoke about the company's MiniMed insulin pump. The pump is based on NASA's Programmable Implantable Medication System and evolved from several NASA technologies, including one originally developed for life search experiments on Mars. "Originally developed for space research, the MiniMed pumps have been used to dramatically improve the quality of life for thousands of patients here on Earth," Sabicer said.

Benefiting the Nation's current "green" trend, and developed in the 1990s, QwikBoost refrigerant and lubricant helps customers save money while protecting the environment. Greg Cole of Mainstream Engineering Corporation said, "The QwikBoost additive was originally developed for NASA and is based on a chemical/mechanical heat pump that increases the performance of air conditioners, heat pumps, refrigerators, and freezers."

Photo credit: Chriss Gunn

Caption: Greg Cole of Mainstream Engineering Corporation.

One of the latest products using NASA technology is a powerful multiprocessor workstation from Bartron Medical Imaging. The recursive hierarchical segmentation software system developed at Goddard enhances a digital medical image to uncover features in the image that are not visible to the naked eye. "The MED-Seg device allows physicians to more quickly and accurately diagnose diseases and other medical conditions," said Fitz Walker of Bartron Medical Imaging.

Ja Hyun "Ashley" Lim, a student at North County High School in Glen Burnie, Md., was recognized for winning Goddard's 50th Anniversary Spin-Off Art Contest. Megha Subramanian, a student at Hershey Middle School in Hershey, Pa., was presented an award by Gregory for her essay, "NASA in My Food."

Photo credit: Chris Gunn

Caption: Ja Hyun "Ashley" Lim receives her award from Fred Gregory.

For more information about Goddard's IPP Office, visit: http://ipp.gsfc.nasa.gov. For more information about NASA technologies, please visit: http://www.sti.nasa.gov/tto. ■

Celebrate Goddard Day Gallery

Photos by Bill Hrybyk, Pat Izzo, and Debora McCallum

Hubble Astronauts Visit Goddard

By John Putman

The crew of theSpace Shuttle *Atlantis* mission to the *Hubble Space Telescope* (HST) for its final planned servicing mission visited Goddard on Thursday, July 23, to join the Goddard community in celebrating the mission's extraordinary success.

As part of their visit, the astronauts' gave a presentation—twice—to a packed Building 8 Auditorium. The crew sat in front of a video screen and narrated footage from their incredible mission. Each crewmember gave their own unique insight during a video play-by-play of their journey. The crew of STS-125 answered questions from Goddard employees after narrating the video summary of their mission.

After the presentations, the Goddard community visited the Goddard Mall from 12:30-2 p.m. to informally connect with, and get autographs from, the *Atlantis* crew of HST Servicing Mission 4. Everyone enjoyed live music from 20 After, featuring HST engineer Mark Hubbard, and Naked Singularity. ■

Photo credit: Pat Izzo

Caption: STS-125 astronauts (l-r) John Grunsfeld, Michael Massimino, Gregory Johnson, Andrew Feustel, Scott Altman, Megan McArthur (behind Altman), and Michael Good.

Photo credit: Pat Izzo

Caption: Mission Specialist Mike Massimino shows the actual hand rail he liberated from the Hubble Space Telescope *during servicing mission 4.*

Photo credit: Pat Izzo

Caption: Goddard employees mob astronaut Mike Massimino for picutres and autographs.

Photo credit: Pat Izzo

Caption: Astronaut Michael "Bueno" Good (center) reflects on a successful, if time-consuming, spacewalk.

Photo credit: Pat Izzo

Caption: Astronaut Megan McArthur poses with some future astronauts at the community picnic.

A New Mission for Goddard

By Adriana Diaz Dopazo

Goddard started a new mission on August 19, 2009. This mission is not into space, however, but one that will expand the boundaries for our service members once they find themselves adjusting to life outside of the military.

As part of its internship programs, Goddard recently introduced the Operation Warfighter (OWF) program, the goal of which is to recruit Federal and private employers, and place injured service members in appropriate education, training, and careers. It is designed to provide meaningful activity for recuperating service members outside of the hospital environment and to give them the opportunity to build their resumes, explore employment interests, develop job skills, and gain valuable Federal Government work experience. Not only does this program give them employment, but it also serves as their first work experience outside of the medical environment and has proven to have a positive impact in their recuperation.

The OWF program began after Chris Durachka, Code 585 Branch Head in the Software Engineering Division, attended a meeting where a former member of the Naval Criminal Investigative Service (NCIS) spoke about his interest in getting his agency involved with the OWF program. After a brief understanding of what it did and how it worked, Chris began to seek approval to implement the program at Goddard. Chris' first step was to have a career fair at Walter Reed Army Medical Center in Washington, D.C. He then made appointments with approximately 15 service members for personal interviews.

Photo credit: Nina Harris

Caption: OWF intern Hien Tran (left) and Chris Durachka tour the Building 7-10-29 complex.

Photo credit: Nina Harris

Caption: Hien Tran, Staff Sergeant Samuel Oyola, and Margaret Barton learn more about the Lunar Reconnaissance Orbiter.

This career fair was designed to introduce OWF participants to Goddard Space Flight Center, show them what we do here, give them a chance to network with Goddard leaders and managers, and let them know about potential intern opportunities.

At the end of the day, everyone involved thought the event had been a success, especially the servicemen and women, who were surprised to learn that you don't have to be a rocket scientist to work at Goddard. The event was a nice dress rehearsal for a larger event being planned for the fall, where Goddard will have a group of Directorates representing all major work areas ready to work with the program.

Goddard already has the first service member of the OWF program working at the Center. His name is Hien Tran–known as "H.T."–who became an OWF intern in Durachka's Branch after interviewing for the position.

"When H.T. began working in our Branch, he was not very confident or self-assured. As he got to know us and we got to know him, he gained a great deal of confidence and self esteem," said Durachka. Durachka also said, "The reason I really like the Operation Warfighter intern program is because it allows the servicemen and women to test out career paths."

Like any other program, the beginning has been challenging, but with the help of Margaret Barton, Administrative Officer for Code 580, and Chris' tireless efforts in expanding this opportunity at Goddard, the program has gained recognition. ■

NASA's *Solar Dynamics Observatory* Arrives at Kennedy Space Center

By Rob Gutro and Laura Layton

NASA's upcoming mission to study the Sun and its effects on Earth in unprecedented detail—the *Solar Dynamics Observatory* (SDO)—arrived at NASA's Kennedy Space Center, Fla. on July 9. The spacecraft left NASA's Goddard Space Flight Center in Greenbelt, Md., on July 7, where it was built and tested.

SDO will undergo final testing at Astrotech Space Operations, located near Kennedy Space Center, in preparation for its anticipated November launch. The SDO team will conduct a series of tests to ensure that the observatory arrived in good condition, as it is being readied for launch.

After the final tests are completed, SDO will move to launch complex 41 at the Cape Canaveral Air Force Station. A United Launch Alliance Atlas V rocket will launch the solar-studying spacecraft into orbit.

Photo credit: NASA

Caption: SDO arrives at Astrotech Space Operations, located near Kennedy Space Center.

SDO will take measurements and images of the Sun in multiple wavelengths for at least five years during its primary science mission. The spacecraft will collect a staggering 1.5 terabytes of data daily, the equivalent of downloading a half million songs a day.

Photo credit: NASA

Caption: SDO arrived during a summertime thunderstorm.

Space weather results from changes on the Sun, called solar activity. Active regions on the Sun can erupt suddenly and violently, usually in the form of a solar flare or coronal mass ejection (CME).

Flares and CMEs can send millions of tons of solar material and charged particles streaming toward Earth on the solar wind. When these particles reach Earth's atmosphere, it can damage orbiting satellites and wreak havoc on navigation systems and the power grid. Understanding space weather requires knowing the nature of changes that happen in the Sun.

SDO is the first space weather research network mission in NASA's Living With a Star program. The spacecraft's long-term measurements will give solar scientists in-depth information about changes in the Sun's magnetic field and insight into how those changes affect Earth.

For more information on SDO, visit: http://www.nasa.gov/sdo or http://sdo.gsfc.nasa.gov. To watch a video of SDO moving out, visit: http://www.nasa.gov/mission_pages/sdo/news/sdo_arrival.html. For more information on NASA's Living With a Star program, visit: http://lws.gsfc.nasa.gov. ■

Nobel Prize Winner and NASA's Blueshift Podcast Take You on a Data Journey

By Francis Reddy

Dr. John Mather, a Nobel Prize-winning astrophysicist at NASA's Goddard Space Flight Center in Greenbelt, Md., joined the Blueshift podcast on June 18 to share his sense of what makes scientific data beautiful. "I think it's worth a lot of attention to portraying the information in the best possible graphic way," he said. "Data are beautiful when they tell a story."

Photo credit: NASA

Caption: John Mather is a Senior Astrophysicist in the Observational Cosmology Laboratory at Goddard.

Blueshift, a series of podcasts produced by Goddard's Astrophysics Science Division, offers listeners a backstage pass to the Division's groundbreaking discoveries, innovative technology, new missions, and other exciting stories.

"Blueshift's summer series kicks off with Dr. Mather's interview," said Sara Mitchell, Director of Blueshift. "This four-part series will follow the stories of missions, scientists, and iconic images as we see how science data is captured and communicated." Podcast listeners will find additional material and images related to each show on the Blueshift Web site.

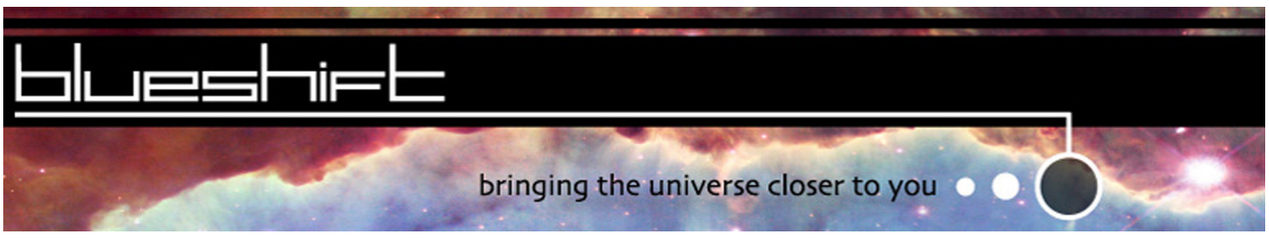
In the episode, John Mather describes how science and data are communicated, and the importance of imagery in sharing data so the world can understand it. In 2006, both he and George Smoot at the University of California, Berkeley, shared the Nobel Prize in physics. They won for their work on NASA's *Cosmic Background Explorer*, a satellite that mapped radiation emitted when the universe was less than 400,000 years. The mission created the first-ever "baby picture" of the cosmos.

If you think that satellites just relay the images that we see here on Earth, you'll be in for a big surprise. Dr. Mather discusses how data are assembled, polished, and transformed into images, animations, and illustrations.

Mather also describes how the new *James Webb Space Telescope* (JWST), slated for launch in 2014, will build upon the valuable science and breathtaking imagery of *Hubble*. JWST will see the most distant objects in the cosmos and take astrophysicists further back in time than ever before.

The term "blueshift" relates to a change in the spectrum of an object that is moving toward us. "We chose 'Blueshift' because we aim to bring the universe of astrophysics at Goddard directly to our listeners," Mitchell said.

To learn more about Blueshift, subscribe to the podcast, or listen to archived episodes, please visit: http://universe.nasa.gov/blueshift. ■



NASA Releases Restored *Apollo 11* Moonwalk Video

By Rani Gran and Mark Hess

NASA released newly restored video from the July 20, 1969, live television broadcast of the *Apollo 11* moonwalk. The release commemorates the 40th anniversary of the first mission to land astronauts on the Moon.

The initial video release, part of a larger *Apollo 11* moonwalk restoration project, features 15 key moments from the historic lunar excursion of Neil Armstrong and Buzz Aldrin. The video was shown at the Newseum in Washington, D.C. on July 16 during a press conference.

Photo credit: Bill Hrybyk

Caption: Reporters gaze up in awe while watching samples of the restored video of the historic Apollo *landing.*

A team of *Apollo*-era engineers who helped produce the 1969 live broadcast of the moonwalk acquired the best of the broadcast-format video from a variety of sources for the restoration effort. These included a copy of a tape recorded at NASA's Sydney, Australia video switching center, where downlinked television from Parkes Radio Astronomy Site in New South Wales, Australia; and Honeysuckle Creek Tracking Station in Canberra, Australia was received for transmission to the U.S.; original broadcast tapes from the CBS News archive recorded via direct microwave and landline feeds from NASA's Johnson Space Center in Houston; and kinescopes found in film vaults at Johnson that had not been viewed for 36 years.

"The restoration is ongoing and may produce even better video," said Richard Nafzger, an engineer at Goddard who oversaw television processing at the ground tracking sites during *Apollo 11*. "The restoration project is scheduled to be completed in September and will provide the public, future historians, and the National Archives with the highest quality video of this historic event."

NASA contracted with Lowry Digital of Burbank, Calif., which specializes in restoring aging Hollywood films and video, to take the highest quality video available from these recordings, select the best for digitization, and significantly enhance the video using the company's proprietary software technology and other restoration techniques.

Under the initial effort, Lowry restored 15 scenes representing the most significant moments of the three-and-a-half hours that Armstrong and Aldrin spent on the lunar surface.

The black and white images of Armstrong and Aldrin bounding around the Moon, seen by hundreds of millions of people live on television, were provided by a single small video camera aboard the lunar module. The camera used a non-standard scan format that commercial television could not broadcast.

NASA used a scan converter to optically and electronically adapt these images to a standard U.S. broadcast television signal. The tracking stations converted the signals and transmitted them to Mission Control in Houston using microwave links, Intelsat communications satellites, and AT&T analog landlines. By the time the images appeared on international television, they were substantially degraded.

At tracking stations in Australia and the United States, engineers recorded data beamed to Earth from the lunar module onto 1-inch telemetry tapes. The tapes were recorded as a backup if the live transmission failed or if the *Apollo* project needed the data later. Each tape contained 14 tracks of data, including biomedical, voice, and other information; one channel was reserved for video.

Photo credit: Bill Hrybyk

Caption: Richard Nafzger shows a 1-inch telemetry tape to reporters.

A three-year search for these original telemetry tapes was unsuccessful. A final report on the investigation is expected to be completed in the near future and will be publicly released at that time.

A copy of the newly restored scenes from the *Apollo 11* restoration effort can be found at: http://www.nasa.gov/multimedia/hd/apollo11.html. ■

Employee Spotlight: Jonathan Gardner

By April Thornton

Photo credit: Bill Hrybyk

Caption: Jonathan Gardner

Jonathan Gardner's fascination with science began as a child when he would tune in to see Carl Sagan talk about astronomy on television. He also read science fiction novels by Robert Heinlein. Gardner said, "What fascinated me was the idea of working on problems that are basically the biggest problems that we have. That is what astronomy does; it is the whole universe; how stars and galaxies form. That is what we can do here, think about the big picture."

Gardner was born in Pennsylvania, but grew up in the small town of Goshen, Ind. He attended Harvard University where he received his bachelor's degree in astronomy and astrophysics. He followed that with graduate school at the University of Hawaii, earning a master's degree and then a Ph.D. in astronomy.

Gardner spent the summers of 1985 and 1986 as an intern at Goddard so he could stay in the space science program. Following the *Challenger* accident in 1986, the launch of the *Hubble Space Telescope* was delayed and it looked like space science would be put on hold for a while. Rather than staying at Goddard, Gardner went to Hawaii to get his Ph.D. using telescopes to study galaxy evolution. He followed that with postdoctoral research at the University of Durham in England. By 1996, *Hubble* had been launched and serviced, and Gardner got an opportunity to return to Goddard. He was hired to work with the Space Telescope Imaging Spectrograph, a camera that was installed on *Hubble* during the second servicing mission in early 1997. Gardner said, "It was a good opportunity to come back here just before the instrument was launched."

After his arrival at Goddard, Gardner worked with *Hubble* data. His Ph.D. thesis and his postdoctoral research were studies of how galaxies evolved using infrared data. He would examine pictures of the sky taken in infrared light, measure the statistics of the galaxy colors and shapes, and determine how the galaxies had changed over time as the universe got older.

Shortly after arriving at Goddard, Gardner heard about a project to build a new space telescope designed to study galaxy evolution using deep infrared surveys. It would be able to look back to the first galaxies that formed after the Big Bang. The new telescope was the successor to *Hubble* and is called the *James Webb Space Telescope* (JWST). In the late 1990s, Gardner participated in the early mission studies and, in 2002, joined the project as the Deputy Senior Project Scientist for the mission. (In 2000, JWST was ranked as the Nation's top priority for the decade by the National Academy of Sciences.) Gardner said, "It is great to have the opportunity to work on a high priority project. People from around world recognize the importance that JWST will have for the progress of scientific discovery."

Since 2006, Gardner has been the Chief of the Observational Cosmology Lab. The goal of this science lab is to study the universe and the galaxies within it. Currently, its two biggest missions are JWST and the *Wilkinson Microwave Anisotropy Probe* (WMAP). WMAP was launched to study the Big Bang and the microwave radiation that is left over from the explosion that started the universe. Measurements of this radiation show how much normal matter, dark matter, and dark energy make up the universe. A future mission being studied in Gardner's lab will follow on to WMAP and study the polarization of the microwave background to see how the Big Bang itself happened.

Gardner enjoys public speaking and gives frequent talks about JWST and cosmology at museums, universities, and conferences. Recent venues have included The Catholic University of America in Washington, D.C., and the Exhibit Museum at the University of Michigan. The year 2009 has been declared the International Year of Astronomy because it is the 400th anniversary of Galileo's first use of a telescope for astronomy. Gardner got an opportunity to speak about space telescopes at the International Year of Astronomy opening ceremonies at the United Nations Educational, Scientific, and Cultural Organization headquarters in Paris, France.

When asked, "What words of encouragement would you tell individuals who are seeking the same career path?" Gardner said, "Have a sense of wonder about the universe and world around us."

This year, Gardner's three children participated in two of the plays put on by the Music and Drama (MAD) club at Goddard. Gardner plays the guitar and, with his wife, performs in a group called Transatlantic Crossing, playing folk music from England, Scotland, Ireland, and the United States. ■