



Goddard View

Volume 8 Issue 11
December 2012

Students from Maryland School for the Blind Visit Goddard

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Technologists Gather to Celebrate Innovation

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THE WEEKLY

LDCM Departs Thermal Vacuum Chamber

On Nov. 23, 2012, the Landsat Data Continuity Mission (LDCM) satellite concluded environmental testing in a thermal vacuum chamber at the Orbital Science Corporation's facility in Gilbert, Ariz. Engineers are now preparing the satellite for shipment to the launch site at Vandenberg Air Force Base in California. To learn more, click on the image.



Building One GEWA Store Now Open

Get a jump on holiday shopping and the newly reopened GEWA store in Building 1. The new hours are 8:00 a.m. to 4:00 p.m. Monday through Friday. Choose from hundreds of NASA and space-related gifts, as well as cards, candy and other sundries. For more information, click on the picture.



CFC Message from the Director

I would like to remind you of the opportunity we have as federal employees to help others through the Combined Federal Campaign (CFC). Goddard employees have contributed more than \$178,000, approximately 32 percent of its goal of \$561,000. The

campaign ends December 15, so there is still time for you to contribute. With your support, I am confident our Center will surpass its goals.

Ways to Cook a Turkey Using NASA Equipment

Goddard science writers and social media specialists combined forces to respond to a Gizmodo request for descriptions of how various NASA processes could be used to cook Thanksgiving turkeys. NASA Headquarters promoted the Gizmodo link on social media accounts. See the results by clicking on the image.



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Outside Goddard

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On the cover: Students from the Maryland School for the Blind had tactile experiences in Goddard's machine shop, fabrication and assembly area as James Buckeridge toured them through the facility.

Photo credit: NASA/Goddard/Debra McCallum

GoddardView

Goddard View is an official publication of NASA's Goddard Space Flight Center. *Goddard View* showcases people and achievements in the Goddard community that support Goddard's mission to explore, discover, and understand our dynamic universe. *Goddard View* is published weekly by the Office of Communications.

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News items for publication in *Goddard View* must be received by noon Wednesday of each week. 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.

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MARYLAND SCHOOL FOR THE BLIND STUDENTS VISIT GODDARD

By: Rob Gutro

October was National Disability Employment Awareness month, and students from the [Maryland School for the Blind](#) visited NASA's Goddard Space Flight Center in Greenbelt, Md., for a hands-on and audible learning experience about what happens at Goddard and career opportunities available to them.

In October, 16 students in grades 9 through 12 came to NASA Goddard to learn about things ranging from space blankets to ice cores. NASA Goddard studies astrophysics, planetary science, Earth science, heliophysics, and develops technology to study them. The main purpose of the visit was to inform the students about science, technology, engineering and mathematics, or STEM, career opportunities available at NASA for blind and visually impaired individuals.

The agenda included a tour of the Spacecraft Fabrication Facility, including machining technology, composites, rapid prototyping, and the model shop. At Goddard's Spacecraft Fabrication Facility, technicians and engineers manufacture components used for spacecraft assembly as well as astronaut tools.

The students also got to tour the space blanket laboratory on the Goddard campus and felt the texture of space blankets used to cover spacecraft and protect them from the harsh temperatures of space. The blankets are unique. For example, to provide adequate insulation for NASA's Hubble Space Telescope, the blanketing material used on the telescope was made up of 16 layers of dimpled aluminum with an outer Teflon skin.

The multi-layer insulation or "blanket" protects satellite instruments from the severe and rapid temperature changes they experience as they move in orbit from very hot sun to very cold night, even though the blanket is incredibly thin, measuring less than one-tenth of an inch thick when laid flat.

Education Specialist Katherine Bender later gave a hands-on presentation entitled, "What ice cores can tell us about the past, present, and future: A Cool, Hands-on Demo!" Bender also spoke about high school internship opportunities at Goddard.

The event was coordinated through Kenneth Silberman and Katherine Bender of Goddard's Education Office. They worked with Colleen Shovestull, a special educator and science teacher at the Maryland School for the Blind to make the visit happen. The partnership is being formed by the NASA Goddard Education Office, the Equal Opportunity Programs Office (EEOPO), and the Equal Accessibility Advisory Committee (EAAC). The visit stems from a partnership that the Individuals with Disabilities Advisory Group is establishing with the Maryland School for the Blind. ■

Above: Students from Maryland School for the Blind heard about space blankets and got to feel the blanketing. Blankets are made at Goddard where they are precisely measured, cut, and carefully sewn for space missions. Photo credit: NASA/Goddard/Debra McCallum



“...native culture has a much more holistic view of the environment and planet...”



A NOD TO NATIVE AMERICANS

By: Claire Saravia

Members of the NASA Goddard Space Flight Center community gathered on campus November 16 to listen to a discussion on a different kind of mission: getting Native Americans more involved in science and technology fields.

Goddard’s Native American Advisory Committee partnered with Navajo Nation Washington for the first time to host a panel discussion on how to create more education opportunities for Native American students, helping them launch careers with agencies like NASA.

“We’ve been doing a lot of work with the Native American community for a long time,” said Goddard diversity director Dan Krieger, who was the event’s MC. “This was an opportunity to try to get a lot of the players together in the same room to talk about some of our initiatives and how we could be more effective at reaching some communities.”

The “Celebrating Native American Voices” event—which was part of Native American Heritage Month—brought together NASA officials and representatives from a handful of national organizations, including Navajo Technical College, the American Indian High Education Consortium (AIHEC), the American Indian Science & Engineering Society (AISES), and the Arctic Slope Regional Corporation.

Krieger said the panel was the first of its kind to bring in such a high caliber of attendees, and provided an opportunity to highlight education initiatives NASA has led.

“We’ve been working with different tribes and universities throughout the country for a long time,” Krieger said. “This is a way for us to share some of the information and programs we’ve had and try to expand that and reach audiences we haven’t.”

The discussion topics included federal initiatives for Native American students like internship opportunities—including some at NASA—and challenges the organizations faced increasing these efforts.

The panel members talked about several NASA programs that have been beneficial for Native American students, including the Tribal Colleges and Universities Project (TCUP), which provides grants for projects developed at the schools that could help the agency.

AIHEC president and CEO Carrie Billy said in the discussion that NASA was a leader in creating internship programs for Native American students, adding that this year there were over 50 students across different centers working on projects to bring back to their communities.

Goddard minority education lead Janie Nall said Goddard’s promotion of education opportunities for Native Americans benefitted the agency as much as it benefitted the students.

“In my experience, native culture has a much more holistic view of the environment and planet,” Nall said. “I’ve found that a lot of the students and faculty from tribal colleges who come in to do work with us bring a different perspective that’s actually quite valuable to groups who are doing scientific research here.”

In addition to helping agencies like NASA advance their research, AISES representative Noller Herbert said the partnerships helped Native American students bring their new knowledge back to their communities.

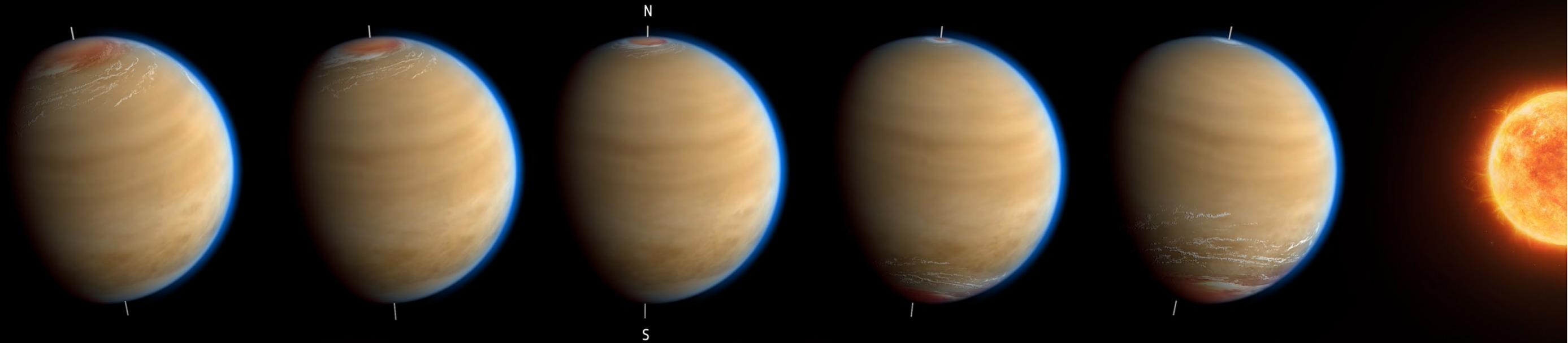
“We need to look at science and technology with our younger generation to develop technologies that deliver the things needed to make our native community a better place to live,” Herbert said.

Nall said the event was a way to communicate topics important to Native American communities while promoting the agency’s commitment to diversity.

“It’s important to NASA that we have a very diverse and inclusive workforce, and NASA products, our missions, and projects impact people all over the world,” Nall said. “We’re hoping that some of the people who came will raise their awareness of what’s going on in the world of native communities and education in those communities.” ■

Above from Left to Right: Crystal Moten, deputy chief, Equal Opportunity Programs Office; Dan Krieger, Goddard diversity director; Carrie Billy, president and CEO of AIHEC; Paul Racette, senior engineer at GSFC; Clara Pratte, executive director of Navajo Nation Washington office; Janie Nall, Goddard lead for minority education; Jared King (not holding plaque), communications director for Navajo Nation Washington; Clay Morad, technical market development manager for Arctic Slope Regional Corporation (ASRC); Elmer Guy, president of Navajo Technical College; Noller Herbert, representative from AISES. Photo credit: NASA/Goddard/Debra McCallum

Opposite: Elmer Guy (left) and Paul Racette discuss creating more education opportunities for Native American students. Photo credit: NASA/Goddard/Debra McCallum



CASSINI SEES ABRUPT TURN IN TITAN'S ATMOSPHERE

By: Jia-Rui Cook, Elizabeth Zubritsky and Nancy Neal-Jones

Data from NASA's Cassini spacecraft tie a shift in seasonal sunlight to a wholesale reversal, at unexpected altitudes, in the circulation of the atmosphere of Saturn's moon Titan. At the south pole, the data show definitive evidence for sinking air where it was upwelling earlier in the mission. So the key to circulation in the atmosphere of Saturn's moon Titan turned out to be a certain slant of light. The paper was published today in the journal *Nature*.

"Cassini's up-close observations are the only ones we'll have in our lifetime of a transition like this in action," said Nick Teanby, the study's lead author who is based at the University of Bristol, England, and is a Cassini team associate. "It's extremely exciting to see such rapid changes on a body that usually changes so slowly and has a 'year' that is the equivalent of nearly 30 Earth years."

In our solar system, only Earth, Venus, Mars and Titan have both a solid surface and a substantial atmosphere—providing natural laboratories for exploring climate processes. "Understanding Titan's atmosphere gives us clues for understanding our own complex atmosphere," said Scott Edgington, Cassini deputy project scientist at NASA's Jet Propulsion Laboratory, Pasadena, Calif. "Some of the complexity in both places arises from the interplay of atmospheric circulation and chemistry."

The pole on Titan that is experiencing winter is typically pointed away from Earth due to orbital geometry. Because Cassini has been in orbit around Saturn since 2004, it has been able to study the moon from angles impossible from Earth and watch changes develop over time. Models have predicted circulation changes for nearly 20 years, but Cassini has finally directly observed them happening—marking a major milestone in the mission.

Other Cassini instruments recently obtained images of the formation of haze and a vortex over Titan's south pole, but the data from the composite infrared spectrometer (CIRS) is sensitive to much higher altitudes, provides more quantitative information and more directly probes the circulation and chemistry. The CIRS data, which enable scientists to track changes in atmospheric temperature and the distribution of gases like benzene and hydrogen cyanide, also revealed changes in hard-to-detect vertical winds and global circulation.

Besides the evidence for sinking air, Cassini also detected complex chemical production in the atmosphere at up to 400 miles above the surface, revealing the atmospheric circulation extends about 60 miles higher than previously expected.

Compression of this sinking air as it moved to lower altitudes produced a hot spot hovering high above the south pole, the first indication of big changes to come. The scientists were also able to see very rapid changes in the atmosphere and pinpoint the circulation reversal to about six months around the August 2009 equinox, when the sun shone directly over Titan's equator. The circulation change meant that within two years of equinox, some gases had increased in abundance 100-fold—much more extreme than anything seen so far on Titan.

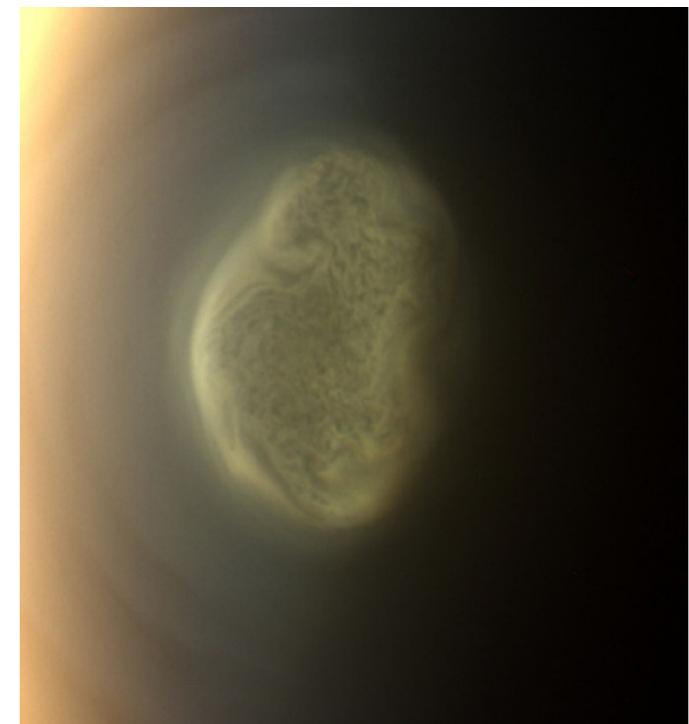
The results also suggest that a detached layer of haze (first detected by NASA's Voyager spacecraft) may not be so detached after all, since complex chemistry and vertical atmospheric movement is occurring above this layer. This layer may instead be the region where small haze particles combine into larger, but more transparent, clumped aggregates that eventually descend deeper into the atmosphere and give Titan its characteristic orange appearance.

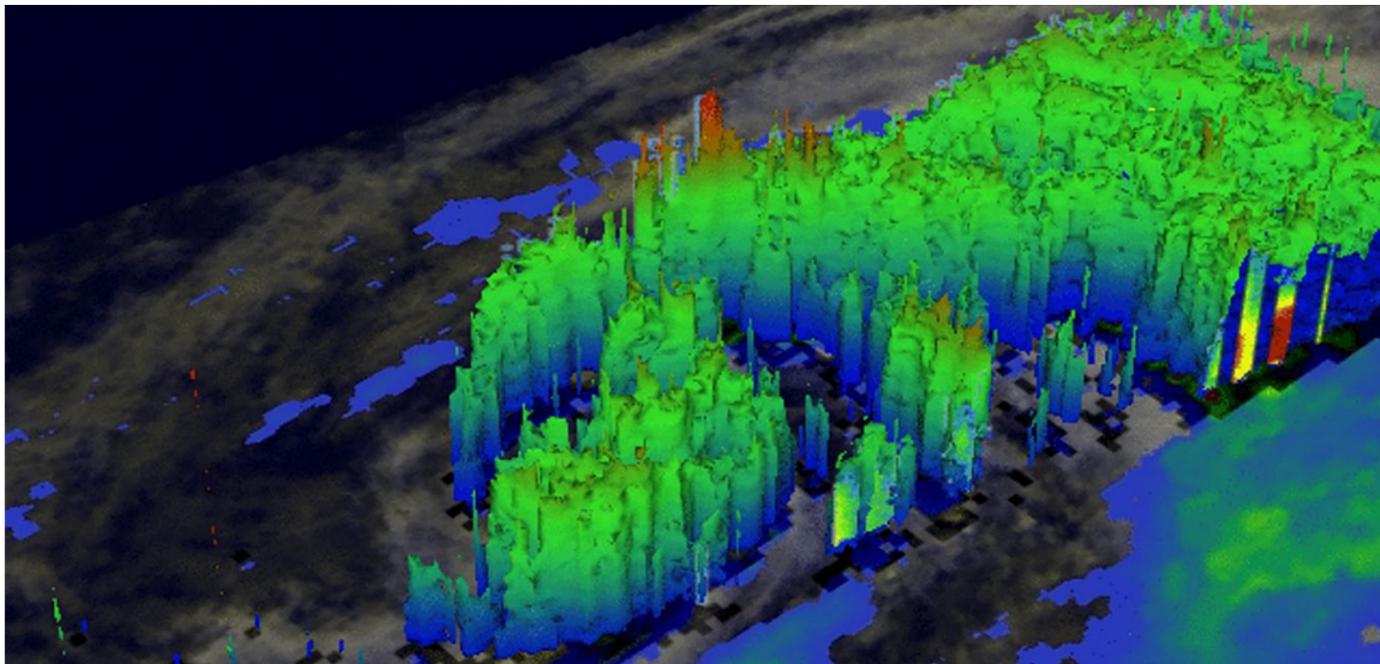
"Next, we would expect to see the vortex over the south pole build up," said Mike Flasar, the CIRS principal investigator at Goddard. "As that happens, one question is whether the south winter pole will be the identical twin of the north winter pole, or will it have a distinct personality? The most important thing is to be able to keep watching as these changes happen."

The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. NASA's Jet Propulsion Laboratory manages the mission for NASA's Science Mission Directorate, Washington, D.C. The visual and infrared mapping spectrometer team is based at the University of Arizona, Tucson. The composite infrared spectrometer team is based at NASA's Goddard Space Flight Center in Greenbelt, Md., where the instrument was built. JPL is a division of Caltech. ■

Above: Artist's impression of Saturn's moon Titan showing the change in observed atmospheric effects before, during and after equinox in 2009. Image credit: ESA

Right: This true color image captured by NASA's Cassini spacecraft before a distant flyby of Saturn's moon Titan on June 27, 2012, shows a south polar vortex, or a mass of swirling gas around the pole in the atmosphere of the moon. Image credit: NASA/JPL-Caltech/Space Science Institute





When it rains it pours, the saying goes, and for the last 15 years, the data on tropical rainfall have poured in. NASA's [Tropical Rainfall Measuring Mission \(TRMM\)](#) was launched on Nov. 27, 1997, and for the last decade and a half has enabled precipitation science that has had far-reaching applications across the globe.

Rain is one of the most important natural processes on Earth, and nowhere does it rain more than across the tropics. TRMM carries five instruments that collectively measure the intensity of rainfall, characteristics of the water vapor and clouds, and lightning associated with the rain events. One of the instruments, the Precipitation Radar, is the first precipitation radar flown in space. It returns images of storms that for the first time have revealed close-up, three-dimensional views of how rainbands in tropical cyclones develop, potentially indicating how strong the storms might become.

The TRMM Precipitation Radar, built by NASA's mission partner the Japan Aerospace Exploration Agency (JAXA), penetrates clouds to see raindrops and precipitation-sized ice such as hail. The radar's ability to make precise measurements of both the altitude and the intensity of precipitation gives scientists clues about the energy that fuels thunderstorms, hurricanes and other kinds of severe weather.

Another key instrument on TRMM is the Microwave Imager, or TMI, that provides X-ray-like images of rainfall across a swath more than three times as wide as that from the radar. Data from TMI goes into [forecasts of tropical cyclones](#) made by the National Hurricane Center, including the recent Hurricane Sandy, and [maps used by emergency managers](#) that show areas at risk of flooding after heavy rains.

Originally a three-year mission, TRMM's extended mission life has provided a great boon to scientific understanding of precipitation and its role in broad weather patterns and climate. TRMM has given scientists a decade and a half of data that allows them a better understanding of how rain varies daily, seasonally and annually; how El Niño affects global rain patterns; how regional rain events vary throughout the season; and how humans have affected local.

"TRMM has become the world's foremost satellite for the study of precipitation and associated storms and climate processes in the tropics," says TRMM Project Scientist Scott Braun at Goddard. "TRMM has met and exceeded its original goal of advancing our understanding of the distribution of tropical rainfall and its relation to the global water and energy cycles."

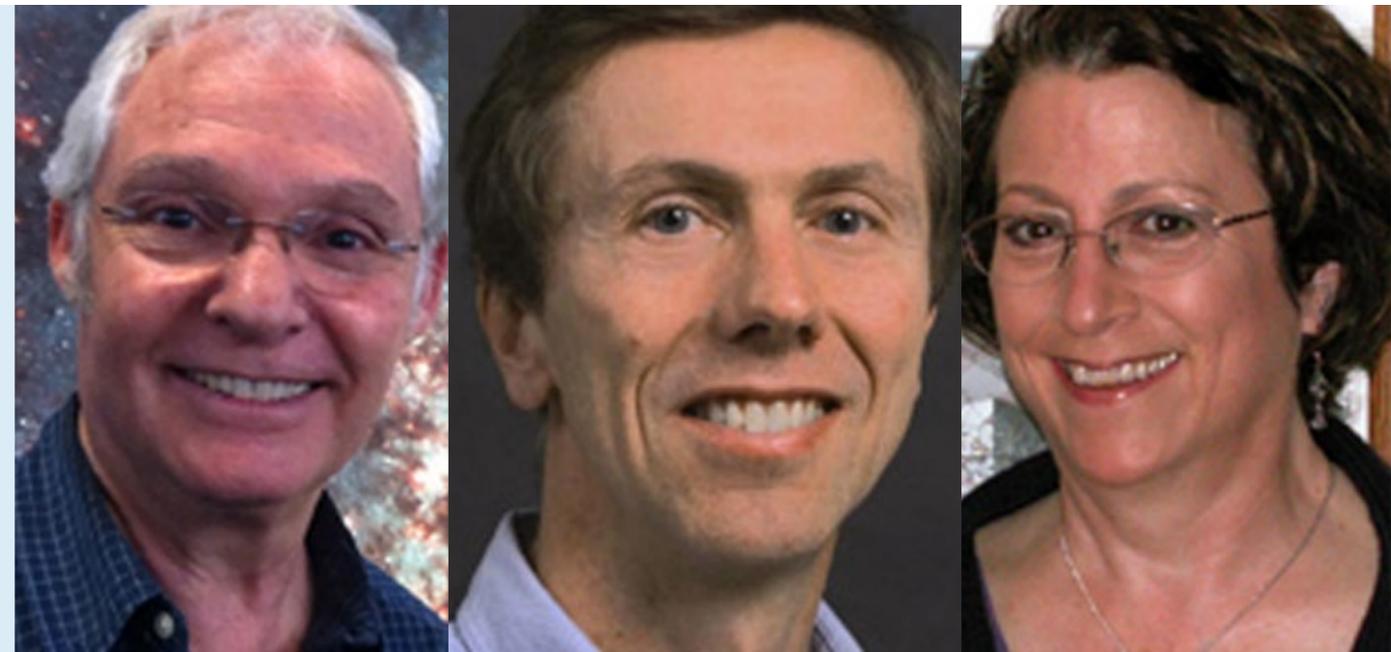
While TRMM continues to collect valuable science data, its fuel will eventually run out. Its successor, the Global Precipitation Measurement (GPM) mission, is gearing up for launch in February 2014. GPM's orbit will extend coverage beyond the tropics to the Arctic and Antarctic circles, and its two instruments, an advanced version of TRMM's microwave imager and a dual-frequency precipitation radar, will be more sensitive to detecting light rain and snow than the instruments currently on TRMM. Together with its U.S. and international partners including the space agencies of Japan, France, India and Brazil, GPM will expand upon TRMM's highly successful legacy.

See [video](#) related to TRMM. ■

Above: This 3-D image of Hurricane Sandy's rainfall was created using TRMM Precipitation Radar data. It shows the storm as it appeared on Oct. 28, 2012. Red areas indicate rainfall of 2 inches (50 mm) per hour. Image sredit: NASA/SSAI/Hal Pierce

NASA'S TROPICAL RAINFALL MEASURING MISSION TURNS 15

By: Ellen Gray



Dr. Eli Dwek and Dr. Neil Gehrels of Goddard, and Dr. Lynn Cominsky of NASA's Fermi and Swift missions have been named as fellows of the American Association for the Advancement of Science (AAAS). The election of an AAAS fellow is an honor bestowed upon AAAS members by their peers.

New fellows will be presented with an official certificate and a gold and blue (representing science and engineering, respectively) rosette pin on February 16 at the AAAS Fellows Forum during the 2013 AAAS Annual Meeting in Boston, Mass. This year, 701 members have been awarded this honor by AAAS because of their scientifically or socially distinguished efforts to advance science or its applications.

Eli Dwek, an astrophysicist at NASA Goddard, will receive this award for his distinguished contributions to the theory of the evolution and nature of interstellar dust grains, including formation and destruction, emission and absorption of light, and unified models of observations.

Dwek has worked as an astrophysicist at Goddard since 1983. He received his doctorate in space physics and astronomy from Rice University in Houston, Texas. His thesis was "Nucleosynthesis of Light Elements in Young Supernova Remnants Surrounding Pulsars." He worked as a postdoctoral research fellow at Caltech in Pasadena, Calif., from 1977-1979. He also served as a research fellow as a part of the Department of Astronomy at the University of Maryland, College Park, from 1979-1981. He first came to Goddard as a National Research Council resident research associate with the National Academy of Sciences. Dwek was also a member of the Cosmic Background Explorer (COBE) science team. Their discoveries of the shape and anisotropy of the cosmic microwave background and the detection of the cosmic infrared background earned the team members the Peter Gruber Foundation's 2006 Cosmology Prize.

AAAS, NASA ANNOUNCE 2012 FELLOWS

By: Laura Betz

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Neil Gehrels, an astrophysicist at Goddard, will receive this award for his leadership on the Swift, Compton, Fermi and future dark energy missions.

Gehrels is principal investigator for the Swift gamma-ray burst MIBEX mission and chief of the Astroparticle Physics Laboratory. He served as the project scientist for the Compton Observatory from 1991-2000, a deputy project scientist for the Fermi Gamma-ray Space Telescope, project scientist for the Wide-Field Infrared Survey Telescope and member of the Laser Interferometer Gravitational Waver Observatory Scientific Collaboration.

Lynn R. Cominsky of Sonoma State University, will receive this award for her work in outreach for X-ray and gamma-ray astronomy and for her inspiration to undergraduate students at Sonoma State. She has been on the faculty of SSU's Physics and Astronomy Department since 1986, and has chaired the department since 2004.

Cominsky is an astrophysicist and is also the education and public outreach lead for NASA's Swift gamma-ray burst mission, the Fermi Gamma-ray Space Telescope, the Nuclear Spectroscopic Telescope Array (NuSTAR) focusing hard x-ray mission, and the U.S. portion of the European Space Agency's XMM-Newton mission. She is also a scientific co-investigator on Swift, Fermi and NuSTAR, and serves as the press officer for Swift and Fermi. In these positions, she often interprets astronomical discoveries for the public. Cominsky's NASA-funded education and public outreach group uses the excitement of high-energy space science to train teachers, inspire and engage students, and increase the scientific literacy of the general public.

The AAAS was founded in 1848, and includes 261 affiliated societies and academies of science, serving 10 million individuals. The tradition of AAAS fellows began in 1874. Currently, members can be considered for the rank of fellow if nominated by the steering groups of the Association's 24 sections, or by any three fellows who are current AAAS members or by the AAAS chief executive officer. ■

Top (left to right): Eli Dwek, Neil Gehrels and Lynn Cominsky. Photo credit: NASA

TECHNOLOGISTS GATHER TO CELEBRATE INNOVATION

By: Lori J. Keesey



The Office of the Chief Technologist held its annual Internal Research and Development (IRAD) program “Poster Session” Nov. 29 in the Building 8 auditorium. The event drew hundreds of visitors who came to learn more about the cutting-edge technologies now being developed under the center’s IRAD program. Here are a few photos capturing the event.

Clockwise from top left:

No, these aren’t toys. Principal Investigator Steven Kenyon created these devices using an emerging technology called “Direct Metal Laser Sintering.” With this 3-D manufacturing process, engineers and scientists may be able to fabricate novel instruments considered impractical or even impossible before. In his right hand, Steven holds a modulated X-ray source; in his left, a 3-D representation of the magnetic field emanating from a pulsar.

The aquatic lotus plant inspired a Goddard team to develop a special coating preventing dirt and bacteria from sticking to and contaminating spaceflight gear. Technologist Kristin McKittrick shows scientist Bill Farrell how well the lotus coating actually works. She doused two samples with a gritty material reminiscent of lunar dust. The material literally fell off the lotus-coating sample on the left. Only water removed it from the coating-free sample on the right.

Scientist Peter Hildebrand (right) holds the joystick that operates the Remotely Operated Vehicle for Environmental Research (ROVER), which Wallops Flight facility technologist Geoff Bland (left) developed under his FY12 IRAD award. The ROVER will be used in coastal ecosystem research conducted by students and faculty at the University of Maryland Eastern Shore.

Chief Technologist Peter Hughes welcomes visitors and participants before awarding this year’s “Innovator of the Year” award to technologist Stephanie Getty.

Center:

Engineer Ken Segal, who has been instrumental in promoting the use of composites in spacecraft design, holds the upper skin of a telescope housing made entirely of composite materials. The structure was originally designed for the Tropospheric Wind Lidar Technology Experiment, an instrument that could fly next year as part of NASA’s Hurricane and Severe Storm Sentinel mission. ■

Photo credit: NASA/Goddard/Pat Izzo

OUTSIDE GODDARD

By: Elizabeth M. Jarrell

INJURIES INCONSISTENT WITH LIFE

While engineer Glenn Bock's work at Goddard involves trying to break equipment through rigorous testing, his focus outside Goddard is finding people—dead or alive. Bock, an avid rock climber and mountaineer, became involved with search and rescue in 1992 when he became a training advisor for the Maryland Search and Rescue, a junior search and rescue team which trains high school kids to help find other missing children. He spent a lot of time preparing the kids for finding dead bodies, which involved talking with the kids and their parents and lots of waivers. Bock taught them basic survival, land navigation, compass and map reading, and first aid including CPR.

"Search and rescue is basically the same as a first responder but without as much gear," says Bock. "The majority of what search and rescue does is find clues. It's tracking and clue awareness." Clues include candy wrappers, foot prints, broken brush, or overturned earth. "For example, the wetter the leaves, the more recently the person walked through there," he explains.

According to Bock, the searchers have to be treated differently for a body recovery as opposed to a live person recovery. "If you tell people it's a body recovery, many will walk away thinking there is nothing they can do. But if you tell people you are helping to save a living person, they will stay and help. Then again, they're screaming and that's a whole different world," explains Bock. One psychological technique he learned is that in an emergency, he keeps people focused on doing something helpful. For example, a line search, which is portrayed in many movies as people in a line walking forward together, is used when the search is going so badly they don't have any other clues.

Bock is certified in search and rescue techniques, rope rescue techniques and Red Cross first aid. Because the group uses search and rescue dogs, all participants must learn pet first aid including

CPR, rescue breathing and making improvised muzzles. "The most common injuries to pets and our search and rescue dogs are cuts on the paws and also breathing difficulties from pesticide exposure while tracking," says Bock.

Bock assisted with the recovery of four bodies over the next eight years, one of whom was a pilot who crashed and burned in bad weather. At the time, Bock was the field team leader for a large group of high school students, only some of whom were his, with just two other adults. He occupied the kids by asking them to do a line search while he stayed in front looking for clues. Once he found a clue indicative of a crash site, he sent the kids home with one adult while he and the remaining adult proceeded to the crash site. "The pilot's body was found in five pieces which we had to document using stick figures. Normally you administer CPR until the person revives or you pass out. In this case, the medical term explaining why we did not apply CPR is 'injuries inconsistent with life,'" says Bock. The deceased cannot be left unattended, so they remained with the dead pilot for eight hours until the Federal Aviation Administration and the National Transportation Safety Board representatives arrived.

Another memorable case during the late 1990s involved a missing child who got scared and hid. Even an infrared helicopter could not find the small child. "Searching sometimes requires a lot of imagination," says Bock. "Finally, a policeman took the child's dog for a walk, got the dog to bark and the kid found his barking dog."

After a three year break, in 2005, he became involved with the Community Emergency Response Teams (CERT), which trains people to do such things as turn off gas, water and electricity in the event of a disaster. Through CERT, Bock discovered the Delmarva Search and Rescue Group (DMVSAR) and became a sustaining member. "I help them with training and provide technical support," explains Bock. DMVSAR is an adult-only group. Bock teaches them basic survival tips including land navigation, GPS and radio communication. He is preparing a textbook for them as well.

What keeps him motivated? "I still like teaching people stuff, I like the woods. I like helping people. Even if you find a deceased person, you have an end to their story and closure for their family," he says. ■

Left: Bock in some of his search and rescue gear used for climbing. Photo provided by Glenn Bock

