

National Aeronautics and Space Administration



Goddard View

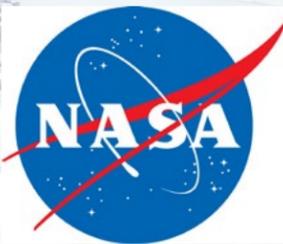
Volume 10 Issue 1
February 2014

A photograph of two people, a man and a woman, sitting together and smiling. The man is on the left, wearing a dark suit and a red tie. The woman is on the right, wearing a green jacket. They appear to be at a formal event. In the background, there is a screen displaying text: "WEBB TELESCOPE UPDATE", "9:00 AM", and "FEBRUARY 3".

Mikulski and Bolden Visit Goddard

GoddardView

THE WEEKLY



Behind the Badge

Conserve energy. Turn off Electronics When you Leave. Use less energy. Dim or turn off lights when appropriate and leave computers off, in sleep or hibernate mode when leaving for the day. No steps are too small when it comes to conserving energy. Click on the image to learn more about the complete NASA Goddard Code of Conduct.

GPM Status Update

The GPM Core Observatory completed final checks and the team is preparing to install it in the transportation canister that will move it to the spacecraft and fairing assembly building at JAXA's Tanegashima Space Center, Japan. To explore GPM, click on the image.



CATS in Space

Developed by NASA Goddard scientist Matt McGill and his team, the Cloud-Aerosol Transport System will study the distribution of aerosols, the tiny particles that make up haze, dust, air pollutants and smoke when it launches to the space station in late 2014 as a demonstration project. Learn more by clicking on the photo.

LRO Snaps a Picture of LADEE

With precise timing, the camera aboard LRO was able to take a picture of LADEE as it orbited our nearest celestial neighbor. The Lunar Reconnaissance Orbiter Camera operations team worked with its LADEE and LRO operations counterparts to make the imaging possible. Click on the photo to see more images.



GoddardView

- The Weekly – 2
- Reflecting on Webb's Progress – 3
- Science Rocks – 4
- NASA Boards the 3-D-Manufacturing Train – 6
- MAVEN is on Track – 8
- Astronaut Candidate Class of 2013 Visits Goddard – 9
- GCDC Science Fair Photo Gallery – 10
- OutsideGoddard Audrey Haar – 12

On the cover: NASA Administrator Charles Bolden and U.S. Senator Barbara Mikulski enjoy a video tour of the James Webb Space Telescope.

Photo Credit: NASA/Goddard/Bill Hrybyk

GoddardView Info

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 by Goddard's Office of Communications.

You may submit contributions to the editor 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.

CONTENTS



Reflecting on Webb's Progress

By: Talya Lerner

As the James Webb Space Telescope scientists and engineers continue to move forward with the observatory's pre-launch testing and assembly, the NASA community is excited to see the outstanding work accomplished so far.

NASA's Goddard Space Flight Center held an employee event on Feb. 3, 2014, to share this progress. The main auditorium was filled with NASA employees, as well as top officials from Northrop Grumman, Ball Aerospace & Technologies, the Space Telescope Science Institute, the Association of Universities for Research in Astronomy, the Canadian Space Agency and others to hear about the strides the Webb Telescope team has made.

Goddard Center Director Chris Scolese welcomed everyone and acknowledged that, "Without their leadership, we wouldn't be here today," he said. "They have taken Webb from the beginning to the really great state it is in today."

The two other guests who joined Scolese were NASA Administrator Charles Bolden and Sen. Barbara Mikulski of Maryland. Bolden shared his excitement and admiration for the scientists and engineers working hard to keep the [Webb Telescope](#) on-budget and on-target for the much-anticipated launch date, scheduled for no earlier than 2018.

The recent completion of the critical design review for Webb and the delivery of all its instruments to Goddard mark significant progress for this mission," Bolden said.

Mikulski, a long-time NASA supporter, has helped secure funding for NASA so scientists and engineers can continue

to push the envelope with their innovation and hard work. "My goal is to help you be you," she said.

Guests also got to see a live tour, through video feed, of the clean room that houses the Webb hardware. They saw the 18 primary mirror segments that will soon be assembled on the Webb Telescope. Paul Geithner, deputy project manager for Webb and tour guide explained the various parts of the telescope housed at Goddard.

Among the instruments was the Near-Infrared Camera, which will be Webb's primary camera and collect images of some of the very first stars and galaxies that formed in our universe. The Near-Infrared Spectrograph analyzes the composition of various astronomical objects. Next, Geithner showed the Mid-Infrared Instrument. The instrument has both a camera and a spectrograph, which can see light in the mid-infrared, a portion of the electromagnetic spectrum that the human eye can't see. The last instrument on the tour was the Fine Guidance Sensor and Near-infrared Imager and Slitless Spectrograph. This will allow Webb to point as precisely as possible at its targets to obtain the highest-quality images possible.

These components, once assembled and launched, will contribute to the Webb Telescope's discovery of amazing things. "This is the promise of JWST," Geithner said. ■

Above: NASA Administrator Bolden, Sen. Mikulski and Goddard Center Director Scolese watch as Paul Geithner, deputy project manager for Webb narrates a tour of the Webb hardware in the Building 29 clean room. Photo credit: NASA/Goddard/Bill Hrybyk



“I really enjoyed doing the project with my parents.”



Science Rocks

By: Shamara Thornton

On January 27, the Goddard Child Development Center was abuzz with science. The annual parent and child science fair was an opportunity for the students to learn about the scientific process in fun and hands-on way.

The 2014 GCDC science fair, “Using the Scientific Method,” featured more than 20 science exhibits crafted by more than 30 students in Shooting Stars through Kindergarten, who put their heads together to create unique projects for the fair.

The science fair has become a tradition at GCDC over the years. It is open to children enrolled in the shooting stars (age 4), constellations (age 4-5) and satellites (4-5) classes. The science fair is a requirement for kindergarten students.

While some students dread homework, the students who entered the science fair voluntarily sacrificed their free time to work on their projects. Students and parents who participated in the event dedicated hours of after-school time to research and put together a one-of-a-kind science display that started with a hypothesis, produced results and came to a conclusion. This year’s project subjects included astronomy, biology, chemistry, physics, food science and nature.

The school encouraged parents to work with their children through the entire project by selecting a topic of interest of the child. “We typically suggest that families help their children answer some of the ubiquitous ‘why’ questions that young children have. Allowing children to find the answers such as these helps them to understand the scientific process and the importance of reasoning and thinking at a higher level,” said Syretha O. Storey, GCDC director.

Highlights from the event included Kayli Gibb who did an eggs in vinegar experiment, “I really enjoyed doing the project with my parents. The best part of the experiment was presenting the eggs and opening it up in front of my class. If I could do another experiment it would be on if big toy cars or small toy cars can go faster.”

Another highlight was mom and daughter duo Kelly and Samantha Farrell who did a project on freezing liquids. Samantha’s prediction was that, out of water, milk, lemonade and ginger ale, lemonade would freeze first. When asked why, Samantha replied, “Of course, because lemonade taste the best!”

GCDC continues the success of the science fair by making it a parent and child event. Throughout the event, children are given the support they need from an adult throughout the learning process. The presence of their parents helps them to understand concepts that they may not be able to on their own.

For some students, the GCDC science fair was just the beginning, serving more as a practice round than the final project. For others, it was their first scientific presentation. The event concluded with a cheering class full of students and parents. Because the learning process is the primary purpose of the event, the science fair was not judged. Each child was given a science fair participation ribbon. ■

Opposite: Kayli Gibb presents to her colleagues about eggs and vinegar while her mother, Meredith Gibb, looks on. Photo credit: NASA/Goddard/Debra McCallum

Above: Evan Forgotson presents his findings to the GCDC scientific community. Photo credit: NASA/Goddard/Debra McCallum



NASA Boards the 3-D Manufacturing Train

By: Lori J. Keeseey

Given NASA's unique needs for highly customized spacecraft and instrument components, additive manufacturing, or "3-D printing," offers a compelling alternative to more traditional manufacturing approaches.

"We're not driving the additive manufacturing train, industry is," said Ted Swanson, the assistant chief for technology for the Mechanical Systems Division at NASA's Goddard Space Flight Center in Greenbelt, Md. Swanson is the center's point-of-contact for additive manufacturing. "But NASA has the ability to get on-board to leverage it for our unique needs."

Led by NASA's Space Technology Mission Directorate, the agency has launched a number of formal programs to prototype new tools for current and future missions using this emerging manufacturing technique. Additive manufacturing involves computer-aided device, or CAD, models and sophisticated printers that literally deposit successive layers of metal, plastic or some other material until they are complete.

In addition to the U.S. Air Force, DOE, NIST and NSF, NASA is part of the government team investing in, America Makes, formerly known as the National Additive Manufacturing Innovation Institute, a public-private partnership created to transition this exciting technology into mainstream U.S. manufacturing.

America Makes is part of the National Manufacturing Initiative, a forward-leaning effort that recognizes our economy requires an advanced, globally competitive manufacturing sector that invents and makes high-value-added products and leading-edge technologies here in the U.S.

"NASA's work with additive manufacturing should enable us to be smart buyers and help us save time, expense, and mass," said LaNetra Tate, the advanced-manufacturing principal investigator for the Space Technology Mission Directorate's Game Changing Development Program. "With additive manufacturing, we have an opportunity to push the envelope on how this technology might be used in zero gravity—how we might ultimately manufacture in space."

As a result of these efforts and others sponsored around the agency, teams of NASA engineers and scientists are investigating how their instruments and missions might benefit from an industry that actually began more than two decades ago, with the introduction of the world's first 3-D system.

"This effort really goes beyond one center," said Matt Showalter, who is overseeing Goddard's disparate 3-D printing efforts. Showalter believes Goddard technologists and scientists will benefit most from collaborations with others also investigating the technology's benefits.

"It's in the national interest to collaborate with other institutions. This is a powerful tool and we need to look at how we can implement it. For us, it's a team effort."

"we have an opportunity to push the envelope"

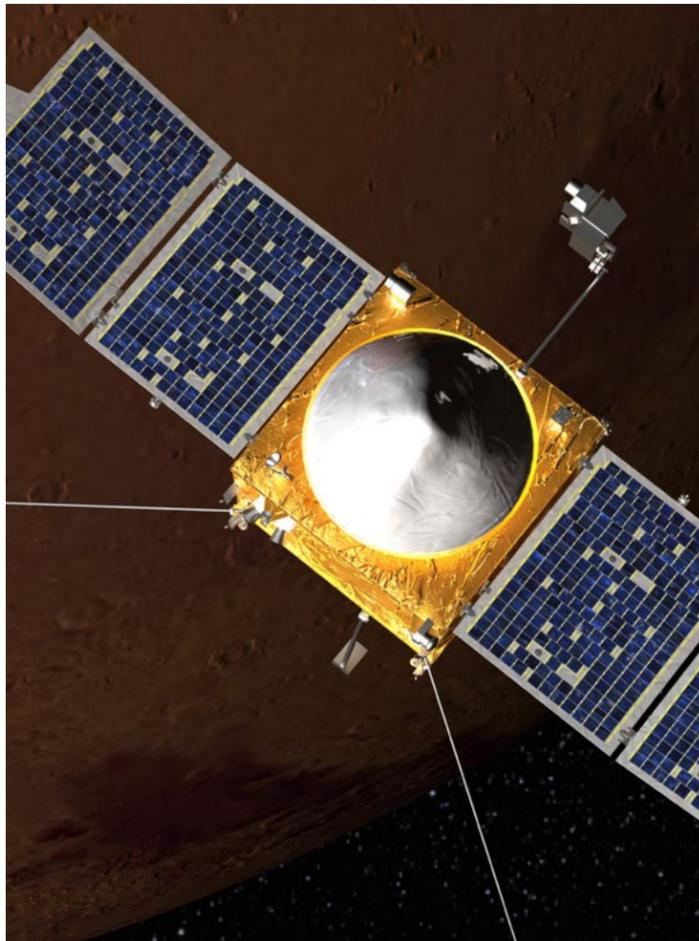
A majority of NASA centers have begun applying the technology to a number of applications pertinent to their areas of expertise.

Goddard, for example, is devoting R&D resources to evaluate the usefulness of 3D printing for a variety of instrument-development efforts. NASA's Langley Research Center, in Hampton, Va., has developed a green-manufacturing process, called the Electron Beam Freeform, or EBF3. It uses an electron-beam gun, a dual-wire feed,

and computer controls to remotely manufacture metallic structures for building parts or tools in hours, rather than days or weeks.

NASA's Kennedy Space Center in Florida is investigating the use of in-situ regolith, or soil, on extraterrestrial bodies as feedstock for building 3-D habitats and other structures. NASA's Ames Research Center in California's Silicon Valley is exploring the application of synthetic biology for the manufacturing of biological materials—everything from construction materials to foodstuffs—from small stocks of cells. NASA's Glenn Research Center in Cleveland recently collaborated with Aerojet Rocketdyne of West Palm Beach, Fla., to fabricate and successfully test an engine injector for the RL-10 rocket.

In addition, NASA's Marshall Space Flight Center in Huntsville, Ala. has used 3-D printing to create components for the J-2X and RS-25 rocket engines. The center also is working with Made In Space, a Silicon Valley start-up, to develop a 3-D printer that astronauts will use on the International Space Station later this year. The idea is that astronauts will create tools and replacement parts they need to operate in space, eliminating the need to transport these items there. The team plans to fly the device on the International Space Station in October 2014. ■



“Successful checkout of the spacecraft and instruments is a major milestone in carrying out our mission,” said Dr. Bruce Jakosky, MAVEN principal investigator from the University of Colorado in Boulder. “While there are still a lot of things that have to happen properly before we get to Mars and can do the mission’s science, we are exactly where we need to be today.”

Upcoming events in the next month include additional instrument testing and spacecraft calibrations, first testing of the Electra communications package that will be used to relay data from the rovers currently on the surface of Mars, and the second planned trajectory correction maneuver. This maneuver will adjust the spacecraft’s path by a very small amount so that it will be positioned properly for the rocket-motor burn that will put it into orbit when it arrives at Mars.

“The performance of the spacecraft and instruments to date bears out all the hard work the team put into testing the system while it was on the ground,” said David Mitchell, MAVEN project manager at NASA’s Goddard Space Flight Center in Greenbelt, Md. “The way that the operations team has performed while flying the system has been nothing short of outstanding. We have big events ahead of us before we can claim success but I am very pleased with how things have gone thus far.”

By 7 p.m. EST on Feb. 4, MAVEN will have traveled 136,949,317 miles. MAVEN will travel about 442 million miles on its path to Mars. MAVEN is currently traveling in its transfer orbit around the sun at a speed of 69,480 mph or 31.06 kps.

MAVEN’s principal investigator is based at the University of Colorado at Boulder’s Laboratory for Atmospheric and Space Physics. The university provided science instruments and leads science operations, and education and public outreach. NASA’s Goddard Space Flight Center manages the project and provided two of the science instruments for the mission. Lockheed Martin of Littleton, Colo., built the spacecraft and is responsible for mission operations. The University of California at Berkeley Space Sciences Laboratory provided science instruments for the mission. NASA’s Jet Propulsion Laboratory in Pasadena, Calif., provides navigation support, the Deep Space Network, and the Electra telecommunications relay hardware and operations. ■

An artist concept of the MAVEN spacecraft. Image credit: NASA/Goddard

The MAVEN spacecraft and all of its science instruments have completed their initial checkout, and all of them are working as expected. This means that MAVEN is on track to carry out its full science mission as originally planned.

The [Mars Atmosphere and Volatile Evolution](#) mission is designed to explore Mars’ upper atmosphere. It will determine the role that escape of gas from the atmosphere to space has played in changing the climate throughout the planet’s history. MAVEN was launched on Nov. 18, 2013, and will go into orbit around Mars on the evening of Sept. 21, 2014 (10 p.m. EDT).

After a five-week commissioning phase in orbit, during which it will get into its science-mapping orbit, deploy its booms, and do a final checkout of the science instruments, it will carry out a one-Earth-year mission. It will observe the structure and composition of the upper atmosphere, determine the rate of escape of gas to space today and the processes controlling it, and make measurements that will allow it to determine the total amount of gas lost to space over time.

MAVEN ON TRACK

By: Nancy Neal Jones

ASTRONAUT CANDIDATE CLASS OF 2013 VISITS GODDARD

By: Rho Christensen and Claire Saravia



The eight new NASA astronaut candidates visited Goddard for an entire day Tuesday, January 28. After being welcomed by Director Chris Scolese, they toured parts of the center to hear about some of Goddard’s missions, including the James Webb Space Telescope and the Magnetospheric Multiscale mission. The class visited the Spacecraft Integration and Test Facility, where Goddard tests and develops spacecraft components. The group learned about Goddard’s work in space weather and Earth science mission operations. They rounded out their visit with hands-on opportunities, including holding actual meteorites at the Astrobiology Analytical Lab and then walking among the robotic prototypes in the Satellite Servicing Capabilities area.

This class comes from the second largest number of applications that NASA has ever received—over 6,100. ■

Ben Reed, deputy project manager in the Satellite Servicing Capabilities Office, explains aspects of robotic refueling for spacecraft. Photo credit: NASA/Goddard/Debora McCallum

Astronaut Candidate class of 2013 pictured with Dr. John Mather (center), senior project scientist for the Webb Telescope. Left to right: Victor Glover, Anne McClain, Josh Cassada, Christina Hammock, Mather, Nicole Mann, Tyler Hague, Jessica Meir, Andrew Morgan. Photo credit: NASA/Goddard/Bill Hrybyk



GCDC SCIENCE FAIR

Photos by Debora McCallum



OUTSIDE GODDARD

Through a Dog's Eyes

By: Elizabeth M. Jarrell

It turns out that you can teach an old dog new tricks, even if you are a cat-lover with no particular background or skills except the ability to see the world through a dog's experiences. Earth science writer Audrey Haar of the Joint Polar Satellite System Office at NASA's Goddard Space Flight Center learned enough about socialization to rehabilitate her middle age dog and, as a bonus, temporarily cared for a puppy for the Guiding Eyes for the Blind.

Haar's husband's dog died during their first year of marriage. They ended up with a different kind of rescue dog: a 5 ½- year-old retired female named Aspen who came from a kennel in the country.

Aspen wanted to play with the neighborhood cats until dissuaded by their constant swats. She tried to make friends with the Christmas lawn decorations. She also had no idea how to interact with people. She flinched when she heard normal household noises. She refused to get into a car. She was always on edge.

"My husband had only raised dogs from puppies. I googled 'adult dogs' and realized that she was doing everything by the book. We just hadn't read the book," said Haar.

A behaviorist explained that Aspen needed to be socialized around people and noises. The process might take some time, but she could learn.

Haar tried to look at the world through Aspen's eyes and limited past experiences. She realized that Aspen's reactions made sense because her world had been a quiet one filled only with dogs and cats, not people. Aspen's only car ride had been to forever leave the kennel, the only home she had ever known.

"We had to teach her how to play with people. I read about communicating with dogs and how to speak her language. I learned to look away when I said 'no' or when I was too busy to give her attention. That's what she does and what she understands," said Haar.

Haar also became interested in Pets on Wheels, a not-for-profit volunteer organization that arranges visits from volunteers and their dogs to people in nursing homes and assisted living facilities. Through POW, Haar met a lady with a Guiding Eyes for the Blind ser-

vice dog in training. Intrigued, she discovered that GEB puppies are sent to live with puppy raisers for their first year and a half.

After deciding to become a puppy sitter, Haar attended GEB's classes. GEB incorporates basic commands like come, sit, stay and heel as part of socialization. Two additional commands are "close," meaning that when the handler taps his or her leg, the dog sits between the handler's legs with its back to the handler, and "place," meaning that the dog calmly lies down where the handler's points. "Checking in" is an important one. Dogs are rewarded for looking at their handler on a very consistent basis, as if asking, "Hey, what are we up to now?"



Service dogs must be thinking dogs. To encourage thinking, dogs are presented with choices and then rewarded for coming to the right conclusion. "If the dog wanders off, you don't immediately ask them to return," said Haar. "You give them a moment and hope that they realize to come back on their own."

In late October, Haar took home Champion, an 11-month-old Black Labrador Retriever, for a week. They went everywhere together.

"When in a class where there is more stress than at home, simple things become difficult," said Haar. "Some dogs get overstimulated by the presence of

other dogs."

Champion and Haar also had a training session with the GEB regional leader, who handled Champion on a pack walk. The GEB regional leader connected with Champion and kept him connected with her.

What Haar finds most rewarding about training dogs is that working with the dogs produces results. The more she works with them, the better the results.

Aspen is now a therapy dog for the organization People Animals Love. Haar's husband regularly takes her to work with elementary school children with reading issues. Some of these children feel more comfortable reading directly to dogs like Aspen than to people. A few even show her the pictures.

Center: Haar and Champion. Photo credit: NASA/ Goddard/Deborah McCallum