National Aeronautics and Space Administration

Goddard View

Volume 11 Issue 11
December 2015

www.nasa.gov

GoddardView

TRENDING

The Best Place to Work, Four Years Running
The Partnership for Public Service has named NASA the best large agency to work for in the federal government for the fourth consecutive year. Rankings are determined by measuring employee satisfaction and commitment.

Center Hosts Series of Meetings With Leaders Across the Agency
Hosted by Goddard Associate Director Nancy Abell, associate directors and associate administrators from across the agency gathered at the center to attend three days of face-to-face meetings.

Goddard Trio Named AAAS Fellows
The American Association for the Advancement of Science has named Lucy McFadden, Jose Rodriguez and Compton Tucker among its fellows for 2015. AAAS fellows are recognized for their distinguished efforts to advance science or its applications.

Local Toys for Tots Coordinator Joins AAAC Holiday Festivities
Capt. Pete Smith of the U.S. Marines, who serves as the area coordinator for the Toys for Tots Foundation, joined the Goddard African American Advisory Committee in collecting Christmas gifts for needy children.

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On the cover: Members of the James Webb Space Telescope team prepare for the installation of the first flight mirror onto the telescope structure.

Photo credit: NASA/Goddard/Chris Gunn

NP-2015-9-337-GSFC

GoddardView Info

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

You may submit story ideas to the editor at darrell.d.delarosa@nasa.gov. All contributions are subject to editing and will be published as space allows.

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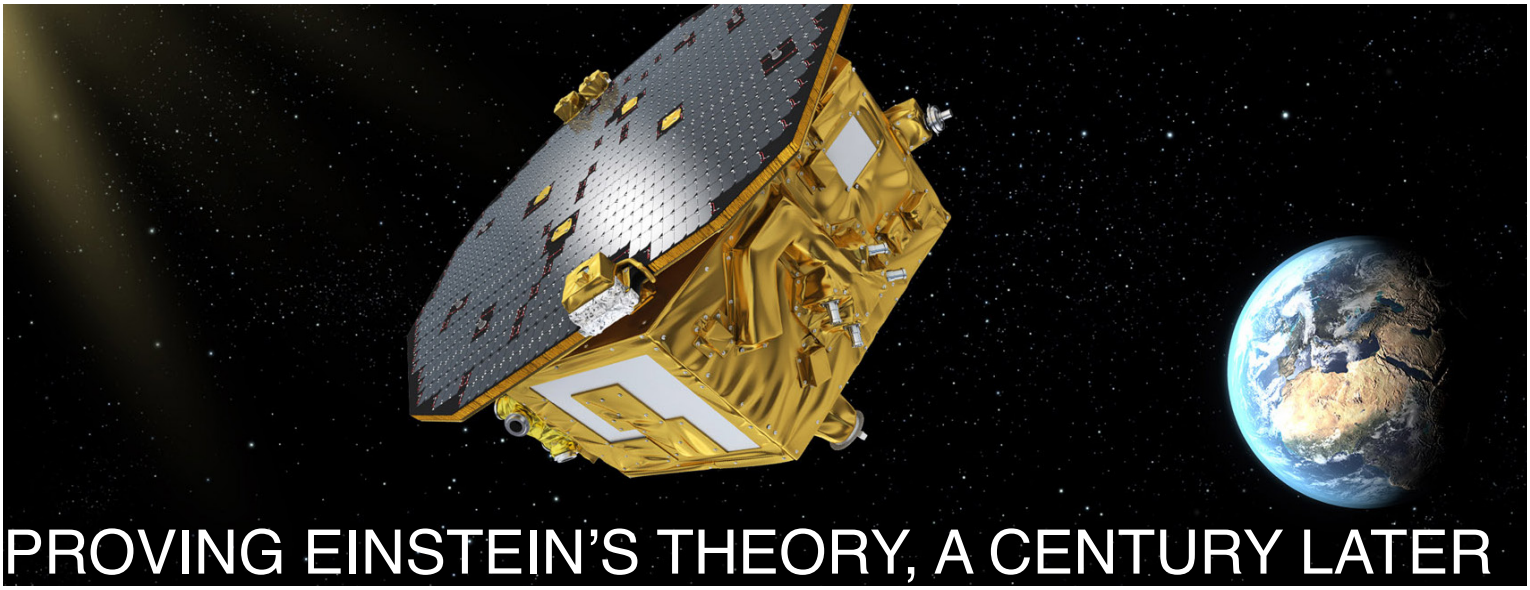

PROVING EINSTEIN'S THEORY, A CENTURY LATER

By Ashley Morrow

Legendary physicist Albert Einstein originally presented his theory of general relativity on Nov. 25, 1915. His theory describes the way in which large masses, like black holes, warp space and time and how such warping produces the effect we experience as gravity. One hundred years after the theory's publication, scientists have not yet been able to directly observe one of its most exciting predictions.

Einstein posited that space and time might be full of small ripples, which are produced by accelerating masses and could travel across the universe. These "gravitational waves" stretch and bend space and time to tiny degrees, akin to a pebble creating ripples in a pond.

Direct observation of this phenomenon could completely change the way we view the universe. On Dec. 3, in near concert with the theory's centennial, NASA and the European Space Agency launched a spacecraft from Kourou, Guiana, to help make that possible.

Unlike electromagnetic waves, which serve as the primary tool for studying the universe, gravitational waves can pass through matter without being as susceptible to reflection, absorption or scattering. They provide a way for scientists to observe more of the universe without such distortions.

"Each time we've opened up a new piece of the electromagnetic spectrum – X-rays or microwaves or radio waves – it has led to big and unexpected discoveries," said Ira Thorpe, lead scientist for the Laser Interferometer Space Antenna Pathfinder mission at NASA's Goddard Space Flight Center. "This would open up a whole new spectrum; it's like opening a door instead of another window."

To date, radio telescopes have made indirect observations of gravitational waves. Scientists can see their effects on binary pulsar systems, which are sets of stars that orbit each other. Radio pulses from the stars allow astronomers to determine their orbits with great precision. These studies show the orbits shrink over time and that the rate of decay exactly matches the energy loss due to gravitational waves as predicted in Einstein's theory.

The LISA Pathfinder team has set out to prove that today's technology can observe the waves directly before moving on to the LISA mission itself, which will serve as a full-scale gravitational wave observatory. LISA Pathfinder contains instruments from both NASA and ESA. The instruments will test various hardware configurations to see which works most effectively.

The payload contains two small metal cubes placed about 15 inches apart and allowed to move freely as gravity dictates. The spacecraft surrounds the cubes to shield them from nongravitational forces such as the solar wind. Thrusters capable of very fine adjustments will ensure the spacecraft does not touch the cubes.

NASA contributed a set of thrusters as well as a control system that governs the delicate dance between the cubes and the spacecraft. NASA's Jet Propulsion Laboratory in Pasadena, California, led the NASA effort and the development of the thruster system, while Goddard developed the control system and is working on data analysis.

"The technology is not new, but it is new to spaceflight," Thorpe added. "Physicists dealing with precise measurements, such as atomic clocks, have been using these types of instruments for years."

Additionally, Thorpe will study the resulting data from the ESA payload as a member of the LISA Pathfinder science team. He expects the mission to begin returning science data to Earth around March 2016 and to operate through late 2016. ■

Above: An artist rendering of the LISA Pathfinder spacecraft.

Photo credit: NASA/Jet Propulsion Laboratory

MIRRORS GIVE WEBB A GOLDEN LUSTER

By Laura Betz

Before setting out into the deep reaches of space in 2018, the James Webb Space Telescope is being equipped with fixtures befitting its epic million-mile journey: gold-coated mirror segments. Eighteen of them to be exact.

In the clean room at NASA's Goddard Space Flight Center, Webb's engineering team used a robot arm to lift and lower the first of the hexagonal segments that measures a little more than 4.2 feet wide and weighs approximately 88 pounds.

After being carefully pieced together, the segments will combine to make one large 21.3-foot-diameter primary mirror. The full installation is expected to be completed in early 2016.

"The James Webb Space Telescope will be the premier astronomical observatory of the next decade," said John Grunsfeld, associate administrator of the NASA Science Mission Directorate. "This first mirror installation milestone symbolizes all the new and specialized technology that was developed to enable the observatory to study the first stars and galaxies, examine the formation of stellar systems and planetary formation, provide answers to the evolution of our own solar system, and make the next big steps in the search for life beyond Earth."

The 18 segments will unfold and adjust to shape after launch. They are made of ultra-lightweight beryllium, chosen for its thermal and mechanical properties at cryogenic temperatures. Each segment also has a thin gold coating, which will help reflect infrared light.

Webb's biggest feature is a tennis court-sized five-layer sunshield that attenuates heat from the sun by more than a million times.

"After a tremendous amount of work by an incredibly dedicated team across the country, it is very exciting to start the primary mirror segment installation process," said Lee Feinberg, Webb's optical telescope element manager. "This starts the final assembly phase of the telescope."

The mirrors must remain precisely aligned in space in order for the telescope to successfully carry out science investigations. While operating at extraordinarily cold temperatures between minus 406 and minus 343 degrees Fahrenheit, the backplane must not move more than 38 nanometers – approximately a thousandth the diameter of a human hair.

"There have been many significant achievements for Webb over the past year, but the installation of the first flight mirror is special," said Bill Ochs, Webb's project manager. "This installation not only represents another step towards the magnificent discoveries to come from Webb, but also the culmination of many years of effort by an outstanding dedicated team of engineers and scientists."

The mirrors were built by Ball Aerospace & Technologies Corp. in Boulder, Colorado. Ball is the principal subcontractor to Northrop Grumman for the optical technology and lightweight mirror system. The installation of the mirrors onto the telescope structure is performed by Harris Corporation of Rochester, New York. Harris leads integration and testing for the telescope.

The Webb telescope is an international project led by NASA with its partners, the European Space Agency and the Canadian Space Agency. ■

Above: An engineer works to install the first mirror onto the James Webb Space Telescope.

Photo credit: NASA/Goddard/Chris Gunn

Joan Bennett

Code 441, Resource Analyst

Why Goddard?: Very fascinating and rewarding place to learn and grow in my professional career.

Hobbies/interests: traveling, music, golf, family

Stephen Munchak

Code 612, Research Meteorologist

Why Goddard?: To contribute to the unique global measurements of precipitation that NASA is making.

Hobbies/interests: running, bicycling, home brewing

Cameron Hashem-Reza Parvini

Code 562, Student Trainee (Engineering)

Why Goddard?: To make distinct contributions to space propulsion.

Hobbies/interests: rugby, music, drawing, spaceflight, manned missions

Katie Baynes

Codes 586/423, Systems Architect for Earth Observing System Data and Information System

Why Goddard?: To make NASA's Earth science data more accessible.

Hobbies/interests: time with kids, sketching, reading, board games

Aryanne Ferguson

Code 603, Resource Analyst

Why Goddard?: The opportunities to continue learning throughout a rewarding career.

Hobbies/interests: running, road trips, reading and writing fiction

Benjamin Ashman

Code 595, Student Trainee (Engineering)

Why Goddard?: I've collaborated with Goddard engineers for years. This was exactly the work environment I wanted to be part of.

Hobbies/interests: pinball, Diplomacy board game, Hammond organ

Rachel Mitchell

Code 151, Assistant Director for Regional Finance Office

Why Goddard?: A new and exciting challenge while maintaining my federal career.

Hobbies/interests: sewing, baking

EMPLOYEE SPOTLIGHT

Goddard is pleased to welcome these new employees to the NASA community.

OFFICIAL VISITOR

IRAD POSTER SESSION SHOWS OFF GODDARD'S INNOVATIVE SIDE

By Clare Skelly

When people think of NASA – and by extension NASA's Goddard Space Flight Center – the space-bound missions will probably be the first things that come to mind. What many may not realize, however, is that the agency is also invested in the development of advanced technology.

The Goddard Office of the Chief Technologist manages the center's Internal Research and Development (IRAD) program, encouraging technological innovation and funding capabilities to fulfill future NASA missions and goals. At the end of each calendar year, the office hosts an IRAD poster session that allows the Goddard community to rate IRAD's successes as well as recognize the center's top innovator.

A crowd of scientists, engineers and other Goddard personnel gathered on Dec. 3 to learn more about the 2015 IRAD portfolio, comprised of projects from small satellites to high-profile flagship-type missions. Students from Bethesda-Chevy Chase High School in Maryland and other local high schools also attended as part of a career day event, which included a tour of some of the center's facilities.

"The full spectrum is what makes Goddard so great," said Peter Hughes, Goddard's chief technologist. "We come up with the science ideas and instruments. Then, we actually conceive the missions."

Midway through the session, Hughes presented the 2015 IRAD Innovator of the Year Award to Nikolaos Paschalidis. As senior project scientist for technology advancement in the Goddard Heliophysics Science Division, Paschalidis has seen several of his projects advance from ideas to prototypes, and eventually as instruments aboard missions.

In 2015 alone, a handful of his technology instruments were aboard missions that either launched or performed groundbreaking science. His application-specific integrated circuits are aboard the Magnetospheric Multiscale mission. Five of his multipurpose microchips are part of the New Horizons spacecraft, which flew by Pluto in July. His circuit technology was also used for the Interstellar Boundary Explorer, Juno, MESSENGER and the Van Allen Probes, among other spacecraft.

"Nick is one of our most productive innovators. He has been productive for generations," said Hughes. "It is this type of innovation – coming up with a new idea, delivering the prototype and taking it all the way to flight – that makes Nick so great."

Upcoming missions – including BepiColombo, Solar Orbiter and Solar Probe+ – will benefit from Paschalidis' work. Some of his other noteworthy projects include a mini ion-neutral mass spectrometer – the smallest instrument of its type ever built – that returned valuable data during a National Science Foundation-funded ExoCube mission, as well as a Goddard-developed CubeSat mission. His insights also contributed to the procurement of two additional CubeSat missions.

"Technically, I think Nick is as close to a genius as anyone can come," added Michael Hesse, Goddard heliophysics director. "He is incredibly creative, finding solutions where others can't."

In addition to recognizing technological achievement, the poster session is intended to inspire interaction among innovators. Many IRAD projects result in new intellectual property, patents and collaborations with external partners, and ideas often generate awards that bring work and funding to Goddard.

"I encourage you, if you have a new idea and connection that came from this poster session, put it down on paper and bring it forward," Hughes told attendees. "It is about the interaction between the people at Goddard to figure out how to do things better." ■

Center: Nikolaos Paschalidis (center), 2015 IRAD Innovator of the Year, poses with his award alongside Chief Technologist Peter Hughes (left) and Heliophysics Director Michael Hesse. Photo credit: NASA/Goddard/Bill Hrybyk

Opposite, top: Attendees learn more about the 2015 IRAD portfolio during the program's poster session on Dec. 3. Photo credit: NASA/Goddard/Bill Hrybyk

Opposite, bottom: Local high school students, who attended the poster session as part of a career day event, listen to Goddard astrophysicist Amber Straughn (right) during a tour of the James Webb Space Telescope clean room. Photo credit: NASA/Goddard/Bill Hrybyk

AWAKENING TO 'THE FORCE,'

By Jenny Hottle

Across the country and worldwide, millions of moviegoers are lining up to catch "Star Wars: The Force Awakens."

For some, the film is merely entertainment. For others, including many at NASA's Goddard Space Flight Center, the seventh installment of the iconic space fiction series is the latest chapter of what has been a lifelong fascination with Star Wars, space technology, and the exploration of galaxies far, far away.

Just like how "the Force" has guided the fate of the Jedi, several of Goddard's own have credited the Star Wars franchise with helping guide their career trajectories.

"People who become astronomers have a very common story. We can't remember any time when we weren't fascinated by stars and space. It's not something you accidentally get into," said Michelle Thaller, former Goddard assistant director for science communication and current NASA deputy director for science communication. "Star Wars was all wrapped up in that: science fiction depictions of space."

One such enthusiast is Dennis Woodfork, assistant division chief for technology in the Goddard Mission Engineering and Systems Analysis Division.

He recalls how – in 1977 – NASA helped launch the Voyager spacecraft, which would eventually encounter Saturn, Uranus and Neptune. In the same year, George Lucas released the first Star Wars film.

"Growing up, Star Wars and the exploration of new planets had such a profound impact on me," Woodfork said. "I thought, 'I have to go do that.'"

The series' themes of temptation and self-discipline would later become instrumental to Woodfork's time in the U.S. Navy.

"You can take these themes from the movies and use them as a way to teach kids," he added. "Themes like: You have to try really hard. Otherwise, you won't reach your full potential."

Similarly, Andrew Maynard was a child when NASA began the Space Shuttle Program. In 1980, when he was 6 years old and about a year before the first shuttle launched into space, he saw "The Empire Strikes Back" – the second release in the Star Wars franchise.

"Star Wars definitely informed my belief system that there is something else out there," he said. "I wanted to live in the Star Wars universe. It was so interesting and gritty and real. Part of what I looked for in a career was being able to find those people because they could be cool. They also could be terrifying."

Today, Maynard is the head of the propulsion branch in MESA.

And while Goddard's brightest minds now work on some of the most complex missions in real-life space exploration, the perpetual excitement over Star Wars makes it seem as if their childhoods never ended.

A LONG TIME AGO

MESA mechanical engineer Allison Evans first learned about Star Wars during an episode of "Reading Rainbow." After watching the series on VHS, she kept trying to use "the Force" to move teddy bears around her room.

"I was 8 years old, and I felt like it was such a grown-up show," Evans said. "My dad and I were on the couch eating popcorn. It was a nice bonding activity."

Decades later, she now searches Goodwill and antique shops for vintage trinkets along with her husband. Thaller, meanwhile, says she's lost track of how many Star Wars costumes she's collected over the years.

Mike Marosy, a graphics designer in the Goddard Technical Information and Management Services Branch, still owns most of the figurines and toys from his childhood. And he has designed five pins, which have helped raise more than $23,000 for local children's charities though a Washington, D.C.-area Star Wars collecting club.

For several years, he's been working to add another toy to his collection: a full-size model of the character R2-D2. "R2's always been a character I enjoyed," he said.

The body parts have all been collected and are ready for painting and eventual wiring. Its dome is functional and has been signed by actor Kenny Baker, who portrayed the robot in all the films in the series.

With two kids and not much spare time, Marosy's not sure when he'll finish the project, which he began in 2006. The delays notwithstanding, he is ensuring that his children will nonetheless share in his passion by taking them to see "The Force Awakens."

Woodfork also took his wife and children to see the film on opening weekend. Meanwhile, Maynard took his wife and kids to the theater while dressed in their Star Wars pajamas.

"We celebrate our nerdity in our household," Maynard joked.

Nearly 40 years have passed since the first Star Wars film made its debut in theaters and captured the imaginations of legions of faithful followers. But with the franchise still going strong, and at least two more film releases scheduled, "the Force" will likely remain with future generations.

"Watching it with my kids, I can see the thrill they get that I got back with the original movies," Marosy added. "It's neat to experience." ■

Above, left: Goddard graphics designer Mike Marosy poses with his homemade R2-D2 robot. Actor Kenny Baker, who portrayed R2-D2 in all the films in the Star Wars series, signs the dome component. Photos courtesy: NASA/Goddard/Mike Marosy

Above, right: Dressed in a Star Wars Jedi costume, Michelle Thaller (left) – former Goddard assistant director for science communication – engages in a lightsaber duel with Piers Sellers, deputy director for the Goddard Sciences and Exploration Directorate. Photo courtesy: NASA/Michelle Thaller

GODDARD GIVES BACK

The Goddard Veterans Advisory Committee wrapped up its fourth Operation Give Thanks campaign with a packing event with fellow center employees and their relatives.

For several weeks, the campaign – regularly taking place during the holiday season – collected donated items from NASA's Goddard Space Flight Center and Wallops Flight Facility to send to U.S. military personnel overseas.

BY GIVING THANKS

Volunteers packed more than 90 care boxes filled with packaged food, household goods and comfort products. This year's contributions included a donation of 150 boxes of Girl Scout cookies. ■

Photo credits: NASA/Goddard/Debora McCallum

AT ANNUAL AGU GATHERING, FIVE OF GODDARD'S BEST STAND OUT

By Rani Gran, Leslie McCarthy and Cynthia O'Carroll

Every fall, the American Geophysical Union brings together nearly 25,000 Earth and space scientists, educators, students, and policymakers for the largest worldwide conference in geophysical sciences. And during every gathering, the AGU Honors Ceremony and Banquet recognizes those who best exemplify the organization's vision to "collaboratively advance and communicate science and its power to ensure a sustainable future."

During this year's meeting in San Francisco, two scientists from NASA's Goddard Space Flight Center were among the recipients. An additional two from the Goddard Institute for Space Studies, along with a former Goddard scientist, were named to AGU's 2015 class of fellows.

"Goddard scientists are amongst the most widely recognized within the science community for their stellar contributions in all disciplines," said Jim Garvin, Goddard chief scientist. "Their exceptional work constantly reminds everyone at NASA that Goddard is the agency's premier science center."

Holly Gilbert, deputy director of the Goddard Heliophysics Science Division, was awarded the Athelstan Spilhaus Award in recognition of her work in engaging the public on space weather and heliophysics. The award, named after the renowned geophysicist and meteorologist, is given annually to an honoree who enhances public engagement in Earth and space sciences.

An expert in conveying physics to lay audiences, Gilbert often appears in science documentaries and television newscasts across the country. "I thoroughly enjoy it," she said. "I feel a responsibility to keep our stakeholders educated and our next generation of scientists inspired."

"Holly has made extraordinary contributions to enhancing the public's understanding of heliophysics and space science while becoming an effective leader in a major research organization," added Michael Hesse, Goddard heliophysics director.

Similarly, Goddard Chief Scientist for Atmospheric Chemistry Anne Thompson was honored for her work in broadening global change awareness with the Roger Revelle Medal – given in memory of a former AGU section president to someone who makes outstanding contributions in atmospheric sciences. For decades, Thompson has pioneered research in the understanding of ozone and other trace gases in the trophosphere and stratosphere.

"Anne drives scientific discovery with her enthusiasm, insights and experience," said William Brune, meteorology professor and her former colleague at Pennsylvania State University, State College. "Her impact on atmospheric science comes from her outstanding research and her leadership, but also from the many collaborations she forges."

As part of the evening's final presentation, Larry Travis, Cynthia Rosenzweig and Lorraine Remer were inducted into AGU's fellows program. Widely considered as one of the most prestigious honors in Earth and space sciences, the program recognizes AGU members who have attained acknowledged eminence in the fields. The honor is bestowed on only 0.1 percent of members in any given year.

For 42 years, Travis – now an emeritus of GISS – made significant contributions to the exploration of planetary atmospheres, spacecraft design and theoretical physics, most notably an explanation of the transfer of energy in the form of electromagnetic radiation.

Rosenzweig, GISS senior research scientist, has led groundbreaking research on the impacts of climate variations on animal and plant life, global agriculture, and urban areas. Her work has helped inform the decisions of policymakers, including those at the United Nations and in the City of New York.

During her work as a Goddard physical scientist from 1998 to 2012, Remer was a science team leader or member on missions that focused on climate change, remote sensing and atmospheric aerosols.

"Each year at major science meetings such as the fall AGU, the exemplary scientific contributions of Goddard scientists are highlighted," added Garvin. "All of us here at Goddard should congratulate our award-winning scientists in yet another exceptional year as we move forward to understand our place in the universe and here on Earth." ■

Center: Goddard scientists Anne Thompson (left) and Holly Gilbert (center), along with GISS scientist Cynthia Rosenzweig, were honored for their career achievements at the 2015 AGU Honors Ceremony and Banquet in San Francisco.

Photo credit: American Geophysical Union/Gary Wagner