National Aeronautics and Space Administration

Goddard View

Volume 17 Issue 1
January - March 2021

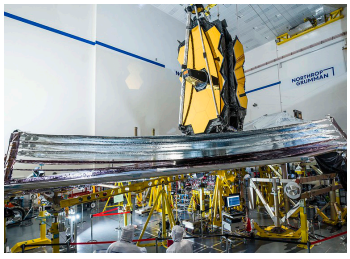
www.nasa.gov

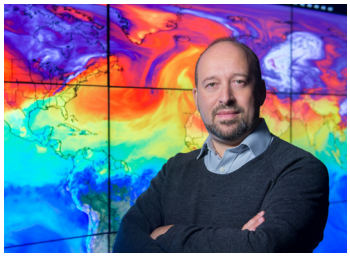
GoddardView

TRENDING

NG-15 Launches From Wallops
Northrop Grumman's 15th contracted resupply mission to the International Space Station launched on Feb. 20 from Wallops Flight Facility. The Cygnus cargo spacecraft aboard the Antares rocket was named after NASA mathematician Katherine Johnson.

Webb Completes Final Functional Tests to Prepare for Launch
Testing teams for the James Webb Space Telescope confirmed the internal electronics are all functioning and that the spacecraft and its scientific instruments can send and receive data properly.





NASA Announces New Role of Senior Climate Advisor
Gavin Schmidt, director of the Goddard Institute for Space Studies, was selected to serve as NASA's acting senior climate advisor. The new position provides recommendations for the agency's programs related to climate.

Celebrating Female Music Through the Decades
With selections ranging from Aretha Franklin to Taylor Swift, the Goddard Women's Advisory Committee co-hosted a celebration of female musicians in observance of Women's History Month in March.

GoddardView

On the cover: A view of Venus from Parker Solar Probe during a flyby of the planet en route to the Sun.

Image credit: NASA/Johns Hopkins University Applied Physics Laboratory/Naval Research Laboratory/Guillermo Stenborg and Brendan Gallagher

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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U.S. POSTAL SERVICE TO ISSUE NASA SUN SCIENCE FOREVER STAMPS

By Mara Johnson-Groh

NASA's images of the Sun's dynamic and dazzling beauty have captivated the attention of millions. In 2021, the U.S. Postal Service is showcasing the Sun's many faces with a series of Sun Science forever stamps that show images of solar activity captured by NASA's Solar Dynamics Observatory (SDO).

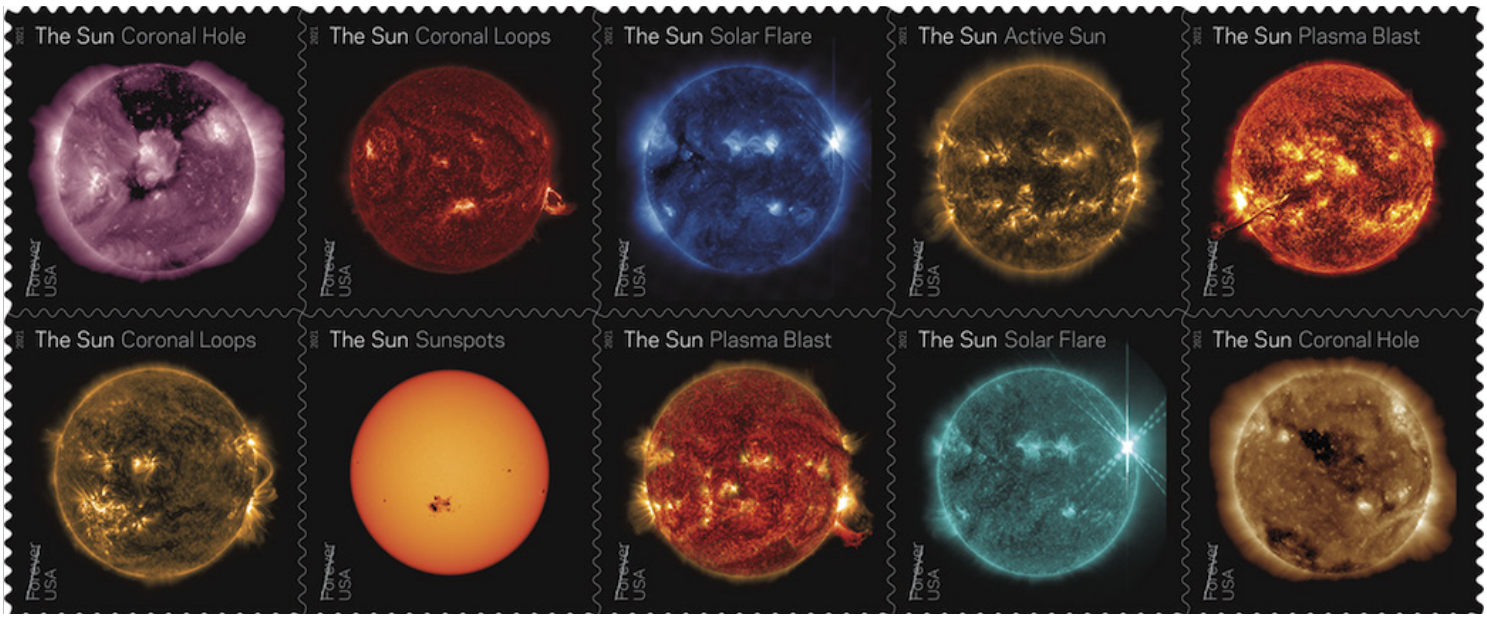
"I have been a stamp collector all my life, and I can't wait to see NASA science highlighted in this way," said Thomas Zurbuchen, associate administrator for NASA's Science Mission Directorate in Washington. "I feel that the natural world around us is as beautiful as art, and it's inspiring to be able to share the import and excitement of studying the Sun with people around the country."

The 20-stamp set features 10 images that celebrate the science behind NASA's ongoing exploration of our nearest star. The images display common events on the Sun, such as solar flares, sunspots and coronal loops. SDO has kept a constant eye on the Sun for over a decade. Outfitted with equipment to capture images of the Sun in multiple wavelengths of visible, ultraviolet and extreme ultraviolet light, SDO has gathered hundreds of millions of images during its tenure to help scientists learn about how our star works and how its constantly churning magnetic fields create the solar activity we see.

That solar activity can drive space weather closer to Earth that can interfere with technology and radio communications in space. In addition to this immediate relevancy to our high-tech daily lives, the study of the Sun and its influence on the planets and space surrounding it – a field of research known as heliophysics – holds profound implications for the understanding of our solar system and the thousands of solar systems that have been discovered beyond our own. As our closest star, the Sun is the only nearby star that humans are able to study in great detail, making it a vital source of data. ■

Below: A series of stamps highlighting images of the Sun captured by NASA's Solar Dynamics Observatory.

Image credit: NASA/Solar Dynamics Observatory/U.S. Postal Service



VIRTUAL PROGRAMMING SPOTLIGHTS TWO

By Emma Edmund

In 2016, the Hollywood hit "Hidden Figures" showcased the contributions of some of NASA's African-American women to the early days of human spaceflight. As part of NASA's Goddard Space Flight Center's observance of Black History Month, the Goddard African American Advisory Committee hosted virtual presentations with two "modern figures" – Sharon McDougle and Stephanie Wilson, a suit technician and an astronaut, respectively, both of whom made lasting contributions to the Space Shuttle Program.

"One of the things we talk about is seeing someone who looks like you and who allows you to believe you can achieve something like that or greater," said Carlton Peters, chair of the committee and head of the Goddard Thermal Engineering Branch, when explaining the selection for this year's speakers.

Suiting Up the Shuttle Program

Following eight years in the U.S. Air Force as a suit technician, McDougle came to NASA to suit up astronauts for the Space Shuttle Program, but her journey from the bottom up wasn't easy.

"I was invisible, hidden in plain sight," she told employees during her presentation, explaining the anxiety she felt being the only African-American on her team.

Her colleagues would eventually come around after noticing the value of her experience gained in the Air Force, and within her first year at the agency, she was assigned to her first mission – STS-37 – and suited up astronaut Linda Godwin in 1991.

"There are so many other opportunities in spaceflight besides being an astronaut or rocket scientist," McDougle said about the pride she felt in contributing to the space program.

The highlight of her career would come a year later in 1992 as she suited up Mae Jemison – the first African-American woman to travel into space – for STS-47. Supervisors typically write the names of the next flight's astronauts on a board, followed by those of the technicians assigned to work with the astronauts. When McDougle heard about Jemison's assignment, she wrote her own name next to hers.

"The rest was history," McDougle said. "When she changed, walked out and saw I was waiting for her, she just smiled really big, because she knew I was the one who was going to be taking care of her."

She became the first female and first African-American crew chief of Boeing's Space Shuttle Crew Escape Equipment Department (CEE) not long afterward, and she created an all-female suit tech crew for STS-78 in 1996.

AFRICAN-AMERICAN 'MODERN FIGURES'

During McDougle's latter years at NASA, a managerial position opened up within CEE, and she would hold the job until her retirement despite not holding a college degree.

"They used my experience in place of a degree, which I thought was so awesome," she said. "For anyone in management, if you have the power to hire people, please give them a chance. You miss so many people if you just look for someone who checks all the boxes. I always say if they can turn a screwdriver, I can teach them."

An Artemis Inspiration

Wilson become the second African-American woman to travel into space during her first spaceflight in 2006. She would go on to fly aboard two more space shuttle missions and is currently among 18 astronauts training with NASA's Artemis program, which will send the first woman and next man to the Moon. She is also the mission support crew branch chief at the Astronaut Office at NASA's Johnson Space Center in Houston.

During her presentation, Wilson referred to the women and African-Americans who preceded her as major inspirations. "I am very fortunate to have come behind many women in the program, and several African-Americans," she said. "I have learned a great deal from them. They have been mentors, shared their experiences and have been able to lay the foundation. It has been easier for those of us following them to come into the office."

With many educators and students also in attendance, she discussed how the next space leaders can prepare for a job in the industry, from pursuing STEM education and finding your passion to mentorship and taking advantage of community programs.

"That area about which you are passionate will drive your career and your success," Wilson said. "If you follow your passion and your heart's desire, it will be effortless to follow that passion. You will enjoy the work that you do every day. Learn all you can in that area, be a constant student, have a mentor in that area and be as prepared as you can technically. That will give you the best foundation."

The Goddard African American Advisory Committee plans to hold similar events throughout the year beyond Black History Month, continuing to recognize and honor excellence within NASA while cultivating future leaders.

"It's important to see those who share the same background as you," said Peters. "It can inspire the next generation." ■

Above (left): Sharon McDougle (right) suits up NASA astronaut Mae Jemison. Photo credit: NASA

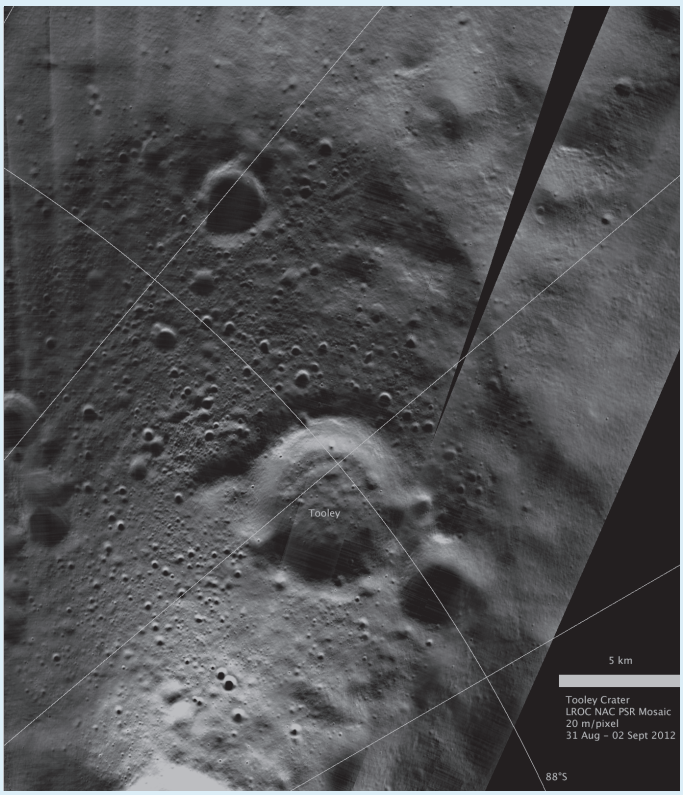
Above (right): NASA astronaut Stephanie Wilson. Photo credit: NASA

THE NAMING OF TOOLEY CRATER

By Vickie Johnson

Like Einstein, Galileo and Copernicus, former NASA project manager Craig Tooley now has a place on the Moon named in his honor. Tooley Crater measures 7 kilometers in a permanently shadowed region of Shoemaker Crater near the lunar south pole. The new crater designation is official and can be used in journal articles and other publications.

This act pays homage to the numerous accomplishments and indelible contributions Tooley made to NASA's exploration community during his 34 years of service. After Tooley's passing in September 2017, members of NASA's Lunar Reconnaissance Orbiter (LRO) team wanted to memorialize Tooley by having a lunar crater named after him. They petitioned the International Astronomical Union Working Group for Planetary System Nomenclature, which approved the request to name a lunar crater after Tooley, the former LRO project manager from NASA's Goddard Space Flight Center.



Tooley oversaw LRO's successful launch in 2009, and the mission continues to make groundbreaking discoveries of Earth's closest celestial neighbor. He transitioned into the same position for the Magnetospheric Multiscale (MMS) mission, a quartet of spacecraft launched in 2015 to study our planet's magnetosphere and provide insight into the phenomenon of magnetic reconnection.

Tooley came to Goddard in 1983 after receiving his bachelor's in mechanical engineering from the University of Evansville in Indiana. He later earned a master's in the same field from the University of Maryland, College Park, in 1990. He joined the Goddard Flight Projects Directorate in 1996. In doing so, he built a reputation as the go-to guy for some of NASA's highest-profile missions, leveraging years of technical experience to become the consummate project manager.

Tooley became deputy project manager for the Triana mission, laying the groundwork for the climate observation mission which would later be resurrected as the Deep Space Climate Observatory (DSCOVR). He helped develop procedures and train astronauts for the Hubble Space Telescope's fourth servicing mission in 2002. He then headed Hubble's Instrument Development Office, overseeing the development of instruments that were installed during the fifth and final servicing mission in 2009.

In his most recent position as deputy director of applied engineering and technology, Tooley used the knowledge he acquired over the years to push Goddard's capabilities forward, championing new and emerging technologies such as advanced electronics systems, CubeSats and SmallSats.

His accomplishments as an engineer enabling science and exploration go well beyond LRO. He served as the mission manager and mechanical lead for five successful Spartan 201 heliophysics missions deployed during space shuttle missions STS-56, STS-64, STS-69, STS-87 and STS-95. LRO, DSCOVR and MMS are still in operation today.

He was the recipient of numerous awards, most notably two NASA Outstanding Leadership Medals – among the agency's highest honors – for his work on the LRO and MMS missions.

Tooley's memory is forever etched into space exploration with the naming of one of the MMS spacecraft as "Craig." His most enduring legacy to Goddard, however, will be the many teams and individuals he impacted both personally and professionally, all embodying his spirit of discovery and innovation. Tooley exhibited an infectious optimism for spaceflight, and as a manager, he always advocated for inclusive leadership and open communication. His passion for and approach to NASA's work produced many dedicated teams and successful missions throughout his career. ■

Center: Tooley Crater

Image credit: NASA/Goddard/Arizona State University

HUBBLE ADAPTS TO COVID-19-RELATED CHALLENGES

By Janiel Hernandez

Amazing images and surprising discoveries from NASA's Hubble Space Telescope have rewritten textbooks and inspired countless people worldwide in the telescope's 30 years since launch. But as the COVID-19 pandemic has upended lives and work around the world, the Hubble team has adjusted operations and workflow to keep the mission going despite the challenges presented.

Like many others across the nation, the Hubble team has had to work from home for the past several months to maintain social distancing and prevent the spread of the virus. In early 2020 before the pandemic, about 100 members of the Hubble operations team reported every day to NASA's Goddard Space Flight Center, where Hubble's control center resides. These are the crews that "fly" the telescope. Now, only two team members commute to their workplace at a time. They come in once a week to send commands and other important information to the telescope. Each person has an assigned partner who works the same shifts so that contact is limited within the team.

The rest of the Goddard operations team continues to monitor the spacecraft – reviewing its mechanical, electrical, instrument and software systems – and remains on the lookout for anything out of the ordinary. Hubble continuously sends information about the health and status of its systems down to the ground, where automated software verifies that everything on the spacecraft is working properly. If something goes wrong, the team receives an alert from the system. Before, team members would gather in person to determine the cause of the anomaly and how to get the spacecraft back on track. Many would then assemble in the control center to help monitor and verify the observatory's recovery. Now, for safety precautions, only a few personnel required to command, oversee and test the spacecraft come in, while the rest of the team contributes remotely.

Sometimes, additional team members need to return on-site to run tests using a spacecraft simulator to resolve an issue or to prepare other ground and flight system updates. Known as the Vehicle Electrical System Test (VEST) facility, the simulator provides engineers a working model of the systems aboard Hubble. Team members follow stringent safety precautions to minimize risks whenever working in the VEST facility.

While the team has had to make modifications to address the challenges presented by COVID-19, it has done so seamlessly while continuing to return high rates of Hubble science and ensuring the health and safety of the spacecraft. None of Hubble's science has been lost to the pandemic.

"Overall, the team has done an outstanding job adopting the temporary measures to mitigate the risk of the coronavirus to the team," said Mission Operations Manager Dave Haskins. "With their dedication and drive, the operations team continues to provide world-class scientific observations."

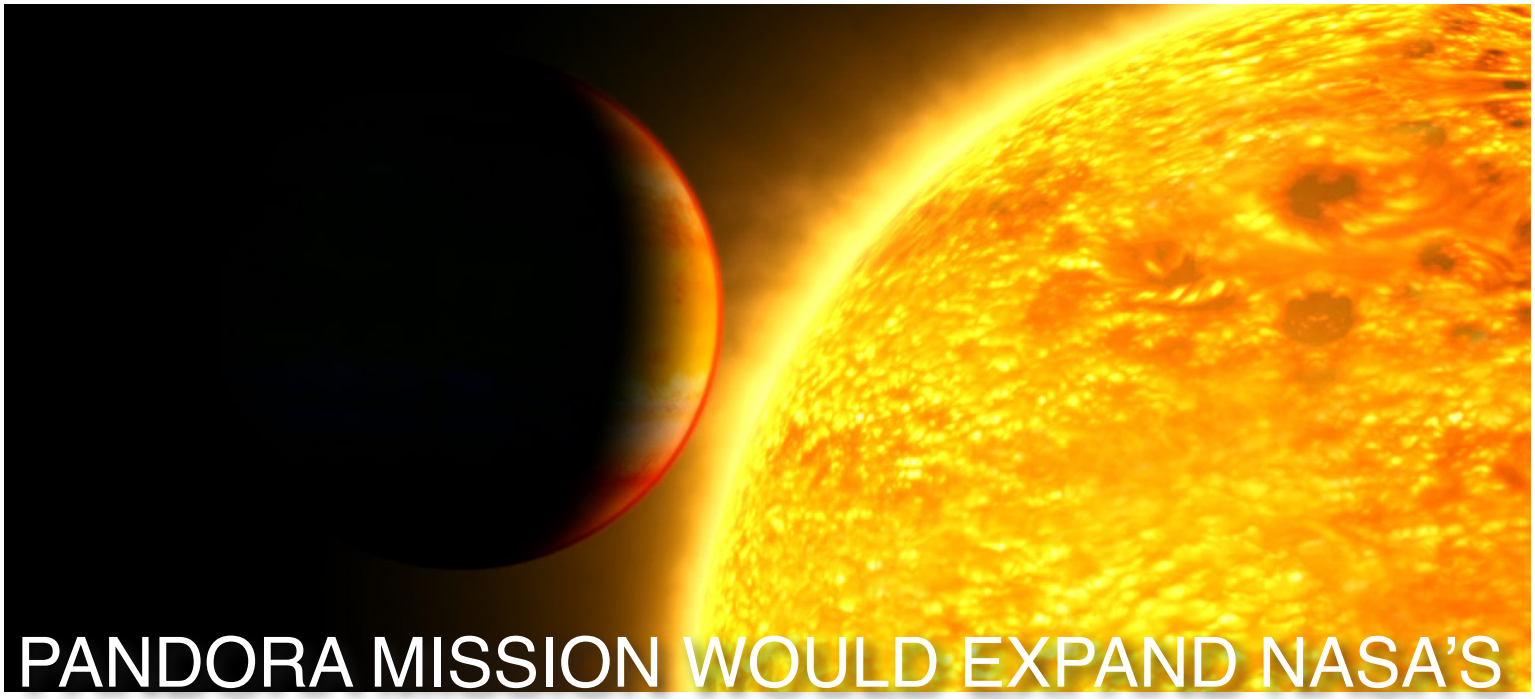
The mission operations team at Goddard continues to work closely with the Space Telescope Science Institute, which carries out Hubble's science operations, in Baltimore. Among the institute's tasks are scheduling the telescope's observations and producing a week's worth of commands for Hubble to follow. Like most of the mission operations team, members of the science operations team are working remotely.

The pandemic did affect in-person events planned across the country to commemorate Hubble's 30th anniversary. Instead, the Hubble outreach team utilized the web and social media for their anniversary efforts. This included sharing the anniversary image, collecting Hubble birthday wishes from celebrities and social media influencers, highlighting great discoveries and history through numerous videos, coordinating question-and-answer sessions with scientists and engineers on the team, hosting a weekly trivia campaign, and publishing "What Did Hubble See on Your Birthday?"

As Hubble continues into its fourth decade, it will keep on surprising us with its extraordinary images, as well as providing us with information on how the universe works and what we can learn from it. The Hubble team will continue to plan for an eventual return to its respective work areas when it is safe to do so. Despite the challenges, this pandemic has not lessened the motivation or desire to continue exploring the cosmos and the secrets it possesses. ■

Center: Systems engineer Steve Sands working in the Hubble Space Telescope's control center during the COVID-19 pandemic.

Photo credit: NASA/Goddard/Rebecca Roth



PANDORA MISSION WOULD EXPAND NASA'S

By Anisha Engineer

In the quest for habitable planets beyond our own, NASA is studying a mission concept called Pandora, which could eventually help decode the atmospheric mysteries of distant worlds in our galaxy. One of four low-cost astrophysics missions selected for further concept development under NASA's new Pioneers program, Pandora would study approximately 20 stars and exoplanets – planets outside of our solar system – to provide precise measurements of exoplanetary atmospheres.

This mission would seek to determine atmospheric compositions by observing planets and their host stars simultaneously in visible and infrared light over long periods. Most notably, Pandora would examine how variations in a host star's light impact exoplanet measurements. This remains a substantial problem in identifying the atmospheric makeup of planets orbiting stars covered in starspots, which can cause brightness variations as a star rotates.

Pandora is a small satellite mission known as a SmallSat, one of three such orbital missions receiving the green light from NASA to move into the next phase of development in the Pioneers program. SmallSats are low-cost spaceflight missions that enable the agency to advance scientific exploration and increase access to space. Pandora would operate in Sun-synchronous low-Earth orbit, which always keeps the Sun directly behind the satellite. This orbit minimizes light changes on the satellite and allows Pandora to obtain data over extended periods. Of the SmallSat concepts selected for further study, Pandora is the only one focused on exoplanets.

"Exoplanetary science is moving from an era of planet discovery to an era of atmospheric characterization," said Elisa Quintana, an astrophysicist at NASA's Goddard Space Flight Center and the principal investigator for Pandora. "Pandora is focused on trying to understand how stellar activity affects our measurements of exoplanet atmospheres, which will lay the groundwork for future exoplanet missions aiming to find planets with Earth-like atmospheres."

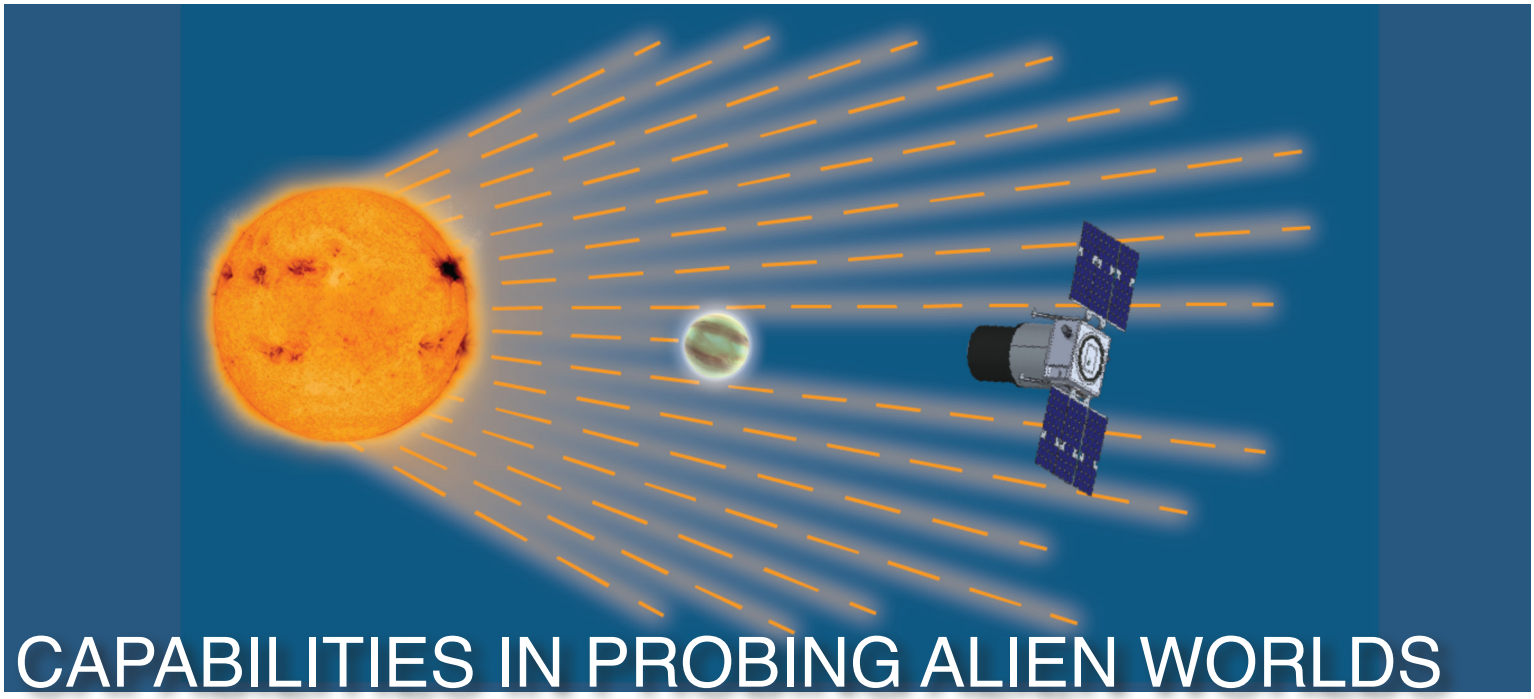
Maximizing the Scientific Potential

Pandora concentrates on studying exoplanetary and stellar atmospheres by surveying planets as they cross in front of – or transit – their host stars. To accomplish this, Pandora would take advantage of a proven technique called transit spectroscopy, which involves measuring the amount of starlight filtering through a planet's atmosphere, and splitting it into bands of color known as a spectrum. These colors encode information that helps scientists identify gases present in the planet's atmosphere, and can help determine if a planet is rocky with a thin atmosphere like Earth or if it has a thick gas envelope like Neptune.

This mission, however, would take transit spectroscopy a step further. Pandora is designed to mitigate one of the technique's most crucial setbacks: stellar contamination. "Stars have atmospheres and changing surface features like spots that affect our measurements," said Jessie Christiansen, the deputy science lead at the NASA Exoplanet Archive at Caltech in Pasadena, California, and a co-investigator for Pandora. "To be sure we're really observing an exoplanet's atmosphere, we need to untangle the planet's variations from those of the star."

Pandora would separate stellar and exoplanetary signals by observing them simultaneously in infrared and visible light. Stellar contamination is easier to detect at the shorter wavelengths of visible light, and so obtaining atmospheric data through both infrared and visible light would allow scientists to better differentiate observations coming from exoplanet atmospheres and stars.

"Stellar contamination is a sticking point that complicates precise observations of exoplanets," said Benjamin Rackham, a 51 Pegasi b Postdoctoral Fellow at the Massachusetts Institute of



CAPABILITIES IN PROBING ALIEN WORLDS

Technology in Cambridge and a co-investigator for Pandora. "Pandora would help build the necessary tools for disentangling stellar and planetary signals, allowing us to better study the properties of both starspots and exoplanetary atmospheres."

Synergy in Space

Joining forces with NASA's larger missions, Pandora would operate concurrently with the James Webb Space Telescope, slated for launch later this year. Webb will provide the ability to study the atmospheres of exoplanets as small as Earth with unprecedented precision, and Pandora would seek to expand the telescope's research and findings by observing the host stars of previously identified planets over longer periods.

Missions such as NASA's Transiting Exoplanet Survey Satellite, Hubble Space Telescope, and the retired Kepler and Spitzer spacecraft have given scientists astonishing glimpses at these distant worlds, and laid a strong foundation in exoplanetary knowledge. These missions, however, have yet to fully address the stellar contamination problem, the magnitude of which is uncertain in previous studies of exoplanetary atmospheres. Pandora seeks to fill these critical gaps in NASA's understanding of planetary atmospheres and increase the capabilities in exoplanet research.

"Pandora is the right mission at the right time because thousands of exoplanets have already been discovered, and we are aware of many that are amenable to atmospheric characterization that orbit small active stars," said Jessie Dotson, an astrophysicist at NASA's Ames Research Center in California's Silicon Valley and the deputy principal investigator for Pandora. "The next frontier is to understand the atmospheres of these planets, and Pandora would play a key role in uncovering how stellar activity impacts our ability to characterize atmospheres. It would be a great complement to Webb's mission."

A Launch Pad for Exploration

Lawrence Livermore National Laboratory (LLNL) in Livermore California, is co-leading the Pandora mission with Goddard. LLNL will manage the mission and leverage capabilities developed for other government agencies, including a low-cost approach to the telescope design and fabrication that enables this groundbreaking exoplanet science from a SmallSat platform.

NASA's Pioneers program, which consists of SmallSats, payloads attached to the International Space Station and scientific balloon experiments, fosters innovative space and suborbital experiments for early-to-mid-career researchers through low-cost, small hardware missions. Under this program, Pandora would operate on a five-year timeline with a budget cap of $20 million.

Despite tight constraints, the Pioneers program enables Pandora to concentrate on a focused research question while engaging a diverse team of students and early-career scientists from more than a dozen universities and research institutes. This SmallSat platform creates an excellent blueprint for small-scale missions to make an impact in the astrophysics community.

"Pandora's long-duration observations in visible and infrared light are unique and well-suited for SmallSats," said Quintana. "We are excited that Pandora will play a crucial role in NASA's quest for finding other worlds that could potentially be habitable." ■

Above (left): An exoplanet as it is about to cross in front of – or transit – its star. Image credit: NASA/Goddard

Above (right): An image illustrating Pandora's use of transit spectroscopy to reliably identify an exoplanet's atmospheric composition as it passes in front of its host star. Image credit: NASA/Goddard/Lawrence Livermore National Laboratory

NEWLY NAMED ASTEROIDS REFLECT CONTRIBUTIONS OF PIONEERING ASTRONAUTS

Twenty-seven asteroids have been named in honor of African-American, Hispanic and Native American astronauts, and one cosmonaut, who have helped expand our horizons beyond Earth and inspire the next generation of space explorers.

Among the 27 people who inspired these new asteroid names are Stephanie Wilson, Joan Higginbotham and Ed Dwight Jr., a captain in the U.S. Air Force who became the first African-American astronaut trainee in 1961. José Hernández, who developed the first full-field digital mammography imaging system, also inspired an asteroid name.

The full list of astronauts and their namesake asteroids was released on Feb. 23 by the Minor Planet Center, an organization affiliated with the International Astronomical Union (IAU), that's responsible for the identification, designation and orbit computation for minor planets and other objects. Up until now, these asteroids had provisional names indicating their time of discovery. All 27 are located in the asteroid belt between Mars and Jupiter.

Asteroids (103738) Stephaniewilson and (103739) Higginbotham were named after women who have made significant contributions to space exploration. On top of distinguished engineering careers, both were selected in 1996 to join NASA's Astronaut Group 16, nicknamed "The Sardines" because of its large class size of 44 candidates.

As an electrical engineer at NASA's Kennedy Space Center in Florida, Higginbotham worked on 53 space shuttle launches between 1996 and 2007. As an astronaut, she launched from Kennedy aboard space shuttle Discovery to the International Space Station, where she served as a mission specialist on an assembly mission.

Wilson, an aerospace engineer, worked for several years at NASA's Jet Propulsion Laboratory in Pasadena, California, as a member of the Attitude and Articulation Control Subsystem team for NASA's Galileo spacecraft. After becoming an astronaut, she traveled to the space station three times, logging more than 42 days in space. Today, Wilson is on NASA's Artemis team of astronauts, one of whom will become the first woman to set foot on the Moon.

Consecutively named asteroids were chosen for Wilson and Higginbotham in a nod to the fact they were selected as astronaut candidates in the same class.

Asteroid (92579) Dwight was named after Ed Dwight Jr., who was born in 1933 in Kansas City, Kansas. He recounts in a media interview being stunned by a newspaper article profiling a Black pilot, a revelation of unimagined possibility. This set him on his own pursuit of flight. After making it to the rank of captain in the U.S. Air Force, he was recruited to be the first African-American astronaut trainee. In the astronaut program, he encountered deeply entrenched racism, was eventually forced out and resigned from the Air Force in 1966. Dwight chose a wildly different path after this major setback, returning to his early love of the arts by reinventing himself as a sculptor of African-American history. He created more than a hundred memorials globally and thousands of other works of art.

José Hernández, the astronaut behind asteroid (122554) Joséhernández, was born into a migrant farming family and spent his youth working in the fields. When he was in high school, Hernández was inspired by Franklin Chang-Díaz, a long-time astronaut who flew seven space shuttle missions from 1986 to 2002. Hernández went on to receive bachelor's and master's degrees in electrical engineering, worked on X-ray lasers, developed the first full-field digital mammography imaging system, and then became an astronaut. Hernández traveled on space shuttle Discovery in 2009 en route to the International Space Station on a mission to deliver a Multi-Purpose Logistics Module. Now, asteroids (122554) Joséhernández and (115015) Chang Díaz can inspire the next generation of space explorers.

"It's an honor and a privilege to name these asteroids in recognition of fellow space explorers while also adding to the message of the power and value of diversity for all human endeavors," said Marc W. Buie, an astronomer who discovered the 27 asteroids in the last couple of decades. Buie is a Boulder, Colorado-based astronomer at the Southwest Research Institute, which is headquartered in San Antonio.

Buie is also a co-investigator on NASA's Lucy mission, which will launch atop the Atlas V 401 rocket from Cape Canaveral, Florida, in October 2021. Its 12-year mission – the first of its kind – will study seven Trojan asteroids that are among the two swarms of space rocks that circle the Sun, leading and following Jupiter in its orbit. Lucy will also fly by one main-belt asteroid.

The asteroid-naming proposal to the IAU, an organization that approves and certifies the names of astronomical objects and features, was a team effort by scientists and students involved with Lucy. It was led by Cathy Olkin, deputy principal investigator of the Lucy mission at the Southwest Research Institute, and Keith S. Noll, a planetary astronomer at NASA's Goddard Space Flight Center, who serves as Lucy project scientist.

"Last summer, a group of us got together to honor a diverse group of astronauts who have traveled to space and the pioneers who paved the way for these explorers," said Olkin. "But there are many more, and we hope to add their names to the sky in the future."

Besides Olkin and Noll, the research and citation writing group included Katherine Kretke, Lucy communications lead; Carly Howett, Lucy instrument scientist; Donya Douglas-Bradshaw, Lucy project manager; Edward "Beau" Bierhaus, Lucy scientist; Jake Olkin, graduate student at the University of Michigan; and Zach Olkin, undergraduate student at the Georgia Institute of Technology. ■

Above (left): Astronaut Joan Higginbotham taking a break from training for the STS-116 mission. Photo credit: NASA

Above (right): Astronaut José Hernández working controls on the flight deck of space shuttle Discovery while docked with the International Space Station on Aug. 31, 2009. Photo credit: NASA

MAHMOODA SULTANA INVENTS NEW TECH AND INSPIRES THE NEXT GENERATION

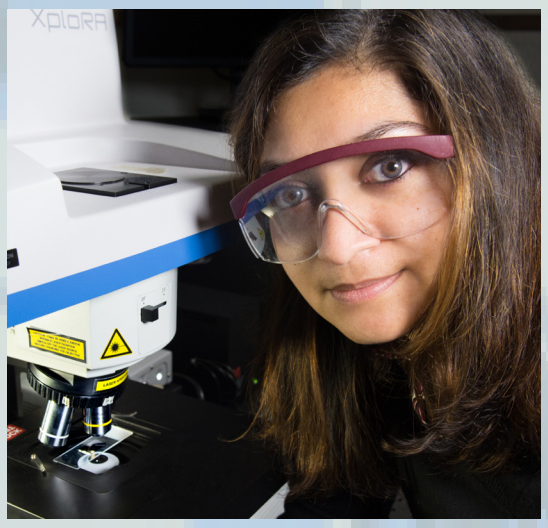
By Elizabeth M. Jarrell

What do you do and what is most interesting about your role here at Goddard? How do you help support Goddard's mission?

My current role allows me to contribute to Goddard's mission in many different ways. I help develop new instruments using cutting-edge technologies that enable new science missions. I also help provide supervisory oversight over the instrument systems engineering work on various flight missions and provide branch management support.

Why did you become an engineer, overcoming cultural and family expectations?

I grew up in Bangladesh. My father was a supervisory civil engineer for the government. He built dams and barrages that controlled the water flow from the Himalayas and India to prevent flooding. He used to take us to the field and explain how the different components work. He let us play in the control room. That definitely got me interested in understanding how different devices worked. We lived in a community where all the government engineers lived together. All our neighbors were engineers. There was not a single woman engineer that I remember in that community of hundreds. My brain automatically presumed that women did not grow up to become engineers.



My great uncle was a physicist at NASA's Ames Research Center in California's Silicon Valley. I loved hearing about his work. Growing up, I wanted to be a mathematician. I loved math, physics and chemistry. I wanted to be a mathematician or a scientist and work for NASA.

When I was 14, my family moved to southern California, and I started in 10th grade. When it came time to apply to colleges, I applied as a double major in math and physics. However, my high school chemistry teacher was very disappointed hearing about my intentions because he wanted me to major in chemistry. He convinced me to major in chemical engineering so that I could combine math, physics and chemistry.

My parents did not want me to pursue math and physics either. They expected me to go to medical school above all or else go to engineering school. In south Asia, people do not value science as much as they value engineering. The best students in South Asia typically go into engineering or into medicine. Sciences and arts are usually second choices. I thought I could go to college for chemical engineering and then go on to medical school. My parents really liked that plan. That is how I got into chemical engineering. Once I was in it, I loved the discipline.

I got a bachelor's in chemical engineering, with a minor in math, from the University of Southern California. I went to the Massachusetts Institute of Technology for a Ph.D. in chemical engineering on a fellowship. I felt that chemical engineering seemed to offer the most options for future work. My parents were disappointed that I did not become a medical doctor.

Please tell us about some of your inventions involving nanotechnology.

I hold a few patents and have additional patents pending in nanotechnology. I have developed several new nanotechnology-based instruments for use on future missions. One of my inventions is a multifunctional sensor platform, which is an instrument-on-a-chip, by printing a suite of sensors and other components made of nanomaterials on a single substrate. This multifunctional sensor platform will be able to detect key gases needed for the origin of life as we know it, and can be used to explore habitability and life on other planets.

In 2017, I won Goddard's Internal Research and Development Innovator of the Year award for some of my work.

Why do you enjoy outreach? What was one of the most meaningful encounters you had doing outreach?

It is very important to me to change the cultural trends and societal expectations of women. Growing up, I never saw any women engineers in my community, so I assumed women did not become engineers. I now give talks at high schools and middle schools sharing my journey with young girls.

Last year, I gave a talk at a Baltimore middle school. After my talk, a young girl approached wearing a T-shirt that said "Forget princess, I want to be an astrophysicist." She took a photo with me, which I treasure. She said, "When I grow up, I want to be just like you. I want to work at NASA." She made my day! ■

Photo courtesy: Mahmooda Sultana