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Goddard View

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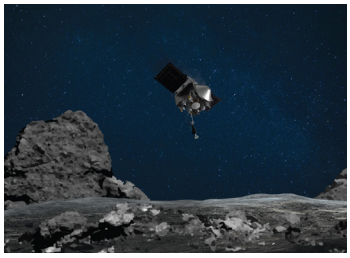
GoddardView

TRENDING

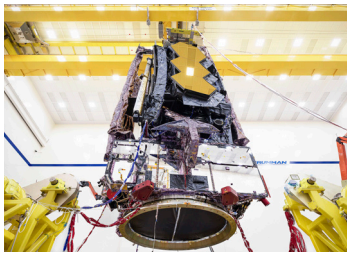


OSIRIS-REX Successfully Collects Sample From Asteroid Bennu
During its Touch-And-Go event, the OSIRIS-REx asteroid sample return mission successfully collected and stowed a sample from the asteroid Bennu and is scheduled to return it to Earth in 2023.

International Observe the Moon Night Goes Virtual
Goddard hosted a virtual public celebration for International Observe the Moon Night on Sept. 26, featuring prerecorded content and a question-and-answer session with NASA scientists and engineers.

Women's Equality Day Presentation
In recognition of Women's Equality Day, the Goddard Equal Opportunity Programs Office and Goddard Women's Advisory Committee hosted a virtual presentation by Caroline Codsi of Women in Governance, which encourages women to develop leadership skills.

Webb Telescope Completes Environmental Testing
The James Webb Space Telescope's recent tests have validated that the observatory will endure the noise, shakes, rattles and vibrations that it will experience during its scheduled launch in 2021.



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On the cover: OSIRIS-REx touches down on the surface of the asteroid Bennu to collect a sample and return it to Earth.

Photo credit: NASA/Goddard/University of Arizona

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.

CONTENTS

MAD CELEBRATES 50 YEARS OF FAMILY AND THEATER

By Mary C. Collins

Since 1970, the Goddard Music and Drama Club (MAD) has delighted audiences with 87 large productions and several dozen smaller shows in the spring, summer and holidays. How would such a group celebrate 50 years of artistic and technical achievements, legendary cast parties, and enduring friendships?

MAD rung in 2020 with ambitious plans for marking its golden anniversary with a lineup of exciting productions. The club presented its winter show, "Steel Magnolias," to enthusiastic crowds at the Barney and Bea Recreation Center, earning second runner-up for a play at the annual Ruby Griffith Awards – an annual competition recognizing theater excellence. MAD held auditions and began rehearsals for a special spring musical. It also began planning for its fall production.

Then came the coronavirus pandemic.

Having faced other challenges over the years – the 9/11 attacks, government furloughs, recreation center renovations and more – MAD was not deterred. Though the in-person spring show was canceled, the club moved ahead with mounting the fall musical "Merrily We Roll Along," holding virtual auditions, securing a talented cast and holding online rehearsals. MAD made every effort to gain permission to present the show virtually, even going so far as to contact its legendary composer Stephen Sondheim. Permission was not obtained in time from the rights holder, so the show was canceled.

Amid the challenges of the pandemic, MAD hosted a two-part 50th anniversary party online, offering an afternoon and an evening party to allow the maximum number of people to attend. More than 80 people dropped in during the day, and many attended both parties. New and many long-time members, and even one of the founding members, were in attendance.

Attendees enjoyed a lively game of MAD trivia. Various members gave a retrospective "tour" by decade, including a slideshow depicting MAD's journey from 1970 to 2020 with people interjecting, "That was my first show!" Others gave recollections of stagecraft feats, such a rainstorm on stage, while others recounted hilarious blunders in front of a packed house.

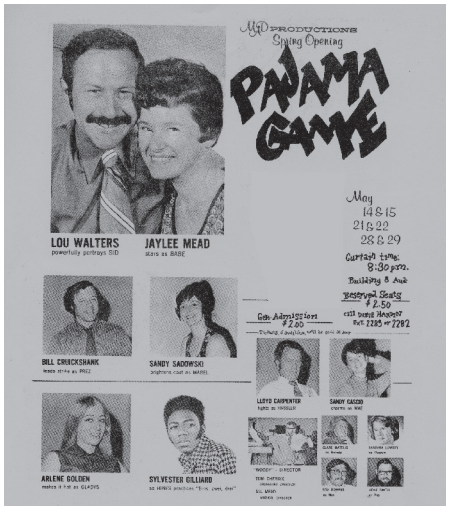
It's tough to be festive over the computer, but MAD came through. The same people who direct, produce and star in the shows led the party. "MAD is a family. We go through everything together," many said.

The club looks forward to once again enjoying the magic feeling when the audience goes quiet and the house lights dim, anticipating an exciting show. Before giving their fond farewells, members agreed to meet again, focusing on a decade at a time. Several volunteered to participate in MAD's oral history project, the results of which will be available in 2021.

For more information on MAD, visit https://www.madtheater.org. ■

Above: New, guest and veteran actors perform a showstopping number during a production of "Follies" in 2017. Photo courtesy: Goddard Music and Drama Club

Below: A flier for "The Pajama Game" in 1971 with Goddard senior scientists and MAD founders in lead roles. Image courtesy: Goddard Music and Drama Club



JOANNA JOINER BECOMES LATEST RECIPIENT OF GODDARD'S MOST PRESTIGIOUS EARTH SCIENCE AWARD

By Laura Ramos Lugo

Named after one of NASA's Goddard Space Flight Center's first pioneers in using remote sensing to investigate Earth and its environment, the William Nordberg Memorial Award is the center's most prestigious peer award for Earth science. For years, Joanna Joiner has worked alongside many of its recipients. In 2020, she became the latest member of the esteemed list.

Part of the Goddard Atmospheric Chemistry and Dynamics Laboratory, she was recognized for her scientific leadership and breakthroughs in the remote sensing of clouds, trace gases and photosynthesis. Her work over the years has ranged from analyzing how gases and particles in the atmosphere interact with sunlight and heat to detecting fluorescence from vegetation with satellites.

"One of the exciting things for me is to be able to be creative. Nobody has ever said to me, 'You can't work on this or that,'" Joiner said. "They've only given me encouragement, and it's really been a wonderful environment to work in."

Some of her projects may have fizzled out over time, while others became more exciting, but there have always been new and exciting directions to pursue. These include determining amounts of various trace gases in the atmosphere using several different satellite instruments, figuring out how high the clouds are in the atmosphere and – more recently – investigating the impacts of the COVID-19 pandemic on pollution.

"We took some of the techniques we developed for remote sensing of fluorescence from plants and applied them to retrieve sulfur dioxide in the atmosphere more accurately than we had ever been able to do," Joiner explained of a recent achievement, while recognizing the contributions of her entire team. "I'm very proud of the work that my whole group has done. It's a group effort. I'm getting the honor here, but really, it's the work of many people."

Past recipients of the Nordberg Award include some of Joiner's collaborators as well as some of her closest mentors.

"It means so much to be on the same page. I'm looking at all the winners, and I've had the good fortune to work with several of the people on this list and admire them greatly and consider them mentors," she said. "It's really just a great honor to be among these scientists." ■

Center: Joanna Joiner (left, U.S. science team leader) with fellow international team leads – Pieternel Levelt (principal investigator, Netherlands) and Johanna Tamminen (co-principal investigator, Finland) – for the Ozone Monitoring Instrument.

Photo courtesy: Joanna Joiner

FIRST VIRTUAL INTERNS REFLECT ON THEIR EXPERIENCE

By Emily Fischer and Kathleen Gaeta

When many NASA employees transitioned to a mandatory work-from-home status in March 2020 because of COVID-19, the agency prepared to launch its first-ever fully virtual internship to ensure students would still have a summer learning opportunity. Interns who successfully worked for NASA's Goddard Space Flight Center shared their experiences.

"Interning at NASA puts me ahead of some of my friends in the same field," said Noah Sandler, a software engineering intern and rising sophomore at the University of Maryland, College Park. "It's been a privilege to have this experience early on in my life."

In the past, NASA visualized a virtual or hybrid format for internships to expand reach in diversity and inclusion, allowing students to intern who otherwise would not have the opportunity. This summer provided the chance to implement a virtual program, which could be a step toward virtual or hybrid internships in the future.

NASA prioritized accessibility when moving online. NASA shipped interns laptops with preinstalled software, while online video meetings helped teams and mentors stay connected virtually.

"Using messaging and video conferencing has been nice because you can still communicate with your mentor really easily, so everything is really accessible in that way," said Scout Crooke, third-year intern at Goddard and rising freshman at Haverford College in Pennsylvania.

Crooke worked three different internship positions over her time at NASA, each in a different branch – a common experience among Goddard interns.

Stephanie Introne from Cornell University in Ithaca, New York, interned at Goddard four times, and this is her second year with the Nancy Grace Roman Space Telescope team. "Working with NASA these past couple summers has been some of the most meaningful work I've had to do with my mechanical engineering degree so far," Introne said. "NASA tries to expose you to a lot of educational opportunities. I really appreciate that there's a focus on not just doing your work for them, but also trying to expand your own learning."

Myah Rather dove headfirst into her first summer internship at NASA last year, measuring formaldehyde in homes and ambient air. At the end of last summer, she gave a speech thanking the program and her mentor for the internship opportunity. Following her presentation, Wade Sisler, executive producer for the Goddard Office of Communications, congratulated her for the courage to speak in front of her peers and supervisors and asked her to apply as a communications intern this summer. For her second round, she worked on social media outreach, collaborating with content creators and expanding NASA's online audience.

"Facing my fears and speaking in front of people got me to where I am now," Rather said. "Communication is one of the most important things, so it's been a good time to work on that."

The tenacity of this year's summer interns impressed Sarah Alspaw, NASA intern program coordinator. She said they challenged themselves by searching for additional projects, innovative solutions and more opportunities to work together in a virtual environment. "It shows their resilience – their willingness to go above and beyond into an environment like this and still get a lot out of it," said Alspaw.

"At the forefront of innovation, NASA operates on the cutting edge, and NASA interns are no different," said Raquel Marshall, program manager for NASA's education initiatives.

Working online also provided more options for collaboration among centers. Interns from Goddard joined presentations from other centers, such as NASA's Johnson Space Center in Houston, NASA's Kennedy Space Center in Florida and NASA Headquarters in Washington, over Microsoft Teams and Cisco Webex.

"Interns at NASA can use their experience to validate their studies and build experience in their field," Marshall said. "The networks they develop and techniques they learn will last beyond the end of their internship." ■

Center: Interns participate in a Microsoft Teams meeting.

Photo credit: NASA/Goddard/Lead Producer Mark Edwards

TEN THINGS TO KNOW ABOUT BENNU

By Tamsyn Brann

NASA's first mission to return a sample from an ancient asteroid arrived at its target, the asteroid Bennu, on Dec. 3, 2018. This mission – the Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer (OSIRIS-REx) – is a seven-year voyage set to conclude upon the delivery to Earth of a sample from Bennu. It promises to be the largest amount of extraterrestrial material brought back from space since the Apollo era. The 20-year anniversary of the asteroid's discovery was in September 2019, and scientists have been collecting data ever since. Here's what we already know (and some of what we hope to find out) about this pristine remnant from the early days of our solar system.

1. IT'S VERY, VERY DARK...
Bennu is classified as a B-type asteroid, which means it contains a lot of carbon in and along with its various minerals. Bennu's carbon content creates a surface on the asteroid that reflects about 4% of the light that hits it, and that's not a lot. By contrast, the solar system's brightest planet, Venus, reflects around 65% of incoming sunlight, and Earth reflects about 30%. Bennu is a carbonaceous asteroid that hasn't undergone drastic, composition-altering change, meaning that on and below its deeper-than-pitch-black surface are chemicals and rocks from the birth of the solar system.

2. ...AND VERY, VERY OLD.
Bennu has been (mostly) undisturbed for billions of years. Not only is it conveniently close and carbonaceous, it is also so primitive that scientists calculated it formed in the first 10 million years of our solar system's history – more than 4.5 billion years ago. Thanks to the Yarkovsky effect – the slight push created when the asteroid absorbs sunlight and re-emits that energy as heat – and gravitational tugs from other celestial bodies, it has drifted closer and closer to Earth from its likely birthplace: the main asteroid belt between Mars and Jupiter.

3. BENNU IS A "RUBBLE-PILE" ASTEROID — BUT DON'T LET THE NAME TRICK YOU.
Is Bennu space trash or scientific treasure? While "rubble pile" sounds like an insult, it's actually a real astronomy classification. Rubble-pile asteroids like Bennu are celestial bodies made from lots of pieces of rocky debris that gravity compressed together. This kind of detritus is produced when an impact shatters a much larger body (for Bennu, it was a parent asteroid around 60 miles [about 100 kilometers] wide). Bennu, by contrast, is about as tall as the Empire State Building. It likely took just a few weeks for these shards of space wreckage to coalesce into the rubble pile that is Bennu. Bennu is full of holes inside, with 20 to 40% of its volume being empty space. The asteroid is actually in danger of flying apart if it starts to rotate much faster or interacts too closely with a planetary body.

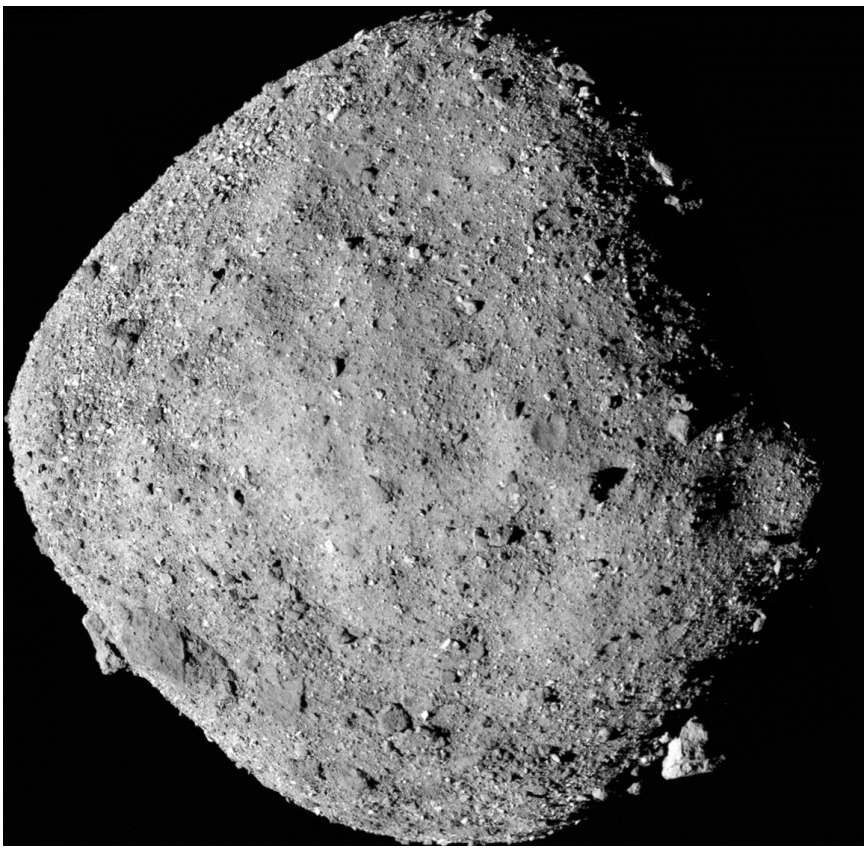
4. ASTEROIDS MAY HARBOR HINTS ABOUT THE ORIGIN OF ALL LIFE ON EARTH...
Bennu is a primordial artifact preserved in the vacuum of space, orbiting among planets, moons, asteroids and comets. Because it is so old, Bennu could be made of material containing molecules that were present when life first formed on Earth. All Earth life forms are based on chains of carbon atoms bonded with oxygen, hydrogen, nitrogen and other elements. However, organic material like the kind scientists hope to find in a sample from Bennu doesn't necessarily always come from biology. It would, though, further scientists' search to uncover the role asteroids rich in organics played in catalyzing life on Earth.

5. ...BUT ALSO PLATINUM AND GOLD!
Extraterrestrial jewelry sounds great, and Bennu is likely to be rich in platinum and gold compared to the average crust on Earth. Although most aren't made almost entirely of solid metal (but asteroid 16 Psyche may be!), many asteroids do contain elements that could be used industrially in lieu of Earth's finite resources. Closely studying this asteroid will give answers to questions about whether asteroid mining during deep-space exploration and travel is feasible. Although rare metals attract the most attention, water is likely to be the most important resource in Bennu. Water (two hydrogen atoms bound to an oxygen atom) can be used for drinking or separated into its components to get breathable air and rocket fuel. Given the high cost of transporting material into space, if astronauts can extract water from an asteroid for life support and fuel, the cosmic beyond is closer than ever to being human-accessible.

6. SUNLIGHT CAN CHANGE THE ASTEROID'S ENTIRE TRAJECTORY.
Gravity isn't the only factor involved with Bennu's destiny. The side of Bennu facing the Sun gets warmed by sunlight, but a day on Bennu lasts just 4 hours and 17.8 minutes, so the part of the surface that faces the Sun shifts constantly. As Bennu continues to rotate, it expels this heat, which gives the asteroid a tiny push toward the Sun by about 0.18 miles (approximately 0.29 kilometers) per year, changing its orbit.

7. THERE IS A SMALL CHANCE THAT BENNU WILL IMPACT EARTH LATE IN THE NEXT CENTURY.
The NASA-funded Lincoln Near-Earth Asteroid Research team discovered Bennu in 1999. NASA's Planetary Defense Coordination Office continues to track near-Earth objects, especially those like Bennu that will come within about 4.6 million miles (7.5 million kilometers) of Earth's orbit and are classified as potentially hazardous objects. Between the years 2175 and 2199, the chance that Bennu will impact Earth is only 1 in 2,700, but scientists still don't want to turn their backs on the asteroid. Bennu swoops through the solar system on a path that scientists have confidently predicted, but they will refine their predictions with the measurement of the Yarkovsky Effect by OSIRIS-REx and with future observations by astronomers.

8. SAMPLING BENNU IS HARDER THAN WE THOUGHT.
Early Earth-based observations of the asteroid suggested it had a smooth surface with a regolith (the top layer of loose, unconsolidated material) composed of particles less than an inch (a couple of centimeters) large — at most. As the OSIRIS-REx spacecraft was able to take pictures with higher resolution, it became evident that sampling Bennu would be far more hazardous than what was previously believed. New imagery of Bennu's surface show that it's mostly covered in massive boulders, not small rocks.



9. BENNU WAS NAMED AFTER AN ANCIENT EGYPTIAN DEITY.
Bennu was named in 2013 by a 9-year-old boy from North Carolina who won the Name that Asteroid! competition, a collaboration between the mission, the Planetary Society and the LINEAR asteroid survey that discovered Bennu. Michael Puzio won the contest by suggesting that the spacecraft's Touch-and-Go Sample Mechanism arm and solar panels resemble the neck and wings in illustrations of Bennu, whom ancient Egyptians usually depicted as a gray heron. Bennu is the ancient Egyptian deity linked with the Sun, creation and rebirth. Puzio also noted that Bennu is the living symbol of Osiris. The myth of Bennu suits the asteroid itself, given that it is a primitive object that dates back to the creation of the solar system. Themes of origins and rebirth are part of this asteroid's story. Birds and bird-like creatures are also symbolic of rebirth, creation and origins in various ancient myths.

10. BENNU IS STILL SURPRISING US!
The spacecraft's navigation camera observed that Bennu was spewing out streams of particles a couple of times each week. Bennu apparently is not only a rare active asteroid (only a handful of them have been as of yet identified), but possibly with Ceres explored by NASA's Dawn mission, among the first of its kind that humanity has observed from a spacecraft. More recently, the mission team discovered that sunlight can crack rocks on Bennu, and that it has pieces of another asteroid scattered across its surface. More pieces will be added to Bennu's cosmic puzzle as the mission progresses, and each brings the solar system's evolutionary history into sharper and sharper focus.

Goddard provides overall mission management, systems engineering, and safety and mission assurance for OSIRIS-REx. Dante Lauretta of the University of Arizona, Tucson, is the principal investigator, and the University of Arizona also leads the science team and the mission's science observation planning and data processing. Lockheed Martin Space in Denver built the spacecraft and is providing flight operations. Goddard and KinetX Aerospace are responsible for navigating the OSIRIS-REx spacecraft. OSIRIS-REx is the third mission in NASA's New Frontiers Program, which is managed by NASA's Marshall Space Flight Center in Huntsville, Alabama, for the agency's Science Mission Directorate in Washington. ■

Center: A mosaic image of the asteroid Bennu.

Image credit: NASA/Goddard/University of Arizona

CHANCE COLLABORATION LEADS TO LINDSAY AWARD

By Laura Ramos Lugo

The Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer (OSIRIS-REx) recently plucked a sample from the asteroid Bennu and is scheduled to return it to Earth in 2023, providing scientists insight into the beginnings of our solar system. The landmark event, known as Touch-And-Go, would not have been possible without the OSIRIS-REx Visible and Infrared Spectrometer (OVIRS) aboard the spacecraft.

"OVIRS allows us to tell what's on the surface of an object by looking at the light that it reflects and how much the reflectance changes as you change wavelengths," explained OVIRS Instrument Scientist Dennis Reuter.

Thanks to this innovation as well as the groundbreaking discoveries made possible by their development and use of infrared spectrometers, Reuter and OVIRS Deputy Instrument Scientist Amy Simon – both from the Goddard Solar System Exploration Division – were recently recognized with the John C. Lindsay Memorial Award. Named after the former head of the Goddard solar physics program, the award is among the highest space science honors bestowed by NASA's Goddard Space Flight Center.

Simon was working on the Hubble Space Telescope and Cassini mission to Saturn when she partnered up with Reuter on the New Horizons mission as it flew by Jupiter en route to Pluto, and they have since been expanding the possibilities of spectral imaging.

"We came from different directions," recalled Simon. "I was working on outer planetary observations, and we landed in the middle together."

Their partnership has solidified through other projects in addition to OVIRS. They worked together on the Thermal Infrared Sensor-2 (TIRS-2) aboard Landsat 9, which will launch in 2021. TIRS-2 will help calculate land water usage, if plants need more irrigation or even if some plants are being irrigated excessively.

"Spectral imaging has a lot of practical applications as well as scientific ones," said Reuter. "We can look at warm spots on volcanoes. You can look at cold spots all over Earth. We can look at places where mosquitoes are breeding and so on."

Reuter and Simon are currently collaborating on L'Ralph, a combined infrared instrument and spectral imaging instrument for the Lucy mission, which will explore the Trojan asteroids by Jupiter following its launch in 2021.

While their projects require some adjustments as they progress, they're confident in the promise of spectroscopy across different fields.

"I think the beauty of spectroscopy is that you can get so much more information out of it than just imaging with filters, because you can get simultaneous information about composition, temperatures and so much more," said Simon.

Reuter and Simon will be presented with the Lindsay Award during a future Goddard Scientific Colloquium. ■

Above: Dennis Reuter and Amy Simon with members of the Lucy project and L'Ralph team and review board. Photo credit: NASA/Goddard/Desiree Stover

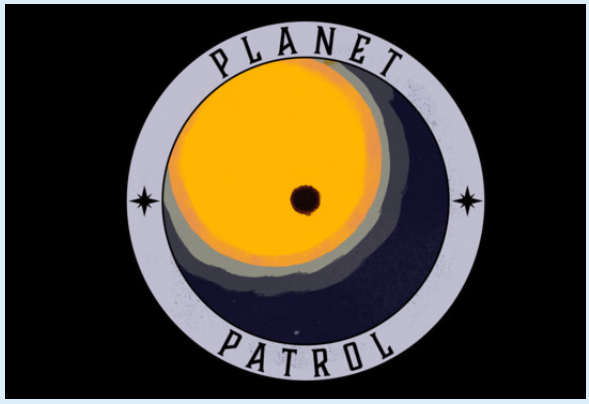
Below: Reuter (left) and Simon at an award dinner. Photo courtesy: Amy Simon

SEARCH FOR NEW WORLDS AT HOME WITH NASA'S PLANET PATROL PROJECT

By Jeanette Kazmierczak

Help NASA find exoplanets, worlds beyond our solar system, through a newly launched website called Planet Patrol. This citizen science platform allows members of the public to collaborate with professional astronomers as they sort through a stockpile of star-studded images collected by NASA's Transiting Exoplanet Survey Satellite (TESS).

"Automated methods of processing TESS data sometimes fail to catch imposters that look like exoplanets," said project leader Veselin Kostov, a research scientist at NASA's Goddard Space Flight Center and the SETI Institute in Mountain View, California. "The human eye is extremely good at spotting such imposters, and we need citizen scientists to help us distinguish between the look-alikes and genuine planets."



Volunteers will help determine which TESS snapshots include signals from potential planets and which ones show planet impersonators.

TESS uses its four cameras to take full images of one patch of sky, called a sector, every 10 minutes for a month at a time. This long stare allows TESS to see when planets pass in front of their stars, or transit, and dim their light. Over the course of a year, TESS collects hundreds of thousands of snapshots, each containing thousands of possible planets – too many for scientists to examine without help.

Computers are very good at analyzing such data sets, but they're not perfect, Kostov said. Even the most carefully crafted algorithms can fail when the signal from a planet is weak. Some of the most interesting exoplanets, like small worlds with long orbits, can be especially challenging. Planet Patrol volunteers will help discover such worlds and will contribute to scientists' understanding of how planetary systems form and evolve throughout the universe.

Planets aren't the only source of changes in starlight, though. Some stars naturally change brightness over time, for example. In other cases, a star could actually be an eclipsing binary, where two orbiting stars alternately transit or eclipse each other. Or there may be an eclipsing binary in the background that creates the illusion of a planet transiting a target star. Instrumental quirks can also cause brightness variations. All these false alarms can trick automated planet-hunting processes.

On the new website, participants will help Kostov and his team sift through TESS images of potential planets by answering a set of questions for each – like whether it contains multiple bright sources or if it resembles stray light rather than light from a star. These questions help the researchers narrow down the list of possible planets for further follow-up study.

Citizen scientists can dive even deeper by learning more about the star in each image and by engaging with the Planet Patrol community.

A Goddard summer intern recently helped discover the TESS mission's first planet orbiting two stars through another citizen science program called Planet Hunters TESS, run by the University of Oxford.

"We're all swimming through the same sea of data, just using different strokes," said Marc Kuchner, the citizen science officer for NASA's Science Mission Directorate. "Planet Hunters TESS asks volunteers to look at light curves, which are graphs of stars' brightness over time. Planet Patrol asks them to look at the TESS image directly, although we plan to also include light curves for those images in the future."

Planet Patrol is a collaboration between NASA, the SETI Institute, the Space Telescope Science Institute in Baltimore and Zooniverse, a collaboration of scientists, software developers and educators who collectively develop and manage citizen science projects on the Internet. It is funded by the Sellers Exoplanet Environments Collaboration at Goddard.

TESS is a NASA Astrophysics Explorer mission led and operated by MIT in Cambridge, Massachusetts, and managed by Goddard. Additional partners include Northrop Grumman, based in Falls Church, Virginia; NASA's Ames Research Center in California's Silicon Valley; the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts; MIT's Lincoln Laboratory; and the Space Telescope Science Institute. More than a dozen universities, research institutes and observatories worldwide are participants in the mission.

For more information about Planet Patrol, visit http://exoplanetpatrol.org. ■

Image credit: NASA/Goddard/ Conceptual Image Lab

NASA'S PARTNERSHIP BETWEEN ART AND SCIENCE: A COLLABORATION

By Scout Crooke

NASA has long used art to represent everything from abstract astrophysical concepts to presentations of satellites in orbit that cannot be directly photographed in great detail.

Since 2013, Maryland Institute College of Art (MICA) in Baltimore has partnered with NASA's Goddard Space Flight Center through the college's astro-animation course and internship opportunities to give MICA students the opportunity to work with scientists at NASA. Students produce creative animations that explore astronomical or planetary topics and spark interest in the public.

"Art gives science the ability to be more widely learned and more accessible to a wider audience. Most theories or complex ideas are greatly helped when accompanied with some sort of visual," said MICA student Bella Potenziani, who is interning at Goddard this year. "It can make a concept easier to understand and discuss. On the other hand, science and its effect on technology has helped many fields in the art world improve and evolve."

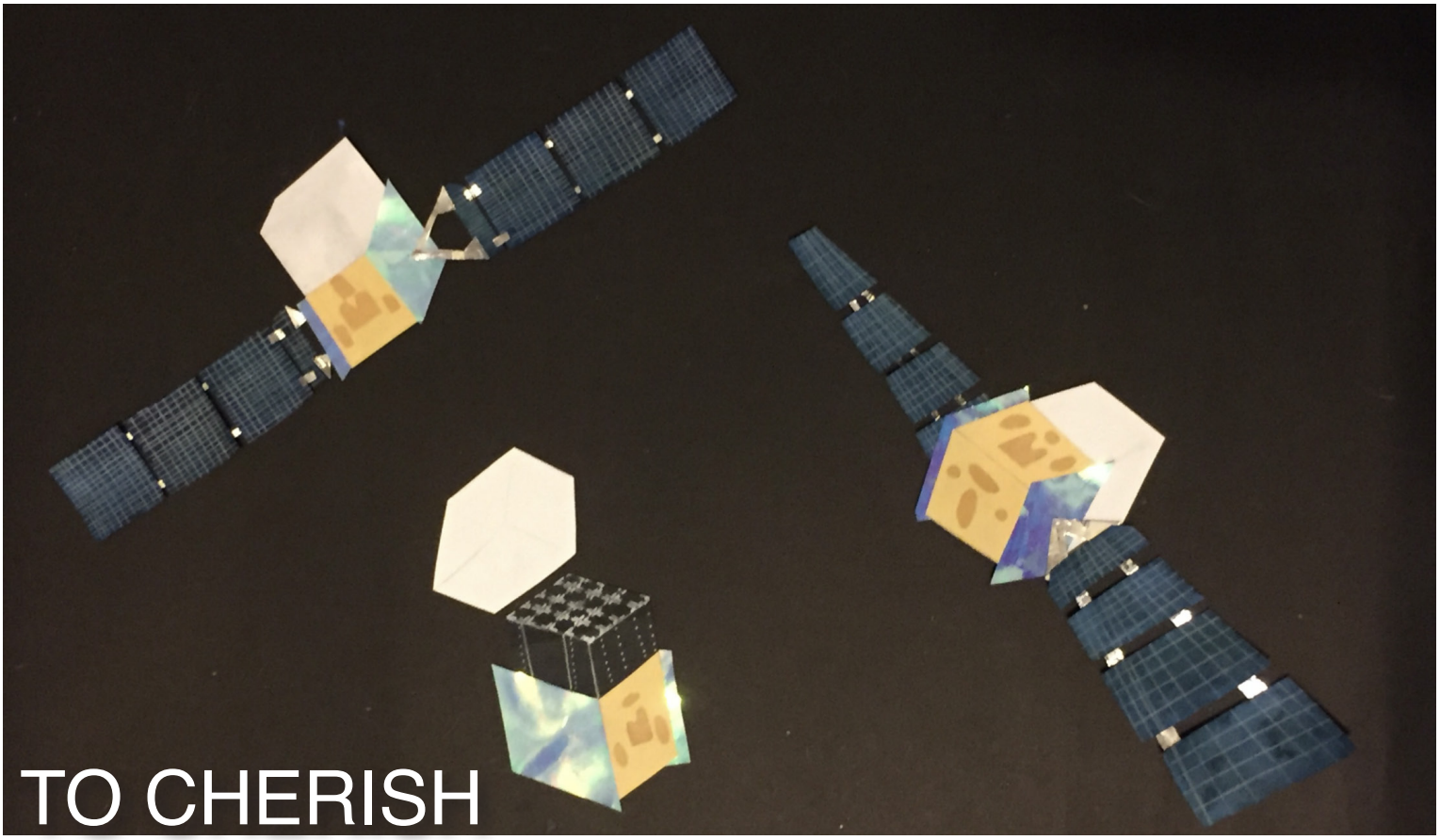
When first discussing the idea of the partnership, Robin Corbet, an astrophysicist at Goddard and co-teacher of MICA's astro-animation course, said, "I confess, I was kind of skeptical at the beginning. I thought to do astrophysics you need to have a bachelor's degree in physics and you spend several years doing your Ph.D."

The partnership between Goddard and MICA began when Corbet met Laurence Arcadias, chair of MICA's Animation Department. When thinking of project ideas and considering topics for students to include in their animations, Arcadias had the idea to do a project about science. Arcadias invited Corbet to MICA to share highlights of his and his colleagues' work in order for the animation students to get a new flavor of content.

Although the astrophysics concepts could be quite complicated, Arcadias said she was confident her students would pick them up quickly. Sure enough, after helpful explanations from scientists, students grasped the concepts and made animations to give people an idea of the complex science, along with their own creative twist.

Roopesh Ojha, an astrophysicist at Goddard, has been working with MICA students for several years. Ojha said he is always impressed by the ability of MICA students, who may or may not have formally studied a lot of science, to absorb quite complicated information and assimilate it well enough to produce good art.

This year, Declan McKenna, a MICA student interning at Goddard, is working on several projects, including an ocean worlds campaign video featuring educational information and interviews with scientists. This is not McKenna's first time working with scientists at Goddard to create animations. Previously, he illustrated the historic detection



of gravitational waves following a neutron star collision. When making that animation, McKenna and the other animators used a sequence of pictures of colorful melted wax to depict the neutron stars merging.

Potenziani is working on a stop-motion animation for NASA's Fermi Gamma-ray Space Telescope's 12th anniversary to show how it collects data. To do this, Potenziani cut out different colors of construction paper and moved them slightly to take snapshot pictures.

Potenziani has worked with NASA scientists on other projects as well. One of these animations, FETCH, was made through the astro-animation course and showcases the terrain and life that could possibly live on Saturn's largest moon, Titan.

Art and science may seem like two separate disciplines, but they benefit each other through connections that allow scientists and artists to reach broader audiences. MICA animations give scientists the ability to communicate complicated science effectively to a large audience that may otherwise find it inaccessible. Interpreting science and technology data gives artists a new variety of content to work from in ways that can reach more people. Even when the scientific concepts are complex in nature, art can make science more approachable and intrigue people, enabling them to see the value of the content.

Working with artists can even make scientists better communicators, Ojha said. "When artists ask questions, they often ask questions from very interesting angles or very interesting points of view, and I often have to think about how to answer them."

Ojha said that he uses these animations in his outreach talks because they are very creative, understandable and often use humor, which is a very effective tool.

"The partnership between Goddard and MICA gives the opportunity for artists who love science to incorporate the two things they love into one thing," Potenziani said. "It also allows scientists to work with artists who are just as passionate about science to help visualize their work." ■

Above (left): A block of colorful wax is scanned, melted and sliced several times to depict a neutron star collision. Photo credit: Leili Arai Tavallaei and Declan McKenna

Above (right): Construction paper is cut to resemble the Fermi Gamma-ray Space Telescope. Photo credit: Bella Potenziani

MARCELLUS PROCTOR, NATIVE AMERICAN AND ELECTRICAL ENGINEER FOR NASA

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?

I manage the operational budget for the Goddard Electrical Engineering Division. I also oversee the division's engineering support services contract, the Electrical Systems Engineering Services contract.

Why did you become an electrical engineer?

As a child, I took things apart and put them back together. When I was 16, I attended an engineering exploration summer program hosted by Morgan State University in Baltimore. It changed my life. The instructors gave us assignments in different engineering disciplines. One problem in particular was in electrical engineering. It was an exercise to calculate the equivalent resistance of a circuit. No one in the class got the answer so I asked the instructor if I could try to calculate the resistance value. I wrote my answer down and I got it right. After class, the instructors pulled me aside and recommended that I look at electrical engineering as a career field.

I have a bachelor's in electrical engineering from the University of Maryland, College Park and a master's in electrical engineering from Johns Hopkins University.

What positions have you held at Goddard?

In 2001, I came to Goddard as an electronics engineer doing electrical electronic and eletromechanical parts engineering (Code 562). I was then the associate branch head of Code 562 for almost seven years. In January 2014, I became the assistant chief of operation in the Goddard Electrical Engineering Division.

As a manager, what do you feel is most important?

The people are the most important, ensuring that they have the resources and tools they need to do their jobs and also providing them the opportunities to foster their growth professionally and personally.

I try to ensure that everyone has opportunities within and outside of their fields, both in terms of daily duties and future development. When a detail or opportunity comes up, both within and outside, we tell our entire division.

What about mentoring?

I believe strongly in mentoring. I have been mentored, and I have mentored others. Several people have helped guide me throughout my career. My mentors told me the spoken and unspoken rules of working within Goddard: how organizations operate. They also advised me about work-life balance and to look at any situation from multiple viewpoints.

As a mentor, I tell people looking to move up in their career to always look for an opportunity you will enjoy doing. I also encourage others before they apply to a position to research the organization and learn how it operates, know their goals, and be prepared to give examples how they would be an asset to the team.

What is your role with the Native American Advisory Committee?

I am a member of the Piscataway-Conoy Nation from Southern Maryland. We are one of several indigenous tribes officially recognized by the state of Maryland. Every nation has a unique language and style of clothing and jewelry. Our language was almost lost, but we are rediscovering it.

In 2007, I was privileged to be the founding chair of Goddard's Native American Advisory Committee. We wanted to advise center management and educate the center about Native American culture and concerns. Although I stepped down as chair in 2012, I remain an active member. Our current senior champion is Chief Counsel Andrew Falcon.

Throughout the year, we provide opportunities for both Goddard's main Greenbelt campus and Wallops Flight Facility in Virginia to learn about Native culture through videos, cultural events and discussions. Typically, we have a speaker in November for Native American Heritage Month. ■

Photo courtesy: Marcellus Proctor