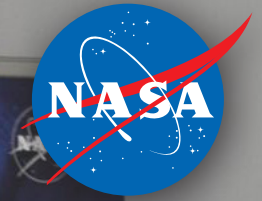


National Aeronautics and Space Administration



# Goddard View

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# GoddardView

## TRENDING

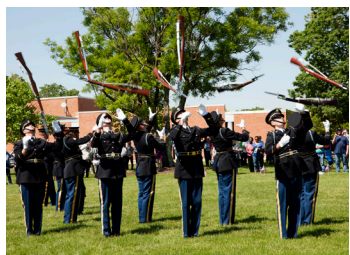
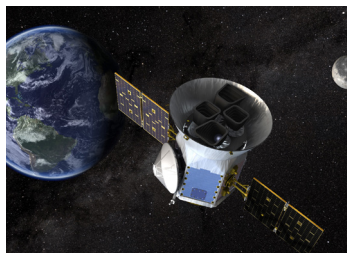


**Administrator Makes First Greenbelt Visit, Addresses Interns**  
NASA Administrator Jim Bridenstine made his first visit to Goddard's Greenbelt campus on July 26. Following an address to employees, Bridenstine toured select facilities and spoke to interns as part of National Intern Day.

### TESS Begins Science Operations

The Transiting Exoplanet Survey Satellite began its search for planets around nearby stars, officially beginning science operations on July 25.

TESS, which launched in April, is expected to transmit its first series of science data back to Earth in August.



### Goddard Observes Memorial Day With Mall Program

In honor of Memorial Day, the Goddard Veterans Advisory Committee and the Goddard Diversity and Inclusion Program Office organized a program featuring a memorial on the Goddard Mall and the U.S. Army Drill Team.

### Goddard Welcomes 2018 Summer Interns

More than 400 interns from across the country arrived in early June to begin their summer internships. The students will work alongside scientists, engineers and mission support teams in their fields of interest.



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**On the cover:** Employees take part in a Fermi Gamma-ray Space Telescope demonstration during the 10th annual Goddard Science Jamboree on July 25.

Photo credit: NASA/Goddard/Jay Friedlander

## 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](mailto:darrell.d.delarosa@nasa.gov). All contributions are subject to editing and will be published as space allows.

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# TAKING OFF FROM ROCKET CLUB: CHRIS SCOLESE DETAILS HIS PATH TO CENTER DIRECTOR

By [Ciana Cain](#)

**C**hris Scolese has held many positions at NASA, faced many challenges and exceeded expectations along the way. He has contributed to such groundbreaking missions as the Earth Observing System, Terra, Space Shuttle Program, Hubble Space Telescope, Curiosity and International Space Station. Through it all, how did he become center director of NASA's Goddard Space Flight Center?

On June 28, Scolese engaged the center in a Maniac Talk – part of a series in which employees discuss their career inspirations – to speak about his upbringing, mentors, the people who have helped him in life and how he got to be where he is today. He mentioned how he had an interest in space exploration from a young age. Growing up in Buffalo, New York, he was a member of a rocket club in high school and was inspired by local aeronautics companies.

Earlier in sixth grade, his reading teacher, Mr. Griffin, asked students to choose three books to figure out what they were thinking. Scolese chose “2001: A Space Odyssey,” “John Glenn: Young Astronaut” and “Walt Disney.” These books, little did he know at the time, would play an integral part in inspiring his aerospace career.

Two other teachers, Mr. Glose and Mr. Weiss, sparked an interest in math and science, respectively – the latter of which strongly encouraged him to take his rockets and transmitters and do something with them. Scolese took this advice to heart and won the Western New York State Science Fair, later advancing to the New York State Science Fair.

“When you have folks suggesting that you do things, they do it because they see potential in you,” said Scolese.

Weiss also introduced Scolese to the American Institute of Aeronautics and Astronautics, and he became a member thanks to Weiss’ sponsorship.

Scolese went on to study engineering at the State University of New York at Buffalo and worked for the U.S. Navy and its nuclear propulsion program. He later obtained a master’s and doctorate in engineering from The George Washington University in the District of Columbia.

Not long after Scolese’s tenure in the Navy, then-NASA employee Tom Buckler saw his resume and Noel Hinners, Goddard center director at the time, decided that Scolese was someone worth hiring.

Beginning as an engineer and later becoming a manager with the Earth Observing System, Scolese went on to hold many different senior positions in the agency, including NASA deputy associate administrator in space science, Goddard deputy center director, NASA chief engineer, NASA associate administrator and NASA acting administrator.

“He’s a good guy,” said Bill Townsend, who worked with Scolese on the Earth Observing System. “Goddard should be thankful that one of their own came back to lead the center. He not only has this broader base of experience, but he knows the center inside and out. He understands the way it works, ticks and functions, as well as the importance of people.”

People, according to Scolese, are the key to shaping the way he sees the world and encouraging him to keep working hard to be the best center director he can possibly be. “There are lots and lots of people in your life who change your direction,” he said. “They help you get things done in a whole variety of ways.” ■

Above: Center Director Chris Scolese discusses his career inspirations with employees during a Maniac Talk on June 28.

Photo credit: NASA/Goddard/Bill Hrybyk



# EMPLOYEES GO GREEN TO SAVE POLLINATORS

By [Emily Bach](#)

**F**rom beehives to pollinator gardens, NASA employees are buzzing with excitement about their new pollinator-friendly projects at NASA's Goddard Space Flight Center. Their work comes after a long series of declines in pollinator populations across the globe.

Entomologists consider habitat changes, pesticide use and new diseases to be the chief factors for the drop nationwide, and Maryland's bees seem to be uniquely affected. A University of Maryland study reported that nearly 55 percent of the state's hives were lost in 2017 alone, compared to the national average of 33.2 percent. The decline has prompted some center employees to look for ways to conserve and grow honeybee and other pollinator populations.

For bee enthusiasts like Thomas Hanyok, chief engineer with the Goddard Satellite Servicing Projects Division, the mission is more than just business. He started hives at a community garden as a hobby, saying that an assignment in elementary school introduced him to the field. Years later, he rediscovered his passion for beekeeping and decided to start his own project at Goddard.

Since then, other beekeepers have joined in as well, and Hanyok's hives have turned a hobby into a small community. He now works alongside three other scientists, and together they've learned the ropes of beekeeping, which Hanyok said is both a complicated and expensive hobby. Just starting out, he spent nearly eight months on paperwork and \$1,000 of his own money on equipment.

Hanyok isn't the only Goddard employee dedicating time to save threatened pollinators. Environmental Engineer Janine Pollack and Environmental Protection Specialist Darlene

Squibb have turned a former garden bed containing a hodgepodge of species into a thriving ecosystem.

Pollack and Squibb reached out to native plant expert Sara Tangren, and the three determined that a meadow would provide important benefits for bees, monarchs and other native pollinators. Pollack says utilizing plants like the narrow-leaf mountain mint has allowed Goddard's meadow to be particularly successful, as they provide nectar sources that are difficult to find elsewhere.

Although the meadow's seemingly random combination of native grasses and wildflowers may not have the appeal of tightly manicured flower beds, these plants are particularly attractive to pollinators. "I think the meadow is beautiful, but I understand that other people might not. It's really about starting to get people to rethink what they consider pretty," Pollack said.

In the future, Hanyok said he hopes to grow his network of beehives at Goddard to accommodate more bees. Similarly, Pollack and Squibb said they hope to expand the meadows project to other locations at Goddard.

But regardless of what their futures hold in store, the three all said that their projects have already been rewarding. "The meadow has taught us a lot about our environment that I don't think we ever would have learned otherwise," said Pollack. ■

Above: One of Thomas Hanyok's hives hosts hundreds of honeybees at Goddard.

Photo credit: NASA/Goddard/Emily Bach

# A TRANSFORMATIONAL EXPERIENCE: OPSPARC WINNERS COME TO GODDARD

By [Jessica Merzdorf](#)

The winners of NASA's 2018 OPTIMUS PRIME Spinoff Promotion and Research Challenge, or OPSPARC, gathered at NASA's Goddard Space Flight Center from June 13-14 to take behind-the-scenes tours, meet some of Goddard's top scientists and receive awards from Peter Cullen, the voice actor for OPTIMUS PRIME in the TRANSFORMERS shows and movies.

Challenge participants – elementary, middle and high school students from the United States and Canada – are instructed to submit innovative spinoff ideas for products to make the world a better place by adapting existing NASA technology. The challenge uses the iconic TRANSFORMERS character OPTIMUS PRIME as its spokesperson because, like OPTIMUS PRIME, NASA spinoffs are first designed for space applications and then change to new forms in order to accomplish different objectives. The theme for the challenge is “Be the Spark,” tying the TRANSFORMERS brand creatively into the innovation process.

More than 3,100 students in grades 3 to 12 registered to submit “Glogs,” or digital poster boards that explained their designs, processes and inspirations. This year's winning designs were inspired by NASA technologies such as adapting aerogels, ultralight insulating materials derived from gels, to prevent fires at drilling sites; electric field imaging to help scan soil for diseases and pests; and repurposing algae as food and fertilizer.

Middle and high school participants also had the option to take their designs a step further by creating 3D models in a virtual space for the 2018 OPSPARC InWorld challenge, which is co-administered by the National Institute of Aerospace (NIA). NIA used NIAUniverse, a copyrighted 3D multiuser gaming platform, to allow the students to collaborate with peers, college mentors and NASA subject matter experts while developing spinoff technologies inspired by the James Webb Space Telescope. The winning high school team for the InWorld phase designed a refrigeration technology that cools food by using thermoacoustics, which uses cooling properties generated by intense sounds. The winning middle school team also designed a portable refrigeration technology for use in places without access to electricity.

“The students are learning the real application of the science and math that they're studying,” said Sharon Bowers, director of NIA's Center for Integrative STEM Education and program manager for the InWorld challenge component. “They learn creative thinking, critical thinking and teamwork. All of these skills will serve them well as they move into the workforce.”

Challenge winners got the opportunity to see the world's first fan-made, full-scale replica of the OPTIMUS PRIME semi-truck. The truck, owned by TRANSFORMERS fan Joe Fiducia, is identical to the OPTIMUS PRIME truck used in the movie “TRANSFORMERS: Age of Extinction.” Second- and third-place OPSPARC winners were also invited to join in the awards ceremony, which featured guest speakers, science demonstrations and goodies from Goddard's OPSPARC partners – Mad Science, TOR Teen, Discovery Education and Hasbro. Winners were presented their awards by Peter Cullen, Hasbro representatives from the TRANSFORMERS brand team and representatives from the Goddard Strategic Partnerships Office.



Founded in 2010, OPSPARC went international for the first time in 2018 with the inclusion of students from Canada. Winners are selected based on their ability to demonstrate their understanding of the spinoff concept, the engineering design process, the science behind the technology and the feasibility of their spinoff concept. The finalists' entries were also posted on social media to garner public votes in order to create broader awareness, for which the NASA challenge judges may award bonus points to a submission's score before making final selections.

“It's been truly gratifying to watch OPSPARC grow and evolve,” said Darryl Mitchell, OPSPARC program manager. “This year, we expanded into Canada with help from Mad Science. For 2019, we plan to expand even further with the inclusion of students from the United Kingdom. We've seen students go on to become college mentors for the challenge, as well as NASA interns. It's exciting to be part of something having a positive impact on so many students' lives.” ■

Center: Winners of the 2018 OPSPARC challenge pose with Peter Cullen (center), voice actor for OPTIMUS PRIME in the TRANSFORMERS shows and movies.

Photo credit: NASA/Goddard/Samantha Kilgore

# NASA'S MOST TECHNICALLY COMPLEX SPACE OBSERVATORY REQUIRES PRECISION

By [Thaddeus Cesari](#)

The James Webb Space Telescope is one of the most ambitious and technically complex missions NASA has ever set its focus upon. Building an infrared observatory of this magnitude, power and complexity has never been attempted before. In order to ensure seamless operation in space, the cutting-edge technology incorporated into Webb must be rigorously tested prior to launch.

The entire design of the Webb telescope took years to develop and was specifically engineered to see more of the cosmos than ever before. It required hundreds of scientists, engineers, optics experts and others to pool their knowledge in a way that had never been done. Relying on the teamwork of three prominent space agencies – NASA, ESA (European Space Agency) and Canadian Space Agency – Webb has come to include more than 1,200 people worldwide to bring the world's newest and most powerful space telescope to life.

“When we first thought of Webb, it wasn't technically feasible. We had to succeed at inventing some things before we could build it, not unlike the Apollo program in this regard,” said Paul Geithner, deputy project manager – technical, at NASA's Goddard Space Flight Center.

Before construction of the telescope could even begin, scientists and engineers set out on the task of creating 10 new technological innovations the world had never seen. Known as “enabling technologies,” these advancements have been incorporated into Webb and will pave the way for it to become the most capable scientific observatory ever built. At nearly 100 times the power of its scientific predecessor, the Hubble Space Telescope, Webb is expected to reveal a wealth of information about where we came from and how planets and stars form, and it will also be used to perform detailed analyses of planets in both our own solar system and elsewhere out in the cosmos.

A revolutionary lightweight carbon-composite material, capable of maintaining its rigid shape to 1/10,000th the width of a human hair at temperatures near absolute zero, forms Webb's backplane and science instrument support structures. This new material offers exceptional load-bearing capability while also experiencing very little thermal expansion and

contraction in the extreme temperatures of space. Webb's mirror segments began as beryllium ore mined in Utah. They crisscrossed the United States to be formed, light-weighted, polished, gold-coated, and finally, perfectly placed on the backplane structure with the help of a robotic arm.

“From an engineering perspective, Webb is extraordinarily difficult. The science means it has to be big, in space, and half of it has to be super cold. This means we had to design it to fold up for the ride into space, then have it unfold flawlessly by remote control,” said Geithner. “It also requires that we build the cold optics part exactly wrong, in gravity and air at room temperature, so that it will be exactly right – the right size and shape – when it's weightless in the vacuum of space operating at temperatures so cold that air turns solid.”



A global team of technicians, engineers and scientists collaborated on building and testing this revolutionary telescope. Beyond the spaceflight hardware, the Webb mission required the construction of assembly structures to piece together the telescope, the use of test facilities to ensure each component is ready for the rigors of spaceflight, transportation enclosures to send it around the country for service, engineering copies called pathfinders and even a miniature “test-bed” telescope.

To ensure Webb and all of its new technology will function as expected in space, NASA intentionally exposes spacecraft to extreme temperatures in a massive cryogenic chamber known simply as “Chamber A” in Houston. Ground-testing to simulate launch-induced vibration or to investigate structural strength has also proven to be vital in developing a successful spacecraft. In order to be certain to evaluate all aspects of structural dynamics – including vibration, vibroacoustics, modal characteristics, sound transmission loss and shock-testing – Webb has been bombarded by a long litany of tests, shaking, freezing and retesting. ■

Center: Goddard engineers work on the James Webb Space Telescope.

Photo credit: NASA/Goddard/Maggie Masetti



# THE SPACE COMMUNICATIONS PIONEERS WHO PROMPTED 35-YEAR TDRS SUCCESS

By [Ashley Hume](#) and [Clare Skelly](#)

In the early days of the nation’s space program, NASA astronauts and spacecraft in low-Earth orbit could only communicate with mission controllers during a limited duration of each orbit. Spacecraft had to be in view of a ground antenna to send and receive data. This limited science data return and heightened the risk of human spaceflight, necessitating a better way to communicate.

In the late 1960s and early 1970s, Goddard civil servants rose to this challenge, resulting in the creation of the Goddard-managed Space Network – a constellation of geosynchronous satellites called the Tracking and Data Relay Satellites (TDRS).

The first TDRS satellite launched in 1983, providing NASA an exponential increase in data rates and communications capabilities with space shuttles and other orbiting spacecraft, such as the Hubble Space Telescope.

The innovative thinking, pursuit of technical excellence and can-do spirit of two Goddard space pioneers took the Space Network and its TDRS constellation from yesterday’s dream to today’s reality. Edmund Habib and John Schwartz, among others, helped develop the TDRS concept, mature many of the required technologies and ultimately establish a communications system that would remain an agency asset for decades.

Habib started his career at the Naval Research Laboratory in the District of Columbia and helped develop Minitrack, the first U.S. satellite tracking network. It was used for Sputnik, Vanguard, Explorer and other early satellites. Schwartz matured the original TDRS concept to the point at which it could become an official project. He then served as the first mission systems engineer for the TDRS project, greatly contributing to the vision and design of the TDRS system.

Habib and Schwartz were recognized by center management at the Robert H. Goddard Honor Awards ceremony in May.

“Their contributions shaped the way NASA communicates with its astronauts and spacecraft, made space exploration safer and more productive and, as a result, enhanced the knowledge of all humankind,” said George Morrow, Goddard deputy center director, at the ceremony.

More than three decades after the first TDRS satellite set into orbit, NASA has continued to expand the TDRS constellation and advance spacecraft capabilities.

TDRS-13 launched in August 2017 and took its place in the Space Network as the final third-generation TDRS spacecraft. With its addition, the network has a record of 10 operational satellites in the space-based fleet, relaying signals from more than 40 missions with nearly 100 percent communications coverage. ■

Above: Edmund Habib (left) and John Schwartz pose with the awards they received from the Robert H. Goddard Awards ceremony. Photo credits: NASA/Goddard/Bill Hrybyk

Below: Center Director Chris Scolese (right) addresses Habib, Schwartz and others during a special awards reception. Photo credit: NASA/Goddard/Bill Hrybyk





# SCIENCE JAMBOREE CONNECTS DISCIPLINES AND INTERNS

By [Emily Bach](#)

**F**inding Earth scientists, astrophysicists and heliophysicists isn't difficult to do at NASA's Goddard Space Flight Center, but it's not every day you can encounter hundreds of them at one time in the same place. The Goddard Science Jamboree, held on July 25, provided an opportunity for interns and senior scientists alike to learn more about the science happening in other disciplines in one room.

Presentations covered a variety of subjects, from exoplanets to Parker Solar Probe. Many featured ongoing or future Goddard missions. Scientist and educator Troy Cline said the event helps employees showcase what they're working on. "Education technology is an emerging medium, which makes educating the public and getting other people involved in what we're doing really important," he said. "The Science Jamboree is a great place to do just that."

The event also fosters collaboration across different scientific disciplines. The Goddard Showcase, a space devoted solely to networking, featured scientists from additional Goddard organizations, including the Citizen Science Task Group, the Goddard Engineering and Technology Directorate, and more.

Scientists Shawn Domagal-Goldman and Avi Mandell said the jamboree helps build a team to search for life on exoplanets. "Because the project is really difficult, we need a team full of smart people to be successful. That's why we're at the Science Jamboree – to find those people," Domagal-Goldman said.

For some interns, the jamboree was also a good time to hear about science subjects outside of their departments and meet new people. "I think the event is amazing because it teaches me about different areas of science that I didn't even know

we're involved in," said high school intern Evan Ruderman. "I've met so many humble and interesting people. It makes me feel like a part of this community and excited for the future." ■

Above: Interns Tamsyn Brann (left) and Rachel Broemmel-siek discuss heliophysics missions at the Science Jamboree. Photo credit: NASA/Goddard/Emily Bach

Below: Science Jamboree attendees gather to hear a presentation about the Transiting Exoplanet Survey Satellite. Photo credit: NASA/Goddard/Jay Friedlander





Joshua Grodin

Code 565, Computer Engineer

Why Goddard?: To take on more challenges and assume more of a leadership role.

Hobbies/interests: golf, softball



Jocelyn Wilkins

Code 596, Student Trainee

Why Goddard?: I want to be a part of all the great science and engineering.

Hobbies/interests: reading, improving handwriting, baking



Raymond Ferrer

Code 582, Computer Engineer

Why Goddard?: To be a part of exciting projects.

Hobbies/interests: playing tennis with family



Kaitlyn Ryder

Code 561, Pathways Intern

Why Goddard?: I get to help NASA explore the universe.

Hobbies/interests: reading, painting, video games



Amanda Trang

Code 564, Pathways Intern

Why Goddard?: I want to take my academic experience and apply it to something innovative and challenging.

Hobbies/interests: video games, music, dogs



Matthew Daehn

Code 564, Pathways Intern

Why Goddard?: I believe in NASA's mission and its ability to unite, inspire and excite people.

Hobbies/interests: sailing, concerts, hiking



Sharon Braha

Code 427, Resources Analyst

Why Goddard?: I love NASA!

Hobbies/interests: audiobooks, road trips

# EMPLOYEE SPOTLIGHT

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



# DOWNLINK SESSION BRINGS NASA ASTRONAUT RICKY ARNOLD BACK DOWN TO EARTH

By [Ciana Cain](#)

The International Space Station orbits hundreds of miles above Earth, but the astronauts aboard are able to keep in touch with people down on the home planet by participating in downlinks – video and audio signals sent through NASA’s Tracking and Data Relay Satellites.

Local summer campers and guests gathered at the Goddard Visitor Center on July 11 for the opportunity to speak with Ricky Arnold – a NASA astronaut from nearby Bowie, Maryland – who is currently aboard the orbiting laboratory as part of Expedition 56. These downlink events, held frequently across the United States, allow participants to engage via video in a live question-and-answer session with the crew and learn what life is like aboard the space station.

“It was really exciting to talk to an astronaut in orbit. Not too many people get the opportunity to do what I did,” said Christopher Salley, an incoming freshman at the University of Maryland, Baltimore County.

Organized by the Goddard Sciences and Exploration Directorate, the event was part of NASA’s Year of Education on Station, an initiative in which former teachers who are now astronauts share their love of STEM and passion for teaching.

“This was an out-of-this-world STEM experience,” said Trena Ferrell, Goddard Earth science education and outreach lead as well as organizer of the event. “I really hope we inspired the next generation of astronauts, scientists and engineers.”

Questions ranged from the physiological impacts of space to the differences astronauts experience in daily routines.

“After you’ve been in space for a while, how does your body feel when you come back to Earth?” asked one attendee.

“I felt really heavy and really dizzy the last time I landed, and I was only in space for a couple weeks,” Arnold responded, referencing his first spaceflight aboard space shuttle Discovery in March 2009. “I’m kind of anticipating the same thing this time,

but I’ve been up here a little longer. I could imagine the adjustment after this mission will probably be in a matter of weeks.”

“How do you shower in space?” asked another participant.

“We do have access to water. Inside this bag is a towel and some soap,” said Arnold, pointing to one of the astronauts’ amenities. “We have to hook this up to a water dispenser and fill it with warm water. We use a wet towel to wipe off with.”

“What food do you eat, and how does it taste different in space?” inquired another.

“Similar to what the military eats when they’re deployed, we have meals ready to eat,” explained Arnold. “We add water and warm it up. It tastes the same here as on Earth. We’ve been here almost 200 days. We get to sample a lot of things.”

Former NASA astronaut Paul Richards, who flew aboard space shuttle Discovery in March 2001, attended the downlink event and provided further insight into the spaceflight experience and working at the agency.

“I hope those in attendance take away a passion to constantly learn, whether it’s STEM or not STEM,” said Richards, who currently works as a technology manager at NASA Headquarters in Washington. “Hopefully, they continue to learn and find ways to contribute to society from that learning.”

The 20-minute session concluded as Arnold waved goodbye and demonstrated a microgravity trick, pushing off a foot restraint and floating toward the space station ceiling. The audience clapped as the screen turned black, with Arnold heading off to further explore what space has to offer. ■

Above: NASA astronaut Ricky Arnold (pictured on screen) addresses attendees at the Goddard Visitor Center during a downlink session for the International Space Station.

Photo credit: NASA/Goddard/Bill Hrybyk

# GEWA'S SUMMER SOIREE, JUST AROUND THE BLOCK



From henna and hula hoops to giant telescopes and Giant Jenga, employees gathered at the Barney and Bea Recreation Center on June 21 to let loose during the Goddard Employees Welfare Association's second annual Block Party. ■

Photo credits: NASA/Goddard/Debora McCallum

# BECAUSE OF DANIEL: EMPLOYEE APPLIES SYSTEMS ENGINEERING TO CANCER RESEARCH

By Daniel S. Baird

**A**t age 11, space communications engineer Theresa Beech's son Daniel was diagnosed with osteosarcoma, the most common form of primary bone cancer and among the deadliest diseases for children and adolescents in the United States. While Daniel was in hospice care, Beech, attempting to save her son's life or at least prolong it, identified two drugs not used in osteosarcoma treatment. She convinced doctors to prescribe them, noting their ability to target genetic mutations in his tumor.

Doctors believe these drugs may have extended Daniel's life by up to six precious months.

While researching new drug treatments, Beech also began investigating the genetics of osteosarcoma tumors, applying her engineering skills to cell biology. Receiving data from parents of osteosarcoma patients through various online support forums, she compiled the largest osteosarcoma genomic and medical history data set ever.

Analyzing this data set as she would a communications network for vulnerabilities, Beech identified a gene – ROCK1 – that, when targeted with medication, might provide better outcomes for those suffering from her son's disease.

Beech has worked in the space communications commercial sector for more than 15 years. She recently came to NASA's Goddard Space Flight Center in October 2017, lending her expertise to the agency as product development lead for the Goddard Mission Services Evolution Center (GMSEC).

GMSEC provides ground systems support to NASA and other federal agencies, developing software that addresses common needs and building custom architectures afterward. GMSEC software provides missions of all sizes a robust ground system, and operators trained on the software have a series of common tools they can rely on across many missions. Additionally, GMSEC's approach standardizes many interfaces, making components and software systems cheaper and easier to replace.

Beech's background in network analysis gave her unique insight into the behavior of cancer cells. Traditionally, the cell

signaling process that informs cancer growth is thought of as a pathway, but Beech had a different idea.

"You have to understand that this was a completely crazy idea I came up with at 1 in the morning, a few months after Daniel died. I was depressed, grieving Daniel's death and deeply sleep deprived," said Beech. "I thought, 'What if cancer behaves like a network? Can I identify a choke point and exploit that vulnerability for treatment?'"

Beech identified that choke point by tracing microRNAs, which play a part in the regulation of gene expression, involved in osteosarcoma to the genes they impact. In her search, ROCK1 – a gene essential to osteoblast mineralization and therefore bone development – kept showing up.



Dr. Rosie Kaplan, a pediatric oncologist and researcher at the National Cancer Institute in Bethesda, Maryland, is now probing further into this connection. She believes a ROCK1-targeting drug, identified by Beech and typically used to treat heart disease and stroke, may work in osteosarcoma treatment because of how it impacts the tumor microenvironment. Early laboratory testing has shown that the drug can kill osteosarcoma cells.

Beech hopes to eventually get a clinical trial going so this drug, Fasudil – alone or in combination with traditional chemotherapy drugs – could become a viable treatment option.

"I would have done anything to save Daniel's life, but I couldn't. He died. Lots of kids die because this disease is deemed too difficult to treat," said Beech. "Our kids deserve better. If by using my engineering abilities I can help kids, then I feel I have to do that. As Emily Dickinson wrote, 'If I can save one heart from breaking, I shall not live in vain.'"

Beech continues her osteosarcoma research and advocacy through Because of Daniel, a nonprofit organization honoring her son's legacy by raising funds for osteosarcoma research, clinical trials and awareness. ■

Center: Theresa Beech (right) with daughter Sara Garcia-Beech and son Daniel.

Photo credit: Ryann Colleen