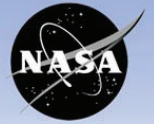


National Aeronautics and Space Administration



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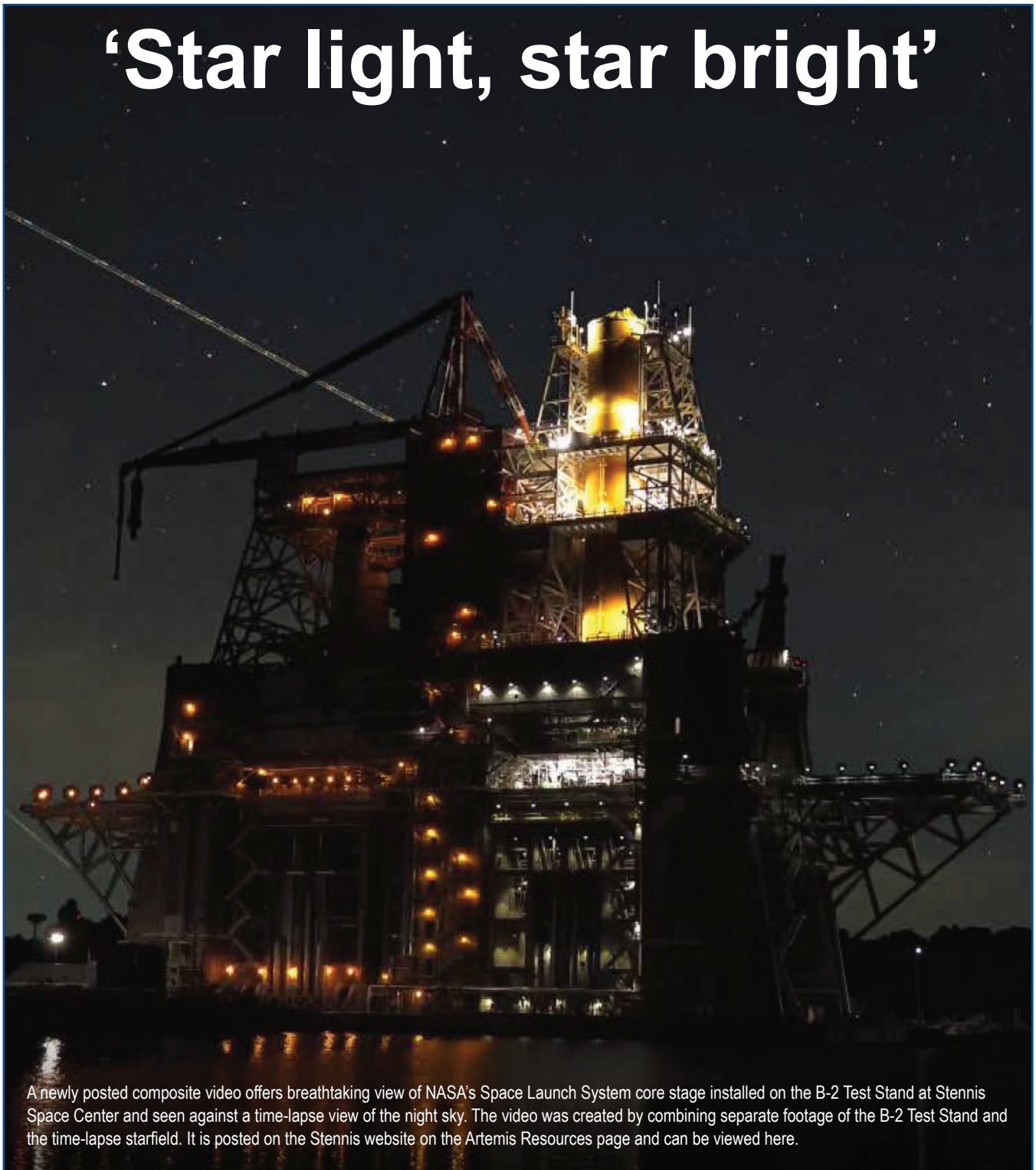
John C. Stennis Space Center

Volume 16 Issue 11

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November 2020

'Star light, star bright'



A newly posted composite video offers breathtaking view of NASA's Space Launch System core stage installed on the B-2 Test Stand at Stennis Space Center and seen against a time-lapse view of the night sky. The video was created by combining separate footage of the B-2 Test Stand and the time-lapse starfield. It is posted on the Stennis website on the Artemis Resources page and can be viewed [here](#).

My good friend Theopolis Turkey is making his annual visit once again. He wanders over from Alabama each year for a Thanksgiving getaway – as in he has to get away from all those folk anxious to have him over for dinner. Ark!

Theo arrived a bit early this year. I think he missed my secret recipe eggnog. Ark! As you would expect, eggnog and old friends have led to extended conversations. One day, I drove Theo out to Stennis to see the Space Launch System (SLS) core stage installed on the B-2 Test Stand for all of the Green Run systems tests.

At one point, I began listing the challenges of the year – COVID-19, adjusting to virtual work environment, multiple hurricanes and tropical systems, the roller coaster economic and political times. Given the approaching holiday, I concluded, “One thing I sure am thankful for is that 2020 is almost over.”

Theo was quiet as the late afternoon began its transition to evening. “I went for a long walk the day before I headed over,” he finally said, apropos to nothing we had been discussing but perfectly typical of our conversations that jump here, there and back to wherever.

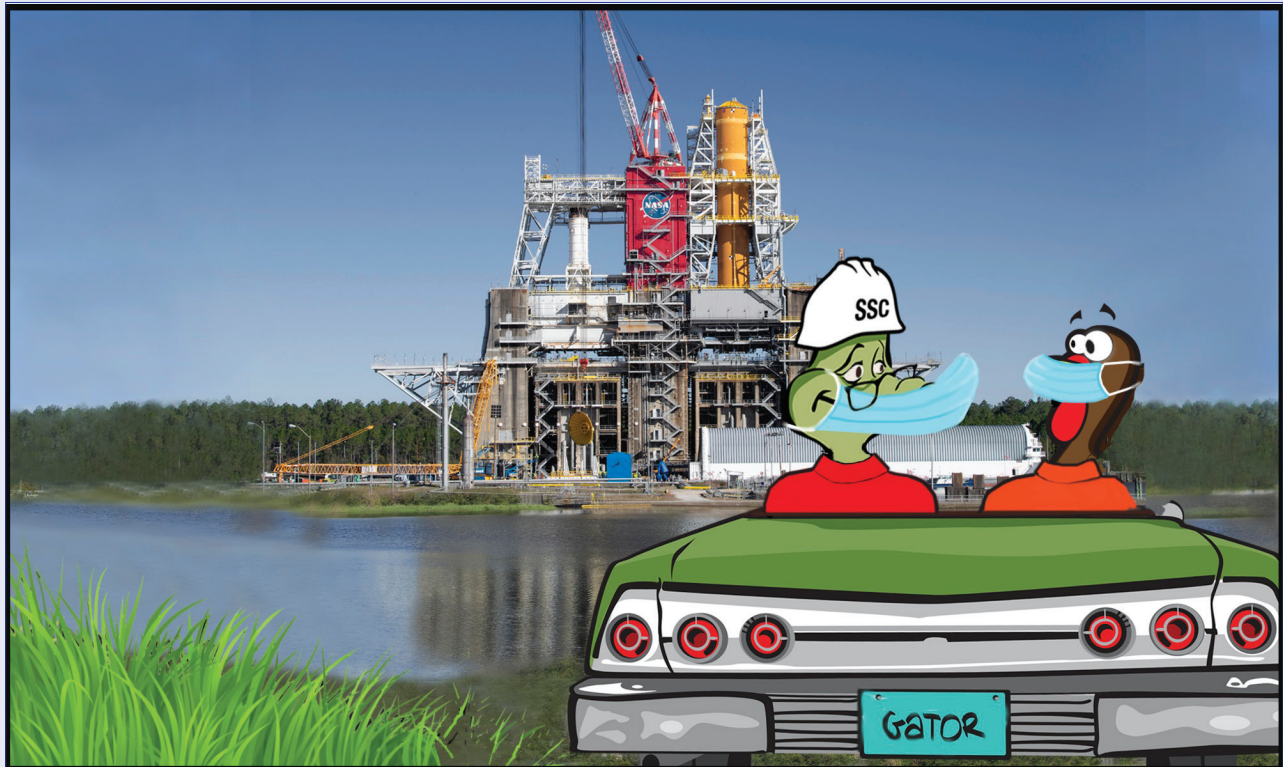
“It was a beautiful day, blue sky, not too hot,” Theo continued. “There was a nice breeze. I walked through the park, where people were biking and jogging. Some were sitting on benches and reading. I passed through the neighborhood and saw folk raking leaves or working in their flower beds. They all waved as I passed.

“I went by an elementary school as classes were let out for the day and saw the moms and dads waiting to meet their kids to go home. I ran into my mailman near the house. We greeted each other on the sidewalk, and I could tell he was smiling behind his COVID mask. All in all, it was a delightful walk.”

I sat silent before finally blurting, “And what does that have to do with anything I was saying?”

Theo turned to me, shrugged and said, “It’s just whenever I hear people complaining that life is hard, I wonder – compared to what?”

Trust Theo to provide perspective. Now, I need to revise the list of all I am thankful for this year. I have a feeling it is going to get pretty long. Enjoy your own “thanks-giving” – and save some eggnog for me. Ark!



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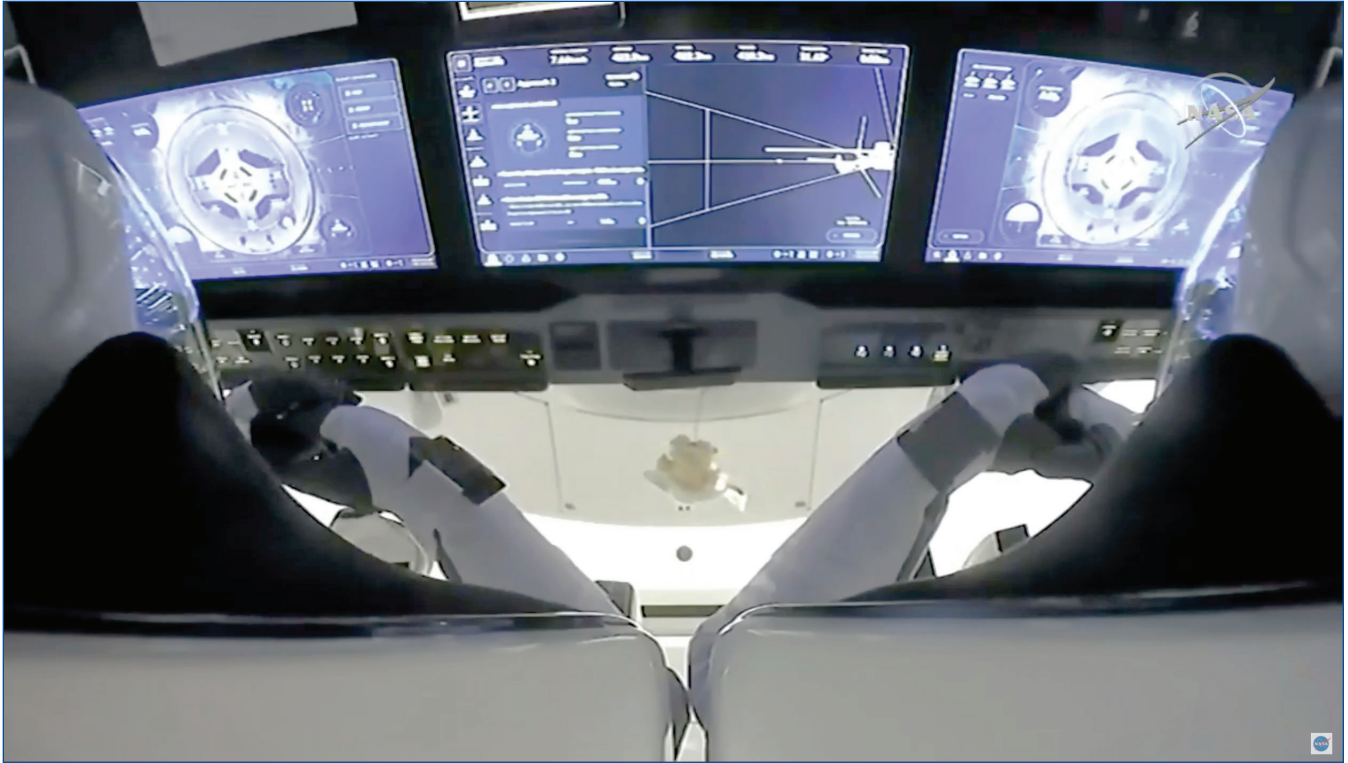
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NASA, SpaceX partner for historic crew mission



Crew-1 Commander Mike Hopkins (above photo, left) and Pilot Victor Glover watch their screens as the Crew Dragon Resilience approaches the International Space Station (ISS) just before docking on Nov. 16. Crew-1 launched on a SpaceX Falcon 9 rocket Nov. 15 (right photo) as the first NASA-certified commercial human spacecraft system in history. With their arrival at ISS, NASA astronauts Michael Hopkins, Victor Glover, and Shannon Walker, along with Soichi Noguchi of the Japan Aerospace Exploration Agency, begin a six-month science mission aboard the space station. "NASA is delivering on its commitment to the American people and our international partners to provide safe, reliable, and cost-effective missions to the International Space Station using American private industry," NASA Administrator Jim Bridenstine said. The mission is the first of six crewed missions NASA and SpaceX will fly as part of the agency's Commercial Crew Program. The mission has several firsts, including:

- First flight of the NASA-certified commercial system designed for crew transportation, which moves the system from development into regular flights.
- First international crew of four to launch on an American commercial spacecraft.
- First time the space station's long duration expedition crew size will increase from six to seven crew members, which will add to the crew time available for research.
- First time the Federal Aviation Administration has licensed a human orbital spaceflight launch.

For more on the mission and NASA's Commercial Crew Program, visit [here](#).



20 Years on International Space Station has led to significant advances on Earth

When the Expedition 1 crew of Commander William M. Shepherd of NASA, Flight Engineer and Soyuz Commander Yuri P. Gidzenko of Roscosmos, and Flight Engineer Sergei K. Krikalev of Roscosmos arrived at the International Space Station (ISS) on Nov. 2, 2000, they marked the start of an amazing chapter of history. Beginning with their mission, humans have occupied the ISS for 20 consecutive years. The uninterrupted operations have led to establishment of a world-class laboratory in space that has contributed to critical areas of daily life. Currently, members of Expedition 64 are aboard ISS, continuing cutting-edge and groundbreaking experiments and work. To commemorate the anniversary, NASA has created a special web page populated with articles, photographs and fact sheets. Access the page at: <https://www.nasa.gov/station20>. In addition, click on the images below to learn some of the amazing details and facts regarding the last 20 years.



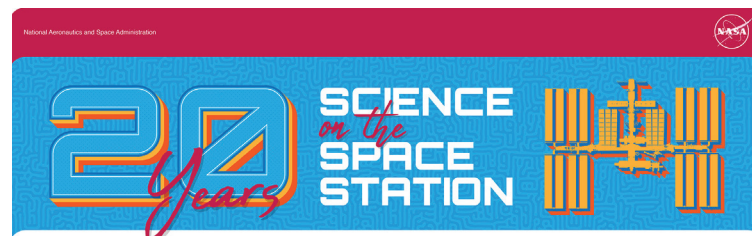
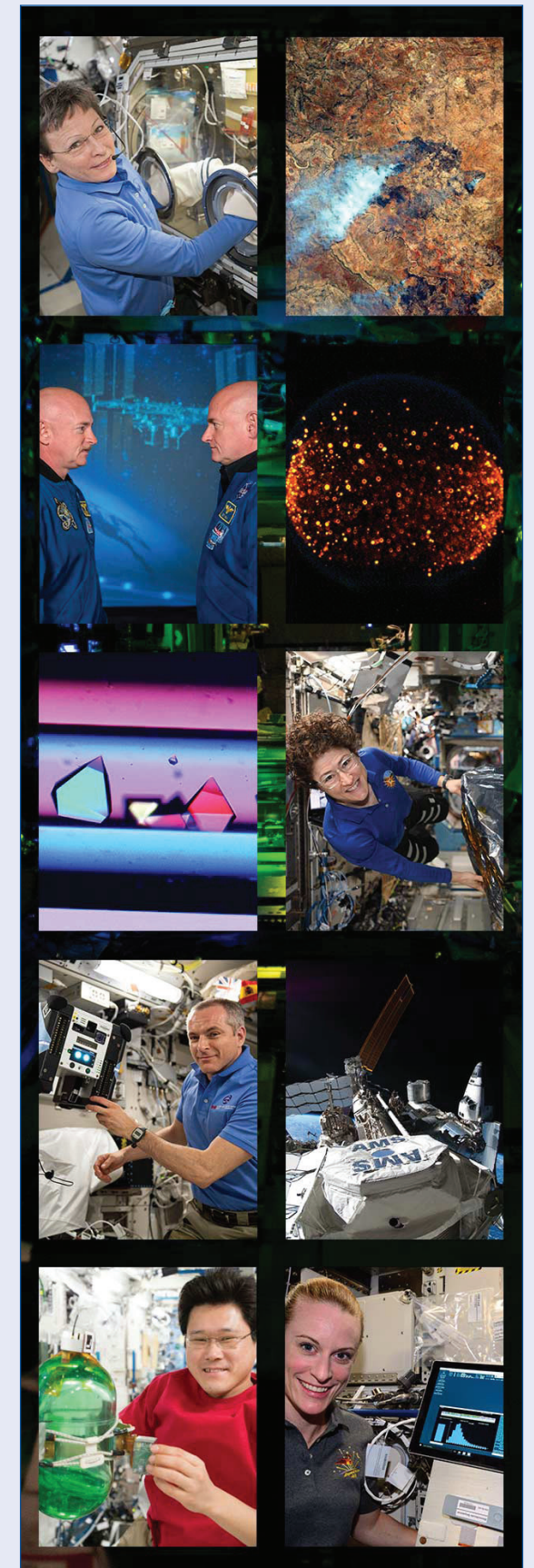
For 20 years, the astronauts aboard the International Space Station have conducted science in a way that cannot be done anywhere else. Orbiting about 250 miles above our planet, the space station is the only laboratory available for long-duration microgravity research.

During the past two decades, the space station has supported numerous discoveries, scientific publications, unique opportunities, and historic breakthroughs. This research not only helps us explore farther into space, it also benefits us back on Earth.

To mark 20 years of science, take a look at 20 scientific and technological breakthroughs we have achieved as a result of space station science.

Click on each breakthrough in the list below to learn more about it, why we conducted the research in microgravity, and why it matters.

- Fundamental disease research
- Discovery of steadily burning cool flames
- New water purification systems
- Drug development using protein crystals
- Methods to combat muscle atrophy and bone loss
- Exploring the fifth state of matter
- Understanding how our bodies change in microgravity
- Testing tissue chips in space
- Stimulating the low-Earth orbit economy
- Growing food in microgravity
- Deployment of CubeSats from station
- Monitoring our planet from a unique perspective
- Collecting data on more than 100 billion cosmic particles
- A better understanding of pulsars and black holes
- Student access to an orbiting laboratory
- Capability to identify unknown microbes in space
- Opening up the field of colloid research
- The evolution of fluid physics research
- 3D printing in microgravity
- Responding to natural disasters



The first research study was on protein crystal growth & started before humans began living on station.
Over 500 more crystal growth studies have been conducted since then, assisting with drug development on Earth.

More than 250 CubeSats have been deployed, accelerating the growth of the small satellite industry and expanding low-Earth orbit research.

More than 1,000 flames have been created during the FICMS experiments. What researchers learn from these flames could improve the use of combustion on Earth.

Astronauts have grown 8 different types of leafy greens in the Veggie facility aboard the station for the astronauts to eat. Learning to grow plants in space could help provide fresh food to astronauts during deep space missions.

Over 1,000 experiments have been conducted on station by more than 4,000 researchers from more than 100 countries.

More than 600 billion particles have been measured by the Alpha Magnetic Spectrometer-02, assisting with the search for dark matter.

10 million miles of DNA were involved in the Twins Study, which compared astronaut Scott Kelly during his year in space with his Earth-bound identical twin brother Mark, helping us better understand how humans adapt to space.

More than 950,000 students around the world have taken part in the Sally Ride EarthKAM program since it began in 2001. The program has captured more than 200,000 images of Earth from the space station. Over 6,000 U.S. schools have taken part in an EarthKAM mission, along with more than 4,000 international schools.

20 Continuous Years of Life on the Space Station
Celebrating the People and Scientific and Engineering Accomplishments of the International Space Station

The SPACE STATION is 357 FEET end to end, one yard shy of the full length of an American football field including the end zones.

240 INDIVIDUALS from 19 countries have visited the International Space Station.

16 EarthKAM cameras have captured more than 200,000 images of Earth from the space station.

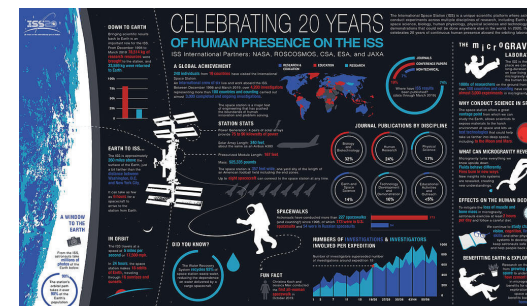
227 experiments have been conducted on station.

3,000 science investigations have been conducted on station.

4 Different ORBITING SPACECRAFT have been launched to study Earth from space.

1 Water Research Experiment Laboratory (WREST) has been launched to study water in space.

www.nasa.gov/station





New NASA posters feature cosmic frights

Just prior to Halloween, NASA released its latest Galaxy of Horrors posters. Presented in the style of vintage horror movie advertisements, the new posters feature a dead galaxy, an explosive gamma ray burst caused by colliding stellar corpses, and ever-elusive dark matter. As fun and creative

as all three posters are, they're based on real phenomena. Free to download, the posters were produced by NASA's Exoplanet Exploration Program Office, with the input of astrophysicists. They're also available in Spanish. Learn more and download the posters here.

NASA in the News

NASA restores contact with Voyager 2

On Oct. 29, mission operators sent a series of commands to NASA's Voyager 2 spacecraft for the first time since mid-March. The spacecraft has been flying solo while the 230-foot-wide radio antenna used to talk to it has been offline for repairs and upgrades. Voyager 2 returned a signal confirming it had received the "call" and executed the commands without issue. The call to Voyager 2 was a test of new hardware recently installed on Deep Space Station 43, the only dish in the world that can send commands to Voyager 2. Located in Canberra, Australia, it is part of NASA's Deep Space Network, a collection of radio antennas around the world used primarily to communicate with spacecraft operating beyond the Moon. Since the dish went offline earlier this year, mission operators have been able to receive health updates and science data from Voyager 2, but they have not been able to send commands to the far-flung probe, which has traveled billions of miles from Earth since its 1977 launch. The successful call to Voyager 2 is just one indication that repairs and upgrades are proceeding well and the dish will be back online in February 2021.

NASA prepared for sample return effort

NASA released an independent review report Nov. 10 indicating the agency is now ready to undertake its Mars Sample Return (MSR) campaign to bring pristine samples from Mars to Earth for scientific study. The agency established the MSR Independent Review Board to evaluate its early concepts for a groundbreaking partnership with the European Space Agency (ESA) to return the first samples from another planet. Following a review, the board concluded NASA is prepared for the campaign, which will require three space vehicles. The first, NASA's Mars 2020 Perseverance rover, is more than halfway to Mars following launch in July. It carries a sophisticated sampling system. Once on Mars, Perseverance aims to cache rock and regolith samples in its collection tubes. It then would leave some of them on the Martian surface for an ESA-provided "fetch" rover to collect and deliver to a NASA-provided Mars Ascent Vehicle, which then would launch the samples into orbit around Mars. An ESA-provided orbiter would then rendezvous with the samples in orbit around Mars and take them in a highly secure containment capsule for return to Earth in the 2030s.

For engineer, Stennis is like 'family working together'

Billy Davis grew up as a “space age” child. His earliest space-related memory is sitting in front of a black-and-white television to watch astronauts walk on the Moon.

In addition, as a native of Pearlington, Mississippi, the young Davis could hear the rocket engine and stage tests conducted at nearby [Stennis Space Center](#). He saw the footage of Saturn V stage tests at the NASA site.

After completing school, Davis asked an acquaintance who worked at Stennis if there were any openings on site. The friend told Davis about an entry-level position with a site contractors. Davis applied and began work with Sverdrup as an electro/mechanical technician in the Calibration Lab in 1989. Two years later, he moved to the test operations side of Stennis as a mechanical technician.

Thirty-one years later, Davis continues work as a site contractor, serving as operation manager/supervisor/engineer for the Cryogenic Storage Facility and the High Pressure Gas Facility. Both facilities provide critical support for propulsion test activities at Stennis.

“Essentially, we provide all the sasses and propellants (fuel) needed to test fire rocket engines and stages on site,” Davis explained.

When it comes to testing the core stage of NASA’s new [Space Launch System](#) (SLS) rocket on the B-2 Test Stand at Stennis, that responsibility looms large. The High Pressure Gas Facility has been modified to provide the large volumes of gases – nitrogen, hydrogen, helium and high-pressure air – needed for testing. The Cryogenic Storage Facility will provide the 733,000 gallons of liquid hydrogen and liquid oxygen needed during the wet dress rehearsal and hot fire test of the SLS core stage.

“Our main focus at this point is to make sure the team and all the equipment is in place and ready to go for wet dress and hot fire tests,” Davis said.

It is an exciting – even historic – time for Davis and others as the SLS core stage systems are activated and tested for the first time before an actual launch. “When I first started out here, Saturn V testing for the [Apollo Program](#) had ended and space shuttle main engines were already being tested,” Davis said. “This SLS testing represents a ‘first,’ so everyone here now will have their own place in the history books, just like those teams that tested the first Saturn stages and all of those space shuttle engines.”

Just as the Saturn V stages were used to fly historic missions to the Moon, the SLS is being built to make new history. It will return humans, including the first woman,

to new regions of the Moon through the [Artemis program](#) and, eventually, power missions to Mars.

Davis is proud not only to be a part of the moment but a part of the Stennis team working to make the moment successful.

“It is exciting to see all of the men and women I work with go above and beyond to everything they

can to support this core stage testing,” he said. “It’s like family working together.”

That family is now growing as younger engineers and technicians arrive on site. In addition to supporting ongoing work, Davis also is focused on helping the new employees transition into their roles so they will be ready to support future testing activity on site. “The future here at Stennis looks bright we get back into regular testing like we did in the space shuttle days and prepare to test the next generation of engines that may roll out,” he said.

Looking back, Davis counts his own tenure at Stennis as a blessing, which he credits both to his colleagues and his family. “I have had the opportunity to work with some of the best engineers and technicians here,” he said. “I learned something from each and everyone of them. But I will have to say my wife and kids have been my rock. They have supported me and my job and always understood when the job called.”



Billy Davis has worked at Stennis Space Center since 1989. He now serves as operations manager/supervisor/engineer for the Cryogenic Storage Facility and High Pressure Gas Facility.

Partnership effort leads to INFINITY Science Center



Note: NASA's John C. Stennis Space Center has played a pivotal role in the nation's space program. The following offers a glimpse into the history of the space program and the rocket engine test center.

In 2001, Stennis Space Center representatives Roy Estess and Myron Webb approached area business leader Leo Seal Jr. with a project – an education outreach and public awareness push for Stennis that would grab the attention of the already millions of families traveling Interstate 10 every year.

The Stennis project needed funding, and Seal was enthusiastic about its prospects. The project became known as INFINITY and was a multimillion dollar effort planned by MAST, Inc. (Mississippi Attraction for Science and Technology), a public-private partnership between NASA and a group of Mississippi businessmen, to develop and build the education center.

In January, 2004, Stennis Director Rear Adm. Thomas

Donaldson (USN, Ret.) announced an overall strategic plan for the center that included developing a national science, technology, and education center on Interstate 10 near the Mississippi Welcome Center.

The science center would bring science, technology, engineering, and mathematics to the people of south Mississippi and Louisiana, with primary focus on the school children of the area.

On Nov. 20, 2008, development and planning of INFINITY reached its first milestone, the official groundbreaking. “At a time when our nation faces a critical need for scientists, engineers, and technicians, INFINITY is designed to spark an interest in thousands of students of all ages,” Apollo 13 astronaut Fred Haise explained at the ceremony.

On April 11, 2012, the ribbon was cut and INFINITY Science Center opened its doors to the public. Through exhibits, school field trips, and camps, the 70,000-square-foot center inspires people of all ages, over 60,000 of them since the center opened.

Community leaders from Mississippi and Louisiana break ground for the new INFINITY at NASA Stennis Space Center facility during a Nov. 20, 2008, ceremony. The ceremonial event signaled the start of construction on the 72,000-square-foot science center designed to serve as a valuable resource for the next generation of scientists and engineers. Groundbreaking participants included INFINITY board member and Apollo 13 astronaut Fred Haise (third from left). The shovel and hard hat in the foreground were placed in memory of Seal, a Mississippi bank executive who served as chair of INFINITY Science Center Inc. from 2001 until his death in 2008.



Hail & Farewell

NASA welcomes the following:

Patrick Cullen

Supervisor, Management and Program Analyst

Office of the Chief Financial Officer

NASA bids farewell to the following:

Jeanne Koger

Attorney Adviser

Office of the Chief Counsel

Office of Diversity and Equal Opportunity

Why it is important to disclose one's disability

According to the Americans with Disabilities Act of 1990 (ADA) an individual with a disability is a person who: Has a physical or mental impairment that substantially limits one or more major life activities; has a record of such an impairment; or is regarded as having such an impairment.

This term should not be used to describe a person as weaker or lesser than anyone else! Every person has a purpose, uniqueness, and value, no matter what hurdles they may face.

For someone with an apparent physical disability, there is often a backstory to their disability that they may or may not choose to divulge. For example, someone who walks with a limp may have cerebral palsy, or have had some type of injury, or may use a prosthetic. The term "invisible disability" refers to symptoms such as debilitating pain, fatigue, dizziness, cognitive dysfunctions, brain injuries, learning differences, and mental health disorders, as well as hearing and vision impairments. These are not always obvious but can often limit daily activities and vary from person to person.

Creating a workplace inclusive to people with disabilities starts with knowing how many employees actually live with a disability (whether it is visible or invisible). Unfortunately, at most companies, only a small percentage of people who have a disability disclose this.

"The decision to formally disclose is a personal one that employees make on a case-by-case basis," said James Emmett, a disability inclusion expert and lead workplace strategist with Understood.

Employees with disabilities may be afraid of discrimination. They may worry that their relationships with co-workers will change, or that their manager will see them as less capable. They may be concerned about fewer opportunities for career advancement. Or, they may see no personal benefit to disclosing.

However, according to a Center for Talent Innovation report, people who disclose their disabilities are more than twice as likely to feel regularly happy or content at work as those who have not disclosed. And one study found that "a perception of inclusion impacts employees' reported job satisfaction, commitment, and productivity."

"When people feel comfortable bringing their whole self to work, their sense of well-being improves," Emmett stated. That kind of culture can lead to more collaboration and innovation."

Accommodations can help people with disabilities perform at their highest level. "You can't provide accommodations to the people who would benefit if you don't know who they are," Emmett said.

Similarly, organizations cannot leverage the unique perspectives and experiences of employees with disabilities if they are not visible.

Employers need to create a work environment where employees with disabilities feel safe enough to disclose their conditions. That happens when employees trust that their managers will not treat them differently and will help to better accommodate their needs. With the right support, employees with disabilities can perform their job at an optimal level.

Many federal employees have heard the phrase "reasonable accommodation," but its meaning is frequently misunderstood. A reasonable accommodation is any change made in the work environment to assist an individual with a disability to apply for a job, perform the essential functions of a job, or enjoy the benefits or privileges of employment.

NASA has a policy for providing reasonable accommodation(s) for qualified individuals with disabilities. NASA employees at Stennis who have questions or need more information about reasonable accommodations should contact their supervisor or Cecy Lewis, Disability Program Manager, Office of Diversity and Equal Opportunity at cecylewis@nasa.gov or 228-688-1020 or online [here](#).

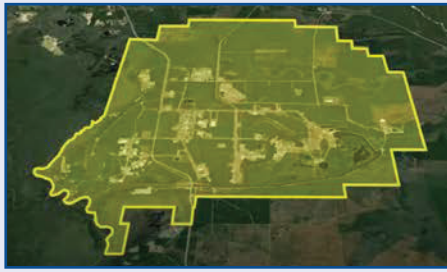
When employees with a disability feel accepted for who they are and are comfortable asking for accommodations, they are more productive, more engaged in their work, and better able to share unique perspectives. This makes for a workplace that is inclusive and better for everyone.

Sources: <https://www.understood.org/en/workplace/rights-at-work/disability-disclosure-how-your-company-benefits> and <https://invisibleabilities.org/what-is-an-invisible-disability>.

Online Resources

Stennis Emergency Management

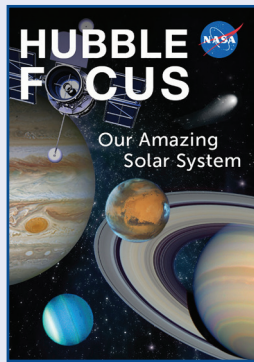
NASA Coronavirus Response



Stennis Virtual Tour



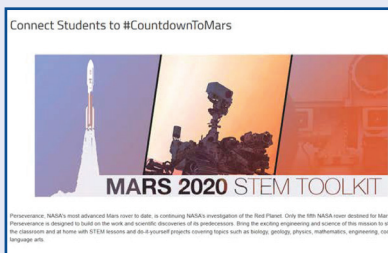
Stennis Fact Sheets



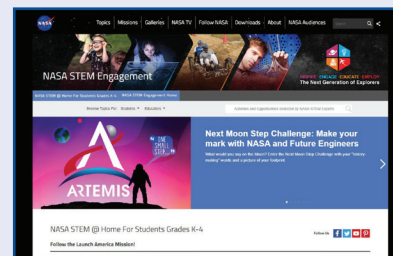
NASA E-Book Downloads



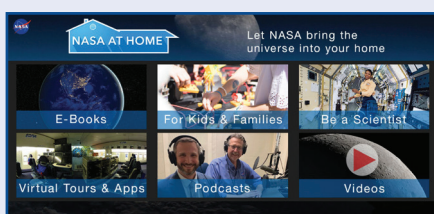
Stennis Artemis Resources page



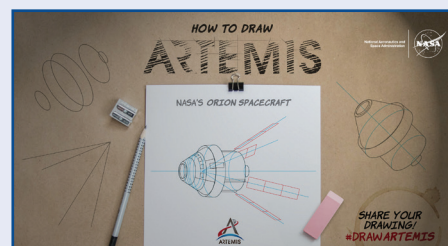
MARS 2020 STEM Toolkit



NASA STEM@Home for Students



NASA at Home



How to Draw Artemis