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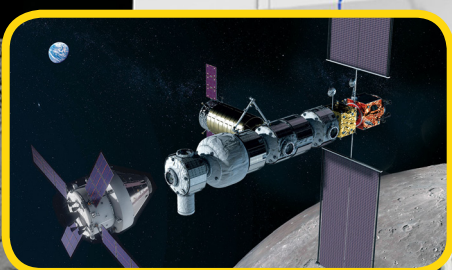
NEWSLETTER

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NASA Secures First International Partnership for Moon to Mars Lunar Gateway

The following is a statement from NASA Administrator Jim Bridenstine on the announcement Thursday by Canadian Prime Minister Justin Trudeau about Canada's support for the Gateway lunar outpost and deep space exploration:

"NASA is thrilled that Canada is the first international partner for the Gateway lunar outpost. Space exploration is in Canada's DNA. In 1962, Canada became the third nation to launch a satellite into orbit with Alouette 1.

"Today, Canada leads the world in space-based robotic capabilities, enabling critical repairs to the Hubble Space Telescope and construction of the International Space Station. Our new collaboration on Gateway will enable our broader international partnership to get to the Moon and eventually to Mars."

NASA.gov



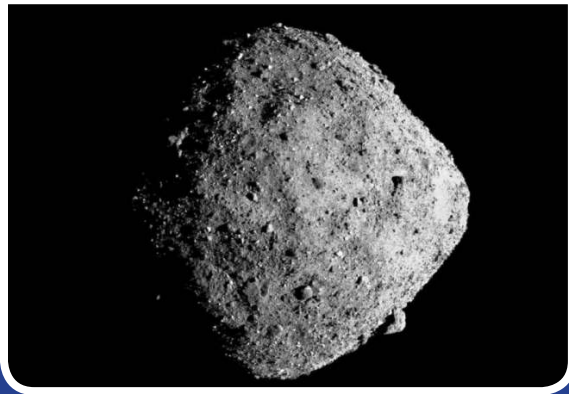
Japan Taps Toyota to Build Futuristic Moon Rover

Japan wants to build the ultimate moon rover for astronauts and has tapped Toyota to help develop a futuristic, off-road, lunar vehicle that could potentially launch in 2029.

The Japan Aerospace Exploration Agency announced Tuesday (March 12) that it is working with vehicle manufacturer Toyota to develop the moon rover of the future – a massive vehicle powered by fuel cells with a maximum range of a whopping 6,213 miles (10,000 kilometers).

JAXA and Toyota have been working together on the moon rover project since May 2018. Building the equivalent of a rugged sports utility vehicle for the moon comes with challenges, JAXA officials said.

Space.com



OSIRIS-REx Spies on the Weird, Wild Gravity of an Asteroid

Research led by the University of Colorado Boulder is revealing the Alice in Wonderland-like physics that govern gravity near the surface of the asteroid Bennu.

The new findings are part of a suite of papers published today by the team behind NASA's Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer (OSIRIS-REx) mission. And they come just three months after OSIRIS-REx first encountered Bennu on Dec. 3, 2018.

Since then, the spacecraft has completed a few dozen laps around the asteroid, which is about as tall as the Empire State Building, circling Bennu from a distance of about a mile. And those early circuits are giving scientists a whole new look at this mysterious rock, said CU Boulder's Daniel Scheeres, who leads the mission's radio science team.

In research appearing in *Nature Astronomy*, for example, his team reports the mass of that asteroid: a respectable 73 billion kilograms.

But Scheeres and his colleagues are also working to develop a map of the asteroid's gravitational pull. Their findings suggest that Bennu exists in a delicate balance between two competing forces, the result of the asteroid's wild spin. Bennu completes a full revolution about once every four hours.



Rehearsing for the Mars Landings in Hawaii and Idaho

Imagine astronauts on Mars, tasked with picking rock samples that will be used by scientists to search for signs of life. But they can only transport a limited number back to Earth. What should they look for? Are some types of rocks better than others? They could try to ask for advice from the team of geologists and biologists back on Earth, but due to the distance between Earth and Mars it could take roughly 40 minutes before they would receive a response. This isn't practical when time outside of the spacecraft can only last for a few hours. When humans are sent to Mars, it is important that these explorers have the support needed to help them do the best science possible.

How do we explore and do good science given necessary operational constraints? This is an important question that the National Aeronautics and Space Administration (NASA) and other space agencies, including the Canadian Space Agency, are interested in answering. Analogue missions on Earth help researchers understand how to do their jobs while faced with the many challenges that arise because of the hostile environment of space.

Mars on Earth

The Biologic Analog Science Associated with Lava Terrains (BASALT) research program explores

and collects samples from places on Earth that are analogous to Martian environments. Building off similar previous analogue studies in Canada and the U.S., the BASALT program operates under simulated Mars mission conditions. Merging scientific, technical and operational research objectives, the insights gained during two major analogue mission deployments are detailed in a special issue of the journal *Astrobiology*.

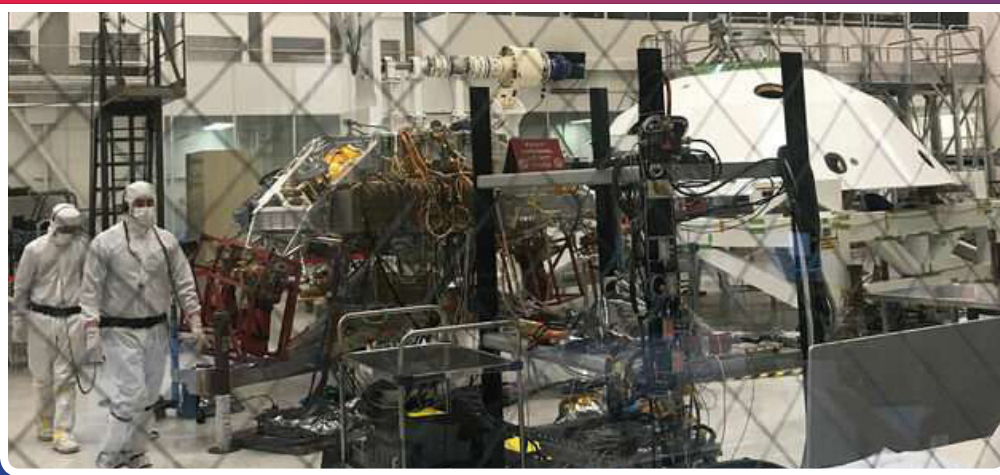
Communication time lag

Simulated EVAs were conducted in two Mars analogue environments: Hawai'i Volcanoes National Park and Craters of the Moon National Monument and Preserve in Idaho. Scientists think that early Mars once had volcanic activity that could have created the kinds of habitats that we know contain life on Earth.

Simulating the Mars environment

Planning a mission to Mars, even a simulated one, is no easy task.

First and foremost, the questions that guided the research were not simulated in any way: these were real questions asked about how microbes live in and interact with volcanic rocks. Deviations from sampling protocols or not collecting enough contextual data about the sampling sites would have consequences for the validity of the results.



NASA's Mars 2020 Rover is Put to the Test

Mars Express has revealed the first geological evidence of a system of ancient interconnected lakes that once lay deep beneath the Red Planet's surface, five of which may contain minerals crucial to life.

Mars appears to be an arid world, but its surface shows compelling signs that large amounts of water once existed across the planet. We see features that would have needed water to form – branching flow channels and valleys, for example – and just last year Mars Express detected a pool of liquid water beneath the planet's south pole.

A new study now reveals the extent of underground water on ancient Mars that was previously only predicted by models.

"Early Mars was a watery world, but as the planet's climate changed this water retreated below the surface to form pools and 'groundwater,'" says lead author Francesco Salese of Utrecht University, the Netherlands.

"We traced this water in our study, as its scale and role is a matter of debate, and we found the first geological evidence of a planet-wide groundwater system on Mars." Salese and colleagues explored 24 deep, enclosed craters in the northern hemisphere of Mars, with floors lying roughly 4000 m below martian 'sea level' (a level that, given the planet's lack of seas, is arbitrarily defined

on Mars based on elevation and atmospheric pressure).

They found features on the floors of these craters that could only have formed in the presence of water. Many craters contain multiple features, all at depths of 4000 to 4500 m – indicating that these craters once contained pools and flows of water that changed and receded over time.

Features include channels etched into crater walls, valleys carved out by sapping groundwater, dark, curved deltas thought to have formed as water levels rose and fell, ridged terraces within crater walls formed by standing water, and fan-shaped deposits of sediment associated with flowing water.

The water level aligns with the proposed shorelines of a putative martian ocean thought to have existed on Mars between three and four billion years ago. Mars Express was launched on 2 June 2003, and reached 15 years in space last year.

This study used observations from the High Resolution Stereo Camera (HRSC) on ESA's Mars Express, from NASA's High Resolution Imaging Science Experiment (HiRISE), and from the Context Camera aboard NASA's Mars Reconnaissance Orbiter. A digital terrain model was used based on data from the HRSC and NASA's Mars Orbiter Laser Altimeter.

SpaceX Is Finally Ready to Test Its 'Starship'

SpaceX is getting ready to go to Mars. Sending humans to the red planet is the company's ultimate goal, and this week it might be getting one step closer. According to reports, SpaceX might be planning to test their planet-hopping 'Starship' rocket very soon.

SpaceX's Starship is a futuristic concept that Elon Musk has claimed could carry 100 people on an interplanetary flight. When it's completed, it will be one of the largest rockets ever built, and could be the first spacecraft to bring humans to another planet.

But the Starship is still in its early stages, and before it brings anyone anywhere it has to be tested extensively. Since January, SpaceX has been ready for one of the more important of these tests: A prototype Starship will liftoff from a pad in Texas and travel several miles into the atmosphere. The launch will test everything from the engines to the heat shield to make sure the design is capable of everything Elon Musk envisions.

This test was supposed to happen in January, but a strong gust of wind knocked the rocket over when it was on the launchpad. That accident caused substantial damage to the rocket that has taken until now to repair. But according to a notice delivered to residents near the launchpad, those repairs are completed and SpaceX is looking to launch the rocket as soon as possible.

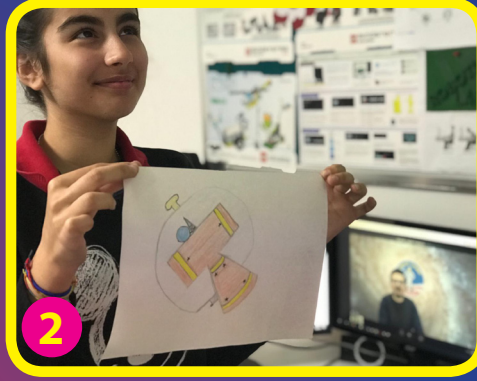
Schools in Action

Dear Followers,

We have been using our Videoconference Online Reservation System since November of 2018. Thanks to this online system, teachers can easily book their videoconference sessions. Up to this month, 165 videoconferences were booked using the system. This means we have conducted over 100 hours of videoconference sessions! We would like to take this opportunity to thank all the schools, teachers, and students that have participated in our programs for their great contribution and effort. We have witnessed some amazing creativity and restored hope for the future thanks to this wonderful young generation.



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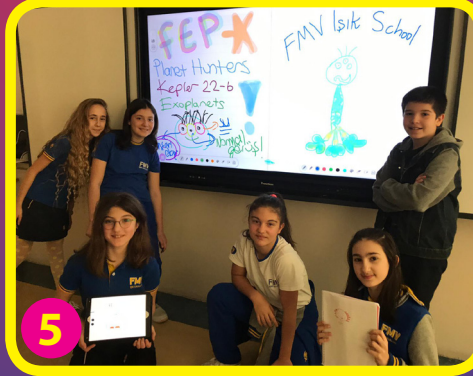
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1- Ekin College, IZMIR 2- Ismail Kaymak College, ÇANAKKALE 3- Tuzla Doğa College, ISTANBUL 4-Yane Sandanski Primary School, BULGARIA 5- FMV Nişantaşı, ISTANBUL 6- Bahçeşehir College, IZMIR

Astronomy Picture of the Day

Star Trails and the Equinox Sunrise

Stars trail and the Sun rises in this night and day composite panorama made on March 19. The view looks toward the eastern horizon from La Nava de Santiago, Spain. To create it, a continuous series of digital frames was recorded for about two hours and combined to trace the concentric motion of the stars through the night sky. A reflection of the Earth's rotation, star trails curve around the north celestial pole toward upper left and the south celestial pole toward the lower right. Of course on that day the Sun was near the celestial equator, a diagonal straight line in the wide-angle projection. A dense dimming filter was used to capture the Sun's image every two minutes. Superimposed on the star trails it rose due east in the morning sky. In the scene, foreground landscape and a local prehistoric monument were illuminated by full moonlight, though. The monument's corridor faces nearly to the east and the equinox sunrise.



apod.nasa.gov

Space Camp Turkey, Aegean Free Zone 35410 Gaziemir, Izmir / Turkey

Phone : +90 232 252 35 00 Fax : +90 232 252 36 00

Email: info@spacecampturkey.com

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