"One of the only ways to get out of a tight box is to invent your way out." Jeff Bezos


SPACE CAMP TURKEY
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# ASTRO NEWSLETTER

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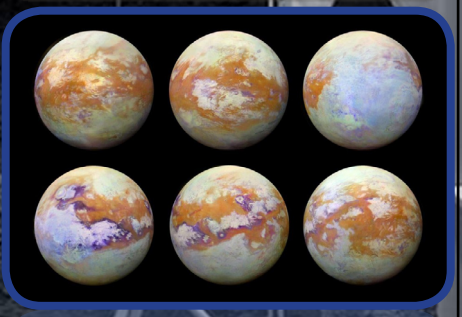


## Surprise 4,000-Mile 'Ice Corridor' Found on Saturn's Moon Titan

Although Cassini's mission ended in 2017, its data lives on, and planetary scientists continue to learn more about the history and surface features of this strangely Earth-like moon. The new technique is called principal components analysis (PCA), and it could be a game-changer for Titan-ophiles.

To test their new tool, the international team of researchers applied PCA to half of Titan's surface, from 30° S to 30° N. Once everything was correlated and indeed found to be accurate, the team was left with a hi-def distribution of water ice on Titan. And curiously, the authors write, it formed in a noticeable pattern. "Our PCA study indicates that water ice is unevenly, but not randomly, exposed across Titan's tropical surface. Most of the exposed ice-rich material follows a long, nearly linear, corridor that stretches 6,300 (kilometers)," or nearly 4,000 miles (6,400 km). That's about 40 percent of Titan's entire circumference.

*Astronomy.com*

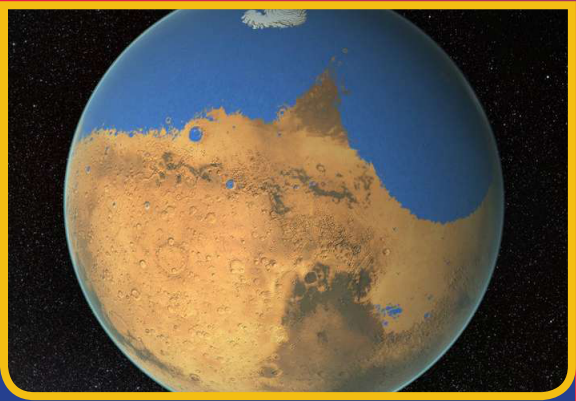



## Blue Moon: Here's How Blue Origin's New Lunar Lander Works

Blue Origin's billionaire founder, Jeff Bezos, revealed the company's plans to land a spacecraft named "Blue Moon" on the lunar surface. During an exclusive presentation here at the Walter E. Washington Convention Center on May 9th, Bezos laid out the details of Blue Moon and all the ways it can be used to explore Earth's natural satellite.

From new tech to possible crewed missions to the lunar surface, there's a lot to unpack from Bezos' presentation. Blue Moon bears some resemblance to NASA's old Apollo lunar modules, but there are some noticeable differences. The most obvious, aside from its sleeker design, is the enormous, spherical fuel tank with the words "Blue Moon" printed in big, blue letters on its side. Blue Moon is a relatively large lunar lander that's designed to deliver science payloads, moon rovers and even astronauts to the lunar surface.

*Space.com*



# New Water Cycle on Mars Discovered

Billions of years ago, Mars was a planet rich in water with rivers, and even an ocean. Since then, our neighboring planet has changed dramatically. Today, only small amounts of frozen water exist in the ground; in the atmosphere, water vapor occurs only in traces. All in all, the planet may have lost at least 80 percent of its original water. In the upper atmosphere of Mars, ultraviolet radiation from the sun split water molecules into hydrogen (H) and hydroxyl radicals (OH). The hydrogen escaped from there irretrievably into space. Measurements by space probes and space telescopes show that even today, water is still lost in this way. But how is this possible? The middle atmosphere layer of Mars, like Earth's tropopause, should actually stop the rising gas. After all, this region is usually so cold that water vapor would turn to ice. How does the Martian water vapor reach the upper air layers?

In their current simulations, the Russian and German researchers find a previously unknown mechanism reminiscent of a kind of pump. Their model comprehensively describes the flows in the entire gas envelope surrounding Mars from the surface to an altitude of 160 kilometers. The calculations show that the normally ice-cold middle atmosphere becomes permeable to water vapor twice a day—but only at a certain location, and at a certain time of year.

*Phys.org*

# NASA Crowns Winner in Mars Habitat Competition

What would life on Mars look like? NASA thinks it's getting one step closer to figuring it out. The Agency has awarded a combined $700,000 to the first and second-place teams in its 3D-Printed Habitat Challenge.

Self-described "multi-planetary architectural and technology design agency" AI SpaceFactory, based in New York, took first place with $500,000. A team of professors from Penn State finished in second with $200,000. AI SpaceFactory beat over 60 other teams in the finale of an ongoing competition that began in 2015. NASA ran the contest in conjunction with Bradley University of Peoria, Illinois, where the final challenges were held. For the On-Site Habitat Competition, teams had to autonomously print a one-third-scale habitat. This habitat had to be built from recyclables and materials that could be found on deep-space destinations, like the Moon and Mars.

Teams built their habitats in 10-hour increments as a panel of judges watched. Once complete, the structures were tested for material mix, leakage, durability and strength. "The final milestone of this competition is a culmination of extremely hard work by bright, inventive minds who are helping us advance the technologies we need for a sustainable human presence on the Moon, and then on Mars," says Monsi Roman, program manager for NASA's Centennial Challenges, in a press statement.

"We celebrate their vision, dedication and innovation in developing concepts that will not only further NASA's deep-space goals, but also provide viable housing solutions right here on Earth."

The winning design, named MARSHA, was built from a biopolymer basalt composite and "marks a radical departure from previous Martian designs typified by low-lying domes or buried structures," according to the winning team. Instead of building MARSHA to fight off gravity and wind, AI SpaceFactory designed it to combat internal atmospheric pressure and structural stresses. For the design firm, that means using a vertical container with a minimal footprint.

"It's light, and it's strong, like an airplane," says Lex Akers, Dean of the Caterpillar College of Engineering and Technology at Bradley University, in the press statement. "That's going to be very important for these types of habitats." Research shows architecture has an impact on human psychology, and any habitat on Mars would likely carry extra emotional significance due to its isolation, at least at first. That gives housing a responsibility to draw out a person's social tendencies.

*PopularMechanics.com*

# Brazilian Scientists Investigate Dwarf Planet's Ring

Discovered in 2004, Haumea is a dwarf planet located beyond Pluto's orbit in a region of the Solar System called the Kuiper Belt. Pluto was demoted from the category of fully fledged planets in 2006 because of the discovery of Haumea and other dwarf planets. Haumea was officially recognized as a dwarf planet in 2008. Its ellipsoidal shape resembles that of the ball used in rugby or American football. It has two moons and a ring. Because of its ring, Haumea is a member of a group of Solar System objects comprising the planets Saturn, Uranus, Neptune and Jupiter, as well as the asteroids Chariklo and Chiron, which orbit between Jupiter and Neptune.

Haumea's ring has never been directly observed. Its existence was inferred in 2017 by an international group of astronomers who took detailed measurements of the light fluctuations as Haumea occulted (passed in front of) a star. In space, an occultation occurs when one object passes in front of another from an observer's perspective.

"The light from the star was observed from Earth as the star was occulted by Haumea. Its brightness decreased as Haumea passed in front of it, enabling the astronomers to obtain information about Haumea's shape," said Othon Cabo Winter, Full Professor at Sao Paulo State University's Engineering School (FE-UNESP) in Guaratingueta, Brazil. The researchers who discovered the ring in 2017 suggested that its orbit around Haumea was very close to the 1:3 resonance region, meaning that ring particles make one revolution every three times Haumea rotates. A new study by Winter, Tais Ribeiro and Gabriel Borderes Motta, who belong to UNESP's Orbital Dynamics and Planetology Group, shows that a degree of eccentricity would be required for this resonance to act on the ring particles. According to Winter, the fact that the ring is narrow and practically circular prevents action by the resonance. However, the group identified a specific type of stable, almost circular, periodic orbit in the same region as Haumea's ring. A periodic orbit is an orbit that repeats over time.

"Our study isn't observational. We did not directly observe the ring. No one ever has," Winter said. The reason is that the ring is very tenuous and much too far-flung to be seen by the astronomic observatories here on Earth. The average distance between Haumea and the Sun is 43 times the distance between Earth and the Sun. In an article published in Monthly Notices of the Royal Astronomical Society, the researchers explore the dynamics of individual particles in the region where the ring is located.

*SpaceDaily.com*

# Our History in the Stars

Astronomers map the substance aluminum monoxide (AlO) in a cloud around a distant young star - Origin Source I. The finding clarifies some important details about how our solar system, and ultimately we, came to be. The cloud's limited distribution suggests AlO gas rapidly condenses to solid grains, which hints at what an early stage of our solar evolution looked like. Professor Shogo Tachibana of the UTokyo Organization for Planetary and Space Science has a passion for space. From small things like meteorites to enormous things like stars and nebulae - huge clouds of gas and dust in space - he is driven to explore our solar system's origins.

Minerals present in CAIs indicate that our young solar system must have been extremely hot. Physical techniques for dating these minerals reveal a fairly specific age for the solar system. However, Tachibana and colleagues wished to expand on the details of this stage of evolution. "Thanks to ALMA, we discovered the distribution of AlO around a young star for the first time. The distribution of AlO is limited to the hot region of the outflow from the disk. This implies that AlO rapidly condenses as solid grains - similar to CAIs in our solar system." explained Tachibana. The team now plans to explore gas and solid molecules around other stars to gather data useful to further refine solar system models.

*SpaceDaily.com*

## Schools in Action

Students are continuously coming up with incredible ideas. Their perseverance deserve admiration. Some of them are really excited and some of the others have an air of confidence. We truly believe some of those projects will become real in the future. Thank you all for the amazing projects you have made.




1- Bahçeşehir College, İZMİR 2- Hristo Botev School, BULGARIA 3- Samsun Final Collage, SAMSUN

# Astronomy Picture of the Day

### *Milky Way, Launch, and Landing*

The Milky Way doesn't look quite this colorful and bright to the eye, but a rocket launch does. So a separate deep exposure with a sensitive digital camera was used in this composite skyscape to bring out our galaxy's central crowded starfields and cosmic dust clouds. In the scene from Merritt Island National Wildlife Refuge, a nine minute long exposure begun about 20 minutes after the Miky Way image recorded a rocket launch and landing. The Falcon 9 rocket, named for the Millennium Falcon of Star Wars fame, appropriately launched a Dragon resupply ship to the International Space Station in the early morning hours of May the 4th. The plume and flare at the peak of the launch arc mark the rocket's first stage boost back burn. Two shorter diagonal streaks are the rocket engines bringing the Falcon 9 stage back to an offshore landing on autonomous drone ship.

*apod.nasa.gov*

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