Space News Update

— September 20, 2018 —

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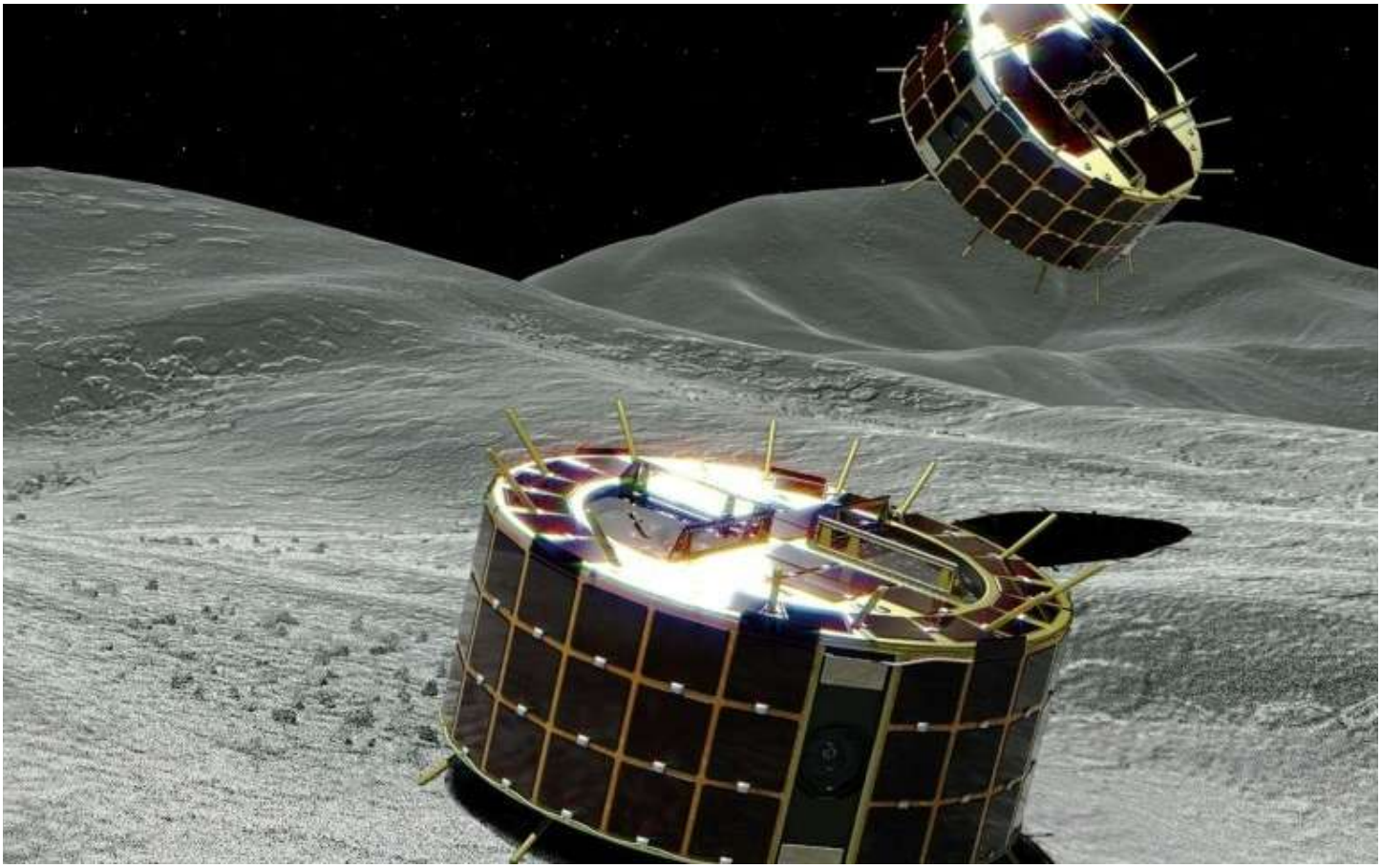
1. Japan Space Probe Drops Hopping Rovers Towards Asteroid



A Japanese space probe Friday released a pair of exploring rovers towards an egg-shaped asteroid to collect mineral samples that may shed light on the origin of the solar system.

The "Hayabusa2" probe jettisoned the round, cookie tin-shaped robots toward the Ryugu astroid, according to the Japan Aerospace Exploration Agency (JAXA).

If the mission is successful, the rovers will conduct the world's first moving, robotic observation of an asteroid surface.

Taking advantage of the asteroid's low gravity, they will jump around on the surface—soaring as high as 15 metres (49 feet) and staying in the air for as long as 15 minutes—to survey the asteroid's physical features with cameras and sensors.

So far so good, but JAXA must wait for the Hayabusa2 probe to send data from the rovers to Earth in a day or two to assess whether the release has been a success, officials said.

"We are very much hopeful. We don't have confirmation yet, but we are very, very hopeful," Yuichi Tsuda, JAXA project manager, told reporters.

"I am looking forward to seeing pictures. I want to see images of space as seen from the surface of the asteroid," he said.

The cautious announcement came after a similar JAXA probe in 2005 released a rover which failed to reach its target asteroid.

Next month, Hayabusa2 will deploy an "impactor" that will explode above the asteroid, shooting a two-kilo (four-pound) copper object into the surface to blast a crater a few metres in diameter.

From this crater, the probe will collect "fresh" materials unexposed to millennia of wind and radiation, hoping for answers to some fundamental questions about life and the universe, including whether elements from space helped give rise to life on Earth.

The probe will also release a French-German landing vehicle named Mobile Asteroid Surface Scout (MASCOT) for surface observation.

Hayabusa2, about the size of a large fridge and equipped with solar panels, is the successor to JAXA's first asteroid explorer, Hayabusa—Japanese for falcon.

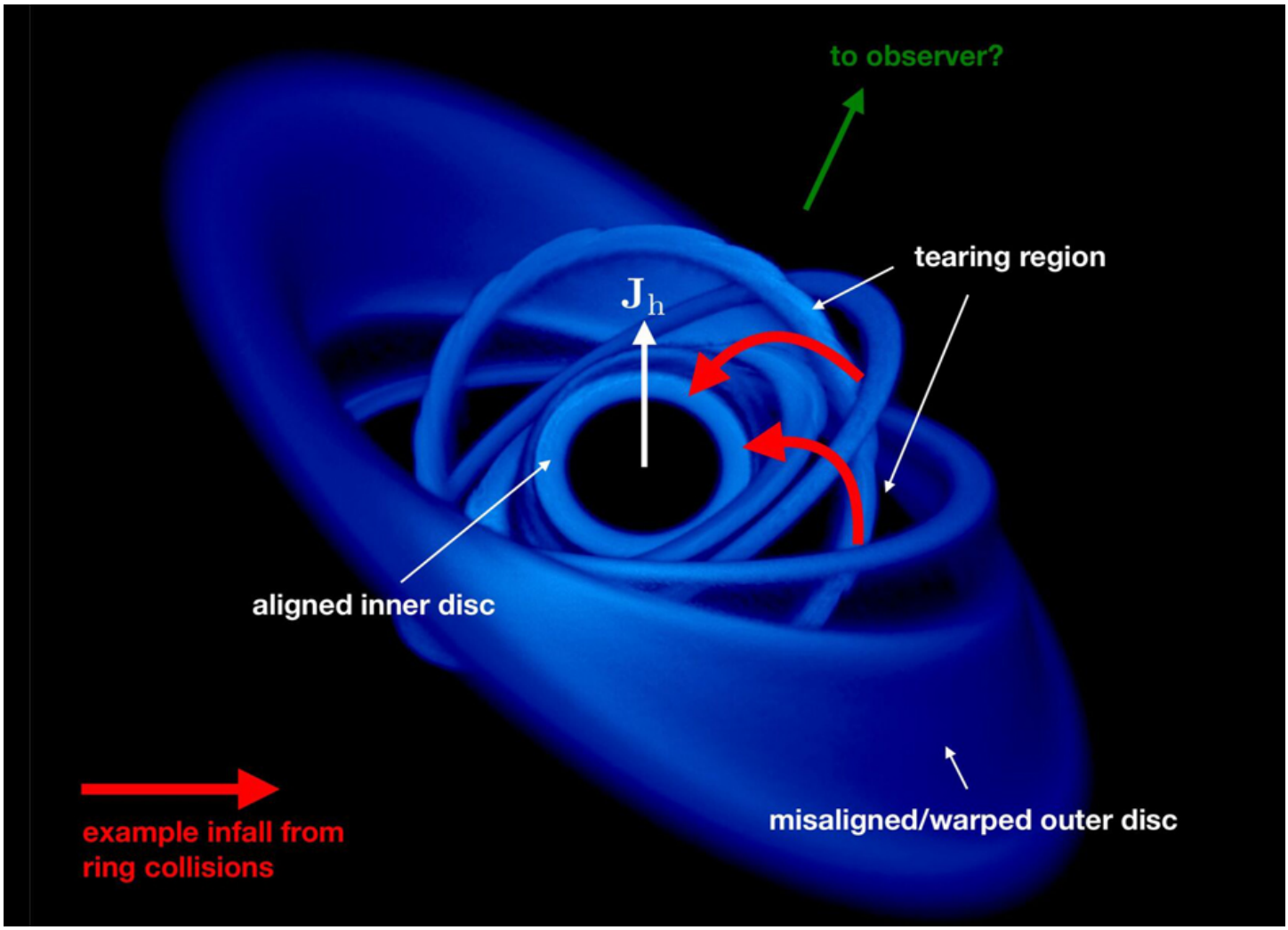
That probe returned from a smaller, potato-shaped, asteroid in 2010 with dust samples despite various setbacks during its epic seven-year odyssey and was hailed a scientific triumph.

The Hayabusa2 mission was launched in December 2014 and will return to Earth with its samples in 2020.

Explore further: Japan space probe reaches asteroid in search for origin of life

Source: Phys.org Return to Contents

2. Matter Falling Into Black Hole at 30% of the Speed of Light



A UK team of astronomers report the first detection of matter falling into a black hole at 30% of the speed of light, located in the centre of the billion-light-year distant galaxy PG211+143.

The team, led by Professor Ken Pounds of the University of Leicester, used data from the European Space Agency's X-ray observatory XMM-Newton to observe the black hole. Their results appear in a new paper in Monthly Notices of the Royal Astronomical Society.

Black holes are objects with such strong gravitational fields that not even light travels quickly enough to escape their grasp, hence the description 'black.' They are hugely important in astronomy because they offer the most efficient way of extracting energy from matter. As a direct result, gas in-fall -- accretion -- onto black holes must be powering the most energetic phenomena in the universe.

The centre of almost every galaxy -- like our own Milky Way -- contains a so-called supermassive black hole, with masses of millions to billions of times the mass of our Sun. With sufficient matter falling into the hole, these can become extremely luminous, and are seen as a quasar or active galactic nucleus (AGN).

However black holes are so compact that gas is almost always rotating too much to fall in directly. Instead it orbits the hole, approaching gradually through an accretion disc -- a sequence of circular orbits of decreasing size. As gas spirals inwards, it moves faster and faster and becomes hot and luminous, turning gravitational energy into the radiation that astronomers observe.

The orbit of the gas around the black hole is often assumed to be aligned with the rotation of the black hole, but there is no compelling reason for this to be the case. In fact, the reason we have summer and winter is that the Earth's daily rotation does not line up with its yearly orbit around the Sun.

Until now it has been unclear how misaligned rotation might affect the in-fall of gas. This is particularly relevant to the feeding of supermassive black holes since matter (interstellar gas clouds or even isolated stars) can fall in from any direction.

Using data from XMM-Newton, Prof. Pounds and his collaborators looked at X-ray spectra (where X-rays are dispersed by wavelength) from the galaxy PG211+143. This object lies more than one billion light-years away in the direction of the constellation Coma Berenices, and is a Seyfert galaxy, characterised by a very bright AGN resulting from the presence of the massive black hole at its nucleus.

The researchers found the spectra to be strongly red-shifted, showing the observed matter to be falling into the black hole at the enormous speed of 30 percent of the speed of light, or around 100,000 kilometres per second. The gas has almost no rotation around the hole, and is detected extremely close to it in astronomical terms, at a distance of only 20 times the hole's size (its event horizon, the boundary of the region where escape is no longer possible).

The observation agrees closely with recent theoretical work, also at Leicester and using the UK's Dirac supercomputer facility simulating the 'tearing' of misaligned accretion discs. This work has shown that rings of gas can break off and collide with each other, cancelling out their rotation and leaving gas to fall directly towards the black hole.

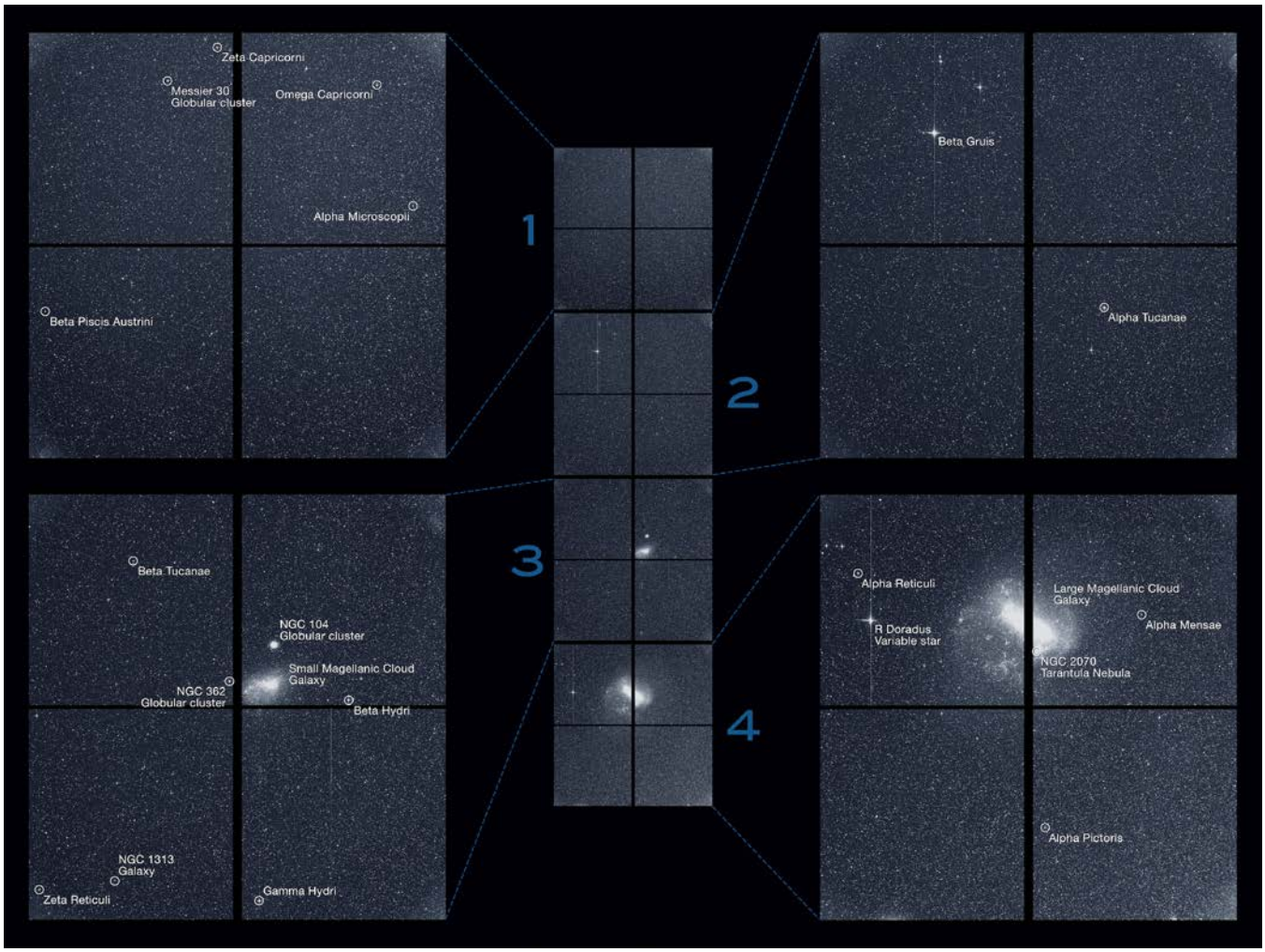
Prof. Pounds, from the University of Leicester's Department of Physics and Astronomy, said: "The galaxy we were observing with XMM-Newton has a 40 million solar mass black hole which is very bright and evidently well fed. Indeed some 15 years ago we detected a powerful wind indicating the hole was being over-fed. While such winds are now found in many active galaxies, PG1211+143 has now yielded another 'first,' with the detection of matter plunging directly into the hole itself."

He continues: "We were able to follow an Earth-sized clump of matter for about a day, as it was pulled towards the black hole, accelerating to a third of the velocity of light before being swallowed up by the hole."

A further implication of the new research is that 'chaotic accretion' from misaligned discs is likely to be common for supermassive black holes. Such black holes would then spin quite slowly, being able to accept far more gas and grow their masses more rapidly than generally believed, providing an explanation for why black holes which formed in the early Universe quickly gained very large masses.

Source: Spaceref.com Return to Contents

3. NASA's TESS Shares First Science Image in Hunt to Find New Worlds



NASA's newest planet hunter, the Transiting Exoplanet Survey Satellite (TESS), is now providing valuable data to help scientists discover and study exciting new exoplanets, or planets beyond our solar system. Part of the data from TESS' initial science orbit includes a detailed picture of the southern sky taken with all four of the spacecraft's wide-field cameras. This "first light" science image captures a wealth of stars and other objects, including systems previously known to have exoplanets.

"In a sea of stars brimming with new worlds, TESS is casting a wide net and will haul in a bounty of promising planets for further study," said Paul Hertz, astrophysics division director at NASA Headquarters in Washington. "This first light science image shows the capabilities of TESS' cameras, and shows that the mission will realize its incredible potential in our search for another Earth."

TESS acquired the image using all four cameras during a 30-minute period on Tuesday, Aug. 7. The black lines in the image are gaps between the camera detectors. The images include parts of a dozen constellations, from Capricornus to Pictor, and both the Large and Small Magellanic Clouds, the galaxies nearest to our own. The small bright dot above the Small Magellanic Cloud is a globular cluster — a spherical collection of hundreds of thousands of stars — called NGC 104, also known as 47 Tucanae because of its location in the southern constellation Tucana, the Toucan. Two stars, Beta Gruis and R Doradus, are so bright they saturate an entire column of pixels on the detectors of TESS's second and fourth cameras, creating long spikes of light.

"This swath of the sky's southern hemisphere includes more than a dozen stars we know have transiting planets based on previous studies from ground observatories," said George Ricker, TESS principal investigator

at the Massachusetts Institute of Technology's (MIT) Kavli Institute for Astrophysics and Space Research in Cambridge.

TESS's cameras, designed and built by MIT's Lincoln Laboratory in Lexington, Massachusetts, and the MIT Kavli Institute, monitor large swaths of the sky to look for transits. Transits occur when a planet passes in front of its star as viewed from the satellite's perspective, causing a regular dip in the star's brightness.

TESS will spend two years monitoring 26 such sectors for 27 days each, covering 85 percent of the sky. During its first year of operations, the satellite will study the 13 sectors making up the southern sky. Then TESS will turn to the 13 sectors of the northern sky to carry out a second year-long survey.

MIT coordinates with Northrop Grumman in Falls Church, Virginia, to schedule science observations. TESS transmits images every 13.7 days, each time it swings closest to Earth. NASA's Deep Space Network receives and forwards the data to the TESS Payload Operations Center at MIT for initial evaluation and analysis. Full data processing and analysis takes place within the Science Processing and Operations Center pipeline at NASA's Ames Research Center in Silicon Valley, California, which provides calibrated images and refined light curves that scientists can analyze to find promising exoplanet transit candidates.

TESS builds on the legacy of NASA's Kepler spacecraft, which also uses transits to find exoplanets. TESS's target stars are 30 to 300 light-years away and about 30 to 100 times brighter than Kepler's targets, which are 300 to 3,000 light-years away. The brightness of TESS' targets make them ideal candidates for follow-up study with spectroscopy, the study of how matter and light interact.

The James Webb Space Telescope and other space and ground observatories will use spectroscopy to learn more about the planets TESS finds, including their atmospheric compositions, masses and densities.

TESS has also started observations requested through the TESS Guest Investigator Program, which allows the broader scientific community to conduct research using the satellite.

"We were very pleased with the number of guest investigator proposals we received, and we competitively selected programs for a wide range of science investigations, from studying distant active galaxies to asteroids in our own solar system," said Padi Boyd, TESS project scientist at NASA's Goddard Space Flight Center in Greenbelt, Maryland. "And of course, lots of exciting exoplanet and star proposals as well. The science community are chomping at the bit to see the amazing data that TESS will produce and the exciting science discoveries for exoplanets and beyond."

TESS launched from NASA's Kennedy Space Center in Cape Canaveral, Florida, on April 18 aboard a SpaceX Falcon 9 rocket and used a flyby of the Moon on May 17 to head toward its science orbit. TESS started collecting scientific data on July 25 after a period of extensive checks of its instruments.

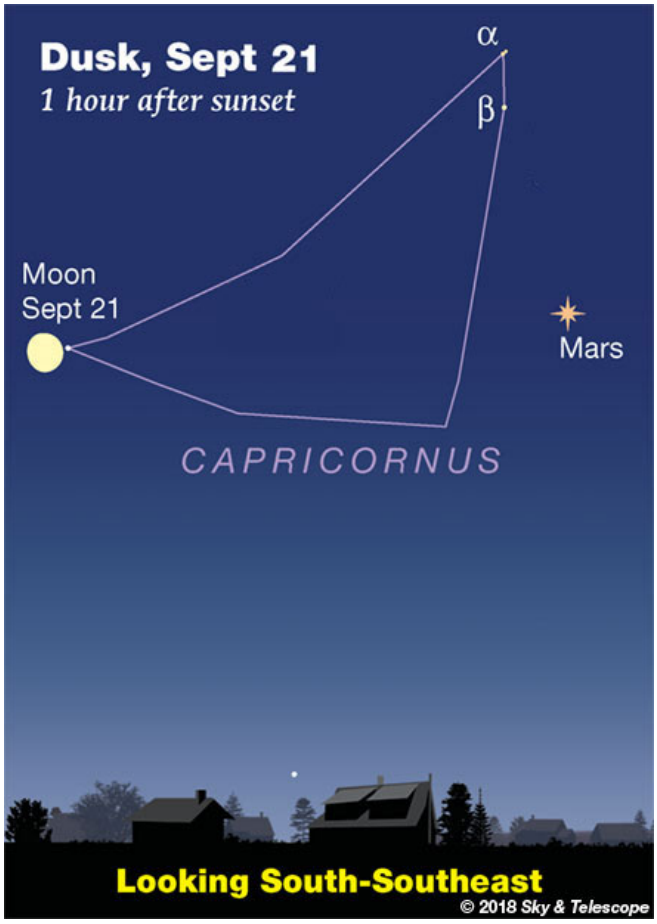
TESS is a NASA Astrophysics Explorer mission led and operated by MIT in Cambridge, Massachusetts, and managed by NASA's Goddard Space Flight Center in Greenbelt, Maryland. Dr. George Ricker of MIT's Kavli Institute for Astrophysics and Space Research serves as principal investigator for the mission. 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 in Lexington, Massachusetts; and the Space Telescope Science Institute in Baltimore. More than a dozen universities, research institutes and observatories worldwide are participants in the missio

Source: NASA Return to Contents

The Night Sky

Friday, September 21

• Mars shines well to the right of the waxing gibbous Moon this evening, as shown here. Between them lies dim, boat-shaped Capricornus — or as I sometimes see it in a dark sky, a huge, smiling clown mouth gaping down at the world. It's 20° from end to end: two fists at arm's length, or three or four binocular fields of view.



• Around the closing days of summer (the equinox is tomorrow), you always find the Sagittarius Teapot moving to the right of south during evening and tipping increasingly far over to the right, as if pouring out summer's end.

Saturday, September 22

• The September equinox occurs at 9:54 p.m. Eastern Daylight Time, when the Sun crosses the equator heading south for the season. This moment marks the beginning of autumn in the Northern Hemisphere, spring in the Southern Hemisphere. And the Sun rises and sets almost exactly east and west.

• Also around when summer turns to autumn, Deneb takes over from Vega as the zenith star after nightfall (for skywatchers at mid-northern latitudes).

• After dark tonight, the Great Square of Pegasus balances on one corner about three fists at arm's length to the left or upper left of the gibbous Moon. The Square's upper right side points down more or less toward the Moon.

Sunday, September 23

• Now the Moon shines even farther left of Mars after dark. Look lower right of the Moon, by roughly half that distance, for Fomalhaut, the Autumn Star, low and slowly on its way up in the southeast.

Monday, September 24

• Full Moon (exact at 10:52 p.m. EDT). The Moon rises in the east soon after sunset. Later in the evening you'll find the Great Square of Pegasus above it by a couple of fists at arm's length.

Source: Sky & Telescope

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ISS Sighting Opportunities

For Denver: No sighting opportunities

Date	Visible	Max Height	Appears	Disappears
Fri Sep 21, 7:24 PM	3 min	14°	10° above SSE	10° above E
Fri Sep 21, 8:59 PM	2 min	33°	10° above WSW	33° above W
Sat Sep 22, 8:07 PM	5 min	74°	10° above SW	29° above ENE
Sun Sep 23, 7:16 PM	6 min	35°	10° above SSW	11° above ENE
Sun Sep 23, 8:54 PM	1 min	27°	23° above WNW	26° above NNW
Mon Sep 24, 8:02 PM	4 min	44°	35° above WNW	12° above NE

Sighting information for other cities can be found at NASA's Satellite Sighting Information

NASA-TV Highlights

(all times Eastern Daylight Time)

Saturday, September 22 –

1:30 p.m., Coverage of the Launch of the JAXA HTV-7 Cargo Craft to the ISS (Launch scheduled at 1:52 p.m. EDT) (all channels)

Tuesday, September 25

3 p.m., RS-25 Engine Test from Stennis Space Center (all channels)

4 p.m., Video File of the ISS Expedition 57-58 Crew's Departure from the Gagarin Cosmonaut Training Center in Star City, Russia for the Baikonur Cosmodrome in Kazakhstan (Ovchinin, Hague) (NTV-3 (Media))

Watch NASA TV on the Net by going to the NASA website. Return to Contents

Space Calendar

- Sep 21 -  [Sep 15] Hayabusa 2, Two Hopping Landers Land on Asteroid Ryugu
- Sep 21 - Comet 133P/Elst-Pizarro Perihelion (2.665 AU)
- Sep 21 - Comet P/2011 U1 (PANSTARRS) At Opposition (3.570 AU)
- Sep 21 - Asteroid 6268 Versailles Closest Approach To Earth (1.159 AU)
- Sep 21 - Asteroid 13513 Manilla Closest Approach To Earth (1.433 AU)
- Sep 21 - Asteroid 2875 Lagerkvist Closest Approach To Earth (2.046 AU)
- Sep 21 - 15th Anniversary (2003), Galileo, Jupiter Impact
- Sep 22 -  [Sep 21] HTV-7 H-2B Launch (International Space Station)
- Sep 22 - Comet P/2018 P3 (PANSTARRS) Closest Approach To Earth (0.783 AU)
- Sep 22 - Comet 203P/Korlevic At Opposition (3.131 AU)
- Sep 22 - Comet 116P/Wild At Opposition (3.678 AU)
- Sep 22 - Asteroid 253 Mathilde Occults UCAC4-372-162925 (12.3 Magnitude Star)
- Sep 22 -  [Sep 15] Aten Asteroid 2018 RH6 Near-Earth Flyby (0.022 AU)
- Sep 22 - Asteroid 4969 Lawrence Closest Approach To Earth (1.451 AU)
- Sep 22 - Asteroid 6542 Jacquescousteau Closest Approach To Earth (1.485 AU)
- Sep 22 - Asteroid 3062 Wren Closest Approach To Earth (1.722 AU)
- Sep 22 - 125th Anniversary (1893), Zabrodje Meteorite Fall (Hit House in Russia)
- Sep 23 - Autumnal Equinox, 01:54 UT
- Sep 23 - Apollo Asteroid 719 Albert Closest Approach To Earth (0.517 AU)
- Sep 23 - Comet 95P/Chiron At Opposition (17.715 AU)
- Sep 23 - Asteroid 253 Mathilde Occults 2UCAC 26110212 (12.4 Magnitude Star)
- Sep 23 -  [Sep 16] Amor Asteroid 2018 RX6 Near-Earth Flyby (0.054 AU)
- Sep 23 -  [Sep 16] Apollo Asteroid 2018 RL7 Near-Earth Flyby (0.057 AU)
- Sep 23 - Asteroid 3106 Morabito Closest Approach To Earth (1.646 AU)
- Sep 23 - 15th Anniversary (2003), New Orleans Meteorite Fall (Hit House in Lousiana)
- Sep 24 -  [Sep 19] Comet C/2018 R5 (Lemmon) At Opposition (2.826 AU)
- Sep 24 - Comet 155P/Shoemaker At Opposition (3.242 AU)
- Sep 24 - Comet C/2015 T2 (PANSTARRS) At Opposition (7.011 AU)
- Sep 24 - Aten Asteroid 2018 RQ1 Near-Earth Flyby (0.010 AU)
- Sep 24 - Apollo Asteroid 2015 EP7 Near-Earth Flyby (0.053 AU)
- Sep 24 - Apollo Asteroid 1981 Midas Closest Approach To Earth (1.240 AU)
- Sep 24 - Asteroid 1704 Wachmann Closest Approach To Earth (1.413 AU)
- Sep 24 - Asteroid 93 Minerva Closest Approach To Earth (1.683 AU)
- Sep 24 - Kuiper Belt Object 2010 RE64 At Opposition (50.896 AU)
- Sep 24 - Charlotte Moore Sitterly's 120th Birthday (1898)

Source: JPL Space Calendar

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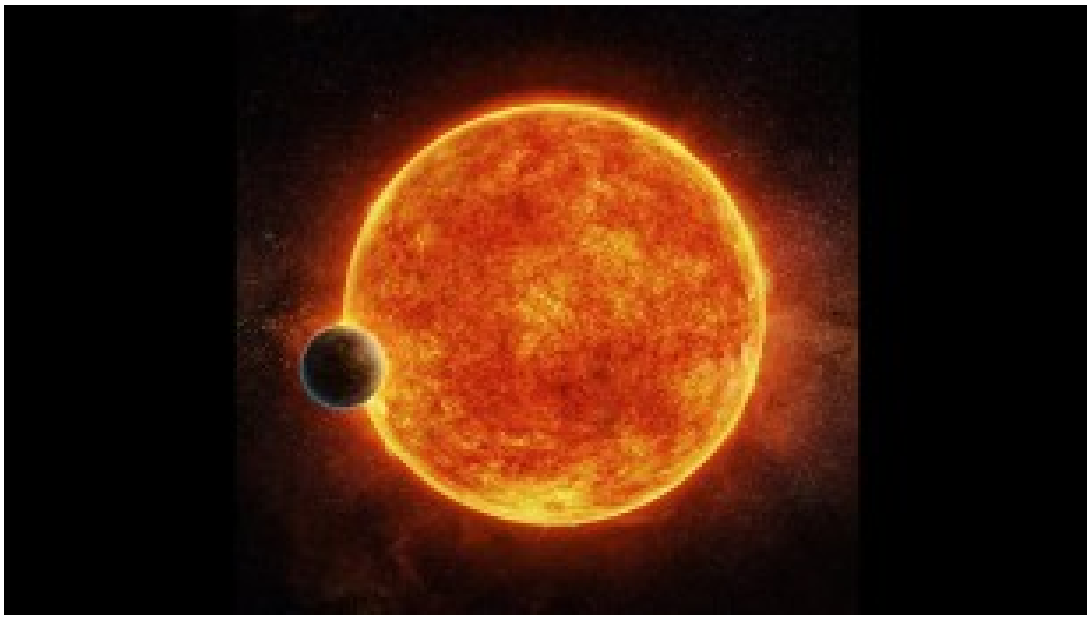
Food for Thought

Paging Mr. Spock: 'Star Trek' planet Vulcan found?



Maybe the final frontier isn't so far out of reach. Astronomers have found an exoplanet reminiscent of the planet Vulcan from "Star Trek," orbiting a star in a system only 16 light-years from Earth.

The discovery, detailed in a study published this week in the Monthly Notice of the Royal Astronomical Society, is the first super-Earth detected by the Dharma Planet Survey and Dharma Endowment Foundation Telescope. The 50-inch telescope is on top of Mt. Lemmon in southern Arizona.

It's "the closest super-Earth orbiting another Sun-like star," said Jian Ge, study author and astronomer from the University of Florida, in a statement.

Super-Earths have a mass greater than Earth's but aren't as big as other giant, gaseous planets.

"The planet is roughly twice the size of Earth and orbits its star with a 42-day period just inside the star's optimal habitable zone," Ge said. When a planet is within the habitable zone of its star, that means liquid water could pool on its surface -- which could support life as we know it.

It orbits an orange-tinted star named HD 26965, which is only slightly cooler and little less massive than our own sun. It is comparable in age to our sun, and it has a similar magnetic cycle, according to Tennessee State University astronomer and study author Matthew Muterspaugh.

"Therefore," he said, "HD 26965 may be an ideal host star for an advanced civilization." And live long and prosper.

But "Star Trek" fans may know the star by another name: 40 Eridani A. This very real star was confirmed by "Star Trek" creator Gene Roddenberry himself as the host star for the fictional planet of Vulcan, the home world of science officer Spock, played by Leonard Nimoy on the original television show.

In July 1991, Roddenberry, along with astronomers from the Harvard-Smithsonian Center for Astrophysics, wrote in a "letter to the editor" published in Sky and Telescope that 40 Eridani A would be the ideal star to host Vulcan.

"Presumably Vulcan orbits the primary star, an orange main-sequence dwarf of spectral type K1. ... Two companion stars -- a 9th magnitude white dwarf and an 11th magnitude red dwarf -- orbit each other about 400 astronomical units from the primary. They would gleam brilliantly in the Vulcan sky," they wrote.

And now, a planet has been found right where Roddenberry and astronomers Sallie Baliunas, Robert Donahue and George Nassiopoulos thought Vulcan would be.

The researchers also pointed out that 40 Eridani A, in the Eridanus constellation, is visible in the night sky with the naked eye -- not something that can be said for most host stars of exoplanets.

The goal of the Dharma Planet Survey is much like the crew of the starship Enterprise, the researchers said.

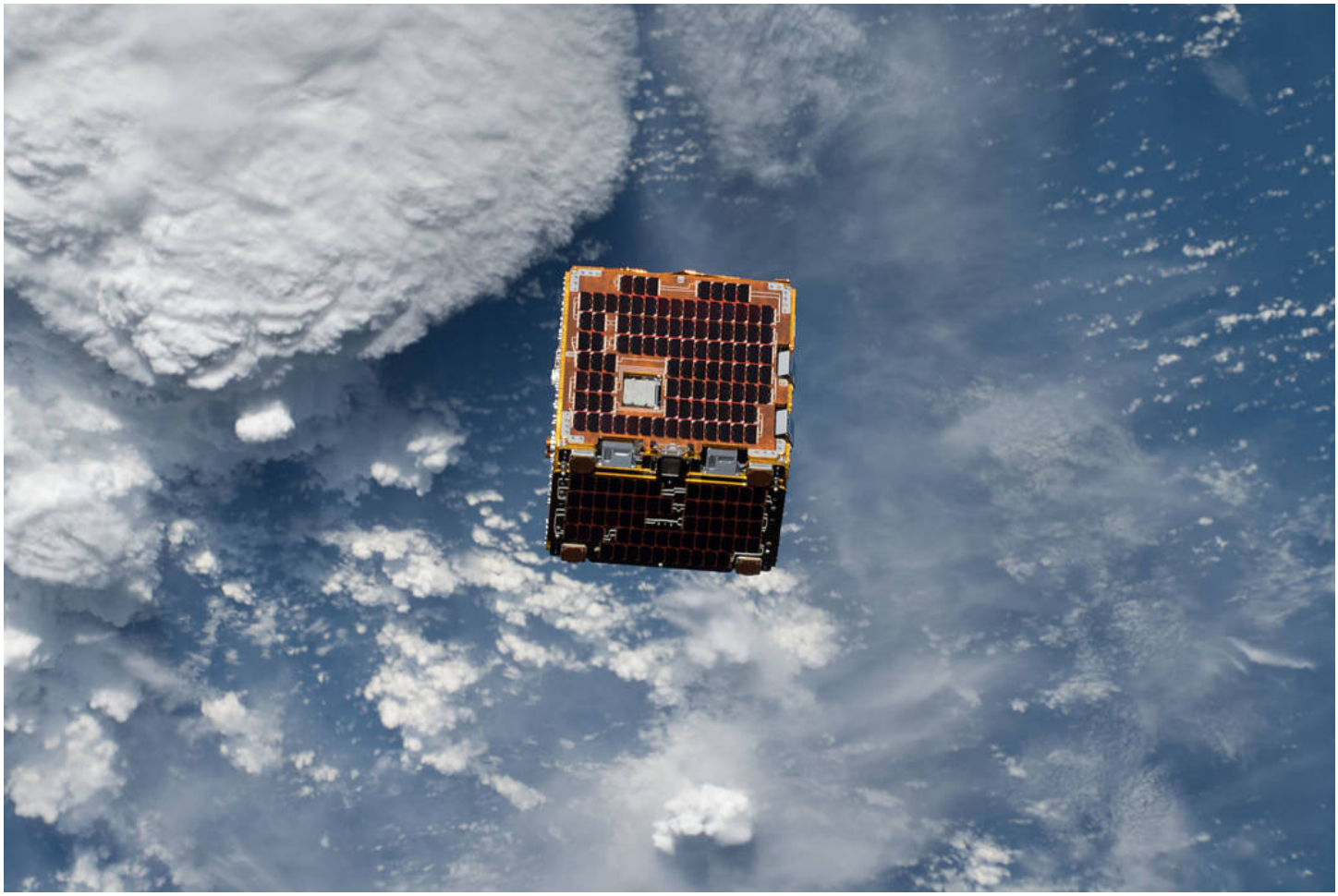
"Spock served on the starship Enterprise, whose mission was to seek out strange new worlds, a mission shared by the Dharma Planet Survey," said Gregory Henry, study author and Tennessee State University astronomer.

And the astronomers involved in this discovery hope it is only the beginning.

"This discovery demonstrates that fully dedicated telescopes conducting high-cadence, high-precision radial velocity observations in the near future will continue to play a key role in the discovery of more super-Earths and even Earth-like planets in the habitable zones around nearby stars," Ge said.

Source: CNN Return to Contents

Space Image of the Week



Small Satellite Demonstrates Possible Solution for 'Space Junk

Explanation The International Space Station serves as humanity's orbital research platform, conducting a variety of experiments and research projects while in orbit around the planet.

On June 20, 2018, the space station deployed the NanoRacks-Remove Debris satellite into space from outside the Japanese Kibo laboratory module. This technology demonstration was designed to explore using a 3D camera to map the location and speed of orbital debris or "space junk."

The NanoRacks-Remove Debris satellite successfully deployed a net to capture a nanosatellite that simulates debris. Collisions in space could have have serious consequences to the space station and satellites, but research has shown that removing the largest debris significantly reduces the chance of collisions.

Image credit: NASA

Source: NASA Image of the Day Return to Contents