Space News Update

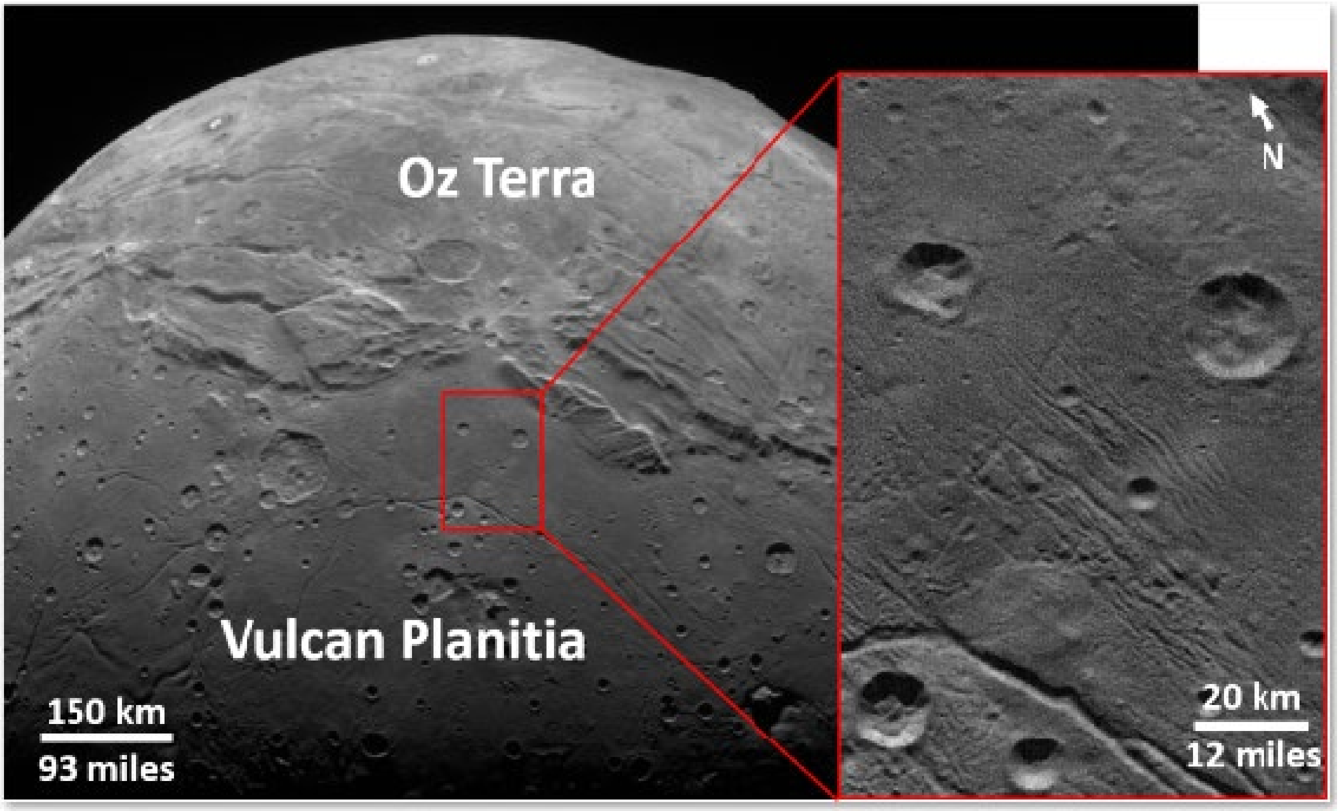
— March 12, 2019 —

Contents

In the News

Departments

1. Pluto and Charon Don’t Have Enough Small Craters



In 2015, the *New Horizons* mission became the first robotic spacecraft to conduct a flyby of Pluto. In so doing, the probe managed to capture stunning photos and valuable data on what was once considered to be the ninth planet of the Solar System (and to some, still is) and its moons. Years later, scientists are still poring over the data to see what else they can learn about the Pluto-Charon system.

For instance, the mission science team at the Southwest Research Institute (SwRI) recently made an interesting discovery about Pluto and Charon. Based on images acquired by the *New Horizons*spacecraft of some small craters on their surfaces, the team indirectly confirmed something about the Kuiper Belt could have serious implications for our models of Solar System formation.

The study that describes their findings, which recently appeared in the journal *Science*, was led by Kelsi Singer – the co-investigator of the *New Horizons* mission from the SwRI. She was joined by researchers from NASA’s Ames Research Center, the Lunar and Planetary Institute(LPI), the Lowell Observatory, the SETI Institute’s Carl Sagan Center, and multiple universities.

To recap, the Kuiper Belt is a large belt of icy bodies and planetoids that orbit the Solar System beyond Neptune, extending from a distance of 30 AU to approximately 50 AU. Much like the Main Asteroid Belt, it contains many small bodies, all of which are remnants from the formation of the Solar System. The main difference is that the Kuiper Belt is much larger, being 20 times as wide and up to 200 times as massive.

After consulting data from the spacecraft’s Long Range Reconnaissance Imager (LORRI), the *New Horizons* team found that there were fewer craters on the surfaces of Pluto and Charon than expected. This finding implies that there are very few objects in the Trans-Neptunian region that measure between 91 m (300 ft) to 1.6 km (1 mile) in diameter. As Dr. Singer explained in a recent JHUAPL press statement:

“These smaller Kuiper Belt objects are much too small to really see with any telescopes at such a great distance. New Horizons flying directly through the Kuiper Belt and collecting data there was key to learning about both large and small bodies of the Belt.”

To put it simply, craters on Solar System bodies act as a sort of record, indicating how many impacts and of what size the body has experienced over time. To astronomers and planetary scientists, these provide hints about the history of the object and its place in the Solar System. Since Pluto is so far from Earth, very little was known about its surface prior to the historic flyby by the *New Horizons* mission.

Much like the glaciers of nitrogen ice and incredibly tall mountains (which reached as high as 4 km/2.5 mi) on its surface, the small craters witnessed by *New Horizons* are indicative of Pluto’s history. Similar to the Main Asteroid Belt, Kuiper Belt Objects (KBOs) are essentially “feedstock” from which larger bodies in the Solar System formed roughly 4.6 billion years ago.

This latest study, which places constraints on the number of smaller KBOs, could therefore provide clues about the formation and history of the Solar System. As Alan Stern, the New Horizons mission’s principal investigator (also of SwRI) explained it:

“This breakthrough discovery by New Horizons has deep implications. Just as New Horizons *revealed Pluto, its moons and, more recently, the KBO nicknamed Ultima Thule in exquisite detail, Kelsi’s team revealed key details about the population of KBOs at scales we cannot come close to directly seeing from Earth.”*

To be fair, Pluto undergoes geological processes that have altered some evidence of its impact history. A good example of this is endogenic resurfacing, where convection between the surface and interior causes the surface undergo periodic renewal. However, Charon is relatively static from a geological point of view, which provided the *New Horizons* team with a more stable record of impacts.

These results are in keeping with a major aspect of the *New Horizons’*mission, which is to better understand the Kuiper Belt. And with its recent flyby of Ultima Thule, the mission has now provided data on the surfaces of three distinct Solar System bodies. And data from that flyby is in agreement with the data obtained from Pluto and Charon.

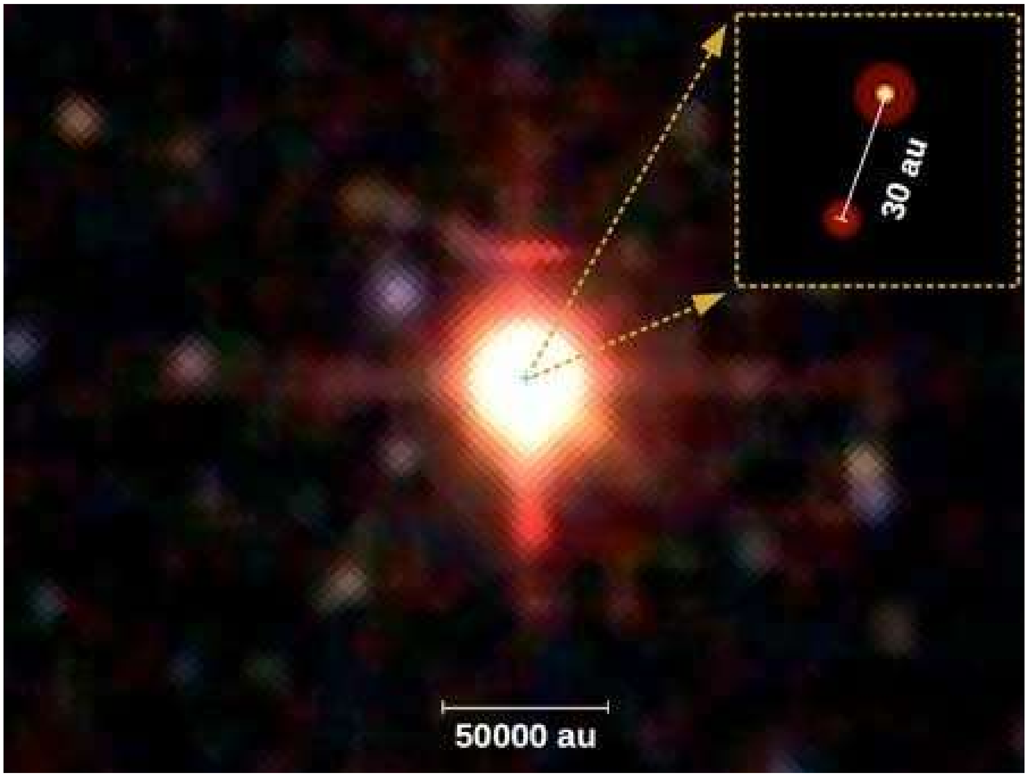
As noted, this latest study could help resolve ongoing disputes about the formation of our Solar System. While there is a relative consensus that our Sun and the planets formed from a molecular cloud starting 4.6 billion years ago, different models have been proposed that result in different populations and locations of Solar System objects.

“This surprising lack of small KBOs changes our view of the Kuiper Belt and shows that either its formation or evolution, or both, were somewhat different than those of the asteroid belt between Mars and Jupiter,” said Singer. “Perhaps the asteroid belt has more small bodies than the Kuiper Belt because its population experiences more collisions that break up larger objects into smaller ones.”

These findings may also influence the planning of future missions to the Main Asteroid Belt and the Trans-Neptunian region. The more we know about the objects in these two belts – like how many there are, their compositions and their sizes – the more we stand to learn about how our Solar System came to be.

Source: Universe Today Return to Contents

2. Massive Twin Star Discovered Close To Its Stellar Sibling



Astronomers have discovered a binary star system with the closest high-mass young stellar objects ever measured, providing a valuable "laboratory" to test theories on high mass binary star formation.

An international team led by the University of Leeds has determined the distance between the massive young star PDS 27 and its orbiting stellar companion to be just 30 astronomical units away or 4.5 billion km. That is roughly the distance between our Sun and Neptune, making them the stellar companions with the closest proximity ever determined for young high mass stars in a binary system - a star system with two stars in orbit around a centre of mass.

Study lead author, Dr Evgenia Koumpia, from the School of Physics and Astronomy at Leeds, said: "This is a very exciting discovery, observing and simulating massive binaries at the early stages of their formation is one of the main struggles of modern astronomy. With PDS 27 and its companion we have now found the closest, most massive young stellar objects in binaries resolved to date.

"There is a shortage of known young massive binary systems in charted space. High mass stars have comparatively short lifespans, burning out and exploding as supernovae in only a few million years, making them difficult to spot. This limits our ability to test the theories on how these stars form."

As part of their study the team has also identified a companion object for another young massive star referred to as PDS 37. The analysis revealed a distance between PDS 37 and its companion to be between 42 to 54 astronomical units -comparable to the distance between the Sun and Pluto. While further apart than PDS 27 and its companion, it is still a significant discovery given the need for confirmed massive young stellar binaries in astronomical research.

Dr Koumpia continued: "How these binary systems form is quite a controversial question with several theories having been put forward. Observational studies of binaries in their early stages are crucial to verifying the theories of their formation.

"PDS 27 and PDS 37 are rare and important laboratories that can help inform and test the theories on the formation of high mass binaries."

PDS 27 is at least 10 times more massive than our Sun, Dr Koumpia explained, and about 8,000 light years away. To determine the presence of stellar companions for PDS 27 and PDS 37, the team used the highest spatial resolution provided by the PIONIER instrument on the European Southern Observatory's Very Large Telescope Interferometer (VLTI). This instrument combines light beams from four telescopes, each of which is 8.2 metres across, and mimics a single telescope with a diameter of 130m. The resulting high spatial resolving power allowed the team to resolve such close binary systems despite their huge distance from us and their close proximity to each other.

Study co-author Professor Rene Oudmaijer, also from the School of Physics and Astronomy at Leeds, said: "The next big question - which we have tended to avoid so far because of observational difficulties - is why so many of these massive stars are in binary systems?"

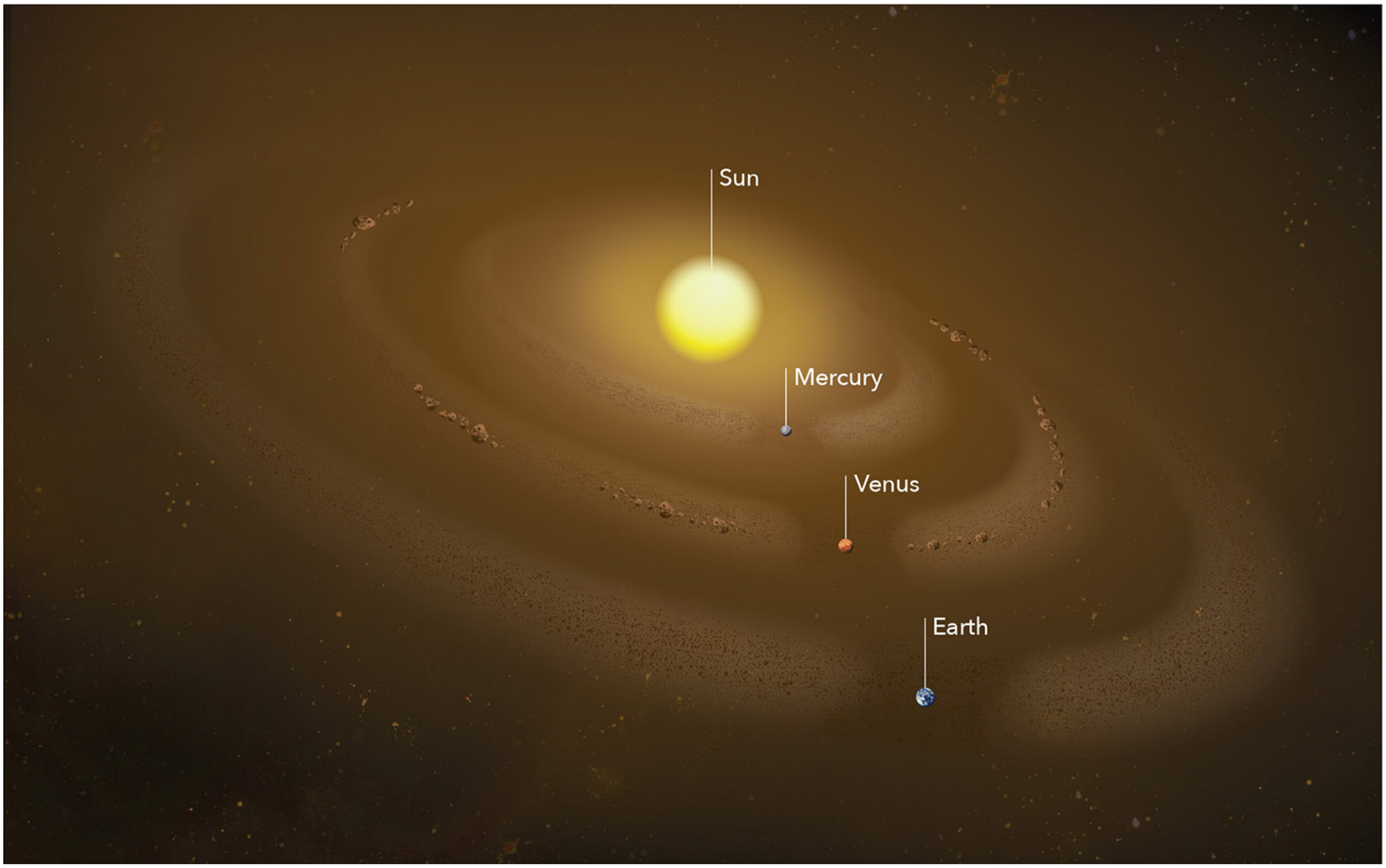
"It has become increasingly clear to astronomers that massive stars are almost never born alone, with at least one sibling for company. But the reasons why that is the case are still rather murky.

"Massive stars exert significant influence on their cosmic environment. Their stellar winds, energy and the supernova explosions they generate in turn can impact the formation of other stars and galaxies. The evolution and fate of high-mass stars is quite complex but previous studies have shown that they can be influenced to a large degree by their binary properties.

"The discovery of massive young binary stars provides a crucial step forward in being able to answer many of the questions we still have about these stellar objects. These discoveries were only possible thanks to the exquisite resolving power provided by the PIONIER instrument on the VLTI."

Source: SpaceRef.com Return to Contents

3. What Scientists Found After Sifting Through Dust in the Solar System



Just as dust gathers in corners and along bookshelves in our homes, dust piles up in space too. But when the dust settles in the solar system, it's often in rings. Several dust rings circle the Sun. The rings trace the orbits of planets, whose gravity tugs dust into place around the Sun, as it drifts by on its way to the center of the solar system.

The dust consists of crushed-up remains from the formation of the solar system, some 4.6 billion years ago — rubble from asteroid collisions or crumbs from blazing comets. Dust is dispersed throughout the entire solar system, but it collects at grainy rings overlying the orbits of Earth and Venus, rings that can be seen with telescopes on Earth. By studying this dust — what it's made of, where it comes from, and how it moves through space — scientists seek clues to understanding the birth of planets and the composition of all that we see in the solar system.

Two recent studies report new discoveries of dust rings in the inner solar system. One study uses NASA data to outline evidence for a dust ring around the Sun at Mercury's orbit. A second study from NASA identifies the likely source of the dust ring at Venus' orbit: a group of never-before-detected asteroids co-orbiting with the planet.

"It's not every day you get to discover something new in the inner solar system," said Marc Kuchner, an author on the Venus study and astrophysicist at NASA's Goddard Space Flight Center in Greenbelt, Maryland. "This is right in our neighborhood."

Another Ring Around the Sun

Guillermo Stenborg and Russell Howard, both solar scientists at the Naval Research Laboratory in Washington, D.C., did not set out to find a dust ring. “We found it by chance,” Stenborg said, laughing. The scientists summarized their findings in a paper published in The Astrophysical Journal on Nov. 21, 2018.

They describe evidence of a fine haze of cosmic dust over Mercury’s orbit, forming a ring some 9.3 million miles wide. Mercury — 3,030 miles wide, just big enough for the continental United States to stretch across — wades through this vast dust trail as it circles the Sun.

Ironically, the two scientists stumbled upon the dust ring while searching for evidence of a dust-free region close to the Sun. At some distance from the Sun, according to a decades-old prediction, the star’s mighty heat should vaporize dust, sweeping clean an entire stretch of space. Knowing where this boundary is can tell scientists about the composition of the dust itself, and hint at how planets formed in the young solar system.

So far, no evidence has been found of dust-free space, but that’s partly because it would be difficult to detect from Earth. No matter how scientists look from Earth, all the dust in between us and the Sun gets in the way, tricking them into thinking perhaps space near the Sun is dustier than it really is.

Stenborg and Howard figured they could work around this problem by building a model based on pictures of interplanetary space from NASA’s STEREO satellite — short for Solar and Terrestrial Relations Observatory.

Ultimately, the two wanted to test their new model in preparation for NASA’s Parker Solar Probe, which is currently flying a highly elliptic orbit around the Sun, swinging closer and closer to the star over the next seven years. They wanted to apply their technique to the images Parker will send back to Earth and see how dust near the Sun behaves.

Scientists have never worked with data collected in this unexplored territory, so close to the Sun. Models like Stenborg and Howard’s provide crucial context for understanding Parker Solar Probe’s observations, as well as hinting at what kind of space environment the spacecraft will find itself in — sooty or sparkling clean.

Two kinds of light show up in STEREO images: light from the Sun’s blazing outer atmosphere — called the corona — and light reflected off all the dust floating through space. The sunlight reflected off this dust, which slowly orbits the Sun, is about 100 times brighter than coronal light.

“We’re not really dust people,” said Howard, who is also the lead scientist for the cameras on STEREO and Parker Solar Probe that take pictures of the corona. “The dust close to the Sun just shows up in our observations, and generally, we have thrown it away.” Solar scientists like Howard — who study solar activity for purposes such as forecasting imminent space weather, including giant explosions of solar material that the Sun can sometimes send our way — have spent years developing techniques to remove the effect of this dust. Only after removing light contamination from dust can they clearly see what the corona is doing.

The two scientists built their model as a tool for others to get rid of the pesky dust in STEREO — and eventually Parker Solar Probe — images, but the prediction of dust-free space lingered in the back of their minds. If they could devise a way of separating the two kinds of light and isolate the dust-shine, they could figure out how much dust was really there. Finding that all the light in an image came from the corona alone, for example, could indicate they’d found dust-free space at last.

Mercury’s dust ring was a lucky find, a side discovery Stenborg and Howard made while they were working on their model. When they used their new technique on the STEREO images, they noticed a pattern of enhanced brightness along Mercury’s orbit — more dust, that is — in the light they’d otherwise planned to discard.

“It wasn’t an isolated thing,” Howard said. “All around the Sun, regardless of the spacecraft’s position, we could see the same five percent increase in dust brightness, or density. That said something was there, and it’s something that extends all around the Sun.”

Scientists never considered that a ring might exist along Mercury’s orbit, which is maybe why it’s gone undetected until now, Stenborg said. “People thought that Mercury, unlike Earth or Venus, is too small and too close to the Sun to capture a dust ring,” he said. “They expected that the solar wind and magnetic forces from the Sun would blow any excess dust at Mercury’s orbit away.”

With an unexpected discovery and sensitive new tool under their belt, the researchers are still interested in the dust-free zone. As Parker Solar Probe continues its exploration of the corona, their model can help others reveal any other dust bunnies lurking near the Sun.

Asteroids Hiding in Venus’ Orbit

This isn’t the first time scientists have found a dust ring in the inner solar system. Twenty-five years ago, scientists discovered that Earth orbits the Sun within a giant ring of dust. Others uncovered a similar ring near Venus’ orbit, first using archival data from the German-American Helios space probes in 2007, and then confirming it in 2013, with STEREO data.

Since then, scientists determined the dust ring in Earth’s orbit comes largely from the asteroid belt, the vast, doughnut-shaped region between Mars and Jupiter where most of the solar system’s asteroids live. These rocky asteroids constantly crash against each other, sloughing dust that drifts deeper into the Sun’s gravity, unless Earth’s gravity pulls the dust aside, into our planet’s orbit.

At first, it seemed likely that Venus’ dust ring formed like Earth’s, from dust produced elsewhere in the solar system. But when Goddard astrophysicist Petr Pokorny modeled dust spiraling toward the Sun from the asteroid belt, his simulations produced a ring that matched observations of Earth’s ring — but not Venus’.

This discrepancy made him wonder if not the asteroid belt, where else does the dust in Venus’ orbit come from? After a series of simulations, Pokorny and his research partner Marc Kuchner hypothesized it comes from a group of never-before-detected asteroids that orbit the Sun alongside Venus. They published their work in The Astrophysical Journal Letters on March 12, 2019.

“I think the most exciting thing about this result is it suggests a new population of asteroids that probably holds clues to how the solar system formed,” Kuchner said. If Pokorny and Kuchner can observe them, this family of asteroids could shed light on Earth and Venus’ early histories. Viewed with the right tools, the asteroids could also unlock clues to the chemical diversity of the solar system.

Because it’s dispersed over a larger orbit, Venus’ dust ring is much larger than the newly detected ring at Mercury’s. About 16 million miles from top to bottom and 6 million miles wide, the ring is littered with dust whose largest grains are roughly the size of those in coarse sandpaper. It’s about 10 percent denser with dust than surrounding space. Still, it’s diffuse — pack all the dust in the ring together, and all you’d get is an asteroid two miles across.

Using a dozen different modeling tools to simulate how dust moves around the solar system, Pokorny modeled all the dust sources he could think of, looking for a simulated Venus ring that matched the observations. The list of all the sources he tried sounds like a roll call of all the rocky objects in the solar system: Main Belt asteroids, Oort Cloud comets, Halley-type comets, Jupiter-family comets, recent collisions in the asteroid belt.

“But none of them worked,” Kuchner said. “So, we started making up our own sources of dust.”

Perhaps, the two scientists thought, the dust came from asteroids much closer to Venus than the asteroid belt. There could be a group of asteroids co-orbiting the Sun with Venus — meaning they share Venus' orbit, but stay far away from the planet, often on the other side of the Sun. Pokorny and Kuchner reasoned a group of asteroids in Venus' orbit could have gone undetected until now because it's difficult to point earthbound telescopes in that direction, so close to the Sun, without light interference from the Sun.

Co-orbiting asteroids are an example of what's called a resonance, an orbital pattern that locks different orbits together, depending on how their gravitational influences meet. Pokorny and Kuchner modeled many potential resonances: asteroids that circle the Sun twice for every three of Venus' orbits, for example, or nine times for Venus' ten, and one for one. Of all the possibilities, one group alone produced a realistic simulation of the Venus dust ring: a pack of asteroids that occupies Venus' orbit, matching Venus' trips around the Sun one for one.

But the scientists couldn't just call it a day after finding a hypothetical solution that worked. "We thought we'd discovered this population of asteroids, but then had to prove it and show it works," Pokorny said. "We got excited, but then you realize, 'Oh, there's so much work to do.'"

They needed to show that the very existence of the asteroids makes sense in the solar system. It would be unlikely, they realized, that asteroids in these special, circular orbits near Venus arrived there from somewhere else like the asteroid belt. Their hypothesis would make more sense if the asteroids had been there since the very beginning of the solar system.

The scientists built another model, this time starting with a throng of 10,000 asteroids neighboring Venus. They let the simulation fast forward through 4.5 billion years of solar system history, incorporating all the gravitational effects from each of the planets. When the model reached present-day, about 800 of their test asteroids survived the test of time.

Pokorny considers this an optimistic survival rate. It indicates that asteroids could have formed near Venus' orbit in the chaos of the early solar system, and some could remain there today, feeding the dust ring nearby.

The next step is actually pinning down and observing the elusive asteroids. "If there's something there, we should be able to find it," Pokorny said. Their existence could be verified with space-based telescopes like Hubble, or perhaps interplanetary space-imagers similar to STEREO's. Then, the scientists will have more questions to answer: How many of them are there, and how big are they? Are they continuously shedding dust, or was there just one break-up event?

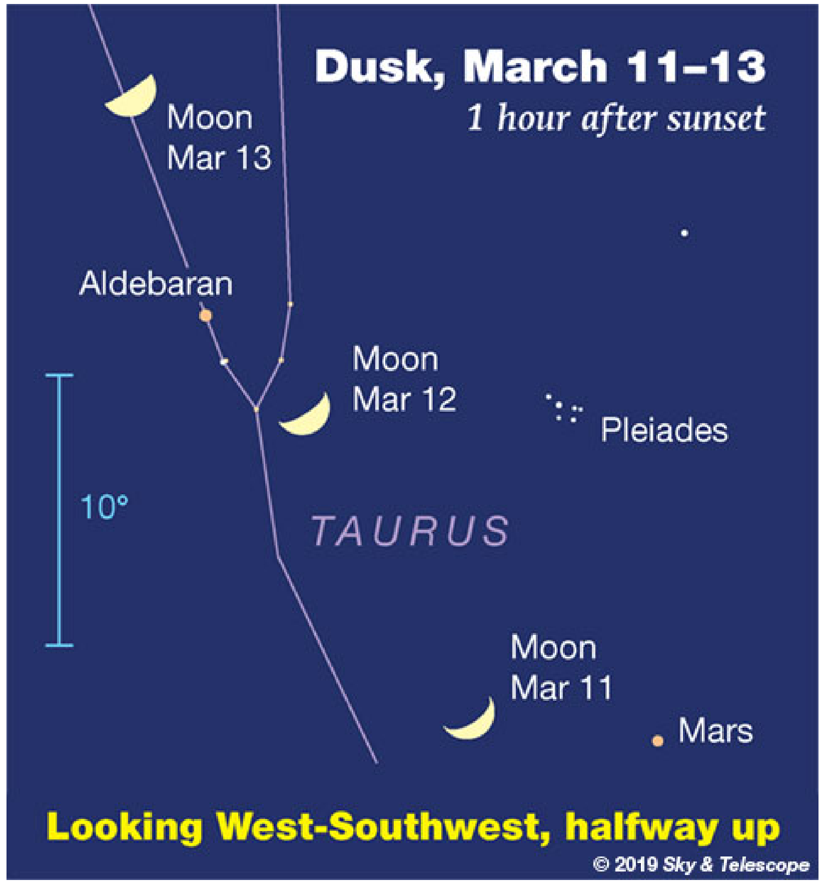
Dust Rings Around Other Stars

The dust rings that Mercury and Venus shepherd are just a planet or two away, but scientists have spotted many other dust rings in distant star systems. Vast dust rings can be easier to spot than exoplanets, and could be used to infer the existence of otherwise hidden planets, and even their orbital properties.

But interpreting extrasolar dust rings isn't straightforward. "In order to model and accurately read the dust rings around other stars, we first have to understand the physics of the dust in our own backyard," Kuchner said. By studying neighboring dust rings at Mercury, Venus and Earth, where dust traces out the enduring effects of gravity in the solar system, scientists can develop techniques for reading between the dust rings both near and far.

Source: NASA Return to Contents

The Night Sky



Tuesday, March 12

• Now the thickening Moon is in the outskirts of the Hyades, near Taurus, as shown here.

• In a very dark sky, the full constellation stick figure of Canis Major is fairly plain to see in the south after dark. The Big Dog is seen in profile prancing on his hind legs, with Sirius as his shiny dog tag. But where many of us live, only his five brightest stars show through the light pollution — hardly doglike.

However, these form the unmistakable Canis Major Meat Cleaver. Sirius and Murzim (to its right) are the wide front end of the cleaver, with Sirius sparkling on its top back corner. Down to Sirius's lower left is the Cleaver's other end, including its short handle, formed by the triangle of Adhara, Wezen, and Aludra. Its blade is chopping toward the lower right.

Wednesday, March 13

• The Moon, barely short of first quarter now, shines in Taurus a little more than halfway from Aldebaran to Zeta Tauri, the fainter of the two horntips of Taurus. The other horntip is Beta Tauri, a little higher above the Moon.

Thursday, March 14

• First-quarter Moon; exactly so at 6:27 a.m. this morning. At nightfall about half a day later, can you see that the Moon's terminator is no longer an exact straight line?

After dark you'll see that the Moon is in the feet of Gemini, high over Orion and just above the top of Orion's very dim club (for North America).

• The **yellow-eyed flying bat** asterism, visible in binoculars, resides in Leo Minor near Lynx. Its wingspan extends nearly across a binocular field of view. Find it to the upper right of Leo's Sickle these evenings using Matt Wedel's Binocular Highlight column and chart in the March *Sky & Telescope*, page 43. As he notes, "It only flies right-side up when Pollux and Procyon are crossing the meridian," as they are now.

Friday, March 15

• Arcturus rises a half hour earlier now than it did a week ago. Look for it very low in the east-northeast after nightfall, and higher in the east later in the evening. It's magnitude 0, one of the very brightest stars in the sky.

Source: Sky & Telescope

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ISS Sighting Opportunities

For Denver:

Date	Visible	Max Height	Appears	Disappears
Tue Mar 12, 5:44 AM	3 min	21°	15° above NNW	18° above NE
Wed Mar 13, 4:55 AM	< 1 min	15°	15° above NNE	13° above NE
Wed Mar 13, 6:28 AM	5 min	74°	10° above NW	23° above ESE
Thu Mar 14, 5:39 AM	3 min	40°	25° above NNW	26° above E
Fri Mar 15, 4:50 AM	< 1 min	20°	20° above ENE	18° above ENE
Fri Mar 15, 6:23 AM	6 min	39°	12° above WNW	10° above SSE

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

NASA-TV Highlights
(all times Eastern Daylight Time)

March 12, Tuesday
2 p.m., 7 p.m. – Replay of Moon to Mars Budget Rollout (All Channels)
4 p.m. - Video File of the International Space Station Expedition 59-60/Soyuz MS-12 Rollout to the Launch Pad; Pad Interviews at the Baikonur Cosmodrome in Kazakhstan and other Crew Activities (Media Channel)

March 13, Wednesday
8:35 a.m. – International Space Station In-Flight Interview for the Canadian Space Agency with Canadian Broadcasters and astronaut David Saint-Jacques of the Canadian Space Agency (Public Channel with interpretation; Media Channel in native language)
4 p.m. – Replay of the Russian State Commission Meeting and Final International Space Station Expedition 59-60 Pre-Launch Crew News Conference in Baikonur, Kazakhstan (All Channels)

March 14, Thursday
2 p.m. - International Space Station Expedition 59-60/Soyuz MS-12 Launch Coverage, includes video B-roll of the crew's launch day pre-launch activities at 2:15 p.m. ET. Launch scheduled at 3:14 p.m. ET (All Channels)
6 p.m. - Video File of ISS Expedition 59-60/Soyuz MS-12 (Ovchinin, Hague, Koch) Pre-Launch and Launch Video and Post-Launch Interviews – Johnson Space Center via Baikonur, Kazakhstan (NTV-3)
8:15 p.m. - International Space Station Expedition 59-60/Soyuz MS-12 Docking Coverage (Ovchinin, Hague, Koch); docking scheduled at 9:07 p.m. ET (All Channels)
10:30 p.m. - International Space Station Expedition 59-60/Soyuz MS-12 Hatch Opening and Welcoming Ceremony; hatch opening scheduled at approximately 11:10 p.m. (All Channels)

March 15, Friday
2 a.m. - Video File of International Space Station Expedition 59-60/Soyuz MS-12 docking, hatch opening and other activities (Media Channel)

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

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Space Calendar

- Mar 12 - Comet P/2018 A4 (PANSTARRS) At Opposition (2.695 AU)
- Mar 12 - Comet 185P/Petriew Closest Approach To Earth (2.933 AU)
- Mar 12 - Comet C/2014 B1 (Schwartz) At Opposition (9.038 AU)
- Mar 12 - Asteroid 433 Eros Occults HIP 33731 (6.7 Magnitude Star)
- Mar 12 - Apollo Asteroid 2019 DJ1 Near-Earth Flyby (0.010 AU)
- Mar 12 - NEW [Mar 07] Aten Asteroid 2019 EE1 Near-Earth Flyby (0.037 AU)
- Mar 12 - Atira Asteroid 434326 (2004 JG6) Closest Approach To Earth (1.277 AU)
- Mar 12 - Asteroid 2873 Binzel Closest Approach To Earth (1.300 AU)
- Mar 12 - Asteroid 7919 Prime Closest Approach To Earth (1.620 AU)
- Mar 12 - Gustav Kirchhoff's 195th Birthday (1824)
- Mar 12-14 - 3rd Sentinel-2 Validation Team Meeting, Toulouse, France
- Mar 13 - Comet 128P-A/Shoemaker-Holt At Opposition (3.498 AU)
- Mar 13 - Asteroid 1473 Ounas Occults HIP 57819 (6.2 Magnitude Star)
- Mar 13 - Apollo Asteroid 88254 (2001 FM129) Near-Earth Flyby (0.087 AU)
- Mar 13 - Asteroid 22824 von Neumann Closest Approach To Earth (1.716 AU)
- Mar 13 - Asteroid 9253 Oberth Closest Approach To Earth (1.831 AU)
- Mar 13 - Asteroid 8444 Popovich Closest Approach To Earth (1.870 AU)
- Mar 13 - 30th Anniversary (1989), STS-29 Launch (Space Shuttle Discovery, TDRS)
- Mar 14 - HOT [Mar 07] Pi Day
- Mar 14 - HOT [Mar 07] Soyuz MS-12 Soyuz FG Launch (International Space Station 58S)
- Mar 14 - PRISMA/ TARANIS Vega Launch
- Mar 14 - Comet P/2006 F4 At Opposition (1.513 AU)
- Mar 14 - Comet C/2018 N1 (NEOWISE) Closest Approach To Earth (2.443 AU)
- Mar 14 - Apollo Asteroid 2016 CK31 Near-Earth Flyby (0.093 AU)
- Mar 14 - Asteroid 1712 Angola Closest Approach To Earth (2.176 AU)
- Mar 14 - Asteroid 50 Virginia Closest Approach To Earth (2.344 AU)
- Mar 14 - Asteroid 30826 Coulomb Closest Approach To Earth (2.425 AU)
- Mar 14 - Asteroid 6042 Chesirecat Closest Approach To Earth (3.310 AU)
- Mar 14 - Lecture: The Golden Age of Exoplanet Exploration, Pasadena, California
- Mar 14 - Gene Cernan's 85th Birthday (1934)
- Mar 14 - Albert Einstein's 140th Birthday (1879)
- Mar 15 - UPDATED [Mar 10] WGS-10 Delta 4 Launch
- Mar 15 - Comet 169P/NEAT Closest Approach To Earth (2.492 AU)
- Mar 15 - Apollo Asteroid 2015 EF7 Near-Earth Flyby (0.052 AU)
- Mar 15 - Aten Asteroid 483656 (2005 ES70) Near-Earth Flyby (0.056 AU)
- Mar 15 - Asteroid 3524 Schulz Closest Approach To Earth (1.309 AU)
- Mar 15 - Amor Asteroid 2368 Beltrovata Closest Approach To Earth (1.888 AU)
- Mar 15 - Asteroid 1762 Russell Closest Approach To Earth (2.046 AU)
- Mar 15 - 10th Anniversary (2009), STS-119 Launch (Space Shuttle Disocvery, International Space Station)

Source: JPL Space Calendar

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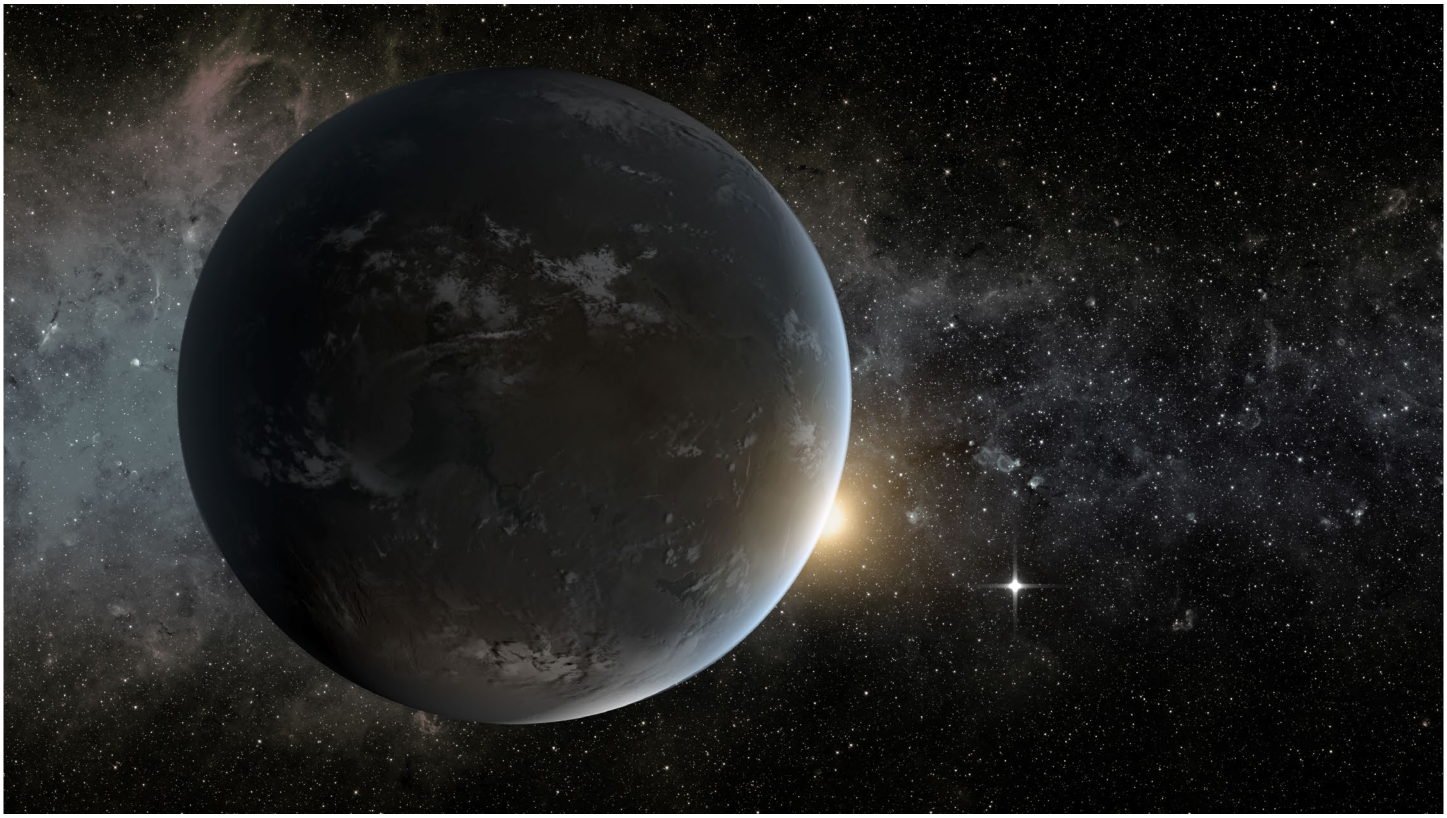
Food for Thought

“Goldilocks” Stars May Be “Just Right” for Finding Habitable Worlds



Scientists looking for signs of life beyond our solar system face major challenges, one of which is that there are hundreds of billions of stars in our galaxy alone to consider. To narrow the search, they must figure out: What kinds of stars are most likely to host habitable planets?

A new study finds a particular class of stars called K stars, which are dimmer than the Sun but brighter than the faintest stars, may be particularly promising targets for searching for signs of life.

Why? First, K stars live a very long time — 17 billion to 70 billion years, compared to 10 billion years for the Sun — giving plenty of time for life to evolve. Also, K stars have less extreme activity in their youth than the universe’s dimmest stars, called M stars or “red dwarfs.”

M stars do offer some advantages for in the search for habitable planets. They are the most common star type in the galaxy, comprising about 75 percent of all the stars in the universe. They are also frugal with their fuel, and could shine on for over a trillion years. One example of an M star, TRAPPIST-1, is known to host seven Earth-size rocky planets.

But the turbulent youth of M stars presents problems for potential life. Stellar flares – explosive releases of magnetic energy – are much more frequent and energetic from young M stars than young Sun-like stars. M stars are also much brighter when they are young, for up to a billion years after they form, with energy that could boil off oceans on any planets that might someday be in the habitable zone.

“I like to think that K stars are in a ‘sweet spot’ between Sun-analog stars and M stars,” said Giada Arney of NASA’s Goddard Space Flight Center in Greenbelt, Maryland.

Arney wanted to find out what biosignatures, or signs of life, might look like on a hypothetical planet orbiting a K star. Her analysis is published in the Astrophysical Journal Letters.

Scientists consider the simultaneous presence of oxygen and methane in a planet's atmosphere to be a strong biosignature because these gases like to react with each other, destroying each other. So, if you see them present in an atmosphere together, that implies something is producing them both quickly, quite possibly life, according to Arney.

However, because planets around other stars (exoplanets) are so remote, there needs to be significant amounts of oxygen and methane in an exoplanet's atmosphere for it to be seen by observatories at Earth. Arney's analysis found that the oxygen-methane biosignature is likely to be stronger around a K star than a Sun-like star.

Arney used a computer model that simulates the chemistry and temperature of a planetary atmosphere, and how that atmosphere responds to different host stars. These synthetic atmospheres were then run through a model that simulates the planet's spectrum to show what it might look like to future telescopes.

"When you put the planet around a K star, the oxygen does not destroy the methane as rapidly, so more of it can build up in the atmosphere," said Arney. "This is because the K star's ultraviolet light does not generate highly reactive oxygen gases that destroy methane as readily as a Sun-like star."

This stronger oxygen-methane signal has also been predicted for planets around M stars, but their high activity levels might make M stars unable to host habitable worlds. K stars can offer the advantage of a higher probability of simultaneous oxygen-methane detection compared to Sun-like stars without the disadvantages that come along with an M star host.

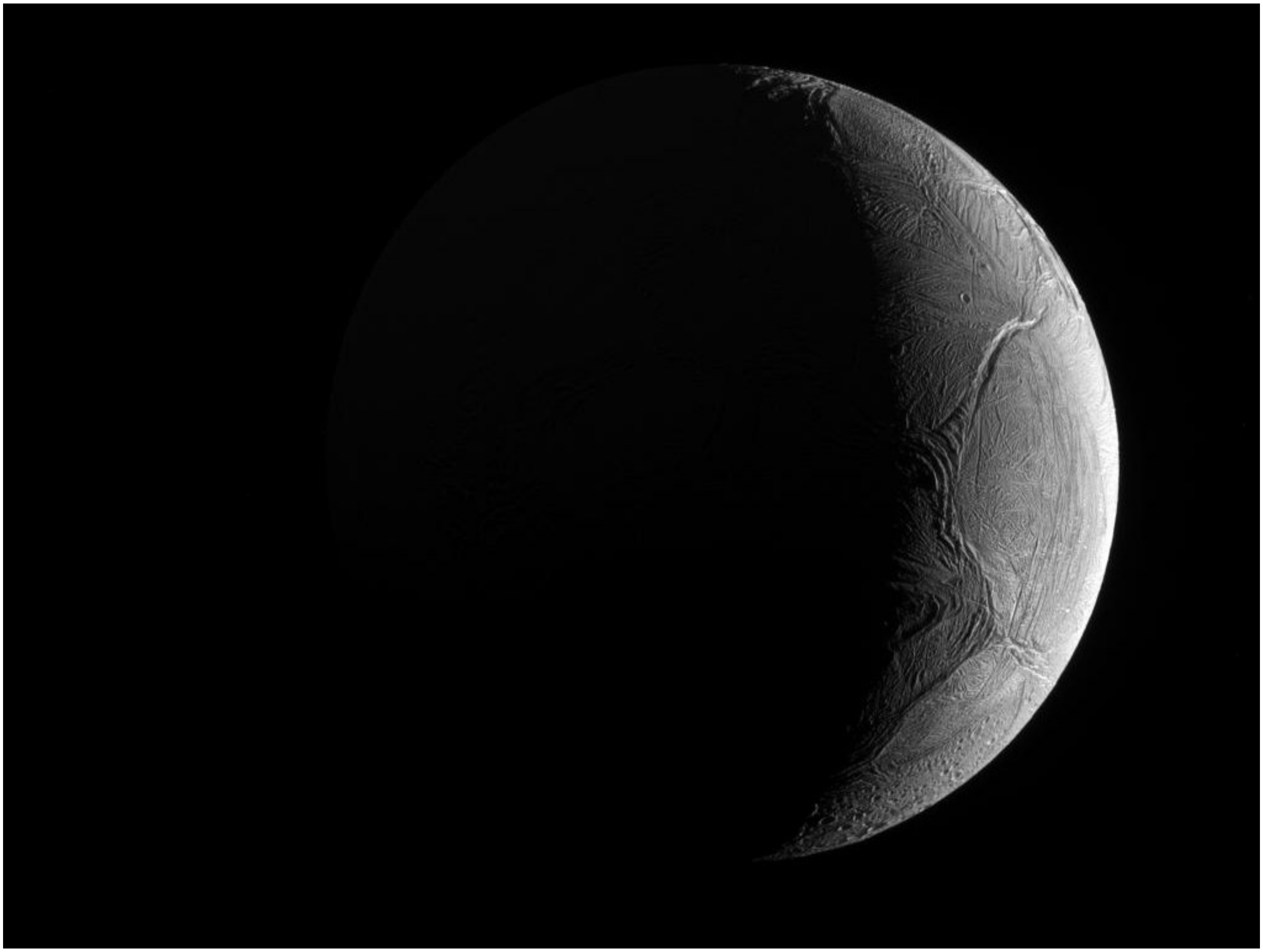
Additionally, exoplanets around K stars will be easier to see than those around Sun-like stars simply because K stars are dimmer. "The Sun is *10 billion* times brighter than an Earthlike planet around it, so that's a lot of light you have to suppress if you want to see an orbiting planet. A K star might be 'only' a billion times brighter than an Earth around it," said Arney.

Arney's research also includes discussion of which of the nearby K stars may be the best targets for future observations. Since we don't have the ability to travel to planets around other stars due to their enormous distances from us, we are limited to analyzing the light from these planets to search for a signal that life might be present. By separating this light into its component colors, or spectrum, scientists can identify the constituents of a planet's atmosphere, since different compounds emit and absorb distinct colors of light.

"I find that certain nearby K stars like 61 Cyg A/B, Epsilon Indi, Groombridge 1618, and HD 156026 may be particularly good targets for future biosignature searches," said Arney.

Source: NASA Return to Contents

Space Image of the Week



Crescent Enceladus
Image Credit: Cassini Imaging Team, SSI, JPL, ESA, NASA

Explanation: Peering from the shadows, the Saturn-facing hemisphere of tantalizing inner moon Enceladus poses in this Cassini spacecraft image. North is up in the dramatic scene captured during November 2016 as Cassini's camera was pointed in a nearly sunward direction about 130,000 kilometers from the moon's bright crescent. In fact, the distant world reflects over 90 percent of the sunlight it receives, giving its surface about the same reflectivity as fresh snow. A mere 500 kilometers in diameter, Enceladus is a surprisingly active moon. Data collected during Cassini's flybys and years of images have revealed the presence of remarkable south polar geysers and a possible global ocean of liquid water beneath an icy crust.

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