

[An online publication of the Milwaukee Lunar Reclamation Society,  
a chapter of the Moon Society and of the National Space Society  
 as well as an “Outpost” of the Mars Society]

*Past issues of Outbound are online at:*

<http://www.moonsociety.org/publications/outbound/>

## OUTBOUND #29, APRIL, 2020

### Asteroid #3 Pallas: 2 unique assets:

- (✓) Highly inclined orbit, from 24° above the Sun’s North Pole to 24° below the Sun’s South pole:
- (✓) A Solar Observatory at each pole of Pallas would have a vantage point to allow studies of the Sun’s North and South poles that could not be done from Earth. Yes, a close in probe with an orbit that swings from high above the ecliptic to well below. But there is an advantage for “manned” observances.

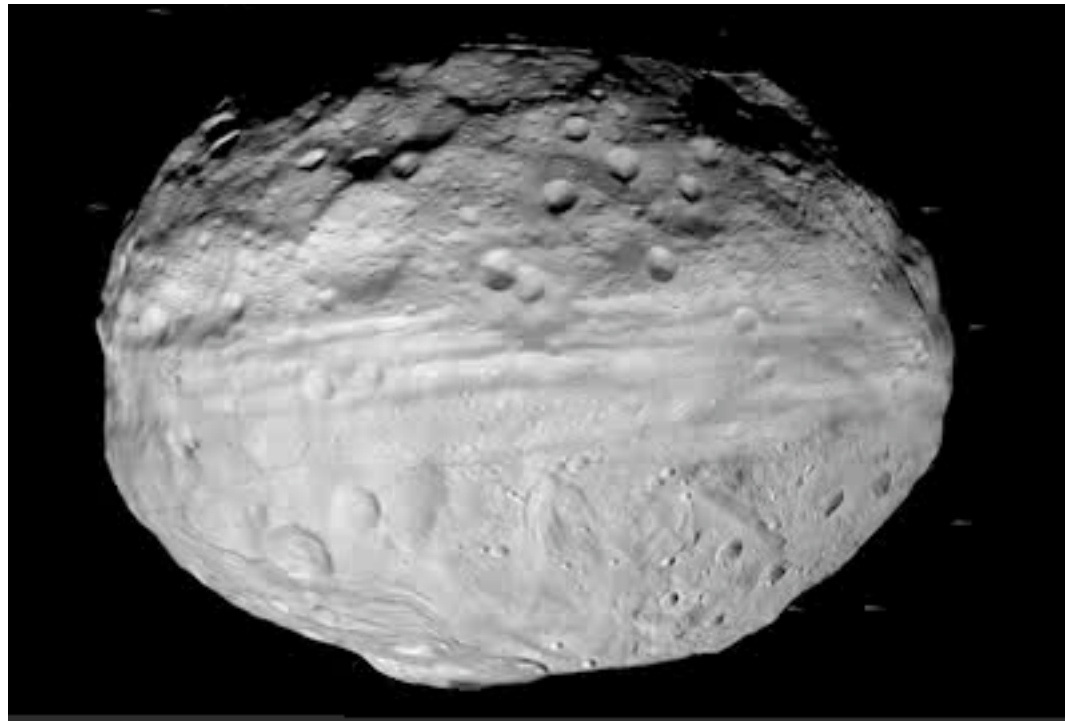
What might we learn about the Sun from these vantage points? We can’t say until the probe is real.

- (1) Fairly spherical: From almost any point on Pallas surface we could tunnel through to its gravitational center, and hollow it out for a laboratory of “negative zero gravity,” ideal for physics studies that could be done nowhere else.

Actually they could be done as well as from the “core” of Vesta, but putting both laboratories, ✓ **solar polar N & S**, and ✓ **upside down zero gravity at the core**, makes sense when it comes to supplying outposts from Earth or from the Moon, and by keeping

science crews there busy In their spare time, crews could explore Pallas' surface. In the image above, there seem to be a "belt" which may or may not run all the way around. Actually, from alternately above and below ecliptic, they could see the rest of the solar system from a fairly high angle above and below the ecliptic, a possible advantage. ##

p.1



## **IF Earth had visitors, where would they most likely leave a “calling card”?**

✓ NOT where we might find it *before* we had begun exploring our Solar System, and *after* we had been to the Moon.

✓ PERHAPS in the #1 visitors tourist attraction on Mars, Valles Marineris canyon, so large as to put Arizona's Grand Canyon in the class of a “ditch.”

Humans would put priority on establishing the first settlements where the two most important assets are nearby, ✓ water, of course, ✓ and basalt, the easiest construction material: for homes, for furniture and furnishings, etc.

✓ Calling cards? if they wanted them to be seen, as soon as possible, key spots in Valles Marineris would likely catch human attention sooner than anything anywhere else.

✓ But what if they didn't want their past presence to be known right away?

✓ at the North or South poles, where signs of the paths of melted water ice are likely to be found?

*✓ debris piles of one kind or another along one time shores of a now gone  
great northern ocean*

**BUT FAR MORE LIKELY THAN NOT IS THAT WE WILL NEVER FIND  
SIGNS OF PAST VISITORS.**

*And if “visitors” had left any, it is likely that they would leave traces that could  
not be discovered until we have become an “adult civilization” (by their  
definition, not ours, likely to be too loose.) ##*

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*A “Planetary Simulator” could help identify habitable alien worlds*  
<https://www.space.com/climate-models-for-alien-worlds.html>

NASA's scientists are applying climate models developed on Earth to understand what other worlds might be able to host life.

**Earth’s climate is pretty great for life as we know it.**

**But scientists have much less data about what the climates of alien  
worlds could be like; and astronomers don't have a way to get a whole lot  
more data anytime soon.** That's inconvenient, since *climate will inevitably shape  
whether life can exist on these exoplanets and in what way.*

To bridge the gap, *scientists are taking models of how Earth's climate works and  
applying them to other worlds.*

"The models make specific, testable predictions of what we should see," Karl  
Stapelfeldt, an exoplanet scientist at NASA's Jet Propulsion Laboratory in California,  
said in a statement. "These are very important for designing our future telescopes and  
observing strategies."

That's because scientists know *it will be a long, long time before they can see any  
life in other solar systems directly. Even studying the atmospheres of these worlds is  
extremely difficult*, although projects such as NASA'S James Webb Space Telescope will  
increase astronomers' capabilities to do that.

So, for worlds with atmospheres, curious scientists are trying to figure out how the  
details of an exoplanet influence that bubble of gases. What happens if a planet is tidally  
locked (to its “sun”), with one side in eternal day and one in eternal night? What happens  
if its surface is all land or all ocean, or a mix of the two?

**And that's where climate models come into play.** By tweaking an Earth model, scientists developed ROCKE-3D, a "planetary simulator." They can feed different combinations of exoplanet characteristics into the model and then see what happens in the atmosphere and how the results might affect habitability.

For example, based on what scientists know now about **Proxima-Centauri B** which orbits in the nearest star system to Earth, they suspect the planet is tidally locked. But ROCKE-3D analysis suggested that, depending on other details of the world, *clouds could cluster on the permanently sunny side of the planet, making the temperature less scalding.*

**Conclusions:** like these could change the way scientists prioritize different exoplanets for precious observation time by future instruments, according to NASA. That's the downside of the wealth that exoplanet scientists have reaped: With more than 4,000 discoveries already, there are far more worlds than instruments will ever have time to study.

"If we want to observe most wisely, we have to take recommendations from climate models," Anthony Del Genio, a planetary climate scientist who recently retired from NASA's Goddard Institute for Space Studies in New York, said in the statement. "That's just increasing the odds." ##

### **Hot News Items that *may change how we think about some things***

*# What looks like a crashed lighter than air craft in Mars' 3,000 mile long Valles Marineris canyon complex has been found. As it could not possibly come from Earth, it will take a dedicated mission to visit these ruins to learn more about these visiting aliens and their interstellar culture. The chances that we will be able to tell from where this alien craft had come from are slight, unless its crew left clues in case Earth's ape-like creatures evolved further.*

*# Discovery of what looks like animal footprints on Mars in the planet's lowest area (with thickest atmosphere) in Hellas Planitia. Only a few bones, and greatly eroded organic compounds are found, along with some tell tale garments. These items were all discovered by the first Russian Mars mission, with a fully robotic crew.*

**# Doctor Robert Zubrin says the Moon must come first for these reasons:  
experience in:**

*use of basalt: housing, furniture, plumbing, fabrics including clothing  
and to build “cabin homes” to take pioneers to Mars*

***and he has now joined the Moon Society as an Advisor, to stress programs  
and missions that are or will be relevant to similar situations on Mars.***

**# Solar tornados have been noticed** in the North and South polar areas of the Sun, sucking in any asteroids that get too close and/or are moving too slowly. (There is a contest to name this “event” - after 3 weeks, the proposed name “Solar Oops” has been the public favorite but is abhorred by scientists.)

**# A European Space Agency mission to Jupiter’s moon Europa, has found biological organic compounds in the orange streaks on this moon’s thick ice crust. The mission’s second goal is to try to find out the thickness of Europa’s highly fractured global ice crust. These fractures may be due to gravitational stress during Europa’s slightly elliptical orbit around Jupiter. Unfortunately, these cracks are so common that it might be very difficult to find an undisturbed part of the ice crust in which to excavate a tube through which probes could be winched down into the ocean below, to learn more about the ice, but above all, to see if there are any kind of living creatures in that ocean, and how primitive or how advanced some may have evolved. This information is of prime importance because it is almost certain that there are far more “Europas” in our galaxy than there are “Earths.”**

**# A new “complementary” MOON TO MARS SOCIETY has been formed to set up an Antarctic outpost in one of Antarctica’s Dry Valleys where the year around climate is closest to what pioneers will have to cope with on Mars: Among the differences:** crews will follow a 24 hour 37 minute day/night schedule. One object is to see whether “morning people” (who can’t wait to jump out of bed and start a new day), or evening people (who will have no trouble sleeping an extra 37 minutes every night), on a more Mars-like schedule. The living quarters will be one story: easier to cover with foam blocks under a tarp to keep quarters below warm enough to be livable, both for ease of insulation, and ease of escape should there be a fire or other serious reason to “abandon” the hab.

# The “**Moon to Mars Society**” has not yet decided where to set up shop in the United States. Arizona and Idaho (Valley of the Moon National Monument) have each welcomed the new Society and have both suggested “ideal sites.” But that the Idaho site is basaltic gives it a considerable edge. In anticipation of this decision, the Society is setting up its United States **headquarters in Boise, Idaho, with a backup office in Salt Lake City, Utah.**

**Another goal of the Moon to Mars Society** is to design its regional “habitats” **as three-story in transit, but one story on location**, with the three “floor” units set side by side, easier to ship and easier to exit in emergency.

Discovery of what looks like animal footprints on Mars in the planet’s lowest area (with thickest atmosphere) in Hellas Planitia. Only a few bones, and greatly eroded organic compounds are found, along with some tell tale garments. These items have all been discovered by the first Russian Mars probe .

**The Moon to Mars Society has lower dues levels:** for ✓ students, ✓ physically impaired, and ✓ retired persons, and for ✓ unemployed adults. But also ✓ higher “voluntary” dues levels, for those with higher income levels. The Society’s goals are such that everyone can help one way or another. ##  
**[Oh, by the way, Happy April Fools Day!!]**

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## **THOUGHT PROVOKING SPACE IN NEWS ARTICLES (for real!)**

**Two Russian satellites are stalking a US spysat in orbit. The Space Force is watching. (Report)**

<https://www.space.com/russian-spacecraft-stalking-us-spy-satellite-space-force.html>

**See the Evolution of SpaceX's Rockets in Pictures**

<https://www.space.com/40547-spacex-rocket-evolution.html>

**What's next for Solar Orbiter after its historic launch to the Sun**

<https://www.space.com/solar-orbiter-launched-whats-next.html>

It will take Solar Orbiter about two years to reach its operational orbit around the Sun, where it will capture unprecedented views of our star's poles. But

the spacecraft still has plenty of work to do before it can start working on its science goals. Here's an overview of what's next for Solar Orbiter.

### **Space Force gets \$15.4 billion in 2021 budget request**

<https://www.space.com/space-force-2021-budget-request.html>

### **2021 NASA budget proposal axes 2 telescopes, 2 Earth science missions & STEM grants**

<https://www.space.com/nasa-2021-budget-cuts-earth-science-telescopes-stem.html>

### **Iran satellite launch fails to reach orbit**

<https://www.space.com/iran-satellite-launch-failure-zafar-1.html>

### **To find alien life, we should focus on white dwarf stars**

<https://www.space.com/search-alien-life-white-dwarf-stars.html>

We know that life can appear around stars like our sun, and we know that stars like our sun will turn into white dwarfs (small, dense stars that are stellar core remnants approximately the size of planets) at the end of their lives. So, perhaps we should be focusing our search around white dwarfs.

### **Our Sun will never look the same again thanks to two solar probes and one giant telescope**

<https://www.space.com/three-big-missions-spotlight-the-sun.html>

### **'Planetary simulator' could help identify habitable alien worlds**

<https://www.space.com/climate-models-for-alien-worlds.html>

Scientists have much less data about what the climates of [alien worlds](#) could be like, and astronomers don't have a way to get a whole lot more data anytime soon. That's inconvenient, since climate will inevitably shape whether life can exist on these exoplanets and in what way. To try to bridge the gap, scientists are taking models of how Earth's climate works and applying them to other worlds.

### **Solar Orbiter launches on historic mission to study the Sun's poles**

<https://www.space.com/solar-orbiter-atlas-v-rocket-launch-success.html>

Solar Orbiter is a collaboration between the European Space Agency (ESA) and NASA. The mission is expected to return unprecedented data and images, as well as our first views of [the sun's polar regions](#), and the team of people behind it are thrilled.

### **Space Force: What will the new military branch actually do?**

<https://www.space.com/united-states-space-force-next-steps.html>

The Trump administration [established the Space Force](#) as a separate military branch in December 2019.

Since then, America's Space Force has gotten its own official ["Star Trek"-esque seal](#), with a logo being developed. Recently unveiled was a traditional camouflage uniform adorned with a blue "U.S. Space Force" nameplate on the chest and a full-color flag on the left arm. ###

### **Mars two mini moons, Phobos and Deimos**

*What we can do with them that speeds up Mars settlements  
Settlements Statistics (size, distance from Mars, orbit times*

*Slowing Deimos so that it is always above Pavonis Mons Settlements on  
Mars' Equator*

*(MMM articles) cable transit with possible collision by Phobos?  
How that is handled  
Used mostly for Cargo*

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### **10 Exoplanets That Could Host Alien Life**

<https://www.space.com/18790-habitable-exoplanets-catalog-photos.html>

### **7 Ways to Discover Alien Planets**

<https://www.space.com/20941-alien-planet-detection-techniques-countdown.html>

### **The Strangest Alien Planets in Pictures**

<https://www.space.com/159-strangest-alien-planets.html>

### **Massive asteroid Pallas has a violent, cratered past, study reveals**

<https://www.space.com/asteroid-pallas-craters-violent-history.html>

Our best view yet of Pallas, the largest asteroid not yet visited by a spacecraft, reveals an extraordinarily violent history with numerous impacts, most likely due to its unusual orbit, a new study finds.

In 1802, Pallas became the second asteroid ever discovered. Named after Pallas Athena, the Greek goddess of wisdom, Pallas is the third most massive asteroid ever discovered, comprising an estimated 7% of the mass in the solar system's asteroid belt. This asteroid has an average diameter of about 318 miles (513 kilometers), which is about 15% of the diameter of the Moon.

Much remains unknown about this large asteroid. To shed light on Pallas' many mysteries, in a new study, scientists used the **Spectro-Polarimetric High-contrast Exoplanet Research (SPHERE)** imager on the **Very Large Telescope** in the Atacama Desert in northern Chile to analyze the asteroid's shape & surface in unprecedented detail.

Based on 11 images they captured of Pallas' surface, the researchers discovered that the asteroid is pockmarked with numerous craters ranging from about 18.5 to 75 miles (30 to 120 km) wide. Their computer simulations also suggest that Pallas has about twice as many craters as the largest known asteroid, the dwarf planet Ceres, and three times as many as the second-largest (and brightest) known asteroid, Vesta.

"Pallas is heavily cratered, Its surface might resemble a golf ball." Two giant craters on Pallas — one near its south pole, the other near its equator — hint that the asteroid once experienced giant sideways impacts with projectiles about 37 to 65 miles (60 to 90 km) in diameter. The impact that created the crater near the equator may have formed the family of *several hundred small asteroids surrounding Pallas, which are less than 12 miles (20 km) wide (and travel with Pallas in its highly inclined orbit around the Sun, which makes it a top candidate for an observatory focused on the Sun's northern and southern poles, out of sight from Earth and the Moon..*

"We performed numerical simulations to determine the most probable age of the family, which is **1.7 billion years**, and this should correspond to the surface age of Pallas, or at least a substantial part of it," Broz said.

Computer simulations of past collisions in the asteroid belt, conducted as part of this study, suggest that the objects hitting Pallas were also traveling at unusually high speeds, averaging about 25,725 mph (41,400 km/h), compared with

the average speeds of about 12,975 (20,880 km/h) for impacts generating craters the asteroid belt.

These high speeds were likely caused by the way that Pallas travels in an unusually tilted and elongated orbit, according to the study. Since fast impacts are more likely to generate craters than slower ones, Pallas' strange orbit likely also helps to explain why the asteroid is so cratered compared with Ceres and Vesta, .

Using their images along with previous estimates of the asteroid's mass, the researchers developed a 3D model of Pallas and found that **Pallas is denser than Ceres but less dense than Vesta.** [Editor: that may make it a better pick for a science lab at the zero-Gravity core.] With this information, the research team suggests that *Pallas possesses a greater proportion of rock to ice than Ceres.*

Pallas' density, combined with how much the asteroid reflects a specific wavelength of infrared light, additionally suggests that the asteroid is most similar in composition to a kind of meteorite known as a CM chondrite.

Taking all this in mind, it appears to me, (Peter Kokh), that Pallas remains the best pick for **North and South polar observatories focused on the Sun**, as well as for **"a negative zero-G physics laboratory"** in its core. If we find a showstopper for such a project, second in line for such a laboratory would be Vesta, but Vesta's orbit does not take it to points well above, then well below the poles of the Sun. ##

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**NASA has a plan for yearly Artemis Moon flights through 2030.**  
**The first one could fly in 2021.**

<https://www.space.com/nasa-artemis-moon-landing-timeline-2021-budget.html>

<https://www.space.com/33908-space-launch-system.html>

<https://www.space.com/27824-orion-spacecraft.html>

<https://www.space.com/nasa-sls-rocket-launch-to-moon-slip-to-2021.html>

The first flight of NASA's Space Launch System (SLS) **megarocket** and Orion crew capsule — and the first big step in putting astronauts back on the moon — was originally scheduled to launch this year, but the mission is now expected to slip to 2021.

A new document from NASA explaining President Donald Trump's fiscal year 2021 budget request for the agency lists the uncrewed test flight, known as Artemis 1, as scheduled to launch in 2021. Although NASA Administrator Jim Bridenstine and other agency officials have said that an updated launch target has not yet been officially announced. ##

### **The Artemis Program**

The **Artemis program** is an ongoing crewed spaceflight program crewed space flight program carried out predominately by ,NASA U.S. commercial spaceflight companies, and international partners such as the European Space Agency(ESA), the Japan Aerospace Exploration Agency (JAXA), and the Canadian Space Agency (CSA) (CSA) with the goal of landing "the first woman and the next man" on the Moon, specifically at the Lunar south pole region by 2024.<sup>[2]</sup> NASA sees Artemis as the next step towards the long-term goal of establishing a sustainable presence on the Moon, laying the foundation for private companies to build a lunar economy, and eventually sending humans to Mars.

✓ [https://en.wikipedia.org/wiki/List\\_of\\_human\\_spaceflight\\_programs](https://en.wikipedia.org/wiki/List_of_human_spaceflight_programs)

✓ [https://en.wikipedia.org/wiki/Private\\_spaceflight](https://en.wikipedia.org/wiki/Private_spaceflight)

✓ [https://en.wikipedia.org/wiki/European\\_Space\\_Agency](https://en.wikipedia.org/wiki/European_Space_Agency)

✓ [https://en.wikipedia.org/wiki/Lunar\\_south\\_pole](https://en.wikipedia.org/wiki/Lunar_south_pole)

### **Not to be confused with the “Artemis Society”**

**Artemis Society International** served as the meeting ground and educational forum for The Artemis Project. The Society was formed in August 1994 to provide an open door to all supporters and participants in **the Artemis Project's quest to establish a permanent, self-supporting lunar community**. The Society was a non-profit foundation incorporated in the State of Alabama, USA.

**At a convention in Las Vegas, Nevada, in 2000, chaired by Peter Kokh, the Artemis Society became the current Moon Society.** Kokh had been publishing Moon Miners' Manifesto (“MMM”) as the publication of the Milwaukee Lunar Reclamation Society, the Milwaukee, Wisconsin chapter of the National Space Society. It then became the publication also of the Moon Society.

### **Serving members of both the National Space Society and of the Mars Society**

And recently, MMM, began to serve members of the Mars Society in the SE area of Wisconsin, who have not founded a Mars Society chapter. ##

**In 1996, February 25th to March 12, 2006,  
we assembled a crew for a 2 week Moon Society exercise at the Mars  
Desert Station in SE Utah.**

**<http://legacy.moonsociety.org/moonbasesim/>  
<http://legacy.moonsociety.org/moonbasesim/moonbasesim.html>**

**Our report listed major and minor defects in the design and maintenance of  
the Mars Society's facility, that should be addressed in designing a first human  
outpost on Mars or on the Moon.**

**After Moon Miners' Manifesto #301**

**Outbound: to the Moon, Mars, and Beyond**

After issue #301 of MMM was published, Kokh introduced a new publication,  
**Outbound: to the Moon, Mars, and Beyond.** ✓ *with no set schedule and* ✓ *no set  
number of pages.* Outbound has ✓ *no print version, only an online version,*  
*putting much less pressure on Kokh,* now 82 (as of 12/11/2019).

And recently, Outbound serves as a publication outlet for Mars Society members  
in SE Wisconsin, not enough (only 1 member) to launch a separate chapter. ##

**And a set of Books (below)**

**A Pioneers Guide to Living on the Moon**  
**published by Amazon in 2018**

**A Pioneers Gide to Living on Mars**  
**to be published by Amazon summer 2020**

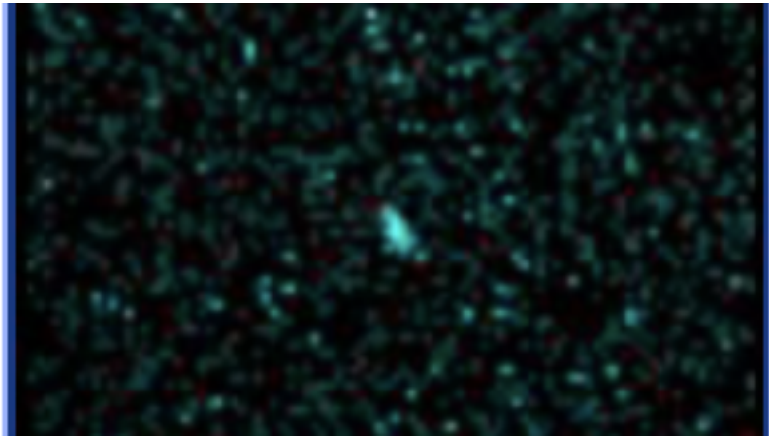
**A Pioneer's Guide to the Rest of the Solar System**  
(a collection of articles from 30 years of past issues of *Moon Miners  
Manifesto*)

Finally, a book about **“the Omniverse”**  
(As vast as our universe is, it can only be one of *an infinite number of universes*)

Tentative title (what makes everything tick)

**“The Omega Factor”** (this may change)

This “book” is currently an uncounted number of 3x4 inch index cards, and actually is the first book I started to write way back in August 1961 after an “eureka moment” one night while I was then living in London, England, age 23 (now 82). I have yet to compose a list of articles. But as book 3, above, will only be a collection of articles already written, I hope to turn my attention to “The Omega Factor” later this year (2020), starting with a brief outline (which may well become longer as I write.) #



**NASA's iconic 'Pale Blue Dot' photo of Earth from space just got a 21st-century makeover**

[https://  
www.space.com/pale-  
blue-dot-earth-space-  
photo-remastered.html](https://www.space.com/pale-blue-dot-earth-space-photo-remastered.html)

The first ever "portrait" of the solar system taken by NASA's Voyager 1 spacecraft Feb. 14, 1990, when the probe was about 4 billion miles (6.4 billion kilometers) from Earth.

**About 15% of larger asteroids turn out, on closer inspection, to be “binary”**

says NASA >> <https://www.jpl.nasa.gov/news/news.php?feature=7187>

*New observations by three of the world's largest radio telescopes have revealed that an asteroid discovered last year is actually two objects, each about 3,000 feet (900 meters) in size, orbiting each other.*

Near-Earth asteroid 2017 YE5 was discovered with observations provided by the Cadi Ayyad University Morocco Oukaimeden Sky Survey on Dec. 21, 2017, but no details about the asteroid's physical properties were known until the end of June. **This is only the fourth "equal mass" binary near-Earth asteroid ever detected, consisting of two objects nearly identical in size, orbiting each other.**

The new observations provide the most detailed images ever obtained of this type of binary asteroid.

On June 21, the asteroid 2017 YE5 made its closest approach to Earth for at least the next 170 years, coming to within 3.7 million miles (6 million kilometers) of Earth, or **about 16 times the distance between Earth and the Moon**. On June 24, the scientists teamed up with researchers at the Green Bank Observatory (GBO) in West Virginia and used the two observatories together in a bi-static radar configuration (in which Arecibo transmits the radar signal and Green Bank receives the return signal). Together, they were able to confirm that 2017 YE5 consists of two separated objects. By June 26, both Goldstone and Arecibo had independently confirmed the asteroid's binary nature.

The two objects revolve around each other once every 20 to 24 hours. The two objects are larger than their combined optical brightness originally suggested, indicating that the two rocks do not reflect as much sunlight as a typical rocky asteroid. 2017 YE5 is likely as dark as charcoal.

**Contact binaries, in which two similarly sized objects are in contact, are thought to make up 15 % of near-Earth asteroids larger than 650 feet (200 meters) in size**



**Go to the online page listed above to watch these two asteroids orbiting each other.**

**Why this “companionship” is so common, has yet to be explained. The cubic size of these objects and their average distance from one another, combined with their size, will give us their mass, and suggest their makeup, and possibly their source.**

**It is most likely that the two objects show the same face to each other, which, if close enough, might be bridged (by humans) somehow.**

**Another question is how similar the two bodies in their makeup. Did the two bodies “find one another” or were they once one body which somehow broke in two.**

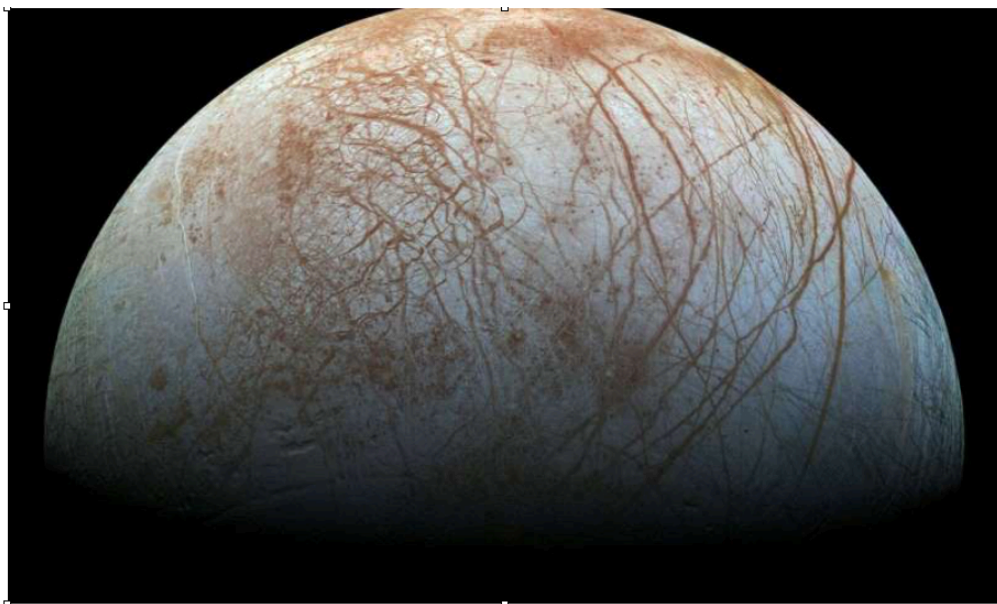
**Would this be an advantage for future human uses?**

**That’s up to the ingenuity of those interested and capable of reaching them and setting up shop somehow. *One idea might be a prison on one, the homes for prison employees on the other.***

**Outbound welcomes your suggestions, and if we get a number of suggestions, we will print them in a future issue of Outbound, along with your names, and your email address, *if you wish.***

**Send your thoughts and ideas to [kokhmmm@aol.com](mailto:kokhmmm@aol.com) under the heading “binary asteroids.” ##**

**'Racing certainty' that there is life on Europa,  
says leading British space scientist at Liverpool Hope University**



**What follows is our shortened version of the original at  
<https://phys.org/news/2020-02-certainty-life-europa-mars-uk.html>**

**It's 'almost a racing certainty' there's alien life on Jupiter's moon Europa—  
and Mars could be hiding primitive microorganisms, too. That's the view of leading**

**British space scientist Professor Monica Grady**, who says the notion of undiscovered life in our galaxy isn't nearly as far-fetched as we might expect.

Professor Grady, a Professor of Planetary and Space Science, says **the frigid seas beneath Europa's ice sheets could harbor 'octopus' like creatures.**

Meanwhile **the deep caverns and caves found on Mars may also hide subterranean life-forms—as they offer shelter from intense solar radiation while also potentially boasting remnants of ice.**

Professor Grady, now *Chancellor at Liverpool Hope University (in NW England)*, where she's just been installed as Chancellor says "When it comes to the prospects of life beyond Earth, *“it's almost a racing certainty that there's life beneath the ice on Europa.”*

"Elsewhere, if there's going to be life on Mars, it's going to be under the surface of the planet. There you're protected from solar radiation. And that means there's the possibility of ice remaining in the pores of the rocks, which could act as a source of water. *"If there is something on Mars, it's likely to be very small—bacteria.”*

*"But I think we've got a better chance of having slightly higher forms of life on Europa, perhaps similar to the intelligence of an octopus.”* (Moon-sized) Europa, one of Jupiter's 79 known moons, is covered by a layer of ice up to 15 miles deep—and there's likely liquid water beneath where life could dwell. The ice acts as a protective barrier against both solar radiation and asteroid impact.

Meanwhile, the prospect of hydrothermal vents on Europa's ocean floor—as well sodium chloride in Europa's salty water—also boost the prospects of life.

As for what's beyond the Milky Way, Professor Grady says the environmental conditions that led to life on Earth are 'highly likely' to be replicated elsewhere.

The expert, resident at the Open University and who's also worked with the European Space Agency (ESA), adds: **"Our solar system is not a particularly special planetary system.”** ##

**Editor: We have long felt that since Europa is a kind of moon that is likely to orbit gas giant planets, no matter how bright or type of the sun they orbit, even around the smallest dimmest star, that this kind of life will be far more common than the kinds of life we find on our home planet Earth.**

**And with this in mind, missions to Europa, that explore what lies under its multi-fractured ice crust, should be “Mission #1” in our “must list” This can start with a landing mission, equipped to chemically analyze the color streaks found everywhere on Europa, pole to pole. No NASA mission could be more important. PK**

**How to get the most to the Moon (& to Mars)  
for the least amount of rocket power,  
by protecting fragile items from breakage by stuffing with needed soft  
items**

✓ **Needed Soft items:** ✓ clothing, ✓ bedding, ✓ pillows, ✓ towels, curtains etc.

✓ **Hard non-fragile items:** ✓ silverware, ✓ metal drinking cups and ✓ plates  
(aluminum would be lightest)

✓ **Hard Fragile items:** *dishes & drinking glasses and coffee cups*, could be  
stuffed with desired items: sugar, salt & pepper and other condiments, *then*  
*protected from one another with soft items*, such as rolled up clothing & or bedding  
to keep fragile items from

**Note:** The idea is to get the most to the Moon (or to Mars) ✓ with the least  
total weight, ✓ in the least amount of space, without anything breaking

✓ **Note:** drinking glasses & cups could be made of metal, as could dinner plates  
and iirc, for the same or lower weight

NOTE: *If* the suggested Dual Torus was built and placed in Earth orbit, with Moon  
level gravity in the inner torus, and Mars level gravity in the outer torus, they could  
be furnished with lightweight unbreakable items as suggested above. **It would be  
far better to catch our mistakes in Earth orbit, than not until after pioneers  
reach Mars!**

**Your comments & suggestions are welcome!**

**Send to > [kokhmmm@aol.com](mailto:kokhmmm@aol.com)**

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**Must Reading:** The Sun does much more than provide sunshine on  
Earth

**Ten brilliant discoveries by NASA's Solar Dynamics Observatory in  
its 1st decade**

**[https://www.space.com/nasa-solar-dynamics-observatory-10-  
discoveries.html](https://www.space.com/nasa-solar-dynamics-observatory-10-discoveries.html)**

1. Solar flares   2. Solar tornadoes   3. Giant waves   4. Comets  
5. Global circulation

**6. Coronal mass ejections    7. Coronal dimming    8. Almost an entire solar cycle    9. Polar coronal holes    10. Spontaneous magnetic reconnection #**

**NASA is considering missions to Venus and to 2 outer solar system moons (Io and Triton) as the next in its Discovery line of planetary science missions.**

NASA announced Feb. 13, 2020 that it has selected **four finalists in the next round of the Discovery program** from an unspecified number of proposals submitted last summer. **Each of the mission proposals will receive \$3 million for what are known as Phase A concept studies to be completed in nine months.**

NASA will select up to two of the missions for development in 2021. “These selected missions have the potential to transform our understanding of some of the solar system’s most active and complex worlds.” (said Thomas Zurbuchen, associate administrator for science at NASA, in an agency statement about the selections.)

**Two of the finalists would go to Venus**, a planet last visited by NASA with a dedicated mission by the Magellan orbiter in the early 1990s. ✓ **The Deep Atmosphere Venus Investigation of Noble gases, Chemistry, and Imaging Plus, or DAVINCI+**, mission includes ✓ an orbiter and ✓ a probe that would descend through the planet’s dense atmosphere to measure its composition.

**Venus Emissivity, Radio Science, InSAR, Topography, and Spectroscopy, or VERITAS**, is a Venus orbiter that would map the surface using a synthetic aperture radar and also link infrared emissions from the surface to geological features.

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**The other 2 proposed missions seek to study moons in the outer solar system.**

> **Io Volcano Observer (IVO)** would perform a series of close flybys of **Io**, the innermost of Jupiter’s four large moons (**Ganymede, Callisto, Europa, Io**) and the most volcanically active body in the solar system, to monitor that volcanic activity.

>**Trident** would make a single close flyby of Triton, Neptune's largest moon, which has **plumes erupting from its surface that could be linked to a subsurface ocean.**

Discovery is NASA's line of relatively low-cost planetary science missions, less expensive than New Frontiers or flagship-class spacecraft. Missions selected in this round of the Discovery program would have *a cost cap, excluding launch and operations, of \$500 million.* Those missions would launch in one of two windows, one from January 2025 through December 2026 and the other from July 2028 through December 2029.

**EDITOR:** *The mysteries of Jupiter's moon Europa, with an ocean below a thick ice crust is INFINETLY more mysterious and important than the volcanoes of IO.*

*It is likely that if there is life on Europa, "Europas" will be far more common in our universe than "Terras" ("Earths".) So boooo! to NASA, for making the wrong selection!*

*And we DO need to explore Titan, but from on its surface, with submarines and other craft, not just from above. But one GOOD mission would be better than 2 "so so" ones. And somehow, we should find a way to fly them sooner!*

### **MONEY IS IMPORTANT**

*BUT it comes in 2nd to Discovering and Understanding worlds with "Life" vastly different than what we have on our beloved EARTH.*

*Our rating of NASA's suggestions: from 1 (lowest) to 10 (highest) is a 5, plus a big boo! PK*

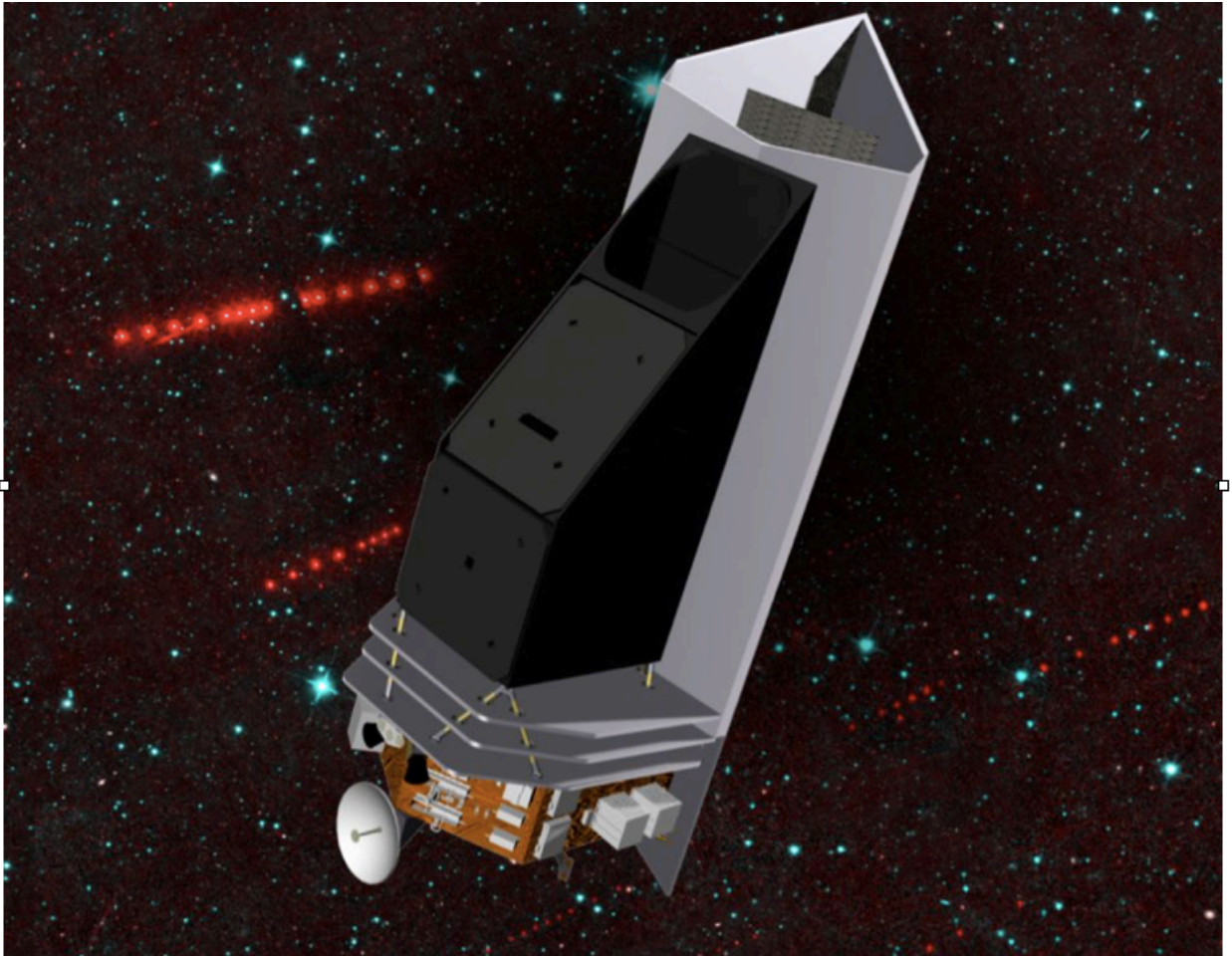
### **Near-Earth Asteroids in the News**

NASA wants a new space telescope to protect us from dangerous asteroids

See the **dramatic increase in near-Earth asteroids** NASA has discovered (video)

<https://www.space.com/41260-near-earth-asteroid-detection-video-nasa.html>

<https://www.space.com/nasa-to-build-near-earth-asteroid-hunter-telescope.html>



Huge (sizable) asteroid “**Apophis**” flies by Earth on Friday the 13th in 2029. A lucky day for scientists

**1,100 feet (340 meters) across** and will pass within 19,000 miles (31,000 km) of Earth's surface.)

<https://www.space.com/asteroid-apophis-2029-flyby-planetary-defense.html>

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**If we are going to call natural satellites around other planets  
“moons”**

**Then we should call other planets “earths”**

And for heavens’ sake, **our Moon should be capitalized because it is a name of a specific body.**

We do not call other planets “earths” so we should not call other natural satellites “moons” - Let’s find another word like “natural satellites,” or “co-planets” or “**orbiters.**”

**Or let’s have a contest for a suitable term.**

*We may have to invent one!*

*And if we have a contest, let’s stick with the winning term.*

*Let the Astronomical Association be the judge, that way everyone will use the new term.*

**Another Option is to call our Moon, “Luna.”**

**(the Roman/Latin word for the Moon)**

*And then we will be free to call other natural satellites around other planets “moons!”*

*Too bad I didn’t do that in my first book: “A Pioneer’s Guide to Living on Luna” (Maybe, if there is a reprint!)*

**But that’s not how English Speaking people refer to *THE* Moon.-PK**

**The SPACE TOURISM INDUSTRY is on the rise**

The space tourism industry garners much deserved attention in launching next generation enterprise offerings.

**Axiom Space is developing the world’s first private space station.**

**Blue Origin** and **Virgin Galactic** are proceeding with plans to offer passenger flights.

**SpaceX** and **Boeing** are testing manned capsules for orbital flight

And **McDonalds** will pay half the ticket cost for every 100 thousandth customer in the door (*or so we wish!*)

**Space Perspective** will fly passengers near the edge of space in their luxury gondola attached to a space-safe balloon. And Space Adventures holds fast to its mission to open the space frontier to private citizens, which it successfully

realized with its client, Dennis Toto, the first space tourist. Even NASA has decided to get in on the action, announcing it will board private space travelers.

### **BILLIONS in Dollars Funding Allocated**

Other high growth areas in space tourism include **Earth-based space themed experiences**, such as **Zero Gravity aircraft flights**. The conference examined the numerous VR simulations at science centers and space museums around the world, new space-themed TV shows and movies, IMAX projects, touring exhibits, Mars/future-themed theme parks, immersive pop-ups, attractions, resorts and experimental activations being green-lit and developed by studios, agencies, and brands.

### **Rocketing Toward Stratospheric Value**

The space tours industry garners much deserved attention in launching next generation private enterprise offerings. **Axiom Space** is developing **the world's first private space station**. Blue Origin and Virgin Galactic are proceeding with plans to offer passenger flights. SpaceX and Boeing are testing manned capsules for orbital flights.

*Join our speakers and supporters - the industry insiders making it all happen. ##*

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(Peter's pet peeve)

**It's "the Moon"(capitalized) - not "the moon"**

**See ought to fill the pickup trucks with the "m"oon dictionaries**

***It is stupid to believe that we should not capitalize the name of Earth's companion***

***because its name begins with "the"***

If we should refer to the Moon as the moon, because there are more than one, although around other planets.

Then we would have to refer to the most important world in **the known universe as the earth**

And then we should refer to **the** hague and **the** netherlands, and **the** united states instead of the **H**ague, the **N**etherlands, and the **U**nited States.

and so on. ***It's time to grow up guys!  
and stop paying attention to the self-appointed English Scholars***

### **Luna, Hellas, Chandra**

***If we should change the name to Luna (the ancient Roman Latin word for the Moon)***

***that's fine for me. As would be Hellas, the ancient Greek word for for the Moon***

***and Chandra literally means the "Moon" in Sanskrit, Hindi and other languages in India.***

***Once there is a government of some kind covering the entire Moon, small letter fans will have to concede, and start saying the Moon.***

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### **Significant NASA budget increases to fund the Artemis program**

**[Artemis (Greek: Ἄρτεμις Artemis in the ancient Greek religion and myth, is the goddess of the hunt, the wilderness, wild animals, the Moon, and chastity.)]**

**[NASA's Artemis program is an ongoing crewed spaceflight program carried out predominately by NASA, U.S. commercial spaceflight companies, and international partners such as the European Space Agency, - Wikipedia]**

February 10, 2020 - The White House is proposing to increase NASA's budget by more than two and a half billion dollars in fiscal year 2021, providing substantially increased funding for the Artemis program while seeking once again to cancel several science and education programs. The budget proposal, released by the Office of Management and Budget Feb. 10, requests \$25.246 billion for NASA in the 2021 fiscal year that starts Oct. 1. That is a 12% increase from the \$22.629 billion that Congress appropriated for NASA for fiscal year 2020.

“This is a 21st century budget worthy of 21st century space exploration, and one of our strongest budgets in NASA history. If the president's support for NASA

wasn't clear before, it should be obvious now.”” NASA Administrator Jim Bridenstine said in a “State of NASA” speech at the Stennis Space Center.

“A major beneficiary of that additional funding is NASA’s Artemis program, which seeks to return humans to the moon by 2024. **The budget requests more than \$3.3 billion for development of human landing systems, an effort that received just \$600 million in 2020.** “The strategy for developing these landers **relies on competition, industry innovation, and robust Government oversight with the goal of delivering safe, reliable landing systems that can enable affordable and sustainable exploration.**”

The budget funds several other lunar initiatives, including  
\$175 million for lunar spacesuits,  
\$212 million for initial work on lunar rovers and a surface habitat and  
\$430 million for a new Lunar Surface Innovation Initiative that will fund technology demonstrations such power generation and utilization of lunar resources.

The overall **“Moon-to-Mars campaign,”** which includes exploration systems, technology development and science programs, has a cost estimate of \$71.3 billion for fiscal years 2021 through 2025, and \$87.7 billion when including funds allocated for fiscal years 2019 and 2020.

The budget proposal, though, offers a “greatest hits” list of programs that the agency once again seeks to cancel. That includes the Office of STEM Engagement, the CLARREO Pathfinder and PACE Earth science missions, and the WFIRST astrophysics mission. The 2021 budget proposal is the fourth in a row that sought to close NASA’s education office and cancel CLARREO Pathfinder and PACE, and the third in a row that proposed cancelling WFIRST. Congress rejected previous efforts to cancel those programs. ##

### **LET’S HOPE THAT THE GOVERNMENT STICKS TO THIS PLAN!**

[**Note:** Peter Kokh was a graduate of Campion Jesuit High School, a boarding school in Prairie du Chien, in SW Wisconsin, 1951-55, and as one of the top students, had to take **2 years of Greek, along with 4 years of Latin**, the language of ancient Rome. *And being self-motivated, he dabbled in ancient Sanskrit (India) as well.*][No, I was *not* “sent” to this school . I “asked” my parents if I could go there, after reading a novel about a boy in a boarding school - *and I loved it, all four years of it.*]

[Unfortunately, due to declining numbers of students, the property was sold 20 years later to the state and its now a Wisconsin State Prison.]



### **The Canadian Hydrogen Intensity Mapping Experiment Fast Radio Burst Project at night.**

One of the universe's deep mysteries just got a lot stranger. Astrophysicists have discovered a clue that could help explain why, every once in a while, superfast bursts of radio waves flash across Earth from deep space. But the clue — a repeating 16-day pattern in one of the bursts, undermines one of the most popular theories for where the bursts are coming from.

Fast radio bursts (FRBs) have likely happened for billions of years. But humans only discovered them in 2007, and have detected only a few dozen of them since. And in June 2019, astronomers finally tracked an FRB to its home galaxy.

But no one knows what causes them. Because these bursts are so rare, unusual and bright — considering that they're visible from billions of light-years across space — physicists have tended to assume they come from a cataclysmic event, such as the collision of stars.

**This repeating pattern, however, suggests that something else is going on, that there's some sort of natural machine in the universe for pumping regular shrieks of radio energy across space.**

No one knows what this pattern means, the researchers noted in a [statement](#), but this pattern doesn't fit neatly into any existing explanations for FRBs.

In general, patterns like this in astrophysics are often related to a spinning object or orbiting celestial bodies. Neutron stars often seem to strobe regularly from the perspective of X-ray detectors on Earth, because hot spots on their surface spin in and out

of view like a lighthouse beacon. And tiny planets may dim the light of the stars they orbit everytime they pass between that star and Earth.

In other words, for astrophysics, **patterns tend to indicate rotation. But no one knows if this pattern governs all FRBs or just some of them. ##**



**Asteroid #3 Pallas: 2 unique assets: (✓) Highly inclined orbit, from 24° above the Sun's North Pole to 24° below the Sun's South pole:**

**(✓) A Solar Observatory at each pole of Pallas would have a vantage point to allow studies of the Sun's North and South poles that could not be done from Earth. Yes, a close in probe with an orbit that swings from high above the ecliptic to well below. But there is an advantage for "manned" observances.**

**What might we learn about the Sun from these vantage points? We can't say until the probe is real. Fairly spherical: From almost any point on Pallas surface we could tunnel through to its gravitational center, and hollow it out for a laboratory of "negative zero gravity," ideal for physics studies that could be done nowhere else.**

Actually they could be done as well as from the "core" of Vesta, but putting both laboratories, ✓ **solar polar N & S**, and ✓ **upside down zero gravity at the core**, makes

sense when it comes to supplying outposts from Earth or from the Moon, and by keeping science crews there busy. In their spare time, crews could explore Pallas' surface. In the image above, there seem to be a "belt" which may or may not run all the way around. Actually, from alternately above and below ecliptic, they could see the rest of the solar system from a fairly high angle above and below the ecliptic, a possible advantage. ##  
p.1

### **Where would Visitors to Earth most likely leave a "calling card"?**

✓ NOT where we might find it *before* we had begun exploring our Solar System, and *after* we had been to the Moon.

✓ PERHAPS in the #1 visitors tourist attraction on Mars, Valles Marineris canyon, so large as to put Arizona's Grand Canyon in the class of a "ditch."

Humans would put priority on establishing the first settlements where the two most important assets are nearby, ✓ water, of course, ✓ and basalt, the easiest construction material: for homes, for furniture and furnishings, etc.

✓ Calling cards left on Mars? if they wanted them to be seen, as soon as possible, key spots in Valles Marineris would likely catch human attention sooner than anything anywhere else.

✓ But what if they didn't want their past presence to be known right away?

✓ at the North or South poles, where signs of the paths of melted water ice are likely to be found?

✓ debris piles of one kind or another along one time shores of a now gone great northern ocean

**BUT FAR MORE LIKELY THAN NOT IS THAT  
WE WILL NEVER FIND SIGNS OF PAST VISITORS.**

*And if "visitors" had left any calling cards, it is likely that they would leave traces that could not be discovered until we have become an "adult civilization" (by their definition, not ours, likely to be too loose.) ##*

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*A "Planetary Simulator" could help identify habitable alien worlds*

<https://www.space.com/climate-models-for-alien-worlds.html>

NASA's scientists are applying climate models developed on Earth to understand what other worlds might be able to host life.

**Earth's climate is pretty great for life as we know it.**

**But scientists have much less data about what the climates of alien worlds could be like; and astronomers don't have a way to get a whole lot more data anytime soon.** That's inconvenient, since *climate will inevitably shape whether life can exist on these exoplanets and in what way.*

To bridge the gap, *scientists are taking models of how Earth's climate works and applying them to other worlds.*

"The models make specific, testable predictions of what we should see," Karl Stapelfeldt, an exoplanet scientist at NASA's Jet Propulsion Laboratory in California, said in a statement. "These are very important for designing our future telescopes and observing strategies."

That's because scientists know *it will be a long, long time before they can see any life in other solar systems directly. Even studying the atmospheres of these worlds is extremely difficult*, although projects such as NASA'S James Webb Space Telescope will increase astronomers' capabilities to do that.

So, for worlds with atmospheres, curious scientists are trying to figure out how the details of an exoplanet influence that bubble of gases. What happens if a planet is tidally locked (to its "sun"), with one side in eternal day and one in eternal night? What happens if its surface is all land or all ocean, or a mix of the two?

**And that's where climate models come into play.** By tweaking an Earth model, scientists developed ROCKE-3D, a "planetary simulator." They can feed different combinations of exoplanet characteristics into the model and then see what happens in the atmosphere and how the results might affect habitability.

Example: based on what scientists know now about **Proxima-Centauri B** which orbits in the nearest star system to Earth, they suspect the planet is tidally locked. But ROCKE-3D analysis suggested that, depending on other details of the world, *clouds could cluster on the permanently sunny side of the planet, making the temperature less scalding.*

**Conclusions:** like these could change the way scientists prioritize different exoplanets for precious observation time by future instruments, according to NASA. That's the downside of the wealth that exoplanet scientists have reaped: With more than 4,000 discoveries already, there are far more worlds than instruments will ever have time to study.

"If we want to observe most wisely, we have to take recommendations from climate models," Anthony Del Genio, a planetary climate scientist who recently retired from NASA's Goddard Institute for Space Studies in New York, said in the statement. "That's just increasing the odds." ##

### **Hot News Items that may change how we think about some things**

**# What looks like a crashed lighter than air craft in Mars' 3,000 mile long Valles Marineris canyon complex has been found.** As it could not possibly come from Earth, it will take a dedicated mission to visit these ruins to learn more about these visiting aliens and their interstellar culture. The chances that we will be able to tell from where this alien craft had come from are slight, unless its crew left clues in case Earth's then ape-like creatures evolved further.

**# Discovery of what looks like animal footprints on Mars in the planet's lowest area and thickest atmosphere in Hellas Planitia.** Only a few bones, and greatly eroded organic compounds are found, with some tell tale garments. These items were all discovered by the first Russian Mars mission, with a fully robotic crew.

**# Solar tornados have been noticed in the North and South polar areas of the Sun,** sucking in any asteroids that get too close and/or are moving too slowly. (There is a contest to name this "event" - after 3 weeks, the proposed name "Solar Oops" has been the public favorite but is abhorred by scientists.)

**# A European Space Agency mission to Jupiter's moon Europa, has found biological organic compounds in the orange streaks on this moon's thick ice crust.** The mission's second goal is to try to find out the thickness of Europa's highly fractured global ice crust. These fractures may be due to gravitational stress during Europa's slightly elliptical orbit around Jupiter. Unfortunately, these cracks are so common that it might be very difficult to find an undisturbed part of the ice crust in which to excavate a tube through which probes could be winched down into the ocean below, to learn more about the ice, but above all, to see if there are any kind of living creatures in that ocean, and how primitive or how advanced some may have evolved. This is of prime importance because it is almost certain that there are far more "Europas" in our galaxy than "Earths."

**# Doctor Robert Zubrin says the Moon must come first for experience in:**  
use of basalt: housing, furniture, plumbing, fabrics including clothing  
and to build “cabin homes” to take pioneers to Mars  
**and he has now joined the Moon Society as an Advisor, to stress programs  
and missions that are or will be relevant to similar situations on Mars.**

**# A new “complementary” MOON TO MARS SOCIETY has been formed to set  
up an Antarctic outpost in one of Antarctica’s Dry Valleys where the year around  
climate is closest to what pioneers will have to cope with on Mars: Among the  
differences:** crews will follow a 24 hour 37 minute day/night schedule. One object  
is to see whether “morning people” (who can’t wait to jump out of bed and start a  
new day), or evening people (who will have no trouble sleeping an extra 37  
minutes every night), on a more Mars-like schedule. The living quarters will be one  
story: easier to cover with foam blocks under a tarp to keep quarters below warm  
enough to be livable, both for ease of insulation, and ease of escape should there  
be a fire or other serious reason to “abandon” the hab.

**# The “Moon to Mars Society” has not yet decided where to set up shop in the  
United States. Arizona and Idaho (Valley of the Moon National Monument) have  
each welcomed the new Society and have both suggested “ideal sites.” But that the  
Idaho site is basaltic gives it a considerable edge. In anticipation of this decision,  
the Society is setting up its United States headquarters in Boise, Idaho, with a  
backup office in Salt Lake City, Utah.**

**Another goal of the Moon to Mars Society is to design its regional  
“habitats” as three-story in transit, but one story on location, with the three  
“floor” units set side by side, easier to ship and easier to exit in emergency.**

Discovery of what looks like animal footprints on Mars in the planet’s lowest  
area (with thickest atmosphere) in Hellas Planitia. Only a few bones, and greatly  
eroded organic compounds are found, along with some tell tale garments. These  
items have all been discovered by the first Russian Mars probe .

**The Moon to Mars Society has lower dues levels:** for ✓ students,  
✓ physically impaired, and ✓ retired persons, and for ✓ unemployed adults. But  
also ✓ higher “voluntary” dues levels, for those with higher income levels. The  
Society’s goals are such that everyone can help one way or another. ##

*[Oh, by the way, **Happy April Fools Day!!**]*