Santa Monica Amateur Astronomy Club

September, 2016

The Observer

UPCOMING CLUB MEETING: FRIDAY, SEPTEMBER 9, 7:30 PM

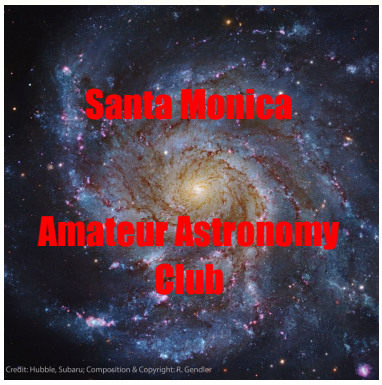
Speaker: Doug Saxon

Topic: Human Space Flight: What's Next?

There has been a lot of talk and speculation about what the next goal for human space flight should be. Some, like Elon Musk say Mars should be the goal. Others have talked about going to an asteroid. Some few hold out for returning to the Moon. Let's look at the options. What are the hurdles to each of these efforts versus the rewards? Be ready to examine the evidence and discuss your favorite proposal.

About our speaker: Doug Saxon has a PhD. in History from UCLA. A retired LAUSD teacher, Dr. Saxon is currently teaching at West Los Angeles College. He is a former Fulbright-Hays fellow and Social Science Research Council Fellow—and a member of the SMAAC.

Moon base, space station—as imagined by Clarke and Kubrick in 2001: A Space Odyssey



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OUR MEETING SITE

Wildwood School
11811 Olympic Blvd.
Los Angeles, CA 90064

Free parking:
Garage, SE corner of Mississippi & Westgate.

Meeting: Friday, September 9, 7:30 pm

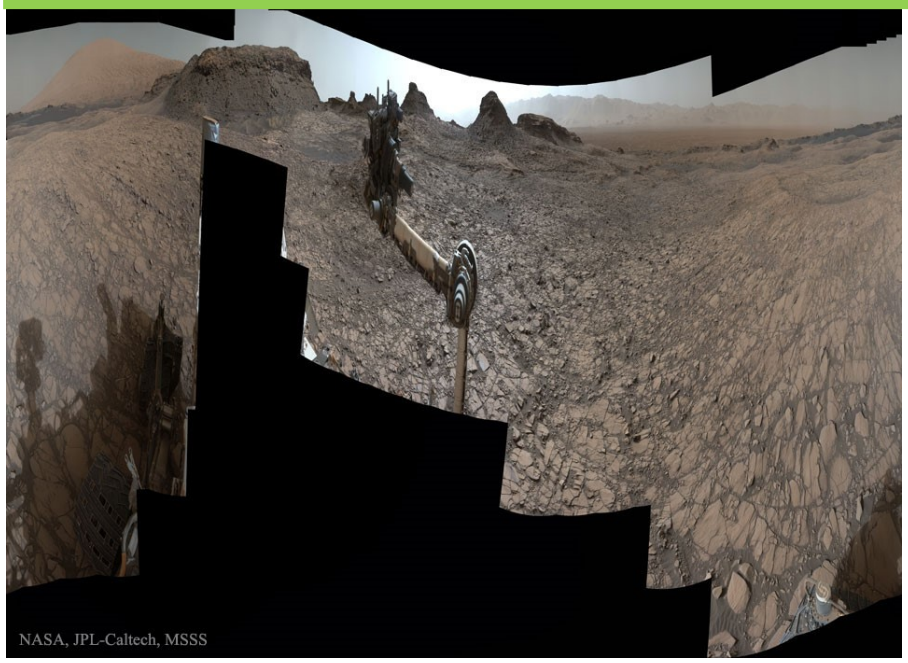
Speaker: Doug Saxon
Title: Human Space Flight: What's Next?

Where do our intrepid astronauts go next, after years of circling in low Earth orbit? Back to the moon? On to Mars? Perhaps to an asteroid? What is the future of people in space? Should remote exploration be left to expendable robots, or do we need living, breathing explorers to lead the way out, into the Solar System?

These are big questions, as we and NASA ponder our human future in space. Join us for a look at these exciting options, and challenging issues.

Doug Saxon will guide us through the options…

…What do you think?

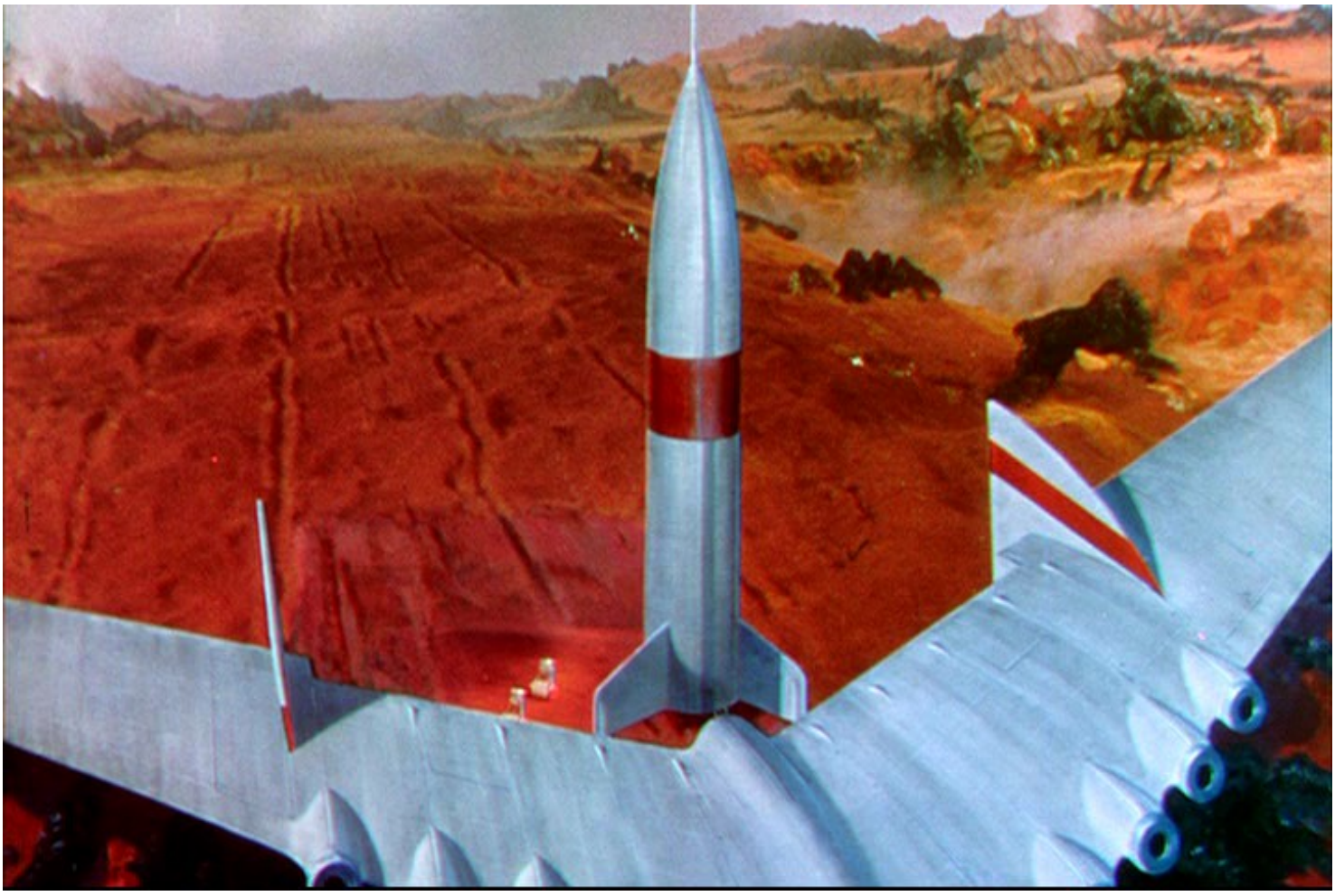


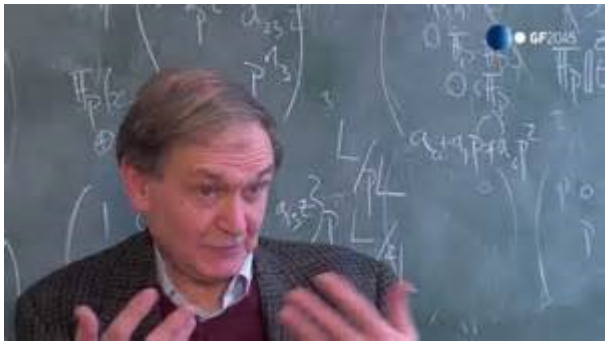
Above: Humans on Mars? Could Elon Musk really do it? Has Matt Damon already got it figured out? Or is Mars just too harsh, too expensive and too remote for anyone to have the Right Stuff?

Left: Curiosity rover at Murray Buttes. Do we, instead, leave Mars to the hard-landing, radiation-toughened, electronically-warmed robots, and return to the moon?

Dr. Saxon will share his views and his historian's perspective. Doug is, of course, also one of our esteemed club members—so please join us for this special event!

From “Conquest of Space”, George Pal, 1955. Even back then, with rockets powered by futuristic nuclear reactors, Mars wasn’t easy. No one knew if the sky was red or blue…or if snow would ever fall on the water-starved base.



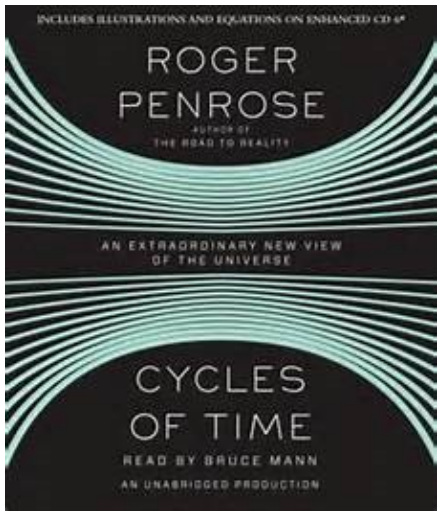


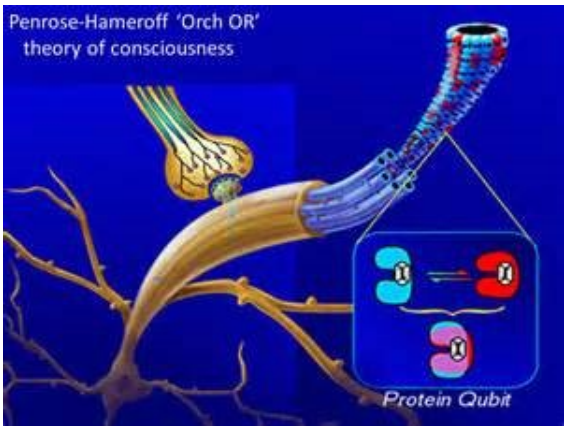
Roger Penrose to speak at Chapman University, September 28:

Sir Roger Penrose, Emeritus Rouse Ball Professor of Mathematics at Oxford, and winner, with Stephen Hawking, of the 1988 Wolf Prize for physics, will be speaking from 4 to 5 pm at Chapman University, September 28. Penrose developed many of the mathematical methods later used by Hawking in his work on black holes. Penrose is widely considered one of the outstanding mathematicians of his generation.

His recent work has focused on the nature of consciousness, and on how our concepts of time and reality might emerge from deeper mathematical structures. This talk may be...somewhere out there....

Tickets are required, but are free. As of 9/5/16, they were still available. Use the website listed at the bottom of this page. If you're interested, sign up now—word will get around quickly.

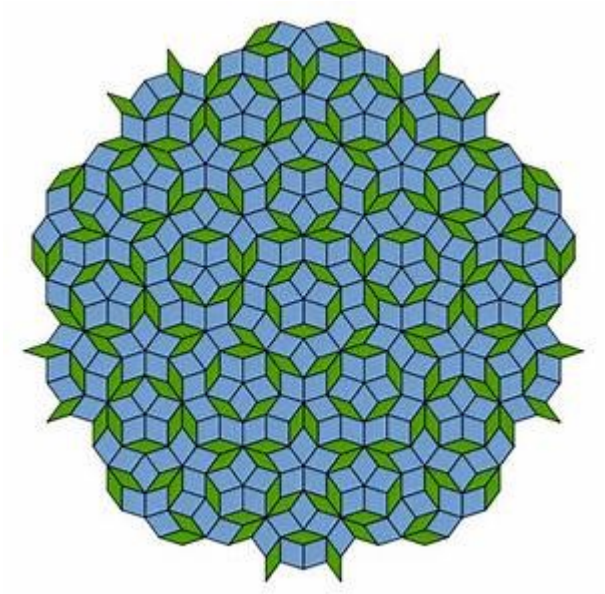


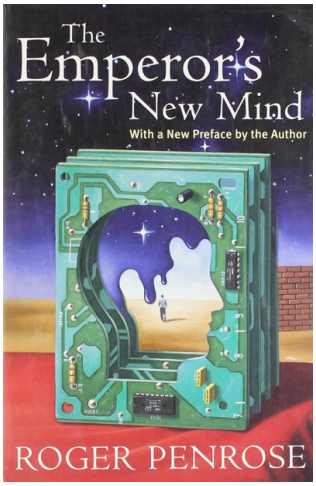


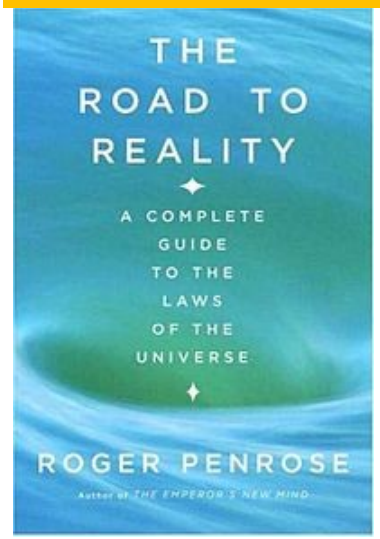
Penrose is the author of many famously thought-provoking books, such as "The Emperor's New Mind," and "The Road to Reality."

His noted mathematical inventiveness has ranged from devising space-time threading techniques leading to his proof that General Relativity implies a Big Bang singularity, to "Penrose Tiling", below left.

Penrose has speculated that microtubules in the brain, above left, could be just the right size and shape to utilize quantum entanglement effects, and give rise to our sense of consciousness. Right or wrong, it has stimulated a great deal of discussion!

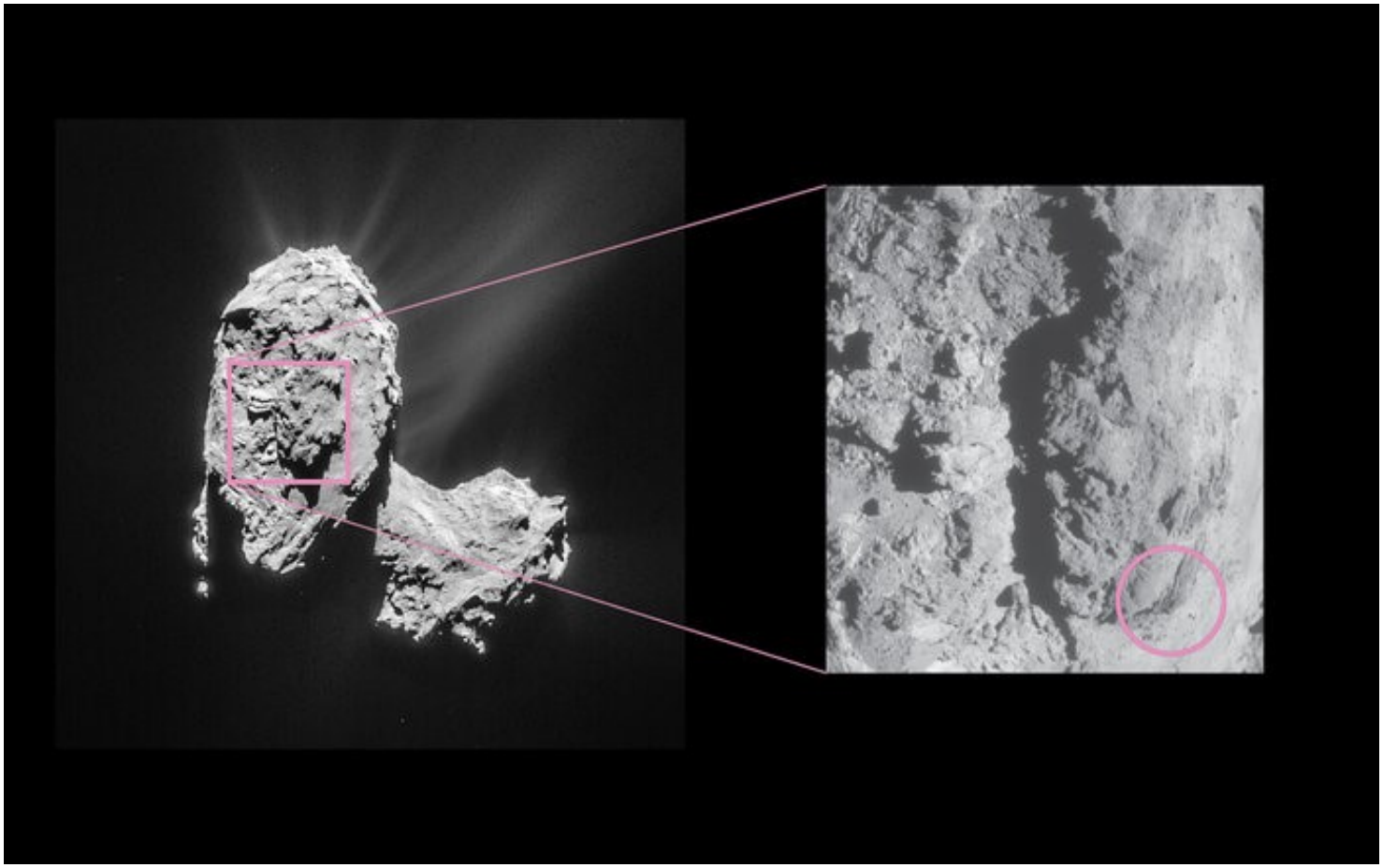






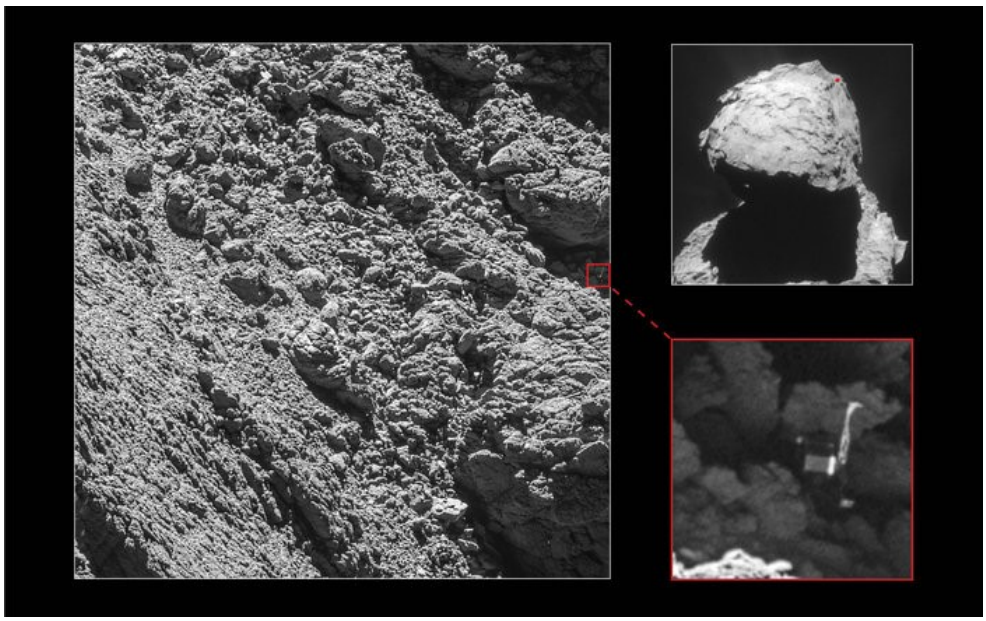
To order free tickets:

http://www.chapman.edu/about/administration/inauguration/events-schedules.aspx



REALLY FROZEN!

The European Space Agency's Rosetta Spacecraft captured a large outburst of material, apparently caused by a landslide on the surface of comet 67P/Churyumov-Gerasimenko. The spacecraft is slated for a "controlled crash landing" on the comet September 30. So, as the month ends, we should be getting some remarkable close-ups of this frozen world from the icy fringes of our Solar System.



PHILAE FOUND, FINALLY!

The Rosetta Mission's Philae lander has finally been found! Its 1-meter wide body was imaged from 2.7 kilometers away. As this spectacular mission closes, the main craft will itself get up close and personal with the comet. Although it is not designed to function from the surface, we're going to get even more spectacular views as the probe comes in for a landing on this utterly exotic landscape.

Hello, Neighbor

An artist's impression of Proxima Centauri b, the closest exoplanet known—and perhaps the closest one possible, given that Proxima Centauri is the nearest star to our sun.

Proxima, a red dwarf star, orbits A and B, the two larger, sun-like stars of the triple system—and now, we're fairly certain, Proxima has its own world orbiting close by.

WHO, OR WHAT, GOES THERE?

Does the closest star system to our sun harbor any planets of its own? Astronomers have been searching the Alpha Centauri system for decades—and now, it appears, we have the answer.

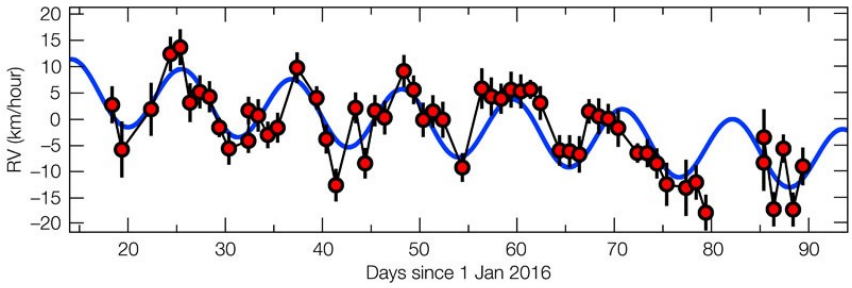
The Alpha Centauri System consists of two bright stars: Alpha Centauri A and B. "A" is a G2V star, just like our sun. Almost exactly the same temperature as our sun, it is about 1.1 time the sun's mass, 1.23 times its diameter, and 1.6 times its brightness.

"B" is a K1V star, a bit cooler than the sun. It is estimated to be about 0.9 times the mass, 0.86 times the diameter and roughly 0.5 times the luminosity of our sun—and for a while, astronomers thought they had detected a planet around it. That turned out to be shaky data, and the planet went away...for now.

"Proxima", the outer member of this system, is so distant from the others that some have though it merely passing through. It now appears to be bound, and on the near side of its roughly half-million year orbit about A and B, lying over 10,000 astronomical units, 1 trillion miles, or 1/6 of a light year, closer. That puts it at more than 256 times the sun-Pluto distance from A and B. Meanwhile, the central A and B stars range, in their 80-year mutual orbit, from 11 au (Earth-Saturn distance) to 36 au (nearly Earth-Pluto distance) apart. Proxima Centauri is only 20 times farther from the Earth than it is from Alpha Centauri A and B!

Proxima, despite its neighborly location, is 100 times dimmer than the dimmest star we can see with the unaided eye (1th magnitude). A class M6V red dwarf, Proxima is 12% the mass, 14% the diameter, and a meager 1/20,000 the brightness of our sun.

The good news: An orbiting planet can give this low-mass star a visible "tug". The "Doppler Wobble" of Proxima is 5 kilometers per hour, or 3,1 mph—no more than a brisk walking pace. Yet, that's well within our current limit of detection. The planet must be at least 1.27 times, but is probably no more than 3 times, the mass of the earth—depending on the inclination of its orbit.



A Shaky Start For a Star

The to-and-fro "wobble" of Proxima Centauri, as it dances about a common center of mass with its planet.

Southern Skies…

Data for Proxima Centauri was taken with the exquisitely sensitive HARPS (High Accuracy Radial Velocity Planet Searcher) spectrograph on the 3.6 meter telescope of the European Southern Observatory at La Silla.

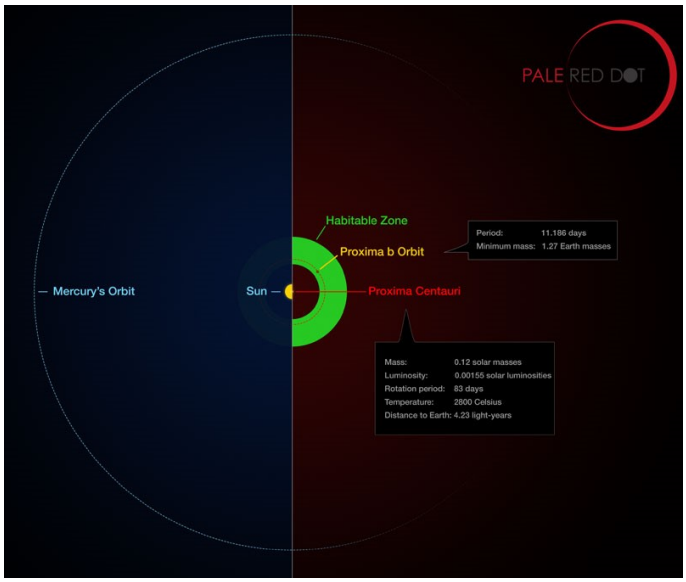
If you want to see Proxima Centauri, you'll need a telescope—not necessarily that big—and an airline ticket.

Here's what's exciting about "Proxima b":

(1) The mean temperature is –38°F, absent any added Greenhouse Effect. Not too far from Earth conditions!
(2) The planet is close enough that its atmosphere might be studied, even imaged, in the not-too-distant future.
(3) Class "M" dwarfs like Proxima represent 95% of the stars in the Milky Way, so planets may be VERY common.
(4) Proxima and its planet figure to be about 5 billion years old, if linked to "A" and "B". Earth: 4.56 billion years!
(5) Proxima b may well have formed farther out from its star, and wandered inward, increasing the chances that it has water—and an atmosphere, which could be stabilized with the help of water, despite current losses.

…But before you get TOO excited about "earthlike" conditions:

(1) Proxima b, only 4.5 million miles from its sun, gets 100 times the X-ray flux that Earth does. Being cool and low mass, Proxima Centauri transfers its heat upward by convection, not radiation. That means it develops magnetic fields, and twists them into knots. When they snap, Proxima flares like our sun, despite its diminutive stature. Red dwarfs are known for this, and Proxima has at least several giant eruptions per year. Ouch! (At least, for us…)
(2) Proxima b is tidally locked to its star, always keeping the same side in daylight during its 11.2 day orbit. Figures to be a windy place, if airy! Dawn and dusk regions would have intermediate temperatures, at least.
(3) The slow rotation of this world, compared to ours, might make for a weaker magnetic field. Magnetic fields protect atmospheres, and atmospheres protect life. (Magnetic fields don't block X-rays, though.)
(4) We learn a lot about planets by observing transits—but there's no evidence that this planet transits across the face of its star.
(5) Earthlike conditions? *Earth* has only been "Earthlike" for the last 10% of its lifetime! You would have needed a space suit on your own planet, until the great Devonian forests raised our oxygen levels. Then again, there was plenty of life before that. Even Mars is often categorized as "Earthlike" planet!



That's the story so far! It's fun to speculate, but the real excitement may lie in projects already being dreamed up by astronomers.

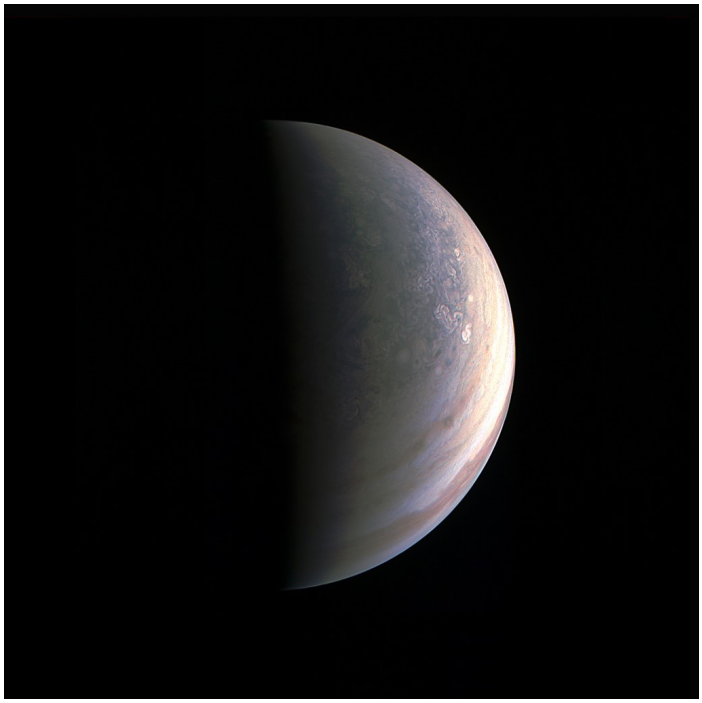
Truth is, we really can't say much about the *actual* conditions on *any* of the thousands of known exoplanets.

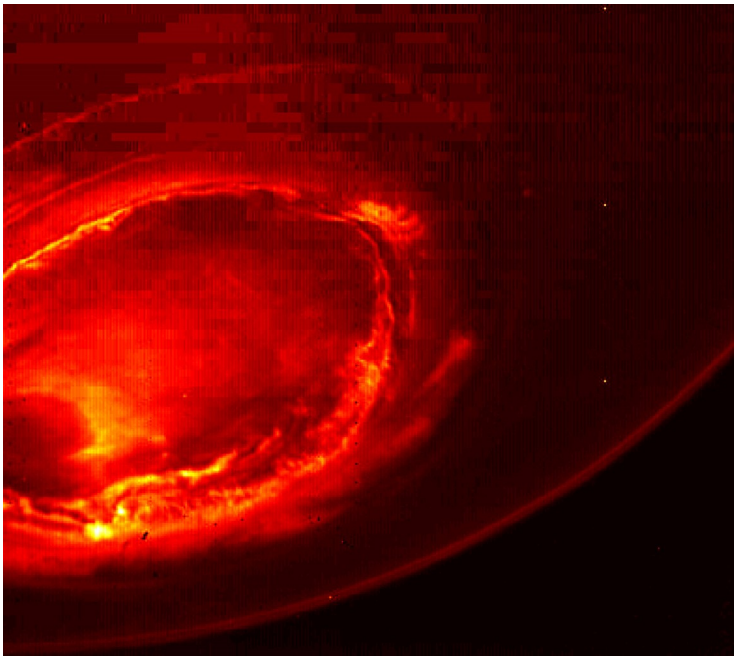
Proxima b is a good place to start! It's already a target for the "Breakthrough Starshot" microprobe project.

Fascinating…stay tuned.

Jupiter reveals a lot in early…poling.

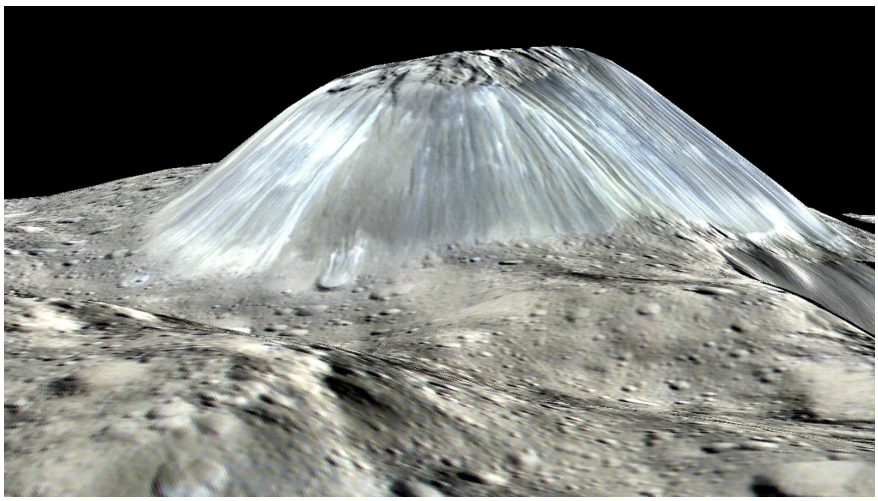
The Juno mission reached perijove on August 27, and returned a rich trove of data on its first instrumented pass. It got infrared data on the entire planet, revealing hotspots and cool features never seen before, with a magnificent image of auroral activity toward the southern regions. Juno also gave us a first-ever close up of the North Pole, with features unlike anything else we've seen in the Solar System. Another "wow" mission begins! Welcome, Juno.





Left: Jupiter's North Pole. Contrast is a bit low because of the viewing angle (and camera, not Juno's prime instrument). But the swirls, and whirls…we've seen hints in prior missions, but this is a truly remarkable view.

Right: Jupiter's Southern Lights. Auroral activity is revealed in this infrared (3.0 to 3.6 micron) view that registers excited hydrogen ions. Whose hydrogen ions wouldn't be excited by this view?

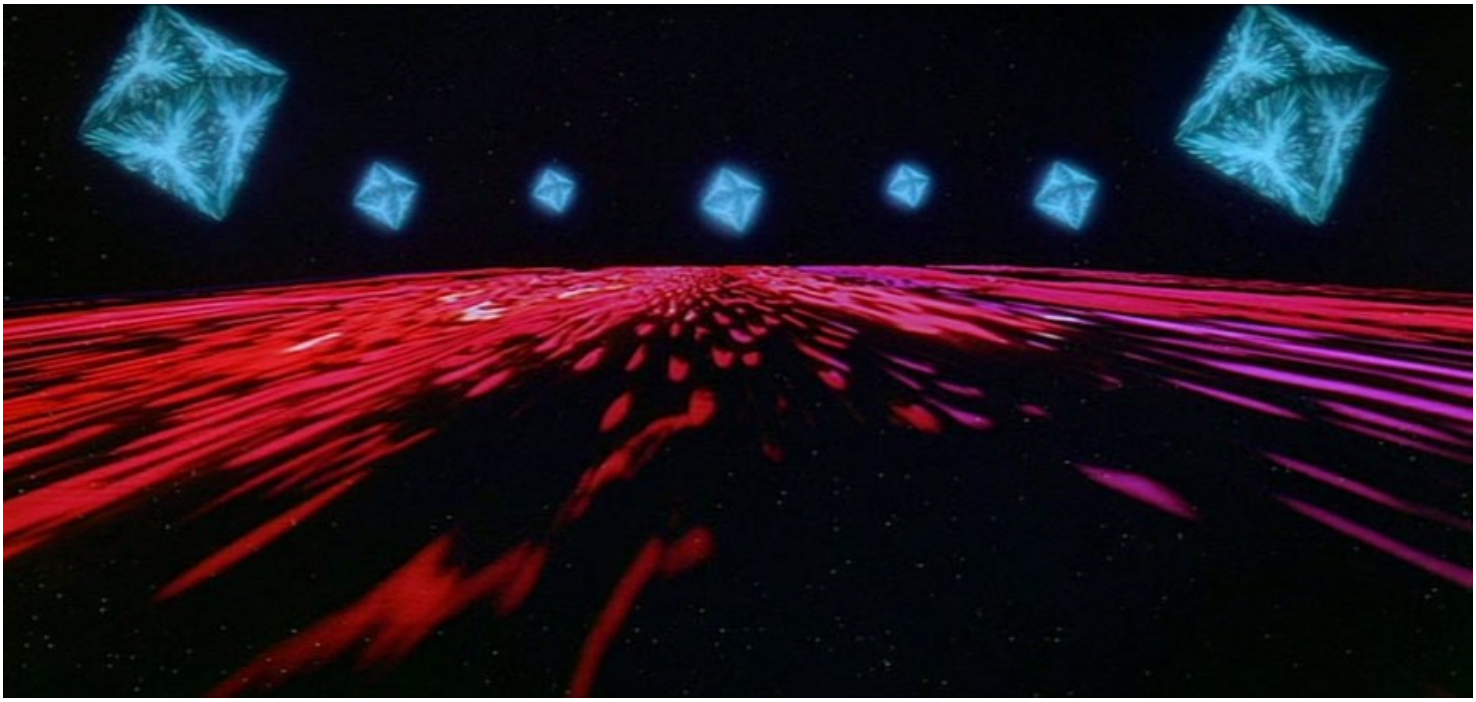


Dawn of the Living?

Ahuna Mons on Ceres, seen here in a simulated side view (stretched 2x vertically) is 3 miles high—and appears to be a cryovolcano that has erupted water and ammonia (among other things) in the not-too-distant past. Dawn has even detected a temporary atmosphere, results indicate! The surface of Ceres has widespread phyllosilicates—clays that have been altered by—yes—water!

See the JPL website for more on these missions.

Parting shot…



Where will space travel ultimately take us?

The movies have already taken us to the edge of space and time. Will we ever get there, ourselves?

(From *2001: A Space Odyssey*)