Newsletter of the Pomona Valley Amateur Astronomers

All truths are easy to understand once they are discovered.
Galileo Galilei

Volume 35 Number 11 ***nightwatch*** **November 2015**

President's Message

The calendar year may be winding down, but November is my favorite month for observing. In the early evening the summer constellations are still high in the western sky, but you don't have to stay up very late to catch the bright winter spectacles in Auriga, Orion, Taurus, and Gemini. Jupiter, Mars, and Venus continue their dance in the pre-dawn sky, and although they won't come as close together as they have in recent weeks, they are still rewarding sights by telescope, binocular, or naked eye.

Also easy to catch this month are the outer gas giants, Uranus and Neptune. They're passing through the constellations of Pisces and Aquarius, which are high in the southern sky on November evenings. I just made my annual pilgrimage to these huge but distant worlds this past weekend. Uranus is a surprisingly bright and easy catch, compared to Neptune's dim and distant blue spark. Get finder charts at

http://www.skyandtelescope.com/urnep.

Closer to home, we're having our last regular meeting of 2015 this Friday, November 20. Our speaker will be Dave Nakamoto of the Los Angeles Astronomical Society, and his talk will be, "The Comet that Wouldn't Die! The Curious Case of Comet Biela".

It's a timely talk: not only are comets in the news these days as the European Space Agency plots the end of the Rosetta mission next year, but we'll have a new comet to observe in just a few days. Comet C/2013 Catalina just passed its closest approach to the Sun - a fairly long 0.82 astronomical units - on November 15, and it will be visible in the morning sky starting next week and continuing through January. This is Catalina's first (and last) pass through the solar system so its brightness is hard to predict. It will probably peak between 5th and 6th magnitude, making it an easy catch with binoculars or a telescope.

We only have one more event planned before the end of the year: our club holiday party next month. There are two important changes from previous years: instead of meeting at the Sizzlin' Skillets in Upland, we'll hold the party at the IHOP at 80 North Euclid Ave. in Upland, on the east side of the street just north of the train tracks. Also, instead of holding the party on a Friday evening, it will be on the evening of Saturday, December 12. I hope to see you there!

Matt Wedel

PVAA Officers and Board

Officers

President ….....	Mathew Wedel	909-767-9851
Vice President ..	Joe Hillberg	909-949-3650
Secretary	Howard Maculsay	909-624-1667
Treasurer	Gary Thompson	909-935-5509
VP Facilities	Jeff Felton	909-622-6726

Board

Jim Bridgewater (2016).....	909-599-7123
Karl Rijkse (2016)	909-428-1884
Ron Hoekwater (2017).....	909-391-1943
Cori Charles (2017) …….	909-646-0275

Club Events Calendar

November 20, 2015, General meeting

December 3, 2015, Board meeting, 6:15
December 12, 2015, Holiday Party, IHOP in Upland, 7:00pm
No scheduled General meeting.
No scheduled Star Party.

What's Up? - A Winged Messenger

Well, Mercury is winged on the Florist Delivery logo. A bantam god who swiftly delivers commerce and messages. Mercury is the fastest orbiting of all the planets. But what messages does it deliver as the smallest non dwarf planet world?

First, it's difficult to see being the closest planet to our Sun with a modest diameter of 3,032 miles. That's less than 1½ times the size of our Moon. It's smaller than Jupiter's moon Ganymede and Saturn's moon Titan. So, although its magnitude can be as bright as +5, its close solar location makes it a fleeting sunset / sunrise object. When you can see it in a telescope it exhibits phases like our Moon because it's between us and the Sun. But the dangerous solar glare prohibits delicate telescopes like Hubble from studying it.

Consequently two probes have been sent to photograph it up close. MARINER 10 ('75) mapped about 45% of its heavily cratered surface. It has more impact craters in a given area than any other object in the solar system. The MESSENGER probe orbited in 2011, mapping the remainder of its pockmarked landscape. Still, it remains the least understood of all the terrestrial planets.

Mercury's landscape looks like a heavily cratered version of our own Moon. But there are differences, Mercury has unique wrinkles called "lobate scarps" which aren't found anywhere else. These form a net of fault cliffs that can rise to 10,000 feet. They must have been caused when Mercury's large iron core and mantle cooled and shrank. Rather like an old apple's wrinkled skin.

Mercury's iron interior is unlike that of any other planet. This hot core has produced large volcanoes. But the planet is still too small to hold even a volcanic atmosphere for long even though it has the greatest interior density after Earth.

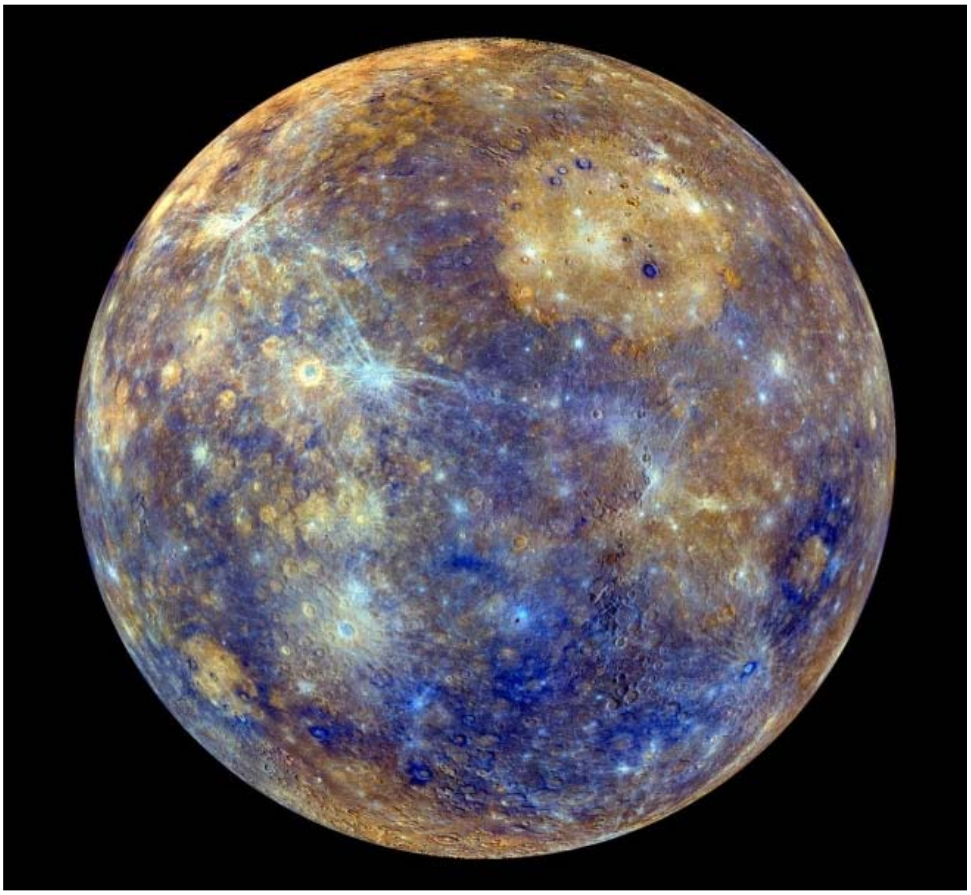
As the first planet our from our Sun, its airless surface is cooked and frozen with the greatest temperature variation of all planets. It ranges from 800 F (hot enough to melt lead) to -136 F. This is made worse by its creepy gravitational lock with the Sun. Observations in the 1880's by Giovanni Schiaparelli suggested a wobble in what he thought to be a firm lock. He called it the "twilight zone" (this inspired a T.V. show). But in fact it's now known that, like our Moon, this innermost planet does rotate while facing our Sun. So, while its orbital year is 88 Earth days, its complete daily rotation happens once every two Mercury years. It's another unique message, its day is longer than its year. It would be an awful waterless and airless place to live with its extreme temperatures. There would be a constant rain of extremely cancerous solar radiation. Astronomers once searched for a hotter planet even closer to the Sun, which they called Vulcan (it also inspired a TV show).

Interestingly, Mercury does have the solar system's strongest magnetic field for its size. This is thought to be caused by ripples in its huge iron core. Also it's surface isn't totally peppered with impact craters, there are smoother plains. Like our Moon's dark maria these were probably caused by cataclysmic impacts which freed subsurface magma to flood the surface. The largest is the Caloris Basin which must have given the little planet a real whack. The shock wave passing through the planet left an area of "weird terrain" on the opposite side. Early in its history an even larger object might have struck Mercury stripping away most of its original crust, leaving a smaller denser planet made mostly of iron core. However, another theory suggests that the original solar nebula dragged away Mercury's lighter particles when it was forming.

Mercury has the most jumbled surface of any world (visible in the colorized picture). There are so many craters it was decided to name them after artists, musicians, painters, sculptors, and authors who have made outstanding contributions. The few scientists that have been able to study the illusive planet give their names to large ridges. Some depressions are named for works of architecture. Plains are named for the word Mercury in various languages. Rupes and scarps have the names of famous ships of discovery.

So the final odd message is that this hostile planet bears the romantic crater names of Beethoven, Michelangelo, Van Gogh, Shakespeare and every other artistic soul anyone can call to mind.

Lee Collins



Our Solar System Is Almost Normal, But Not Quite

It was just over 20 years ago that the very first exoplanet was found and confirmed to be orbiting a star not so different from our own sun. Fast forward to the present day, and the stellar wobble method, wherein the gravitational tug of a planet perturbs a star's motion, has been surpassed in success by the transit method, wherein a planet transits across the disk of its parent star, blocking a portion of its light in a periodic fashion. Thanks to these methods and NASA's Kepler spacecraft, we've identified many thousands of candidate planets, with nearly 2,000 of them having been confirmed, and their masses and densities measured.

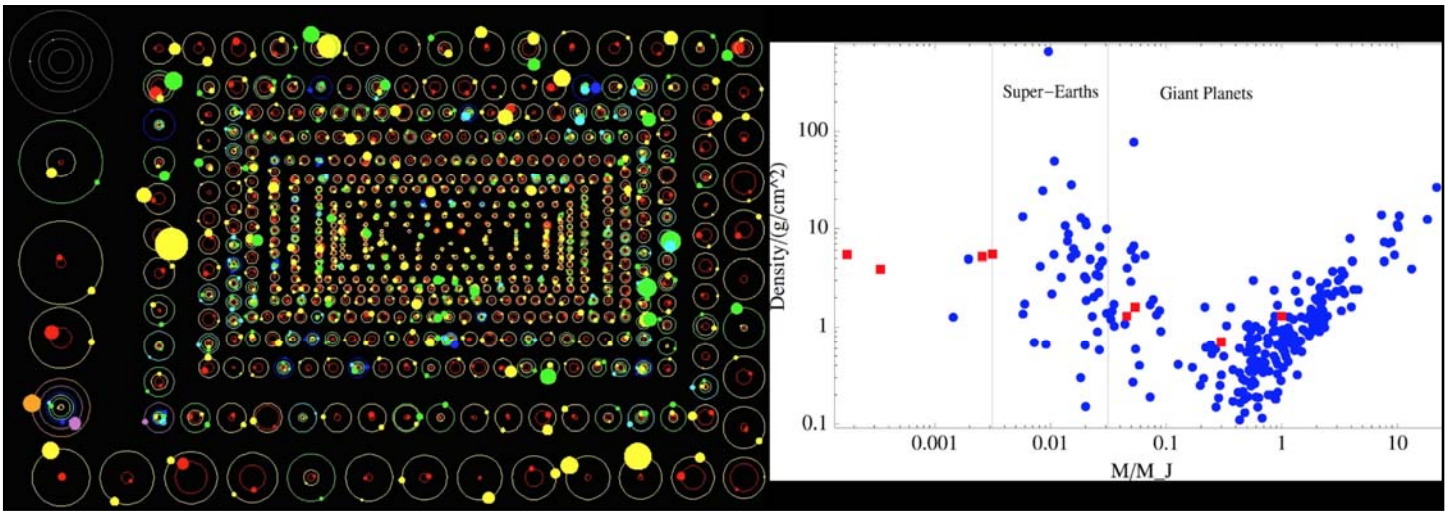
The gas giants found in our solar system actually turn out to be remarkably typical: Jupiter-mass planets are very common, with less-massive and more-massive giants both extremely common. Saturn—the least dense world in our solar system—is actually of a fairly typical density for a gas giant world. It turns out that there are many planets out there with Saturn's density or less. The rocky worlds are a little harder to quantify, because our methods and missions are much better at finding higher-mass planets than low-mass ones. Nevertheless, the lowest mass planets found are comparable to Earth and Venus, and range from just as dense to slightly less dense. We also find that we fall right into the middle of the "bell curve" for how old planetary systems are: we're definitely typical in that regard.

But there are a few big surprises, which is to say there are three major ways our solar system is an outlier among the planets we've observed:

- All our solar system's planets are significantly farther out than the average distance for exoplanets around their stars. More than half of the planets we've discovered are closer to their star than Mercury is to ours, which might be a selection effect (closer planets are easier to find), but it might indicate a way our star is unusual: being devoid of very close-in planets.
- All eight of our solar system's planets' orbits are highly circular, with even the eccentric Mars and Mercury only having a few percent deviation from a perfect circle. But most exoplanets have significant eccentricities, which could indicate something unusual about us.
- And finally, one of the most common classes of exoplanet - a super-Earth or mini-Neptune, with 1.5-to-10 times the mass of Earth—is completely missing from our solar system.

Until we develop the technology to probe for lower-mass planets at even greater distances around other star systems, we won't truly know for certain how unusual we really are!

Ethan Siegel



Images credit: NASA / Kepler Dan Fabricky (L), of a selection of the known Kepler exoplanets; Rebecca G. Martin and Mario Livio (2015) ApJ 810, 105 (R), of 287 confirmed exoplanets relative to our eight solar system planets. .

This article is provided by NASA Space Place.
With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology.
Visit spaceplace.nasa.gov to explore space and Earth science!