



Newsletter of the Pomona Valley Amateur Astronomers

Volume 34 Number 8

nightwatch

August 2014

The August meeting will convene in Shanahan B460

President's Message

Lots going on in space these days.

The biggest news is the rendezvous of the European Space Agency's Rosetta probe with Comet 67P/Churyumov-Gerasimenko on August 6. Rosetta is settling in a series of lower orbits around the comet nucleus. If all goes well, Rosetta's lander, called Philae, will set down on the comet sometime this November.

A little farther out—okay, a LOT farther out—NASA's New Horizon probe shot a time-lapse video of Pluto and Charon orbiting each other. This is just a first taste of the data that New Horizon will send back between now and its flyby of the Pluto system next July.

On August 5, a SpaceX Falcon 9 rocket successfully boosted Asiasat-8 to a geosynchronous transfer orbit. Video taken by cameras on board the first stage of the rocket showed it making a controlled descent toward the Atlantic Ocean, but unfortunately the first stage broke up in heavy seas before it could be retrieved.

There's plenty to wow Earthbound observers as well, from last weekend's "supermoon" to the peak of the Perseid meteor shower on the evening of August 12 and 13. It's a good time to go planet-hunting, too, with Mars and Saturn still visible in the evening sky and Jupiter and Venus headed for a very close conjunction in the morning sky.

Our speaker this month is astronomer, aerospace engineer, and skeptic Jim Gallivan, who will speak to us on, "The Unification of Astronomy, Astrology, GPS, Supernovae and UFOs".

One last thing—if you haven't gotten your annual dues turned in; please do so immediately, before we have to start sending out personal reminders!

Matt Wedel

Club Events Calendar

August 15, General meeting – Jim Gallivan
The Unification of Astronomy, Astrology, GPS, Supernovae and UFOs

August 23, Star Party

September 4, Board meeting, 6:15

September 12, General meeting

September 27, Mt Wilson Observing

October 2, Board meeting 6:15

October 10, General meeting

October 25, Star Party

October 30, Board meeting, 6:15

November 7, General meeting

November 22, Star Party

December 4, Board meeting, 6:15

December 12, Christmas Party, Sizzlin' Skilletts 7:00pm

No scheduled Star Party

Knight Landing Library

I am a science buff – back in the day when few girls took Calculus and Physics, there I was in those classes plugging away and getting good grades. College courses were more of a challenge as suddenly my competition was pre-vets and pre-doctors. I think what actually got me out of the hard sciences was Tuesday/Thursday 8am Organic Chemistry class – who in their right mind deals with right and left handed molecules at 8 in the morning!!

As a consolation prize, I have always enjoyed Astronomy as a hobby and was active in the PVAA when I lived in Southern California. For the last 5 years, we have lived close to a small (population 995) town near Sacramento. I got to know the local librarian while attending community dinners over the past couple of years and offered my services to conduct an astronomy program from the library. I used to help with such an event 4 times a year for the Ontario (population 160,000+) library. The Club would supply 5-6 scopes, I'd give a talk to 100 people, mostly families with Elementary to Jr. High school kids and a good time was had by all.

I spent several hours rounding up my supplies – scope, eyepieces, and handouts, polished off my talk about galaxies and nebula, and checked that the green laser pointer had fresh batteries. I want to the local library and found it was the size of a double-wide mobile home, there were 6 parking spaces, and when the 4:30pm start time rolled around there was NO ONE sitting on the carpet in front of my chair. Within 5 minutes though, my guests started to arrive: 3 and 5 year old siblings, a group of 4 kids aged 4 to 7, and a third family whose ages topped out at about 10. After introducing myself, I asked in anyone knew what Astronomy was... crickets... my next question – what objects do they know of that are in the day and night skies? Responses – the sun, moon, and stars. Gulp... I'm thinking talks about gravity, supernova, and comets might be

beyond this group. When pressed, the 10 year old did know all the planet names and reeled them off but for the younger kids even this was beyond their current education.

Sooo – now that 95% of what I had planned was inappropriate, what to do during the next 55 minutes of my 1 hour presentation?? I decided we would create a pretend solar system with one child as the sun the rest as the little planets. The planets had to hold hands to stay in their vaguely concentric circle “orbits” and was designed to keep them from getting loose in the library. I'm sure Kepler would have disapproved! It was a challenge for them to let go of the sun, in fact, but I persisted and at least that part of our little Solar System was accurate. Our moon and Earth demo was slightly more realistic as we were able to pull off the fact that the same face of the moon always faces the Earth so we had tidal locking down. Libration also came pretty naturally to this crowd so we got that concept in hand as well.

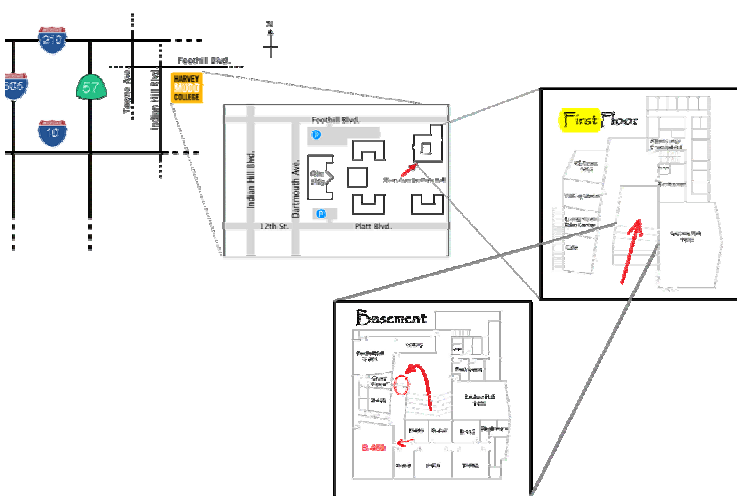
This brought us to the half-way point in my allotted time and fortunately, this was well-filled up with Star Catcher (think the cootie catcher concept only with constellations) and bookmark coloring projects which were enjoyed by all.

Needless to say, my mostly pre-school to second grade students were not going to be able to stay up past bedtime late enough for a Star party start time of 9pm when Mars and Saturn would start to be visible so I suggested to the librarian that we try another event during the fall or winter, and in conjunction with the local elementary school – where I might find some more experience with such exotic space objects as the ISS, asteroids, and black holes!

It was a fun afternoon and reminded me of many other public education outreach events spent down South.

Claire Stover

Northern California contingent, PVAA



**For the June, July, and August meetings
we will convene in Shanahan B460**

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PVAA General Meeting 07/11/14

PVAA President Matt Wedel opened the meeting and encouraged everyone to take pictures using their cell phones and telescopes. While it is possible to get Saturn with your cell phone, the moon is your best bet. You can get a descent photo of the moon's craters with your cell phone. Also, now is the time to sign up and pay for the night at Mount Wilson. It is \$100.00 for the entire night on the 60 inch scope. If you really want a great view of Jupiter or the Ring Nebula, the 60 inch will beat any telescope you have looked through, without a doubt. Our night on the 60" is Saturday, September 27.

Our guest speaker was Tim Thompson. Tim is very active in the Los Angeles Astronomical Society, and at Mt. Wilson Observatory and Griffith Observatory. He works at NASA's Jet Propulsion Laboratory (JPL).

The title of his presentation was "A Universe of Stars." He stated that stars are the fundamental element of astrophysical evolution. Several great pictures from the Hubble Space Telescope and several earth observatories were shown. M45 or Pleiades and commonly known as The Seven Sisters, is a great binocular object you don't need (or even want) a telescope for. Here is a picture from the Digitized Sky Survey, which is an extremely wide field telescope: M45 is about 454 light-years (LY) away and 16 LY across. For some great shots Tim suggested <http://www.telescopes.cc/> and <http://www.celestialwonders.com/>

Tim talked about how the star's color and brightness are dependent on the temperature of the star. (OK, distance from Earth is also a factor in brightness.) He talked about Planck's Law named after Max Planck who proposed it in the year 1900. It describes electromagnetic radiation, as does Wien's Law named after Wilhelm Wein.

He also touched on the size of Betelgeuse in the Orion Nebula that is bigger than the orbit of Mars. Still, even bigger is



VY Canis Majoris, which is as big as the orbit of Saturn. VY Canis Majoris is known as a red hyper-giant.

He also talked about the Magnitude Scale – apparent magnitude and absolute magnitude. Absolute magnitude is the brightness of the object if the object was 10 parsec away. (A parsec is 3.26 LY). - So, while the full moon has an apparent magnitude that is very high, it's absolute magnitude is very, very small. - It's all about location, location, location.

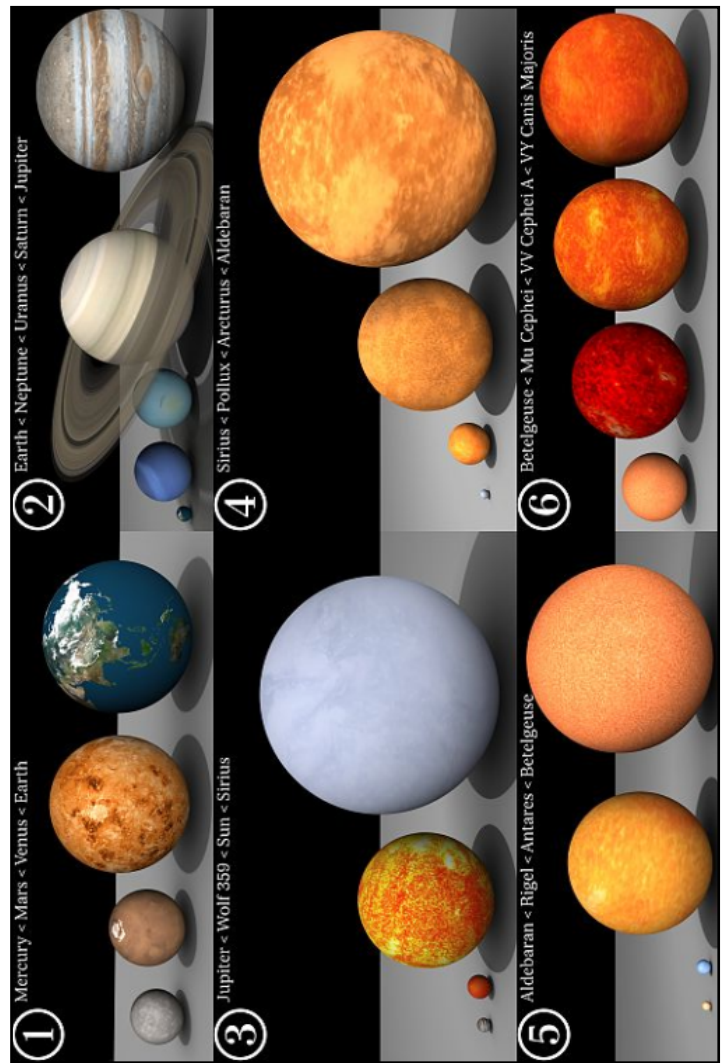
Tim brought up the OBAFGKMLT spectral classes of stars, and the work done by Willimina Fleming, Antonia Maury and Annie Cannon. He also brought up the Zeeman Effect. Pieter Zeeman won a Nobel Prize with is work on splitting spectral lines with a strong magnetic field. (Before he won his Nobel Prize, his employer fired him for his frivolous use of company equipment.)

While the Sun is in the "main sequence", it is bigger than 95% of all stars. He also recommends the website:

<http://avertedimagination.com/> .

As we were running out of time he touched on planetary nebula, like the Crab Nebula from 1054AD, and a neutron star the size of LA County spinning 30 times per second. Tim has his own website: <http://www.tim-thompson.com/>

Gary Thompson



What's Up? - Tiger Stripe Moon

Let's return to the impressive discoveries uncovered by the 17 year exploration of Saturn's Cassini-Huygens probe. Cassini is the fourth craft to visit Saturn and the first to enter orbit in 2004.

Cassini was able to very closely examine Saturn's moon Enceladus. It was already famously odd for being the whitest, most reflective object in our solar system. Although it had previously been photographed by Voyager I it could still conceal secrets. It's Saturn's sixth-largest moon, but at 314 miles in diameter it barely fits inside the state of Arizona. Its icy surface reflects almost 100% of the sunlight that reaches it, which is suggestive of a resurfacing process involving an ongoing light "snowfall." The source of this recurring "snow" is are dramatically named "tiger stripes." These are sinuous parallel fissures discovered by Cassini near the south pole. They geyser forth water from a sea beneath the frozen surface. This southerly located body of water is thought to have the volume of Lake Superior. Such a geologically heated liquid could be the home of microbial life.

In a 2005 Cassini fly-by the craft went right through one of Enceladus' geysers. It detected all the important elements of life: carbon, hydrogen, nitrogen and oxygen. These geyser-jets of water vapor shoot out into space at 1,300 MPH. When the moon's orbit brings it close to Saturn the "stripes" close up, but as it moves further out they open up to spew out their build up of hot steamy pressure.

Enceladus was first spotted by William Herschel in 1789 and later more carefully located and named by his son John Herschel after the mythological Titans associated with Saturn. Features on Enceladus are named after the tale of Aladdin and his Genie called "One Thousand and One Nights." A recent romantic choice of the International Astronomical Union. There're icy tectonic features of cold troughs, scarps, ridges and elaborate groove systems with African desert names like Samarkand Sulci. Craters shapes show the softer viscous relaxation impacts typical of a moon that is mostly icy. Two large craters are named Aladdin and Ali Baba.

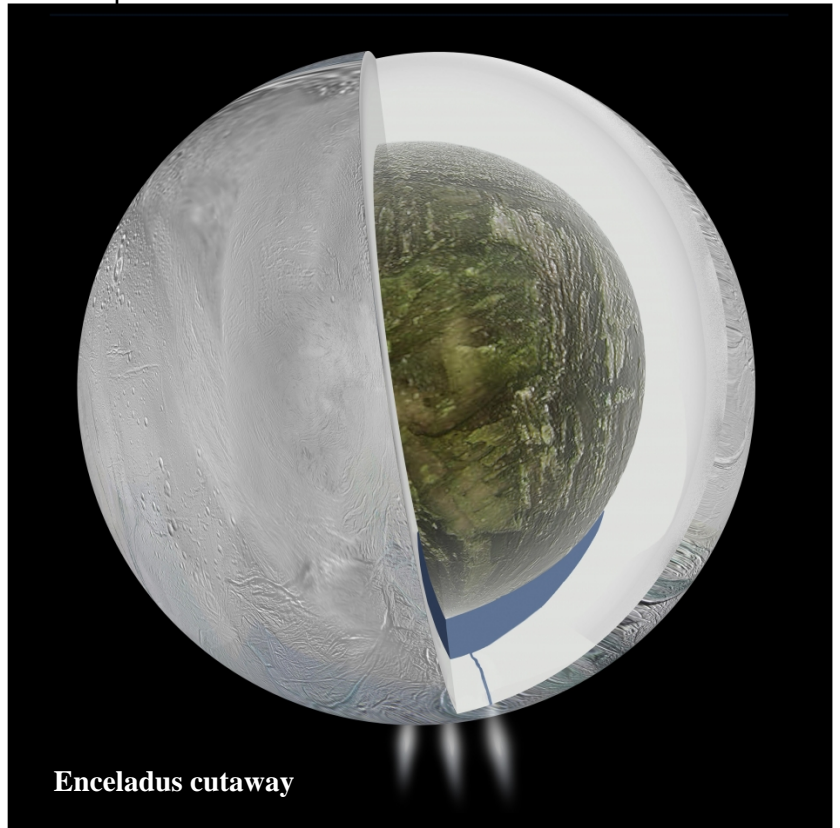
Like many moons Enceladus rotates synchronously with its orbital period. It's gravity locked with one face always pointed toward Saturn. Being diminutive it orbits in a rapid 33 hours allowing its zippy trip around Saturn to be observed by astronomers in one night.

Enceladus sea is tidally heated due to its orbital resonance with Saturn's larger moon Dione. This the origin of the recurring geysers. Jupiter's innermost moon Io, undergoes a similar tidal heating with the resulting eruption of sulfur volcanoes rather than water geysers.

Because of this small moons low gravity much of its salty water vapor is released into orbit to form Saturn's E Ring. This constantly replenishes the ring. This E Ring is not one of those bright rings seen in familiar pictures of Saturn but the last, faintest most diffuse ring of the inner ring system. There is also an additional Phoebe Ring associated with the moon Iapetus.

This ring is even thinner and further out. All the material in the rings comes from material blasted out of Saturn's icy moon system. Much of it certainly from smaller moons that were torn to shreds by gravitational forces eons ago.

Enceladus' frigid cryovolcanoes spurting from their south poles "tiger stripes" also constantly provide the moon with a very thin atmosphere of 91% water vapor and some nitrogen, carbon dioxide and methane. Any atmosphere is very unusual for so small an object.



Enceladus cutaway

Even more like Enceladus is Jupiter's second moon Europa which also has an outer covering of rock hard ice concealing a subsurface sea. Probes imaging Europa have observed reoccurring plumes of water shooting out of Europa just as they do from Enceladus. These plumes appear when Europa is farthest from Jupiter and are inactive when the moon is closest to Jupiter. Again the same geologically activity as on Enceladus. Because Europa is much larger than Enceladus the plumes shoot out at a much higher speed and achieve a greater height. Since Europa is closer to Earth than Enceladus probes have been planned to penetrate the frozen surface and search for microbial life in its subsurface sea.

Whether Europa or Enceladus harbor life is something yet to be discovered. But certainly Enceladus has proven to be another one of Saturn's surprisingly odd moons.

Lee Collins

Droughts, Floods and the Earth's Gravity, by the GRACE of NASA

When you think about gravitation here on Earth, you very likely think about how constant it is, at 9.8 m/s² (32 ft/s²). Only, that's not quite right. Depending on how thick the Earth's crust is, whether you're slightly closer to or farther from the Earth's center, or what the density of the material beneath you is, you'll experience slight variations in Earth's gravity as large as 0.2%, something you'd need to account for if you were a pendulum-clock-maker.

But surprisingly, the amount of water content stored on land in the Earth actually changes the gravity field of where you are by a significant, measurable amount. Over land, water is stored in lakes, rivers, aquifers, soil moisture, snow and glaciers. Even a change of just a few centimeters in the water table of an area can be clearly discerned by our best space-borne mission: NASA's twin Gravity Recovery and Climate Experiment (GRACE) satellites.

Since its 2002 launch, GRACE has seen the water-table-equivalent of the United States (and the rest of the world) change significantly over that time. Groundwater supplies are vital for agriculture and provide half of the world's drinking water. Yet GRACE has seen California's central valley and the southern high plains rapidly deplete their groundwater reserves,

endangering a significant portion of the nation's food supply. Meanwhile, the upper Missouri River Basin—recently home to severe flooding—continues to see its water table rise.

NASA's GRACE satellites are the only pieces of equipment currently capable of making these global, precision measurements, providing our best knowledge for mitigating these terrestrial changes. Thanks to GRACE, we've been able to quantify the water loss of the Colorado River Basin (65 cubic kilometers), add months to the lead-time water managers have for flood prediction, and better predict the impacts of droughts worldwide. As NASA scientist Matthew Rodell says, "[W]ithout GRACE we would have no routine, global measurements of changes in groundwater availability. Other satellites can't do it, and ground-based monitoring is inadequate." Even though the GRACE satellites are nearing the end of their lives, the GRACE Follow-On satellites will be launched in 2017, providing us with this valuable data far into the future. Although the climate is surely changing, it's water availability, not sea level rise, that's the largest near-term danger, and the most important aspect we can work to understand!

Dr. Ethan Siegel

Learn more about NASA's GRACE mission here:

http://www.nasa.gov/mission_pages/Grace/

Kids can learn all about launching objects into Earth's orbit by shooting a (digital) cannonball on NASA's Space Place website. Check it out at:

<http://spaceplace.nasa.gov/how-orbits-work/>

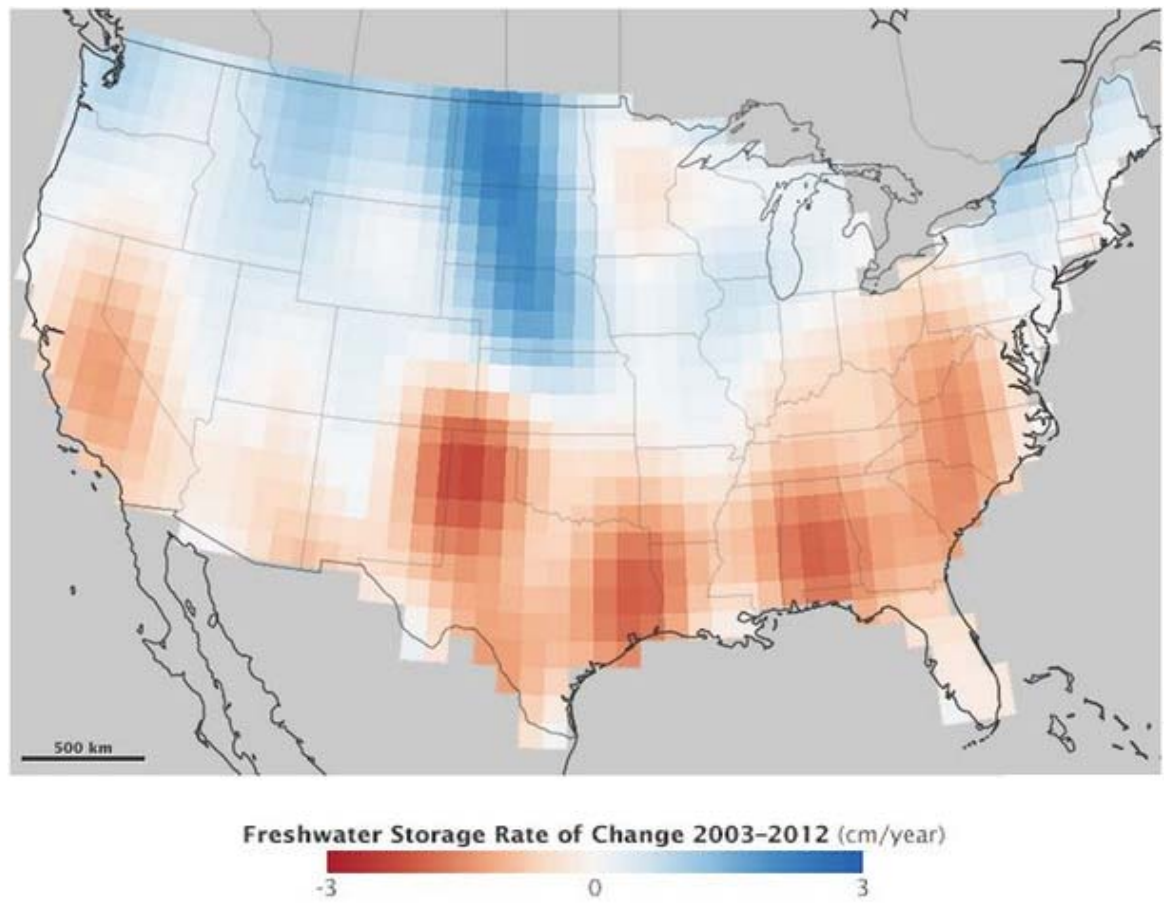


Image credit: NASA Earth Observatory image by Jesse Allen, using GRACE data provide courtesy of Jay Famigleitti, University of California Irvine and Matthew Rodell, NASA Goddard Space Flight Center.
Caption by Holli Riebeck.