



Newsletter of the Pomona Valley Amateur Astronomers

Volume 34 Number 7

*nightwatch*

July 2014

## The July meeting will convene in Shanahan B460

### President's Message

Mostly business this time:

1. If you haven't already turned in your annual dues to the club, please do so quickly! We've already paid the club's annual membership to the Astronomical League, our national parent organization. Our next step is to coordinate the list of members we reported to the AL, the list of people who receive this newsletter, and the list of people who have covered their dues. We will be sending reminders to anyone who forces us, but we'd rather skip that step.

2. We're still trying to round up enough people for the Mt. Wilson trip on Saturday, September 27. If you're interested in going, please let me or another of the club officers know quickly, either at this Friday's meeting or by email or phone. And if you are going, please bring your payment (\$100 per person) to the meeting or figure out another way to get it to us, because payments to Mt. Wilson are due well in advance and that deadline is near. In the event that we have to cancel, we would of course return your check.

3. After much investigation and consideration by the club's board members, we are in the process of incorporating the PVAA as a nonprofit corporation.

This will bring us lots of benefits, including better protection in the unlikely event that the club is ever sued. Among those benefits is the ability to open a new checking account. For various complicated reasons, the club's old account is now defunct, and we can't open a new one in the club's name until we are incorporated—the rules for setting up new checking accounts are a lot more strict now than they were pre-9/11. Anyway, in the meantime our club treasurer, Gary Thompson, has created a new account under his own name to hold the club assets. This was done with the full knowledge of the board and it's all completely above-board, we just needed someplace other than a mattress or a pickle jar to keep the club's money until we are incorporated. There is one practical consequence: for now, we are no longer able to accept checks made out to the PVAA. If you are turning in a check for annual dues or for the Mt. Wilson trip, please make the check out to Gary Thompson and put "PVAA dues" or "PVAA Mt Wilson trip" in the memo line. Hopefully our incorporation paperwork will go through quickly and this work-around will be behind us soon.

continued

President's Message continued

**Club Events Calendar**

**July 11, General meeting**

**July 26, Star Party, Mt Baldy, Cow Canyon Saddle**

**August 2, Girl Scout Nature at Night, Skyland Ranch**

**August 7, Board meeting, 6:15**

**August 15, General meeting**

**August 23, Star Party**

**September 4, Board meeting, 6:15**

**September 12, General meeting**

**September 20, Star Party**

**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**

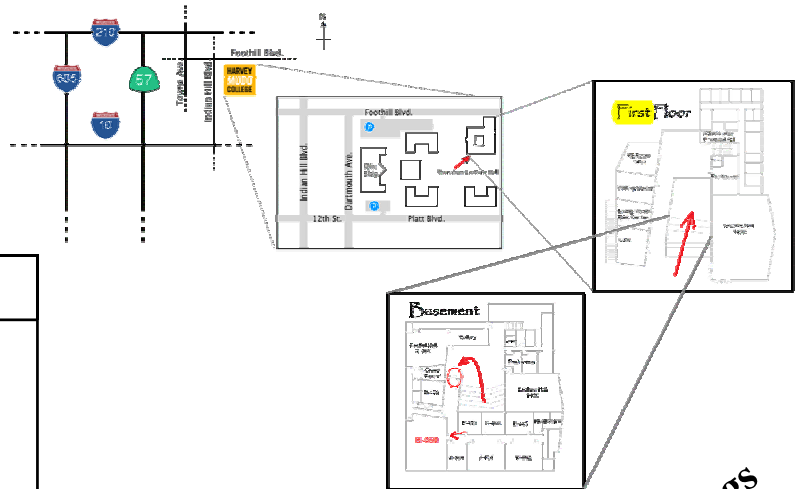
**December 5, Christmas Party, Sizzlin' Skilletts 7:00pm**

**No scheduled Star Party**

4. Finally, something happy and less boring: we have a cool outreach opportunity coming up. We have been invited once again to assist with the Nature at Night Girl Scout Camp, on Saturday, August 2nd. The camp is located near Idyllwild in the San Jacinto mountains. There will be food and overnight accommodations for those who attend, but the venue is close enough that you can drive home afterward if you prefer. See the club website for a map and details.

Our speaker this month is Tim Thompson, who will talk about "A universe of stars". I hope to see you there.

*Matt Wedel*



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

**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**

Lee Collins (2015) .....	626-852-9442
Ron Hoekwater (2015).....	909-391-1943
Jim Bridgewater (2016).....	909-599-7123
Karl Rijkse (2016) .....	909-428-1884

**Directors**

Membership / Publicity.....		
	Gary Thompson .....	909-935-5509
Outreach .....	Jeff Schroeder .....	909-758-1840
Programs .....	Ron Hoekwater .....	909-391-1943
Nightwatch .....	John Stover .....	909-988-9747

## PVAA General Meeting 06/13/14

PVAA President Matt Wedel opened the meeting with a few reminders and announcements. First, PVAA club dues are now due: \$30 per year for an adult or \$40 for a family. If you are under 18, it is \$18.

We still have a few openings for the Mount Wilson Observatory on Saturday night September 27th. We will be renting out the 60" telescope for the entire night. There is a \$100 fee per person.

On June 3rd Matt took some 30 second photos through Steve Sittig's 14 inch Celestron and Andrew Hamilton's digital single lens reflex (DSLR) camera. He actually had a few good shots of M81 – Bode's Galaxy, M82 – the Cigar Galaxy, M57 – the Ring Nebula & M13 – the Great Globular Cluster in Hercules. Now "good" is relative. For a first try, all in one night, they were surprising in the detail for a 30 second, non-guided "red-neck" shot. They definitely will not win any awards. But the thrill of just being able to do it was worth it. The stars were not perfect dots, hey they did move in 30 seconds, but they didn't move much. Maybe we should start having "Red-Neck Astro-Photography" during our star parties.

The topic for the night was "Hunting for Black Holes Big & Small" presented by Ann Esin of Harvey Mudd College. First, what is a black hole? You could define a black hole as an object that has an escape velocity that exceeds the speed of light which is 299,792,458 meters/second or 186,282 miles per second or 670,616,629 miles per hour. To become a black hole, you do not need a lot of mass. You just need a lot of density. If you took the mass of the Earth and compressed it into a ball with a diameter of 18 meters or radius of 9 meters, it would be a little mini black hole. The sun's mass would have a radius of 3 kilometers to be a black hole. Back in 1918 Karl Schwarzschild calculated the "Schwarzschild Radius", or "Gravitational Radius" needed to create a black hole:

$$r_s = \frac{2Gm}{c^2},$$

where:

$r_s$  is the Schwarzschild radius;

$G$  is the gravitational constant;

$m$  is the mass of the object;

$c$  is the speed of light in vacuum.

This formula was written on the chalkboard, but copied from Wikipedia.

She talked about how time slows down the faster you go, how gravity bends space-time, and that space itself rotates around a black hole. That led to the question "How do you detect a black hole?" Basically we don't "see" the black hole but the Event horizon around it. As light and mass fall towards a black hole, it starts to orbit around it. (Remember that this region of space is actually spinning around the black hole.) The event horizon is as close as you can get without falling into the black hole itself. There is so much kinetic energy of the mass orbiting the black hole that massive amounts of radiation are produced. Ann compared the energy released in chemical reactions, nuclear reactions and  $E=mc^2$ . Many black holes have a companion star orbiting it. Sometimes the event horizon is so bright that you can't see the secondary binary star.

Some event horizons of super massive black holes are so bright that they are brighter than our entire galaxy. Neutron stars are very close to being black holes, but are not quite dense enough. According to her calculations, a neutron star can not be more massive than 3 solar masses.

As an ending thought, she said that space-time switches inside the event horizon. Outside the event horizon (normal space) you can move in any direction in space, but you are stuck in linear time. Inside the event horizon you can only move toward the black hole, but can move different directions in time.

*Gary Thompson*



Ann Esin with daughter



## What's Up? - Walnut Moon

The amazing Cassini-Huygens space probe sent to Saturn has been exploring this system for seventeen years now. A product of NASA and the European Space Agency it's discovered many new things about the ringed planet's fantastic system.

Let's examine what it's uncovered about one of Saturn's oddest moons, Iapetus. Iapetus is odd because it's two magnitudes dimmer on one side than on the other. Only 925 miles in diameter it looks like a black and white yin-yang symbol. This was first noticed by Giovanni Domenico Cassini, the Italian-French astronomer who discovered it in 1671. It was very bright on one side of Saturn but almost invisible when it came around the other side. He concluded that its leading edge was much darker than its behind. This also meant that it was tidally locked, keeping one face always toward Saturn. What the Cassini-Huygens probe discovered was a wall-like equatorial belt (pictured). It exists mainly on the dark side, and seems almost artificial. It looks like a seam on a nut waiting to be cracked open. This gave it the nickname of Walnut Moon.

In 1847 it was officially named after Iapetus, a Titan from Greek mythology. Naming the moons after Titans, the relatives of Saturn, was initiated by John Herschel (William Herschel's son) who discovered two other moons Mimas and Enceladus. Geological features on Iapetus draw names from the French epic poem Song Of Roland. One of its largest craters is Charlemagne. How romantic.

Cassini-Huygens was able to tell that Iapetus has a density so low that it is mostly ice, with some rocky material. Viewed from its leading edge it looks like a brownish seamed walnut. The ice bright trailing side has no ridge but a series of isolated peaks along the equator. The ridge contains some of the highest mountains in the Solar System. How was this belt-wall formed

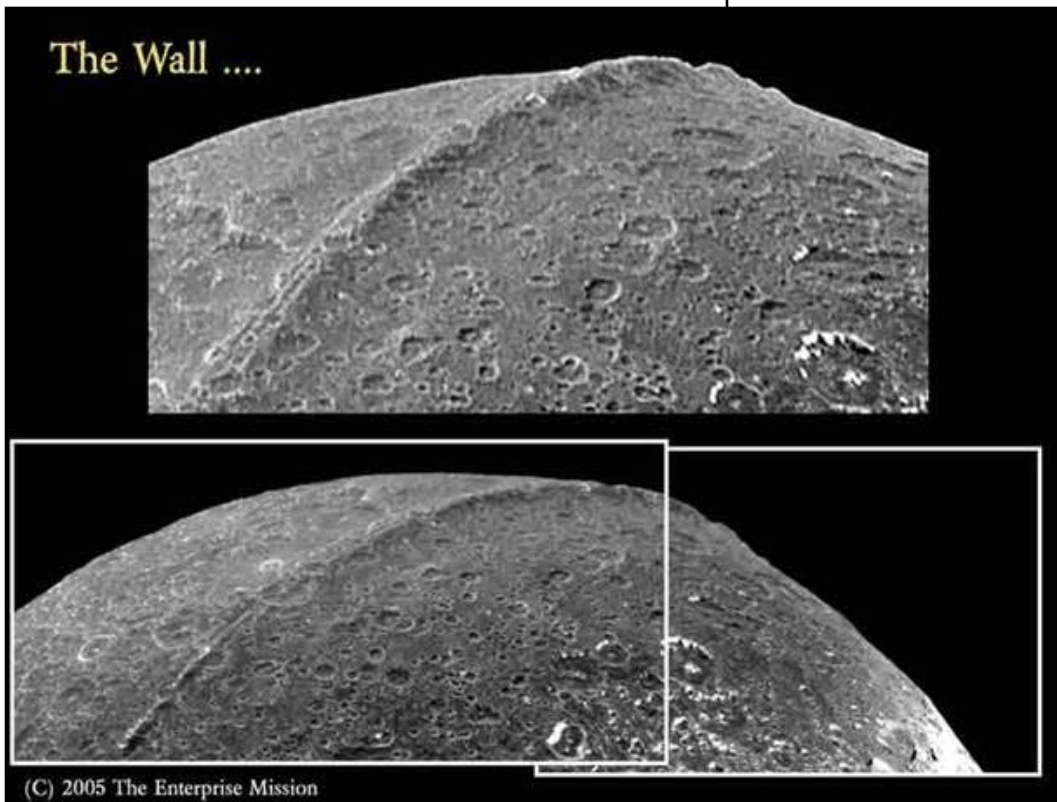
and why does it follow the equator perfectly? There are a number of theories. The ridge is heavily cratered which indicates that it dates from Iapetus' ancient formation. Then the moon was quite plastic, rotating as rapidly as every seventeen hours. This would have forced the ridge up even as Saturn slowed the moon's rotation to today's tidally locked seventy nine days. This early rapid spinning has given Iapetus squashed poles and a bulging belted waistline. Another theory is that Iapetus had an equatorial ring system at its formation that slowly collapsed onto its surface. Also there could be an isostatic equilibrium at work similar to Earth's mountain systems. Still it looks like a giant walnut seam.

The origin of the dark material on the leading face is also a subject of wide speculation. It looks like it was sprayed on by a spray can and so certainly came from outside rather than inside Iapetus. The trailing side and the poles are white with ice suggesting they are protected from the spraying effect. It's now felt that the original dark material came from the moon passing through what is know as the Phoebe ring. This is a far-out dusty ring of material blasted out by meteor impacts on the smaller neighboring moon Phoebe. It ages past the ring was probably much heavier and contained orbiting material from other moons as well. Today much of the dark material is maintained by a lagging effect of the sublimation of ice from the warmer dark side. The whiteness of the ice evaporates to migrate to the bright side leaving a darker residue behind. This perpetuates the brownish leading edge. Actually the dark material is apparently a very thin layer only about a foot thick although it may be deeper in crater bottoms. This explains why there are no shades of grey. An analysis of the dark material shows it to contain carbonaceous organic compounds. There are

hydrogen cyanide polymers and cyano-compounds. These are substances found in primitive meteorites and comets which indicates an exterior origin.

The surface of Iapetus is very heavily cratered with formations typical impacts into ice rather than rock. There are also many long pushed out landslides which come from massive ice sliding.

All of Saturn's moons are unique in their own way. Titan has an atmosphere, rain and lakes even though its too cold for liquid water. Enceladus has an interior sea that spews out hot steam through surface cracks called "tiger stripes" and Mimas has a crater so large it must have almost split the moon in half. But none of them looks like a giant walnut.



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