



Space isn't remote at all. It's only an hour's drive away,
if your car could go straight upwards. - *Sir Fred Hoyle*

Annual Holiday Party!
7:00 PM this Friday, Dec. 12, at
Sizzlin', 275 East Foothill Blvd in Upland,

Newsletter of the Pomona Valley Amateur Astronomers

Volume 34 Number 12

nightwatch

December 2014

President's Message

I'll keep this update short and sweet. As 2014 draws to a close, our club is in fine shape. We're officially incorporated as a 501(c)(3) charitable organization and we should have our tax-exempt status arranged very soon. We're fiscally secure, and I have the privilege of serving with a really great group of officers. Our library telescope program rolls on, with two telescopes available for checkout at the Claremont Public Library. Most excitingly for me, we've had an influx of new members in the last six months, and the experience and enthusiasm they've brought to the club is invaluable. This has been a great year for us, and I think 2015 will be even better. I hope all of you have happy holidays, and I'll look forward to seeing you in the new year.

...but first, I will look forward to seeing you at 7:00 PM this Friday, Dec. 12, at Sizzlin', 275 East Foothill Blvd in Upland, for our annual holiday party! Come out for good food, great company, and out-of-this-world prizes.

Mathew J. Wedel

Club Events Calendar

December 12, Christmas Party, Sizzlin' Skillets 7:00pm
No scheduled Star Party

No January Board meeting
January 9, 2015, General meeting
January 17, 2015, Star Party, Afton Canyon
January 29, 2015, Board meeting, 6:15

February 6, 2015, General meeting
February 21, 2015, Star Party, Mecca Beach, Salton Sea
February 26, 2015, Board meeting, 6:15

March 6, 2015, General meeting
March 21, 2015, Star Party, Cottonwood Spr, Joshua Tree
March 26, 2015, Board meeting, 6:15

April 3, 2015, General meeting
April 18, 2015, Star Party
April 23, 2015, Board meeting, 6:15

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

PVAA General Meeting 11/07/14

PVAA president Matt Wedel started off the meeting by greeting the members and a few new guests here for the first time. He also invited everyone to our annual Christmas Dinner Party at the Sizzlin restaurant at 275 E. Foothill Blvd. In Upland. You buy your own dinner from their reasonable price menu. Matt also reminded the people that signed up for the NASA/JPL Goldstone tour that this is at Fort Irwin, so you will need an ID, and if you are driving, you will need proof of insurance and the car's registration.



Our speaker for the evening was our own Ken Elchert – Author of the book “*The Star - An Investigative Journey in Search of the Star of Bethlehem*”. His presentation followed the same topic. Ken is a retired aerospace engineer, working 37 years for Rockwell International and Boeing. He worked in the Guidance, Navigation & Control Group and Systems

Engineering. He stated right off that he is not a biblical scholar, linguist or expert in ancient history. Ken used Stellarium 0.11.0 for the positions of the Sun, Moon & planets. Stellarium accounts for the precession of the equinoxes.

Of the books in the Bible, only the gospels of Matthew and Luke provide any information on the birth of Jesus, and only Matthew mentions the Star of Bethlehem. In 12 verses the Star is mentioned 4 times.

There are three possible explanations for the star mentioned by Matthew in his gospel: 1.) It was a miracle and, therefore, a one-time event which has no natural explanation. 2.) It was a story fabricated by Matthew, in which case it never existed. 3.) It was a real astronomical object. In his book he investigates option 3, as we know the place, and the approximate time.

Ken then screened the astronomical objects based on 9 facts inferred from the gospels like: Visible for months, Star-like, Stops its motion, Bright, Visible south of Jerusalem, Rises in the East., etc. Then, of course, the object needed to be visible at his birth. Jesus was born on Dec 25th, year 0, right? - WRONG! - The year of His birth is estimated to be from 7 BC to 6 AD by various scholars. Most believe it was 3 – 2 BC. Since shepherds were keeping watch over their flocks, that would put it from March to early May. Since King David was born in Bethlehem 7 weeks after Passover, it is possible that Jesus and King David not only shared the same birth place, but the same birthday!

To give the findings of his book away, Ken believes that the “Star of Bethlehem” was the planet Jupiter. It fits all the criteria, and his book, which is 265 pages, goes into great detail of how he came to this conclusion. Whether you agree or disagree, Ken wishes you a Merry Christmas and a prosperous New Year & Clear Skies.

Gary Thompson

The NASA and ESA Rosetta mission succeeded in setting down gently on a comet. This is a first. You can follow the lander in its quest for information about the comet on

<http://www.nasa.gov/rosetta/>

You can also simulate the mission by playing Comet Quest. The game is available on line at

<http://spaceplace.nasa.gov/comet-quest/>

and in the Apple apps store for the mobile version at

<https://itunes.apple.com/us/app/comet-quest/id504786625?mt=8&ls=1>



Rosetta's Lander Touches Down on a Comet!



What's Up? - Secret Seas?

Earth's Moon is bone dry and geologically dead. So when probes explored the moons of the gas giants they were surprised to find them geologically active with secret seas. Most notable were Jupiter's Europa, and Saturn's Enceladus. Both have plumes of water that shoot up in low gravity from warm salty seas beneath their icy surface caps.

Subsurface oceans of unknown size may also exist in Jupiter's Ganymede and Callisto. Saturn's smoggy methane moon Titan is thought to have a hidden body of water and ammonia. Then there are the far-out dwarf planets of the Kuiper Belt area. Pluto, Eris, Sedna and others could be covered in ice with subterranean lakes of a warmer liquid.

Also, Neptune's moon Triton has been observed to have nitrogen geysers that erupt up to eight km. high for as much as a year. These gaseous plumes constantly resurface the moon adding to its mottled cantalope melon appearance. This cryovolcanism of Triton certainly must originate from a concealed fluid body.

The deep cold of the outer solar system is rich in ices. Not only water but carbon dioxide, nitrogen, and methane ice. Here compounds like ammonia-water with a lower freezing point can exist.

The notion of hidden oceans beneath icy crusts started about 1970 when it was theorized that internal heating processes could melt subsurface water. But by 1980 other astronomers argued that icy shells would thicken as a moon loses heat over geologic time. They felt that a convection would occur causing warm ice at the bottom would float upward while the cold ice at the top would sink downward. This would eventually freeze a subsurface sea.

However, observations by the Galileo spacecraft in the 1990's discovered factors in the magnetic fields of Callisto that could only be caused by a wet conducting layer inside the moon. Similar magnetic field observations indicating internal fluids were later discovered in Europe and Ganymede. A salty antifreeze could lower the melting temperature of ice and encourage secret seas.

Jupiter's innermost moon Io is already well known as being the most geologically active object in the solar system due to its tidal flexing and heating. It's caused by an orbital resonance between Jupiter and the other three Galilean moons. This produces sulfur and sulfur dioxide volcanic plumes that shoot as high as 300 miles above a lava flow covered surface. These surprising examples of fluid volcanism were discovered in 1979 by the Voyager spacecraft. Io is so hot that it has driven off any water ice cover it might have ever had and replaced it with a multi-colored surface of huge pits and volcanoes higher than Everest. If tidal heating can produce volcanoes on Io why not warm secret seas on the other moons?

Jupiter's second moon Europa continues to be the most likely to hold a wet salty ocean beneath its icy surface. It's rocky core supports a frozen surface layer entirely of water ice. This makes it the smoothest object in the solar system and one of the whitest. Its surface is striated with cracked ice floes. Theories suggest that heat from tidal flexing would cause a subsurface ocean to remain liquid driving a movement of ice blocks like plate tectonics. It's the only example of plate tectonics outside of Earth.

It's icy surface is spider-webbed with crisscrossing lines that indicate that it spun on a highly tilted axis once in his history then moved into its present position. A spin pole shift may still be continuing to a lesser degree even now. Many forces must be at work, still an elaborate system of cracks certainly records stresses caused by subsurface tides in a secret sea.



Europa's most striking features are dark streaks covering its entire globe called linea. These represent gigantic fault lines between moving ice crusts. They've spread open allowing warmer layers beneath to color them in darker tones. Its crater free smooth surface remains young as it's constantly being resurfaced by water geysers and ice shelf movements. Still many surface features are weirdly chaotic and defy easy explanation.

The Galileo probe of the 1990's produced most of the in depth information on Europa. Any exploring below the surface would need an ice penetrating "cryobot" (see picture). With it they would hope to find microbial life. The European Space Agency's Jupiter Icy Moon Explorer (JUICE) is due to launch in 2022. Then we will learn more about Europa's secret seas.

Lee Collins



Photos by Gary Thompson



Where the Heavenliest of Showers Come From

You might think that, so long as Earth can successfully dodge the paths of rogue asteroids and comets that hurtle our way, it's going to be smooth, unimpeded sailing in our annual orbit around the sun. But the meteor showers that illuminate the night sky periodically throughout the year not only put on spectacular shows for us, they're direct evidence that interplanetary space isn't so empty after all!

When comets (or even asteroids) enter the inner solar system, they heat up, develop tails, and experience much larger tidal forces than they usually experience. Small pieces of the original object—often multiple kilometers in diameter—break off with each pass near the sun, continuing in an *almost* identical orbit, either slightly ahead-or-behind the object's main nucleus. While both the dust and ion tails are blown well off of the main orbit, the small pieces that break off are stretched, over time, into a diffuse ellipse following the same orbit as the comet or asteroid it arose from. And each time the Earth crosses the path of that orbit, the potential for a meteor shower is there, *even after* the parent comet or asteroid is completely gone!

This relationship was first uncovered by the British astronomer John Couch Adams, who found that the Leonid dust trail must have an orbital period of 33.25 years, and that the contemporaneously discovered comet Tempel-Tuttle shared its orbit. The most famous meteor showers in the night sky all have parent bodies identified with them, including the Lyrids (comet Thatcher), the Perseids (comet Swift-Tuttle), and what promises to be the best meteor shower of 2014: the Geminids (asteroid 3200 Phaethon). With an orbit of *only* 1.4 years, the Geminids have increased in strength since they first appeared in the mid-1800s, from only 10-to-20 meteors per hour up to *more than 100* per hour at their peak today! Your best bet to catch the most is the night of

December 13th, when they ought to be at maximum, before the Moon rises at about midnight.

The cometary (or asteroidal) dust density is always greatest around the parent body itself, so whenever it enters the inner solar system and the Earth passes near to it, there's a chance for a meteor storm, where observers at dark sky sites might see *thousands* of meteors an hour! The Leonids are well known for this, having presented spectacular shows in 1833, 1866, 1966 and a longer-period storm in the years 1998-2002. No meteor storms are anticipated for the immediate future, but the heavenliest of showers will continue to delight skywatchers for all the foreseeable years to come!

Dr. Ethan Siegel

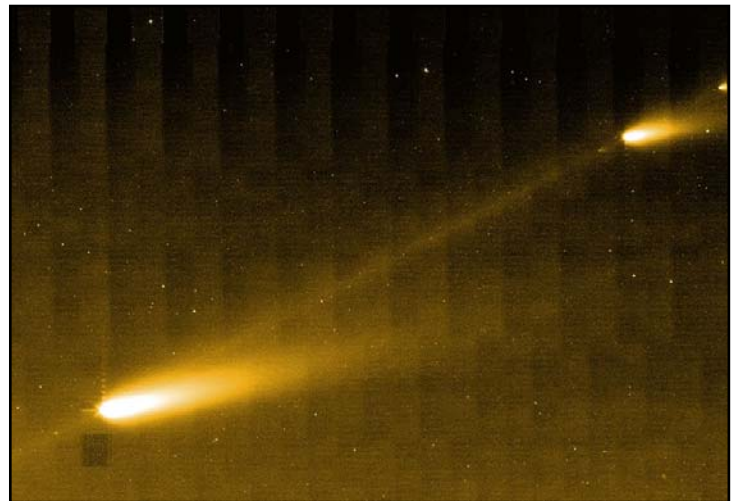


Image credit: NASA / JPL-Caltech / W. Reach (SSC/Caltech), of Comet 73P/Schwassman-Wachmann 3, via NASA's Spitzer Space Telescope, 2006.

What's the best way to see a meteor shower? Check out this article to find out:
<http://www.nasa.gov/jpl/asteroids/best-meteor-showers>.

Kids can learn all about meteor showers at NASA's Space Place:
<http://spaceplace.nasa.gov/meteor-shower/>.