nightwatch
Newsletter of the Pomona Valley Amateur Astronomers

Volume 33 Number 11 ***nightwatch*** **November 2013**

President's Message

Stephen King once wrote that almost all horror movies ended up disappointing him, but he kept going to see them because every now and then, unpredictably, one would recapture whatever magic had made him fall in love with horror movies as a kid.

I think about that a lot in relation to comets. Amateur astronomy is a pretty sedate pursuit, but if there is one thing that makes the field in general go a little bonkers, it's a comet. If one of these puffballs even threatens to rise to naked-eye visibility, you can bet it will make the covers of the astronomy magazines, probably with breathless prose about it being the "comet of the [ambitiously long time period]".

So what's the deal? Why do we seem to lose all sense of proportion when it comes to comets? I think it's down to three things:

1. The best ones are a surprise. Now that we have math and software capable of calculating where you need to stand to get the best view of a solar eclipse in the year 10,000, things we can't predict become rare and precious.

2. They move. Other than the dance of the moons of Jupiter and Saturn, and the slow creep of light and shadow across the lunar surface, comets offer about the only opportunity to watch something in the sky move in real time.

3. They're pretty. Amateur astronomy is largely an aesthetic pursuit, and even run-of-the-mill comets have the delicate play of light and detail that we otherwise associate with the most famous nebulae.

I am by no means immune to the charms of comets. Comet 17P/Holmes ushered me into amateur astronomy back in 2007. About a year ago at this time, I was regularly chasing 168P/Hergenrother and sketching it as it moved against the background stars. And this very spring I was out viewing PanSTARRS as often as opportunity allowed.

I may wish that we could attend to comets with a little more decorum or, in the case of the astro mags, with less nakedly capitalistic zeal. But the fact is that as ISON approaches, I will be there like Stephen King, ticket in one hand and popcorn in the other, hoping the show does not disappoint.

Our speaker this month is Gary Peterson, Emeritus Professor of Geology at San Diego State University, who will speak on "The Satellites and Ring System of Saturn". And don't forget that next month is our annual holiday party at Sizzlin' Skillets in Upland, Friday, December 6, at 7:00 PM.

Matt Wedel

Club Events Calendar

November 15 - General meeting, Gary Peterson, "The Satellites and Ring System of Saturn"
November 20 – Bear Gulch School Star Party, 6:00pm

December 6 - Holiday Party - Sizzlin' Skillets, 7:00pm
No scheduled Star Party
December 12 - Board Meeting, 6:15

January 9, 2014, Board meeting, 6:15pm
January 17, 2014, General meeting, Brian Sinana, "The Frontier Fields: Hubble's Next Big Campaign to Find Distant Galaxies"
January 25, 2014, Star Party, Afton Canyon

February 6, 2014, Board meeting, 6:15
February 14, 2014, General meeting
February 22, 2014, Star Party, Mecca Beach, Salton Sea

How did the first galaxies form?

In this article there is a great deal of speculation but it indicates the areas that are being investigated. Science can never "prove" a theory. But one observation can "falsify" it. So long as a concept is consistent with all observations it can be considered reasonable. If it can hold up under intense scrutiny and many attempts to falsify it, it may be considered reliable. The concept presented here is just beginning to be scrutinized. As of now, consider it speculation but generally accepted as the best we have.

As baryonic matter began to form, dark matter must have been forming as well. Atoms of hydrogen and dark matter began to cluster due to mutual gravitation. Clouds of dark matter would have surrounded the cluster of atoms since they rarely interact with matter. Eventually clusters of stars would appear. At the center of each cloud of stuff one large star would begin to accrete from its surroundings.

The fusion of hydrogen into helium can permit very large stars to form before collapse. It is possible to think the first stars could grow to between 250 and 600 solar masses. The range of possibilities depends on spin. Centrifugal force will permit a larger star. But eventually they can become too massive. A great super nova would have occurred followed by a massive black hole. Chandrasekhar has shown that a neutron star can't exceed three solar masses. These first black holes would have masses in the range of a few hundred solar masses.

When a spinning star explodes, and we think most were spinning, a portion of the mass is thrown out at escape velocities. Some is thrown along the axis of the spin and some is thrown outward along the perpendicular to the spin. The stuff that falls back in is far more likely to fall back into the center if it was thrown along the spin axis. The stuff thrown perpendicular to the spin is far more likely to go into orbit. This may explain why galaxies tend to be disk shaped.

Each bit of accreted mass contributed to the final result. Just like the spinning skater spins faster as he or she pulls in their arms, the star will spin faster as it pulls in the surrounding matter. Some angular momentum is in the accretion disk, some in the orbiting stars and some in the central star. As the organization gets tighter, everything spins faster.

So now we have a picture of numerous stars gathering in orbit around a central black hole that starts less than about 600 solar masses but can grow. Those stars attract more stars. As a disk of orbiting stars takes shape around one hole, the same is happening throughout the universe at other centers. The first galaxies are being organized and around each one is a halo of dark matter.

Now we should ask what observations might lead us to this concept. First the Cosmic Microwave Background provides a measure of likely distribution of matter in those early days. The unevenness of the background may be caused by photons being shadowed by areas of greater and lesser density of mass. There is a bit of uncertainty which depends on how and when one thinks those photons started out.

If this happened many times before the earliest galaxies we have seen, it could explain why we only see disk shaped galaxies. As galaxies merged in those early years there may have been many supernovas. It is still unclear why the disk shape remains even when two galaxies merge without a resulting supernova. But it seems to be happening in Andromeda and has happened in our own Milky Way. Super computer models are expected to eventually give us the answers.

Ken Crowder

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 (2014)	626/852-9442
Ron Hoekwater (2014).....	909/391-1943
Jim Bridgewater (2013).....	909/599-7123
Karl Rijkse (2013)	909 428-1884

Directors

Membership / Publicity.....	Gary Thompson	909/935-5509
Outreach	Jeff Schroeder	818/298-3965
Programs	Ron Hoekwater	909/391-1943
Nightwatch	John Stover ….....	909/988-9747

New Dark Sky Site

Next fall PVAA will try out a new dark sky site, Hard Luck Mine, Nevada. This site is about 22 miles northeast of Mesquite Spring Campground in Death Valley. The elevation at the Hard Luck Mine site is just over 6,000 feet. This will be one of the darkest sites from which PVAA has observed. It might even be a little darker than White Mountain.

Besides the very dark skies this site has other attractions. Number one is the Hard Luck Mine Castle. The Castle is an amazing 4 story 22 room structure that is worthy of the name "castle." The Hard Luck Castle is open for tours with the owner/ builder during the day.

There are also a number of abandoned mines in the area including the Bonnie Claire Mine. The old time mining town of Gold Point is 10 miles away. And of course, Death Valley and that other castle, (Scotty's) is just over the border in California.

So, the Hard Luck Mine star party promises to be good luck for attendees. Stay tuned for updates.

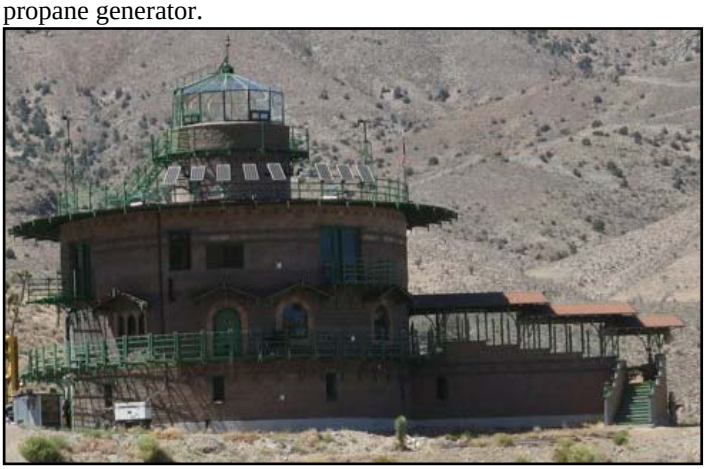
Ron Hoekwater

General Meeting 10/18/13

PVAA President Mat Wedel started off the meeting noting that the Claremont Library Telescopes are doing well. The Riverside Astronomical Society is looking for Volunteers and a Board member for next May's RTMC.

Lee Collins followed with his "What's Up" segment on Novas and Supernovas. Tycho Brahe saw a supernova that was brighter than Venus in 1572. Thirty-two years later Johannes Kepler observed another supernova. While actually observing a nova or supernova occurring in our galaxy is very rare, we can observe the aftermath remnants of an exploding star. M1 – the Crab Nebula is what is left over from a supernova observed more than a thousand years ago by the Chinese. The Crab nebula is expanding by 3 million miles per hour. Now we can see several novas per year by observing millions of galaxies, although few, if any, in a given year can be observed without a telescope.

Following Lee's "What's Up" Ron Hoekwater gave a short presentation on his visit to "Hard Luck Mine Castle". He did some observing there, and the sky was very dark. Hard Luck is located NE of Scotty's Castle in Death Valley, in Nevada. Because of it's distance, (331 miles/~5 hours 35 min), this would should be more than a 1 night stay. The castle has 2 pipe organs that he was assembling, a 4 seat theater, a 4,000 gallon water storage and is for sale. It also comes with it's own gold mine. He generates his own electricity using wind, solar cells and a propane generator.



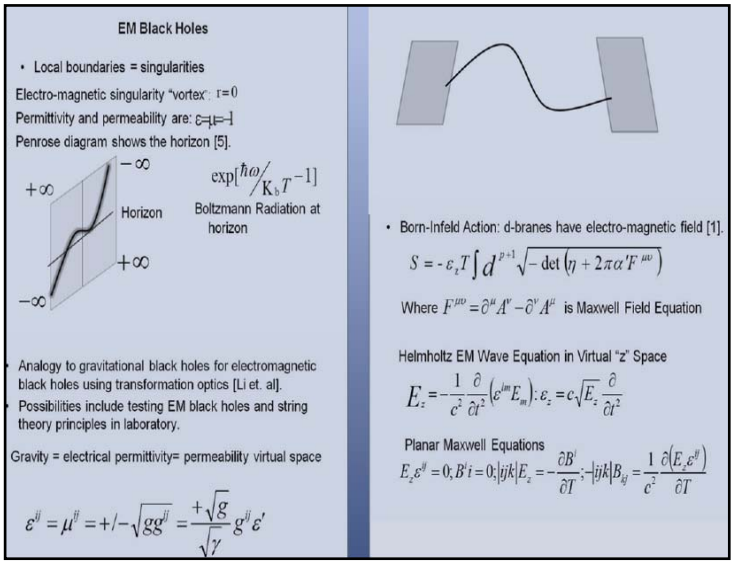
You can see more pictures and get more information by going to his website:

hardluckcastle.com

Mat Wedel then gave a short presentation on M97 & M108 in URSA Major. Although they are "Messier" objects, they were discovered by Pierre Mechain in 1781 and added to the Messier catalog. M97 is also known as the "Owl Nebula" while M108 is a barred spiral galaxy with no apparent nickname. Since they are only one degree apart, you can see them at the same time using your telescope and an appropriate eyepiece.

The main presentation was given by fellow PVAA member Scott Little. The title of his talk was "Electromagnetic Black Holes, General Relativity" -

So what does that mean? It means **A LOT OF MATH !**



Basically they are trying to create an Electomagnetic Black Hole using microwaves. There are several advantages to this:

1.) It's not a "real" black hole that will gobble up the Earth and everything with it.
2.) Microwaves are cheap.
3.) Even if you 'kill' a microwave, you won't go to jail.

Scott is doing this with his associates at MAD Fellows, LLC with their main office in Prescott, AZ. Their website is:

madfellows.com

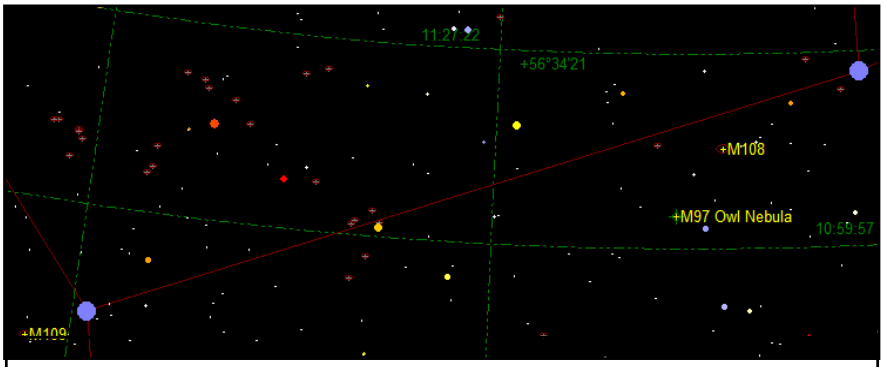
Their biggest problem is not figuring out the math, but FUNDING, since they are not currently affiliated with any university. Right now they are using microwaves in the 5 GHz range.

As for the string theory part of it, you may want to see the you-tube video:

http://www.youtube.com/watch?v=2rjbtsX7twc&feature=c4-overview&list=UUTev4RNBiu6lqtx8z1e87fQ

It is string theory to the tune of Bohemian Rapsody.

Gary Thompson



The two brightest stars shown here are the bottom of the bucket of the "Big Dipper."

The most volcanically active place is out-of-this-world!

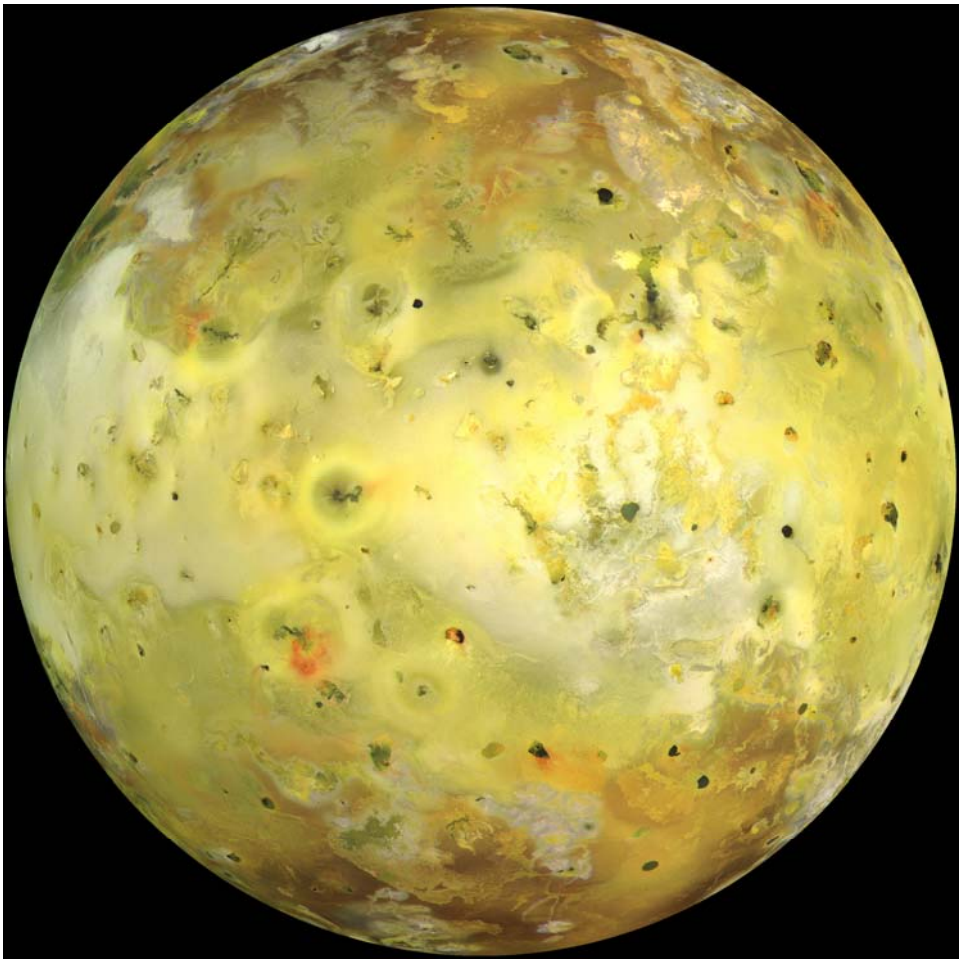
Volcanoes are some of the most powerful and destructive natural phenomena, yet they're a vital part of shaping the planetary landscape of worlds small and large. Here on Earth, the largest of the rocky bodies in our Solar System, there's a tremendous source of heat coming from our planet's interior, from a mix of gravitational contraction and heavy, radioactive elements decaying. Our planet consistently outputs a tremendous amount of energy from this process, nearly three times the global power production from all sources of fuel. Because the surface-area-to-mass ratio of our planet (like all large rocky worlds) is small, that energy has a hard time escaping, building-up and releasing sporadically in catastrophic events: volcanoes and earthquakes!

Yet volcanoes occur on worlds that you might never expect, like the tiny moon Io, orbiting Jupiter. With just 1.5% the mass of Earth despite being more than one quarter of the Earth's diameter, Io seems like an unlikely candidate for volcanoes, as 4.5 billion years is more than enough time for it to have cooled and become stable. Yet Io is anything but stable, as an abundance of volcanic eruptions were predicted before we ever got a chance to view it up close. When the Voyager 1 spacecraft visited, it found no impact craters on Io, but instead hundreds of volcanic calderas, including actual eruptions with plumes 300 kilometers high! Subsequently, Voyager 2, Galileo, and a myriad of telescope observations found that these eruptions change rapidly on Io's surface.

Where does the energy for all this come from? From the combined tidal forces exerted by Jupiter and the outer Jovian moons. On Earth, the gravity from the Sun and Moon causes the ocean tides to raise-and-lower by one-to-two meters, on average, far too small to cause any heating. Io has no oceans, yet the tidal forces acting on it cause the world itself to stretch and bend by an astonishing **100 meters** at a time! This causes not only cracking and fissures, but also heats up the interior of the planet, the same way that rapidly bending a piece of metal back-and-forth causes it to heat up internally. When a path to the surface opens up, that internal heat escapes through quiescent lava flows and catastrophic volcanic eruptions! The hottest spots on Io's surface reach 1,200 °C (2,000 °F); compared to the average surface temperature of 110 Kelvin (-163 °C / -261 °F), Io is home to the most extreme temperature differences from location-to-location outside of the Sun.

Just by orbiting where it does, Io gets distorted, heats up, and erupts, making it the most volcanically active world in the entire Solar System! Other moons around gas giants have spectacular eruptions, too (like Enceladus around Saturn), but no world has its surface shaped by volcanic activity quite like Jupiter's innermost moon, Io!

Dr. Ethan Siegel



Io. Image credit: NASA / JPL-Caltech, via the Galileo spacecraft.

Download photo here:
http://photojournal.jpl.nasa.gov/catalog/PIA02308

Learn more about Galileo's mission to Jupiter:
http://solarsystem.nasa.gov/galileo/.

Kids can explore the many volcanoes of our solar system using the Space Place's Space Volcano Explorer:
http://spaceplace.nasa.gov/volcanoes.