



.A good picture is equivalent to a good deed.
Vincent Van Gogh

Newsletter of the Pomona Valley Amateur Astronomers

Volume 35 Number 4

nightwatch

April 2015

President's Message

Things have been hopping around here lately. Last week we had a trio of public outreach events: at Oakmont Elementary School on Thursday, March 26, at Mountain View Elementary School on Friday, and at the Claremont Public Library's Children's Book Festival on Saturday. As usual, the highlight of the school outreach events was Jeff Schroder's giant refractor. At the library event, Cori Charles brought a wonderful selection of astronomy booklets, bookmarks, and stickers, I helped about 200 kids draw what they saw in the full moon, and we had both library telescopes out on display. See the photos later on in this issue for more on those events.

There's plenty going on in the sky this month as well. For deep-sky fanatics, we're still in the height of spring galaxy season, and the summer constellations are up before the sun rises. For those willing to go on dawn patrol, there are a couple of worthwhile current events. Nova Sagittarius 2015 No. 2 is still hovering around 5th magnitude as of this writing, and should be visible in binoculars for a little while longer. We'll also have a total lunar eclipse early this Saturday morning, April 4. The penumbral eclipse begins at 3:16 AM PDT and runs until

6:45 AM—just after sunrise here in SoCal—and the very short umbral eclipse starts at 4:58 AM and lasts only 5 minutes.

Our star party this month will be up at Cow Canyon Saddle on Mount Baldy, on the evening of Saturday, April 18. Our speaker this month is David Nakamoto of the Los Angeles Astronomical Society, who will talk about "Urb'n Imagin' ": the practical issues, and reasons, for imaging in the middle of light pollution central. The general meeting will be in room B460 in Shanahan Center (the 'new' building) at Harvey Mudd College.

Finally, if you're not already a member of the PVAA group on Facebook—and I'm guessing you're not, since there are only six of us so far—please join up! We're going to start making more use of this, not only to announce star parties, club outreach events, and upcoming speakers, but also so that people can check in with other members to see who's planning to attend various club functions, and to coordinate carpools to star parties. The more people join the group, the better it will work. Here's the link:

<https://www.facebook.com/groups/1378161432440156/>

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

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

March General Meeting

The March General Meeting opened with Ron Hoekwater welcoming a few new attendees, and a review of upcoming events. This September 13th we will be renting the 100" Hooker Telescope on top of Mount Wilson. There are only 14 openings, so you need to sign up ASAP. The price is \$390 per person for a night of unbelievable seeing. (Just comparing the area of a 10" telescope to a 100": $A = \pi \times \text{Radius squared}$. Radius of 10=5, $5 \times 5 = 25 \times \pi (\sim 3.14) = 78.5$ - 100" diameter means a radius of 50, $50 \times 50 = 2,500 \times 3.14 = 7,850!$ Oh My Gosh! – 100 times the light gathering power at 10 times the diameter.

The speaker of the night was PVAA member Jeff Schroeder. Jeff was one of the original 5 founding members of PVAA. He retired from JPL, and now is a "Telescope Driver" for Mount Wilson's 100" and 60" telescopes. His topic for the night was the 100" Hooker telescope on Mount Wilson, along with the other telescopes on the mountain. Both the 100" and the 60" no longer do scientific research due to the light pollution from Los Angeles and other bigger telescopes being in truly dark sky areas. The last time the 100" was used for scientific observation was January 1st, 2012. The 150' solar telescope is still being used for scientific observations, and is the in longest continuous use for scientific research. (The 150' is the focal length of the 19 inch mirror, thus the name – the tower is actually 176' high.)

Jeff stated that 3 telescopes have had the most impact on astronomy: The Galileo, the Mt. Wilson 100", and the Hubble space telescope. The 100" telescope became operational in 1917. Before that the Mt Wilson 60" telescope was the largest ever built. Since it was built in 1917, they used WWI battleship rivets to put the base and telescope structure together. These were actually built in shipyards. The 100" mirror is made of Saint Gobain's wine glass in France. It took over a year for the mirror to slowly cool down so that it wouldn't crack. The entire movable portion of the mount floats on a film of mercury. That way it remains smooth as it glides on mercury, not touching the other surfaces. It can be configured from a focal length of f30 to f5. George Ellery Hale conceived and founded not only Mount Wilson's 60" and 100" scopes, but also the former largest 40" telescope at Yerkes Observatory, and then the next world's largest telescope at Mt. Palomar: the 200" telescope. A truly amazing thing. Thank you Mr. Hale! And thanks Jeff for a great presentation .

Gary Thompson

Club Events Calendar

- April 3, 2015, General meeting
- April 18, 2015, Star Party, Mt. Baldy Cow Canyon Saddle
- April 23, 2015, Board meeting, 6:15

- May 1, 2015, General meeting
- May 21-25, 2015, RTMC (anticipated date)
- No scheduled Star Party.
- May 28, 2015, Board meeting, 6:15

- June 5, 2015, General meeting
- June 13, 2015, Star Party, Angeles Oaks

- July 18, 2015, Star Party
- July 23, 2015, Board meeting, 6:15
- July 31, 2015, General meeting

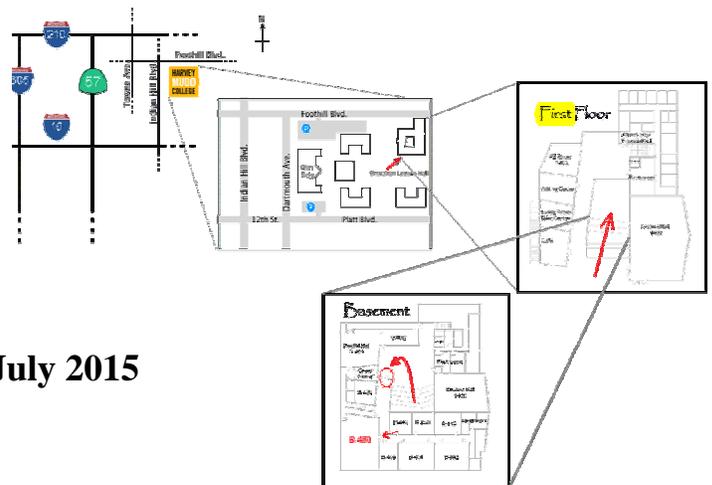
- August 15, 2015, Star Party
- August 20, 2015, Board meeting, 6:15
- August 28, 2015, General meeting

- September 12, 2015, Star Party or Annual Mt. Wilson
- September 17, 2015, Board meeting, 6:15
- September 25, 2015, General meeting

- October 10, 2015, Star Party
- October 22, 2015, Board meeting 6:15
- October 30, 2015, General meeting

- November 12, 2015, Board meeting, 6:15
- November 14, 2015, Star Party
- November 20, 2015, General meeting

- December 3, 2015, Board meeting, 6:15
- December 11, 2015, Holiday Party, Sizzlin' Skillets 7:00pm
- No scheduled General meeting.
- No scheduled Star Party.

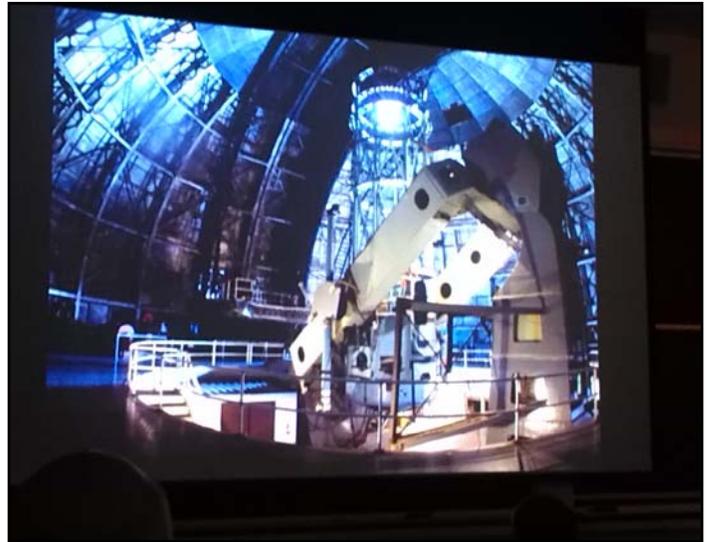
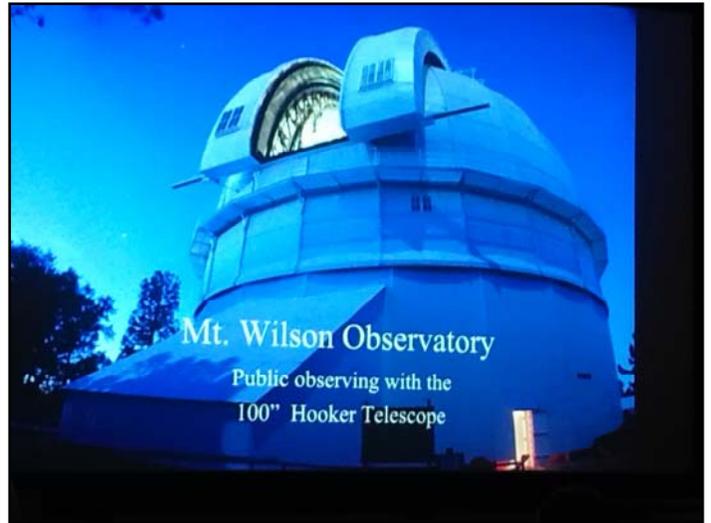


We are reserved in Shanahan B460 through July 2015

Observe with 100-Inch Telescope

PVAA has reserved the 100-inch "Hooker" Telescope. We have the telescope from dusk until dawn on the night of Sunday, September 13, 2015. September 13 is the date of the new moon. September also gives a greater chance of good to excellent seeing.

On September 13-14 we will have the planets Uranus and Neptune and their brighter satellites to look at. Also some globular clusters and numerous planetary nebula will be well placed for observing. The Ring Nebula is spectacular, showing color in the 100-inch scope. The small field-of-view (about 4 arc-minutes) make the 100-inch a disappointment when looking at galaxies.



The fee for a night with the 100-inch scope is \$390.00 per person. At this price PVAA breaks even with 13 people. We are limiting the number to a maximum of 14 people in order to allow each person plenty of time at the eyepiece.

If you wish to participate in this observing adventure contact Ron Hoekwater: astro4ron@gmail.com

What's Up? - The Theory Of Everything

Yes, it's the title of a movie about cosmologist Stephen Hawking that won an Academy Award for best actor (Eddie Redmayne). The only award winning biographical movie about an astronomical icon I've seen. It's all about Hawking's battle with ALS (Lou Gehrig's disease) that slowly paralyzed him over decades. But it suffers from that biopic weakness of whether or not to discuss what made the person famous. Will astrophysics bore the audience? It occasionally comes up. His wife Jane (Felicity Jones) at one point compares Einstein's physics to potatoes and quantum physics to peas. She says, "Einstein hated peas". But there's enough discussion of Hawking's work in physics and the thermodynamics of black holes to encourage viewers to look into the subject. There's even the irresistible comparison between his interest in black holes and the fact that he has an illness that seems to pull him down into his own black hole. The dramatic fact is that, although at age 21 he's given two years to live, he goes on to get married (twice), have three children and write a best selling book. This was *A Brief History Of Time* ('84) which stayed on a British best seller list for a sizable 237 weeks. With editorial help he continued writing for a popular audience with *The Universe In A Nutshell* ('01), *A Briefer History Of Time* ('05), and *God Created Integers* ('06).

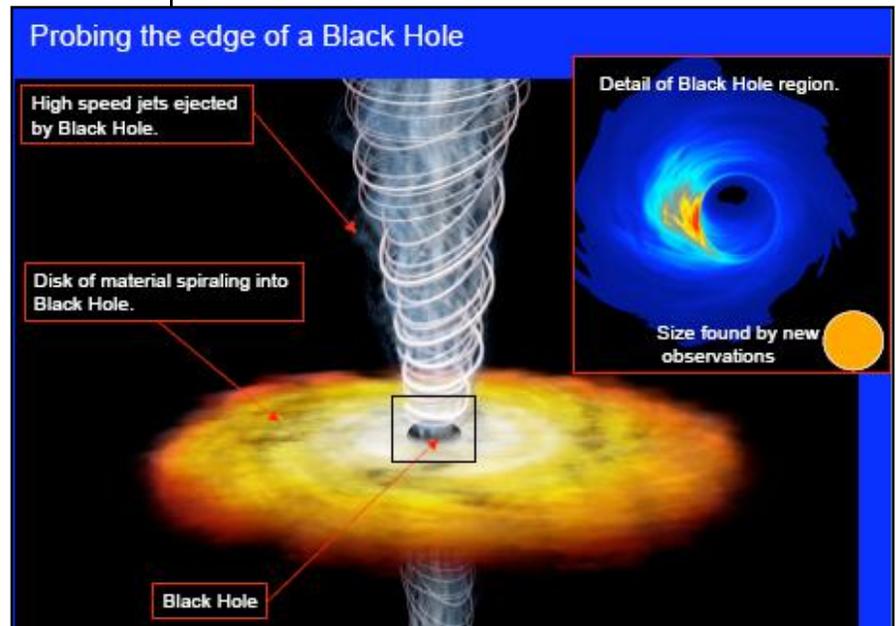
The admirable support of his wife and his determination not to give up on life are central to the story. This and Hawking's often annoying personality make for a lot of character conflict. His wife believes in God and Hawking states that God isn't necessary to his theoretical conclusions. One of his controversial theories is a black hole at the beginning of time. Divine creation or not. His theory of everything is his ambitious effort to find an explanation for the entire universe. This involves a cosmology that unifies Einstein's theory of relativity with quantum mechanics. His critics have their doubts about whether he truly finds his theory of everything. His wife accuses him of wanting to be godlike. His voice box came about when he was so ill his wife was asked if life support should be terminated but she approved a tracheotomy instead. His disability means that all responsibility of his family is on his wife's shoulders. These complications and Hawking's continuing struggle to survive his wasting illness makes for an engrossing film that can sidestep any need to explain astrophysics to the average filmgoer.

Understandably Hawking took a great interest in the film. He donated a speech generating device as well as papers and awards to use in the drama.

His accomplishments in astronomy center on that infamous gravitational singularity called a black hole. By definition no one has ever seen a black hole since no light can escape from it. Einstein's theory of relativity says that a totally compact mass will deform space to form a black hole. However Hawking and

his partner Jacob Bekenstein conjectured that black hole entropy was proportional to the area of its boundary known as the event horizon. This was called the BH formula (Bekenstein-Hawking or black hole). Hawking theorized that matter falling into a black hole will show an accretion disk through friction. This hot radiation emitted by black holes came to be called Hawking radiation.

The size limitation of a black hole singularity was originally stated as the Schwarzschild radius after Karl Schwarzschild, a follower of Einstein who first considered a light sucking gravity collapse back in 1915. In 1931, Subrahmanyan Chandrasekhar further calculated mass limitations on a non-rotating body of



electron-degenerate matter and postulated the Chandrasekhar limit. The first use of the name "black hole" was in a journal article by Ann Ewing in 1964. This name soon became a colorful (or colorless) term for a scary region having such a gravitational pull that no particle or electromagnetic radiation can escape from its destructive power.

Despite the invisibility of its interior a black hole can be visually inferred through its interaction with matter and radiation falling into it. Stars come to orbit a black hole and their orbits can be used to judge its size and location. So, astronomers have identified possible black holes in binary systems. Also the core of the Milky Way and other galaxies are now felt to contain super massive black holes. (pictured)

I don't have a real feeling for the physics of black holes but I felt that this movie, *The Theory Of Everything*, reached me with its story of Hawking's struggle to be a renowned figure in the history of astrophysics.

Lee Collins

Please join the PVAA Facebook group!

We're going to start making more use of this, not only to announce star parties, club outreach events, and upcoming speakers, but also so that people can check in with other members to see who's planning to attend various club functions. The more people join the group, the better it will work.

<https://www.facebook.com/groups/1378161432440156/>

See you out there!

Thanks,

Matt



First quarter moon - C80ED and iPhone 5 - 2015-03-26



PVAA table at 2015 library book festival



Jeff Schroder and his 11-inch refractor



Oakmont astronomy outreach
Wedel boys with telescopes

**Oakmont Elementary
(150 parents and kids) and
Mountain View Elementary
(220 parents and kids)
Star Parties**



Pictures from Jeff Schroeder

The Cold Never Bothered Me Anyway

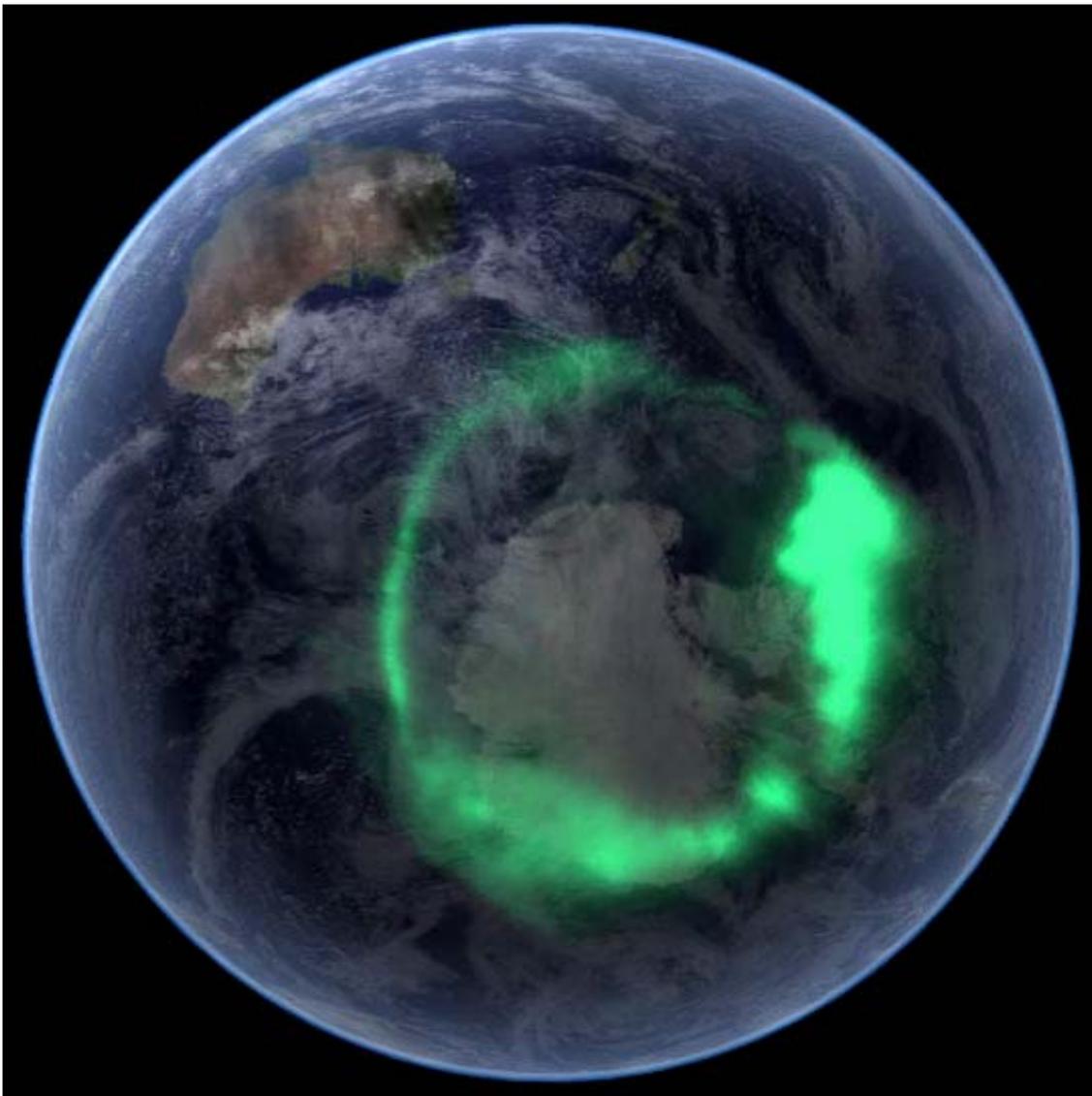
For those of us in the northern hemisphere, winter brings long, cold nights, which are often excellent for sky watchers (so long as there's a way to keep warm!) But there's often an added bonus that comes along when conditions are just right: the polar lights, or the Aurora Borealis around the North Pole. Here on our world, a brilliant green light often appears for observers at high northern latitudes, with occasional, dimmer reds and even blues lighting up a clear night.

We had always assumed that there was some connection between particles emitted from the Sun and the aurorae, as particularly intense displays were observed around three days after a solar storm occurred in the direction of Earth. Presumably, particles originating from the Sun—ionized electrons and atomic nuclei like protons and alpha particles—make up the vast majority of the solar wind and get funneled by the Earth's magnetic field into a circle around its magnetic poles. They're energetic enough to knock electrons off atoms and molecules at various layers in the upper atmosphere—particles like molecular nitrogen, oxygen and atomic hydrogen. And when the electrons fall back either onto the atoms or to lower

energy levels, they emit light of varying but particular wavelengths—oxygen producing the most common green signature, with less common states of oxygen and hydrogen producing red and the occasional blue from nitrogen.

But it wasn't until the 2000s that this picture was directly confirmed! NASA's Imager for Magnetopause-to-Aurora Global Exploration (IMAGE) satellite (which ceased operations in December 2005) was able to find out how the magnetosphere responded to solar wind changes, how the plasmas were energized, transported and (in some cases) lost, and many more properties of our magnetosphere. Planets without significant magnetic fields such as Venus and Mars have much smaller, weaker aurorae than we do, and gas giant planets like Saturn have aurorae that primarily shine in the ultraviolet rather than the visible. Nevertheless, the aurorae are a spectacular sight in the evening, particularly for observers in Alaska, Canada and the Scandinavian countries. But when a solar storm comes our way, keep your eyes towards the north at night; the views will be well worth braving the cold! !

Dr. Ethan Siegel



.Auroral overlays from the IMAGE spacecraft.

Image credit: NASA Earth Observatory (Goddard Space Flight Center) / Blue Marble team.

The April-May Space Place Newsletter is here!

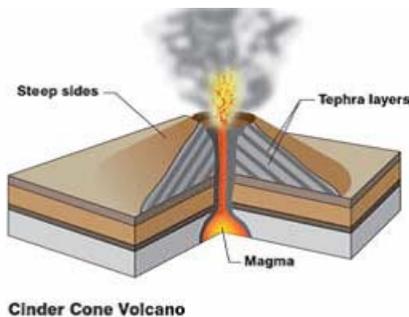


Read about volcanoes on other planets, Voyager 1 entering interstellar space (and what that is!), how GPS can help you find the nearest pizza place, and so much more!

We have a new gallery of 3-D images of Earth and other planets, moons, and smaller objects taken from space. With inexpensive red and blue 3-D glasses, students can “ooh” and “ahh” their way through the solar system. We also have an Earth Day activity for making a “stained glass” Earth with a paper plate and tissue paper.

<http://spaceplace.nasa.gov/educator-newsletter>

Have fun exploring our universe!



Where do old satellites go to die?

Countries and commercial ventures have been putting spacecraft in orbit around Earth since the late 1950s.

There must be a lot of space junk out there.

So what happens to them when they no longer work?

Find out at

<http://spaceplace.nasa.gov/spacecraft-graveyard>

