nightwatch
Newsletter of the Pomona Valley Amateur Astronomers

All we know is still infinitely less than all that remains unknown.
William Harvey

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President's Address

Our joint RAS / PVAA star party out at the new and improved GMARS site in Landers was a success. There were more telescopes in one place than I have seen since last year's RTMC. The Riverside club always does a great job with the events they put on. If you weren't there, you missed out on a good time.

Recently Laura and I attended a lecture on dark matter. The speaker was Dr. Josh Simon of the Carnegie Observatories. For the seventh consecutive season, the Carnegie Astronomy Lecture Series is being held at the Huntington Library in San Marino. The lectures are free and open to the public, but seating is limited so arrive early to be sure of getting a seat. The lecture we attended was packed. All lectures start at 7:30 p.m. and will be held in Friends' Hall. Parking is free. To access the parking lot, enter The Huntington via the Allen Avenue gate. The remainder of the series lectures are: April 20, Dr. Sean Solomon "Exploring Mercury by Spacecraft: The First Two MESSENGER Flybys" and May 4, Dr. Jane Rigby " Black Holes and Brand-New Stars: Seeing Them in All Possible Colors."

Among of the most thrilling experiences of my PVAA life (or of my life in general for that matter) have been our group trips up to Mount Wilson to spend a night observing through 60-inch telescope. With the 60-inch I have seen the moons of Mars. I was afforded views of the planets Jupiter and Saturn that rivaled images from the Hubble space telescope. Revealing 17th magnitude stars with ease and intricate detail, invisible in a lesser instrument, planetary nebulae such as the Ring and the Cat's Eye were nothing short of spectacular. A night with what was once the largest telescope in the world is a unique and unforgettable adventure for any amateur astronomer.

On June 20, 2009 PVAA will be returning to Mt. Wilson. A maximum of 25 are allowed to attend so get your name in soon!

Ron Hoekwater

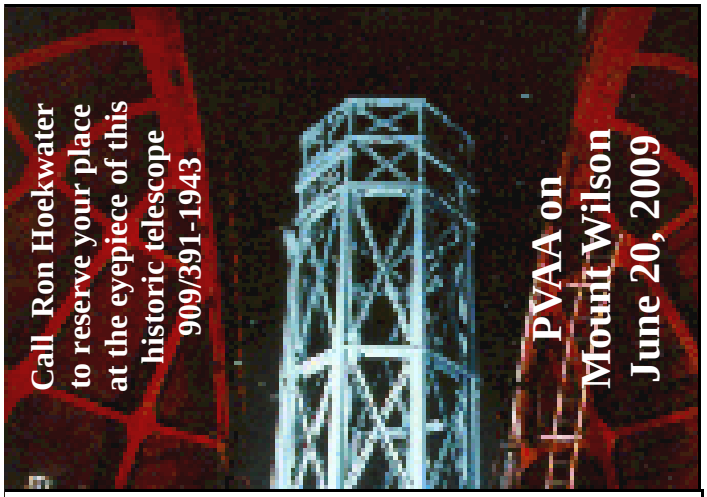
March Star Party

Our March 28th star party was held at Landers, Hosted by the Riverside Astronomical Society. Attending were two other clubs and the PVAA. The night was very clear and no wind at all. RAS had a barbeque with lots of good food for everyone. The Press Enterprise newspaper was also there to do a story on the Messier Marathon that RAS was hosting. The story is to be in the April 6th issue of the newspaper.

Mr. Scott Roberts was there with his new **Explore Scientific** line of telescopes. I got a look through his new 127mm Triplet ED APO refractor. The stars were tight, pinpoint and with high contrast.

Our April star party will be held at the Mojave River Forks Regional Park in Hesperia. This is a new site for the PVAA. I hope it turns out to be a great one and to see many of you attending.

Jim Bridgwater



Get info about Mt. Wilson at http://www.mtwilson.edu/60in.php

Club Events Calendar

April 10, General Meeting - Bob Stephens of RAS to speak on Sir William and Caroline Herschel
April 25, Star Party – Mojave River Forks Regional Park
April 30, Board Meeting

May 1 and 2, Claremont Class and Star Party with Laura Jaoui
May 8, General Meeting
May 22 - 25, RTMC
May 28, Board Meeting

June 5, General Meeting
June 13 - 19, Ron plans to be at White Mountain
June 20, Mount Wilson viewing with 60"
- Contact Ron Hoekwater

July 2, Board Meeting
July 10, General Meeting - Speaker Phillip Choi, Professor, Dept of Physics & Astronomy, Pomona College
July 11, Tour of Mt Palomar 2 PM.
July 18, Star Party - Mojave River Forks Regional Park
July 30, Board Meeting

August 7, General Meeting - Speaker Greg Lyzenga, Geophysics Professor, Harvey Mudd College on Asteroid Occultations
August 22, Star Party - Helipad at Camp Angeles
August 25, Ontario Library Main Branch, 7 – 9 PM
August 27, Board Meeting

September 4, General Meeting
September 19, Star Party
September 24, Board Meeting
September 26 - 27, Second Annual PATS, Pasadena

October 2, General Meeting
October 17, Star Party
October 22, Board Meeting
October 27, Ontario Library Main Branch, 7 – 9 PM

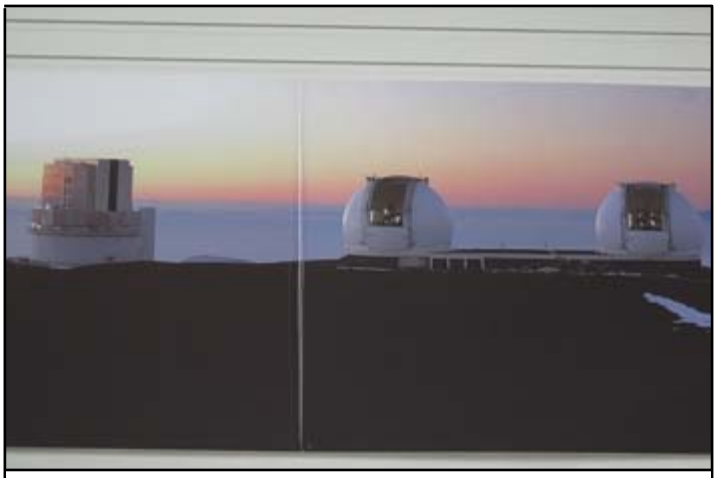
November 6, General Meeting
November 14, Star Party
November 19, Board Meeting

December 4, - Holiday Party
December 12, Star Party
December 31, Board Meeting

Palomar Observatory

On Saturday, July 11th at 2:00 PM, the PVAA is touring Palomar. The limit of 30 people have signed up, but if you are still interested, please contact **Claire Stover** .

If you have signed up for this event, but cannot attend, please let us remove you so that others may sign up.



Mauna Kea by Lee Collins

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We were reminded of some Club events coming up during the next few months – our June 20th trip to Mt. Wilson and the July 11th tour of Mt. Palomar. If you are planning to attend Mt. Wilson please get your $100 payment to Ludd or Claire at the next meeting to reserve your spot. We will soon open signups to other astronomy groups and you'll want to be sure we save space for you as the Observatory has a strict limit of 25 people within the telescope dome. The Palomar trip is already full but if you signed up and will not attend please let me know as there are others who may like to come. Cost for this trip is $5 per person, payable ahead of time or on the day of the trip.

Laura reminded us of the City of Claremont *Astronomical Observing for Beginners* classes coming up on Wednesday, April 1st and Friday, May 1st. She can use our help with the observing portion of the class, please contact her to assist.

Ron announced the formation of a Youth Outreach Committee which was formed with the goal of involving more young people in the Club and in the hobby of astronomy. Several Club members have already volunteered to join the new group – please consider adding your skills, experience, and interest to theirs. Become involved from the start in this new outreach effort, designed to bring in new people, keep our hobby active in our communities, and to help fill gaps in the science education offered in our local schools. Many of us enjoy the Club's public programs: what ideas do you have to continue these efforts and to specifically reach out to young people and get them involved in our interesting and stimulating hobby. Please consider lending your ideas to this new team of amateur astronomers.

Member Eldred Tubbs shared with us a book report on *Universe in a Mirror: the Saga of the Hubble Space Telescope and the Visionaries Who Built It* by Robert Zimmerman. Links to another two reviews of the book are included at the end of this article if you'd like to compare Eldred's impressions with those of others. Thanks for your interesting report, Eldred.

Another member let us know about the Golden State Star Party which is held in Northern California near Mount Shasta in late June. It looks like a very dark sky event and includes lots of fun activities; another good excuse for getting out the observing equipment and sharing it with others.

Lee shared with us his trip to Kitt Peak in Arizona. We saw the large telescope collection atop the mountain and enjoyed the pictures and tales of his visit. All went well except that nighttime observing was cancelled due to snow and inclement weather. I guess Lee will just need another visit to add looking through the Kitt Peak telescopes to his list of accomplishments.

March Featured Speaker

Next up during our jam packed March meeting was Club member Frank Murray, who spoke to us on the topic of "Nuclear Processes in Stars." We all learned something of interest from Frank. Some got a refresher from their college Nuclear Physics and Chemistry courses while others heard for the first time how the heavier elements found in our solar system and on our planet were first formed during the explosions at the end of a star's life.

While doing research for this article, I came across a term I didn't expect to see in a discussion of star evolution – metallicity. The term refers to the part of a material which has a chemical composition other than the two lightest and most common elements – hydrogen and helium. While we don't consider carbon, oxygen, and nitrogen to be metallic, they are considered so for simplicity's sake within the field of astronomy as they are overall so rare in the universe and represent byproducts of the earliest stars formed since the Big Bang.

Stars are referred to as belonging to Populations I, II, and III. This list is in order from the first discovered to the most recent – from the highest metallicity to the least. The oldest stars have the lowest metallicity while those most recently formed contain the highest percentage of heavy elements; those beyond hydrogen and helium on the periodic table.

Population I stars were the first discovered and are also known as metal-rich. Our sun is an example of such a star and many are found in the spiral arms of our Milky Way Galaxy. During the last decade or so as we've begun to discover exoplanets which orbit other stars it has been found that planets are most likely to be found in orbit around these metal-rich stars.

Population II, or metal-poor stars, were formed earlier than stars such as our sun, and contain a lesser amount of heavy elements. Population IIIs are known as metal-free stars and contain almost no metals on their surface and just a small amount of heavier elements in their cores which were formed during the Big Bang itself. This last group of stars has yet to be actually observed and they are still in the realm of theoretician's notebooks and computers. According to theory, they would survive for less than one million years and are so very far away from us – in both time and space – that observing them is anticipated to be very difficult.

The path of stellar evolution over the last 15 billion years or so since the Big Bang helps explain the fact that we and the world around us are made up of "star dust." As the very first Population III stars exploded, the few metals in their cores formed the seeds of the Population II generation which in turn led to even more metal enriched stars such as our Population I sun. Both the heavier elements and the odds of planets and therefore life circling these nuclear engines have increased with each succeeding generation of stars.

Frank helped us understand the nuclear and chemical reactions that take place inside various types of stars so we were better able to appreciate the power and complexity of the forces which lead to sunshine and starlight – as the powerful "burning" of hydrogen in its nuclear furnace dwarfs the energy produced during the much more modest burning of firewood around our evening campfires – though oddly enough those small fires owe their existence to the long ago hydrogen burners from 15 billion years ago.

Thanks you for an interesting and educational evening, Frank.

Claire Stover

References:

More reviews of *Universe in a Mirror*:
http://press.princeton.edu/titles/8618.html
http://www.thespacereview.com/article/1143/1
Information on the Golden State Star Party
http://goldenstatestarparty.blogspot.com/
Population I, II, and III Stars
http://en.wikipedia.org/wiki/Population_II_stars

Last month I told of my visit toArizona's Kitt Peak which proclaims itself home to "the world's largest collection of telescopes." At 7,000 feet, I found it sprinkled with two inches of snow, but tours were still open.

Recently, I visited Hawaii's Mauna Kea which proclaims itself home to "the world's largest telescopes." Both claims are correct, Kitt Peak has 26 telescopes, but Mauna Kea with only 12 telescopes has three of the world's largest – the Gemini North at 318", Japan's Subaru at 327", and the twin 400" Keck telescopes with their interferometer.

Sadly, I never got to the top of Mauna Kea (white mountain). At 14,000 feet, it was frozen up by three feet of white snow and 40 M.P.H. winds. Observatories were shut down.

I got as far as the Onizuka Center (named for a Hawaiian astronaut killed in the Challenger Shuttle explosion in 1986) where the pavement ends. At 9,000 ft. this is where the operating staff live, acclimatize, and recover.

While using smaller telescopes at the Onizuka Center I spoke to staff members who reminded me that professional astronomers view information from on-line monitors down in the warm lowlands while they keep the 500 ton telescopes working at a frigid 14,000 ft.

There was a surprising amount of disagreement when I asked which was the world's largest telescope. With telescopes this complex there are a lot of factors to consider. Some said Arizona's Mt. Graham Large Binocular Telescope with its combined 474" binocular eyes was the biggest. Some favored Spain's 410" Gran Telescopio Canarias, or even the 362" Hobby-Eberly at McDonald in Texas. But most of the locals favored Mauna Kea's twin Keck scopes (funded in 1993 by W. M. Keck, a Texas oil billionaire).

The next day, in the Hawaiian cattle town of Waimea, I visited the Keck Observatory Center. Here computer screens are studied at a tropical elevation where the mind functions more efficiently at 14,000 ft. Neat models demonstrated how its 36 adjustable hexagonal segments moved. With computer adaptive optics and interferometer, it's the latest in telescope science. Keck is managed by NASA, Caltech, and the University of California.

I also went to Japan's Subaru Observatory Center near the University of Hawaii at Hilo. Named after the Pleiades (Subaru) star cluster it's operated by the National Astronomical Observatory of Japan, not the car company. This 327" telescope (1999, 6th largest) has the biggest single mirror weighing 23 tons. We watched a film on the elaborate re-silvering of the monster mirror. Subaru's experimental dome has an odd conical shape, causing remarks like, "the Japanese always have to be different."

Nearby is the Center for Gemini North (1999, 8th largest). Operated by an international consortium, it has a southern twin in Chile allowing them to "view the entire sky." To use the giants, one must submit a proposal and pay a fee of up to $40,000. This is why searching for comets or asteroids is done with smaller or even amateur telescopes.

Next door, I visited the 'Imiloa Planetarium and Astronomy Center. 'Imiloa was built to show that astronomers were more than scientists desecrating a peak sacred to volcano goddess Pele. They were carrying on a tradition of star studies used by ancient Polynesians when they voyaged Hawaiian seas. Like Griffith Observatory, it's a popular science center.

One exhibit dealt with a recent strong volcanic earthquake that had damaged both the telescopes and historic island structures. I asked why the most expensive telescopes in the world were built on top of the world's largest volcano and only ten miles from Kilauea, the world's most active volcanic crater. They said "far-south and great seeing conditions!"

The University of Hawaii was the first to erect a 24"scope in 1968. They followed this with an 88" optical-infrared in 1970. The United Kingdom then erected the world's largest infrared scope (150") in 1978. NASA followed with a 118" infrared in 1979. Next came the Canada-France-Hawaii Telescope (142"), an optical-infrared with a mammoth CCD imager.

All this time the world's largest radio telescopes were build on Mauna Kea. The James Clerk Maxwell has the biggest submillimeter dish protected by the biggest piece of Gore-Tex. The Caltech Submillimeter is the largest remotely operated radio dish. The Smithsonian's Submillimeter Array has six interlocking dishes. The 10 story high Very Long Baseline Array coordinates with nine others in North America. It's so sensitive it has to be isolated from the others. Please turn off those cell phones!

At this point the dry atmospheric stability and tropical inversion of the site were so famous that the giants: the Keck, Subaru, and Gemini North were erected. There's talk of a super-duper giant telescope, but native Hawaiians warn of angering volcano goddess Pele.

The logo of Mauna Kea Observatories shows the Southern Cross plus Alpha and Beta Centauri. On this trip to America's southernmost point I finally got to see this group of first magnitude stars. Alpha Centauri shines bright because it's the closest star system at 4.4 light years. The sky's third brightest star (-0.3 mag.) it's also the brightest double star. The very closest star is a third tiny member of the system, Proxima Centauri at 4.2 light years. Proxima (nearest to) is an 11mag. red dwarf flare star discovered in 1915. Alpha Centauri also has the non Greek letter catalog names of Rigel Kentaurus (Foot of Centaur) and Tolimon which may be Arabic for ostrich. Most astronomers, and Star Trek fans, prefer the familiar Alpha Centauri.

Next to the Alpha Centauri system is Beta Centauri (0.6mag.), the tenth brightest star. This sparkling couple form the closest pair of first magnitude stars in the entire sky. Beta Centauri is a blue-white giant star and also a triple star system at 400 ly. Beta Centauri has non-catalog names of Agena (knee, the Centaur's) and Hadar which is Arabic for ground. This is because Arabian chart makers couldn't conceive of it ever rising off the ground.

Near by are more Greek letter first magnitude stars in the Southern Cross. Alpha or Acrux at 0.81 mag., Beta or Becrux at 1.3 mag. (also known as Mimosa for its flowery color), and Gamma or Gacrux at 1.6 mag. The entire gleaming circumpolar group is as close to the south stellar pole as the Big Dipper is to the north pole. Old Polynesians navigators used these two north & south polar asterisms as guides. Sadly, the south pole has no polar star like the North Star. That's why versions of these sparkling southern stellar stars appear on the flags of five nations. Seeing them, I know I'm truly as far south in the United States as I can get.

Lee Collins

Mauna Kea by Lee Collins

Kitt Peak by Lee Collins

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