Every animal leaves traces of what it was;
man alone leaves traces of what he created.
Jacob Bronowski

Newsletter of the Pomona Valley Amateur Astronomers

Volume 31 Number 06 ***nightwatch*** **June 2011**

President's Message

A few weeks ago I spent a night at Joshua Tree with some of my former students. They were there for the meteor shower, and they invited me along. I took my 10" reflector, and we stargazed off and on from sunset until a little after midnight.

Whenever I go out to a dark site, I always take along at least one observing list. Sometimes I take several, to suit changes in sky conditions or in my mood. That night at Joshua Tree was no exception. I had lists of things I wanted to find for myself, but somehow I never got around to unpacking them. Instead, the students and I just surfed around the sky, hitting the best and brightest in every category. Without making any concerted effort, we ended up seeing about three dozen objects, including at least three of every major type of deep sky object. It was the perfect time of year for casual stargazing--we saw a lot of galaxies early in the evening, and finished with the jewels of the summer Milky Way.

I've done a lot of outreach before, but that night was different. There was something special about having a lot of time with a small group of people, and the opportunity to see so many kinds of things under such dark skies. I had a fantastic time, and the students did as well.

Goethe wrote that anatomical dissection "opens up the profoundness of nature to us more than any other endeavor." I won't quibble with that; I have experienced moments of revelation in the anatomy lab. But I suggest that astronomical observation is equally ennobling, taking us not inward but outward and upward, drawing our minds to the sweep of the cosmos--and, not incidentally, drawing us closer as we take turns at the eyepiece, talking about what we've seen and about the thoughts and feelings inspired by our observations. Telescopes are by definition optical instruments, but they can serve as social instruments as well.

Matt Wedel

Club Events Calendar

June 17 – General Meeting - 7:30 - Beckman Hall

Alex McConahay's presentation, titled
"Through Rose Colored Glasses"
will cover the use of filters in astronomical observing.

Mr. McConahay is a retired educator and the editor of Riverside Astronomical Society's newsletter, *Prime Focus*. His contributions to amateur astronomy are too numerous to mention more than just a few. In addition to having held several offices in RAS, he is one of people who organize and bring us the Pacific Astronomy and Telescope Show and the Riverside Telescope Makers Conference every year. As one of the Riverside Amateur Telescope Makers he has built two telescopes and earned an RTMC Merit Award. He is a frequent speaker to local astronomy clubs.

July 7 - Board Meeting, 6:15
July 12 - Star Party - Galster Park Nature Center
July 15 – General Meeting
July 30 - Star Party - White Mountain

August 4 - Board Meeting, 6:15
August 5 - Columbia Memorial Space Center, 7:00-9:30 PM
August 9 – Main Branch, Ontario Library, 7 – 9 PM
August 12 – General Meeting - Vatche Sahakian
Aug 27 - Star Party - Angelus Oaks

September 1 - Board Meeting, 6:15
September 9 – General Meeting
September 24 - Mt. Wilson Observing

October 8 International Observe the Moon Night, Claremont

How Does It Work?

This is the second in a series to examine the design of telescope eyepieces. In this article we will look at the historical record and see how the designs evolved. In the following discussions I have excerpted from the on line Wiki Encyclopedia. For more information you may want to Google "eyepiece design."

The first image from a telescope is a real image. A piece of paper can be placed at the focus and a real image will appear. It is informative to do this with a full moon. Knowing where the focus is can be very helpful when adding filter wheels, focal reducers, barlows and eyepieces to the back end.

A virtual image is one where the image cannot be shown on a piece of paper but does appear when viewed through the optical system. The purpose of an eyepiece is to create just such a virtual image. The target area of the sky appears real when viewed through the eyepiece. The virtual image is magnified as determined by the ratio of the telescope focal length and that of the eyepiece. The object and the apparent field of view are magnified by this ratio. Most eyepieces will have a stated FOV. The real FOV can thus be determined by dividing the apparent FOV by the magnification.

Galileo probably couldn't imagine today's eyepieces when he used a single negative lens in 1609. A negative lens was placed just inside the primary focal point. When the right side focal point of the negative lens is coincident with the primary focus, a virtual image can be seen when looking through the system. His small refractive scope had limitations, but it must have been exciting to look at the moon and planets. Aberrations were there, but the concepts to deal with them had yet to be discovered.

Over fifty years later, sometime in the 1660's the next recorded design took place. Chritiaan Huygens used two plano-convex lenses separated by an air gap to form an image with reduced chromatic aberrations. Huygens place the plano side of both lenses toward the observer.

This worked adequately for long primary focal lengths which was typical of that period. The next recorded improvement came about 1782 when Jesse Ramsden reversed the first lens and adjusted the spacing. There was another small improvement in chromatic aberration.

The first record of a "modern" design was created by Carl Kellner in 1849. Kellner replaced the second plano convex thin lens with a doublet. A doublet is simply two lenses made of different glasses and cemented together. The difference in index between the types of glass allows the result to be called an achromatic eyepiece. Kellner designs are still popular today for an inexpensive eyepiece.

The Kellner eyepiece can have problems with excessive reflection losses unless the doublet is well made and anti-reflection coatings are used. The apparent FOV is typically 40 to 50 degrees.

In 1860 Georg Plossl developed a design using two doublets. This improved the FOV to a more consistent 50 degrees or slightly larger. The primary limitation of this design is eye relief which is limited to about 70 to 80 per cent of the focal length. For short focal length eyepieces this can be a problem.

Note that the Kellner and Plossl are both fairly simple design changes of the basic Huygens concept. The difficulty is in the making of the doublets. They must "fit" together well to minimize the cement thickness that bonds them. Otherwise internal reflection will reduce contrast of the image. Anti-reflection coatings and quality of workmanship determine the cost.

Ken Crowder

PVAA Officers and Board

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So - what is going on in this photo, anyway? What are those 4 banners and who is the bearded mountain man?

I'm sure the hard core amateur astronomers among you will recognize the 4 test patterns that help you determine the resolution of your telescope. What you may not know is that, thanks to the inspiration of member Ludd Trozpek, your Club has its very own set of them and they have been provided free of change to attendees at the RTMC Astronomy Expo which has

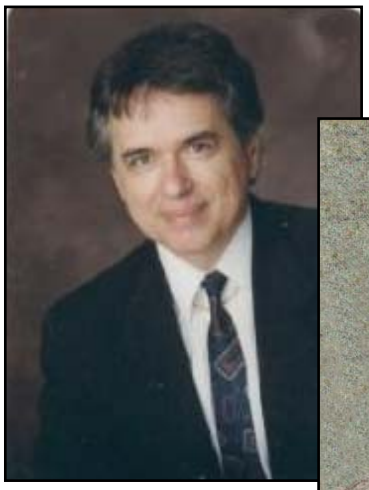
May General Meeting

PVAA President Mathew Wedel started the meeting even closer to the official 7:30pm start time than last month, proving that progress is being made, and that he is a man of his words. He passed out a sign-up sheet for the Mount Wilson Observatory night scheduled for the Saturday, September 24th. If you are interested, and haven't signed up, please contact Ron Hoekwater.

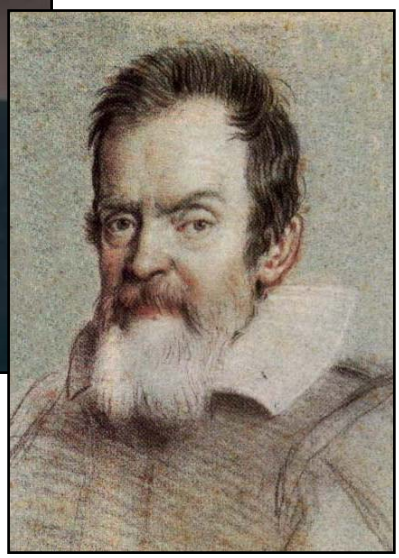
Lee Collins gave his usual great presentation of What's Up. It's really worth going to the meetings just to hear the little known, abstract facts that he comes up with. He centered on the constellation of Hydra, and pointed to the multitude of galaxies in and around the constellation of Virgo. Just think if of how many "M" objects there would be if Charles Messier had a slightly better telescope!

Our speaker for the night was Albert Di Canzio, author of Galileo: His Science and His Significance for the Future of Man. The title of his talk was "Remembering Galileo: An Astronomer's Legacy." Albert pointed out that Galileo di Vincenzo Bonaiuti de' Galilei was more than an astronomer. He was a mathematician, a physicist and a philosopher as well. Steven Hawkins said: "Galileo, perhaps more than any other single person, was responsible for the birth of modern science."

In 1594 he received a patent for a pump. His pump was a device that raised water by using only one horse. This was truly the first "one horsepower" pump. He also invented a geometric compass, the microscope, and an early thermometer.



What the world remembers him most for however is his astronomical discoveries.



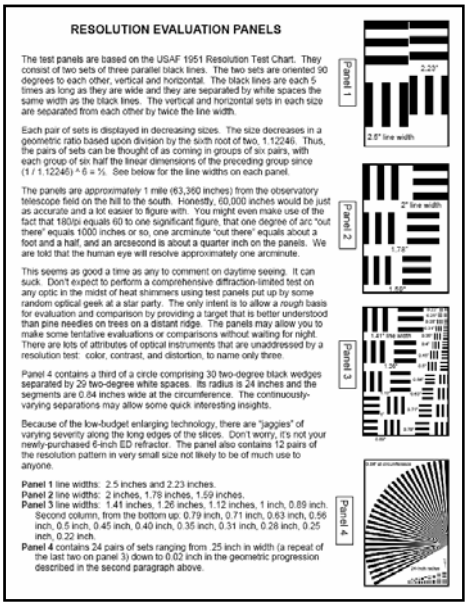
His finding the moons of Jupiter, - the first objects found orbiting another world. The moon proved to be a less than perfect globe. He saw that Venus had phases like the moon, proving that Venus was closer to the Sun than the Earth, and that there were so many more stars that the eye alone can not see. Using eyepiece projection, he saw sunspots. The heavenly sun had blemishes.

The world owes a big debt to Galileo. Thank you Albert for reminding us.

Gary Thompson

So - what is going on continued

taken place on or around Memorial Day weekend since 1969. Ludd's resolution charts, placed conveniently (for Expo attendees anyway) within sight of the Telescope Field near the vendor booths and the observatory have only been in existence since 2007. The first version was paper on cardboard but after helping get it up the hill the next year and picking up the pieces after, John Stover contributed his banner making skills and the current sturdier form was born. Aside from a hiatus in 2010 when neither Ludd, John, nor the banners made it to Camp Oakes; the test patterns have been peering down on the telescope field for a few days each May.


RESOLUTION EVALUATION PANELS

The test panels are based on the USAF 1951 Resolution Test Chart. They consist of two sets of three parallel black lines. The two sets are oriented 90 degrees to each other, vertical and horizontal. The black lines are each 5 times as long as they are wide and they are separated by white spaces the same width as the black lines. The vertical and horizontal sets in each size are separated from each other by twice the line width.

Each pair of sets is displayed in decreasing sizes. The size decreases in a geometric ratio based upon division by the sixth root of two, 1.12246. Thus, the pairs of sets can be thought of as coming in groups of six pairs, with each group of six half the linear dimensions of the preceding group since (1 / 1.12246) ^ 6 = ½. See below for the line widths on each panel.

The panels are approximately 1 mile (63,360 inches) from the observatory telescope field on the hill to the south. Honestly, 60,000 inches would be just as accurate and a lot easier to figure with. You might even make use of the fact that 180/pi equals 60 to one significant figure, that one degree of arc "out there" equals 1000 inches or so, one arcminute "out there" equals about a foot and a half, and an arcsecond is about a quarter inch on the panels. We are told that the human eye will resolve approximately one arcminute.

This seems as good a time as any to comment on daytime seeing. It can suck. Don't expect to perform a comprehensive diffraction-limited test on any optic in the midst of heat shimmers using test panels put up by some random optical geek at a star party. The only intent is to allow a rough basis for evaluation and comparison by providing a target that is better understood than pine needles on trees on a distant ridge. The panels may allow you to make some tentative evaluations or comparisons without waiting for night. There are lots of attributes of optical instruments that are unaddressed by a resolution test: color, contrast, and distortion, to name only three.

Panel 4 contains a third of a circle comprising 30 two-degree black wedges separated by 29 two-degree white spaces. Its radius is 24 inches and the segments are 0.84 inches wide at the circumference. The continuously-varying separations may allow some quick interesting insights.

Because of the low-budget enlarging technology, there are "jaggies" of varying severity along the long edges of the slices. Don't worry, it's not your newly-purchased 6-inch ED refractor. The panel also contains 12 pairs of the resolution pattern in very small size not likely to be of much use to anyone.

Panel 1 line widths: 2.5 inches and 2.23 inches.
Panel 2 line widths: 2 inches, 1.78 inches, 1.59 inches.
Panel 3 line widths: 1.41 inches, 1.26 inches, 1.12 inches, 1 inch, 0.89 inch. Second column, from the bottom up: 0.79 inch, 0.71 inch, 0.63 inch, 0.56 inch, 0.5 inch, 0.45 inch, 0.40 inch, 0.35 inch, 0.31 inch, 0.28 inch, 0.25 inch, 0.22 inch.
Panel 4 contains 24 pairs of sets ranging from .25 inch in width (a repeat of the last two on panel 3) down to 0.02 inch in the geometric progression described in the second paragraph above.

Panel 1
2.23"
2.5" line width
Panel 2
2" line width
1.78"
1.59"
Panel 3
1.41" line width
1.26"
1.12"
1"
0.89"
0.79"
0.71"
0.63"
0.56"
0.5"
0.45"
0.4"
0.35"
0.31"
0.28"
0.25"
0.22"
Panel 4

Well, that sounds easy enough, you might think – nice charts you can see when you are trying to choose between a few pricey toys for your own backyard astronomy hobby. Here's the catch, though – the charts are placed about 1 mile from the field and about 600 feel above it. Back in 2007, Ludd figured he'd make the "short" trek up the hill on foot and just tie up his paper charts. The many-hour project was much easier said than done but fortunately walkie talkies kept Ludd in touch with his Club mates who helped make sure the signs were visible before Ludd came down off the mountain.

John assisted with the trek in 2008 and 2009 so 2011 was my turn. The trip to place the test patterns now takes a little over 2 hours and involves driving back to the entrance of Camp Oakes then heading up the hill on a bumpy dirt road. A bit off the beaten track but perfectly passable in a sturdy vehicle, at least in dry weather. After one false turn – is this it – no, let's go on for a ways – no, that was it – we arrived and headed "800 strides" down the hill with the banners, rope, carabiners, and the walkie talkie. We strung the upper rope between two trees, "carabined" the banners to it and secured the bottom corners to some logs. Last step was to verify with ground crew Joe Hillberg that all looked OK and then we headed down the hill for some breakfast.

I'm pleased to report that except for some minor folding at the bottom, the banners held up very well all weekend and this is despite winds from Saturday afternoon to Sunday night that reached 80 miles per hour at the ridge and a large percentage of that down at the Telescope Field and the campground! Shhh – don't tell anyone that Ludd's scheme worked so well or they'll have him helping put up vendor tents next year. I'm afraid they didn't fare nearly so well as PVAA's test patterns!

Claire Stover

What's Up - Blackeye, Sunflower and Sombrero

Stargazers who like to check out galaxies will recognize three nicknames from the Realm Of The Galaxies area centered around Canes Venatici (Hunting Dogs), Coma Berenices (Berenice's Hair), and Virgo (Virgin). These constellations contain over 20 Messier cataloged galaxies. Nearby constellations contain even more. There are hundreds of galaxies visible in a large telescope and over 2000 in all. Some being closer are easier to see and study.

In the northern Canes Venatici is the Sunflower Galaxy (M63) with a petal-like mottled appearance in its tight spiral. This celestial flower is part of the M51 Galaxy Group near the Milky Way's Local Group of galaxies.

Also in the Hunting Dogs the spiral M94, which exhibits very active star forming activity near its center, making it a "starburst" galaxy.

M51 (Whirlpool), the Sunflower, and M94 were some of the first galaxies in which spiral structure was noted by the Earl of Rosse in the middle of the 19th century. The wealthy Earl observed with his pioneer 72 inch telescope called the Leviathan of Parsonstown which had to be moved by ropes like a ship's sail.

The concept of galaxies was unimaginable at that time and these spiral nebulae were thought to be newly forming solar systems. The abundance of nebula in the Coma-Virgo area impressed all observers. Today called the Coma-Virgo Galactic Super Cluster. Millions of these galactic clusters are now known to exist in the vastness of the universe.

Moving south into Coma Berenices, near our North Galactic Pole, we find the Blackeye (M64) or Sleeping Beauty galaxy. Also called the Pea Galaxy. Is it a blackeyed pea? Its "bruise" is an area of obscuring dust that contains ongoing star formation. It may have been caused by the cannibalism of a small satellite galaxy.

Coma Berenices comes from the tale of an Egyptian Queen who cut off her hair as an offering for her husband's safe return from battle. It looks "hairy" to the unaided eye, not because of many galaxies, but because of a big fuzzy star cluster, Melotte 111.

On the border between Coma Berenices and Virgo are 16 Messier objects in addition to over a hundred more. Many are non-spiral galaxies called lenticular or elliptical. In the center of the Coma-Virgo Galactic Super Cluster is a closer elliptical, M87. One of the most powerful of radio telescope objects it's classified as Virgo A and Virgo X1 for its X Rays. This radiation comes from a super massive black hole at its core. Its most astounding characteristic is a jet of energetic plasma that shoots out 5,000 light years into space. Is this another violent galactic merger?

Near M87 is chain of galaxies like a string of pearls called Markarian's Chain. It's an easy trail with a telescope and surrounded by more galaxies

By Virgo's southern border with Corvus (Crow) is M104, the south of the border Sombrero Galaxy. Its thick dust lane forms a broad hat-like rim. This warmer rim is impressive in a heat

sensitive infared study of M104 (pictured). Again this may be the result of the merging of two galaxies. The brim is also an area of new star formation. The Sombrero's glowing central bulge may be caused by two galactic cores coming together. That could explain a massive black hole at the center.

Virgo as a constellation on the mythical Zodiac has long been associated with the Springtime when it appears in the Northern Hemisphere. Spica, its first magnitude star, means a Spring ripened spike of wheat. Spica is a brilliant star about 2300 times more luminous than our Sun. It has a fainter close companion detectable only by spectroscope.

Below Spica the kite shaped constellation of Corvus, with its merging Antennae Galaxies, seems to hover near the tasty wheat star like a real crow.

Brightest object in Virgo now is Saturn which takes it's retrograde reversal very slowly. So it seems frozen as near as ¼ degree from Porrima for much of June. Porrima comes from a Goddess of Prophecy associated with a future birth. Perhaps the Virgin will eventually get pregnant. But Porrima already has a companion, it's an identical twin binary with a 171 year orbit. The twin stars are very close now but you could split them in the same telescope field as Saturn.

So this Realm Of The Galaxies contains thousands of galaxies. Many seem to be merging together into strange radiant forms. All hold deep mysteries too far away and long ago for our minds to really comprehend.

Lee Collins

Joshue Tree Star Parties

The June 4th Star Party consisted of an outreach Friday evening for Project Bright Sky and a regular Star Party Saturday Evening, both at Cottonwood Springs Campground, Joshue Tree National Park

We hosted a group of blind individuals from the Palm Springs area numbering twenty members and a number of helpers. Frank Busutil had contacted the Rangers and made arrangements for a nature walk (feel and smell) in the area of the group camping ground, and a presentation of sky images after dark at the amphitheater which is equipped with a rear projection screen. Joe Hillberg, JimBridgewater, Frankand Barbara Busutil, Gary Thompson and I were the hosts.

The afternoon began with looking at sun spots and a ranger took the group on a walk to see, touch and smell the flora in the area. After that, a picnic dinner was served. Then, as dusk drew a shroud over the camp, we brought them to the scopes to view the crescent moon and Saturn. Most of the blind folk were able to see the details, most of them for the first time. Enthusiasm was rampant!

At nine pm the group walked over to the Amphitheater. The show featured familiar Messiers projected live from an 11" mead go-to. There were some problems with the unit holding alignment, but the show was very impressive, to say the least. The screen was almost 10 ft high and 15 ft long and the image was bright and crisp. Gary was our "official" photographer and he was able to capture one of the images. At the conclusion of the show, around 10pm, our guests returned to Palm Springs.

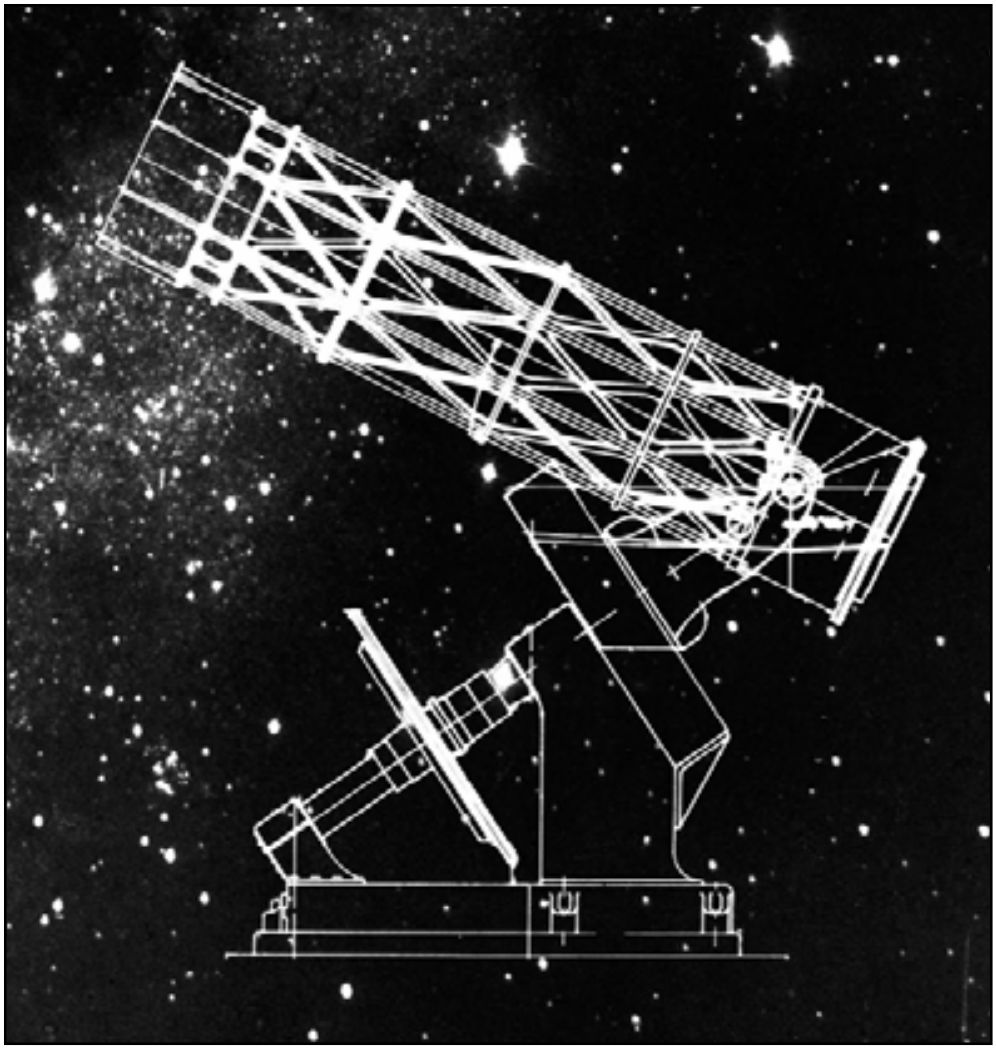
We got out our charts and began observations, but luck eluded us and the clouds moved in. Most of us called it a night around 11, while Jim and Joe needed to return to town.

The next day was full of broken clouds, overcast sky and nervous astronomers. "Stay or go, or go, or stay..." was in our thoughts all day. Gary needed to make some emergency repairs to "Big Red", whose mirror detached itself from its mount when Gary moved it near the horizion the previous night. We were able to remove the mirror mount and wrap the mirror for transport. Gary had brought his refractor as well, so he was not without a scope. Bill and Gary took a hike in the area of the spring and saw a monitor lizard. We got some brief breaks in clouds and then around dusk the sky mostly cleared up. Frank set up his camera and monitor and I was able to see some great views of the Trifid and the Lagoon nebulas. Come around midnight we were all tired and called it a night.

Having a roof and shade in the group camping areas really makes for pleasant camping in that usually hot park. At $30 a night it is a bargain! We also discussed future meetings with Project Bright Sky. We realized that after an hour of observing they all will have seen about as much as possible, so it would be practical for them to attend one of our regular star parties. By 9:00 or 10:00 they would be ready to leave and we could begin our own observing.

William (Bill) Connelly

In Edwin Hubble's Shoes



What was it like to be one the great astronomers of the last century? How would it be spending one's evenings under the silent majesty of the largely unexplored heavens using the world's finest research instruments at sites such as Mount Wilson Observatory? What if we could go back in time and spend an evening in Edwin Hubble's shoes?

Well, in a sense we can. We amateur astronomers of Southern California are in a most enviable position. We can go back and spend that evening on Mount Wilson using the same 60-inch telescope once employed by the likes of W. S. Adams, Harlow Shapley, Milton Humason, George Ritchey, and perhaps Edwin Hubble.[1]

From Saturday evening, September 24th until dawn Sunday morning, PVAA has reserved the 60-inch scope on Mount Wilson. As PVAA members we have the opportunity to observe with this optically excellent, groundbreaking and history making instrument. Few amateur astronomers will ever have the opportunity that is ours.

From its completion in December 1908 until first light of the 100-inch, Hooker Telescope on November 1st 1917 the 60-inch telescope was the largest in the world. This is the instrument that showed the way for all the large telescopes to follow in the next half century. As one who has spent more than 10 nights with the 60-inch scope I can tell you that observing with the 60-inch telescope has been one of my most exciting astronomical experiences. Every minute at the eyepiece has been an adventure, every minute in the dome a thrill.

What will there be to see? As for the planets, on September 24th Uranus will be one day from opposition. The 24th of September is about one month before Jupiter reaches opposition and one month after Neptune's opposition. (A few years back, from Mount Wilson we saw incredible detail in the structure of Jupiter's cloud bands.) Also, Ceres, the largest of the asteroids will be 8 days past opposition.

The 60-inch is a superb instrument for the observation of small high surface brightness planetary nebulae, globular clusters, and some unusually colorful stars, such as Albireo, Campbell's hydrogen star, and Andromeda's Almach. The 60-inch telescope is capable of revealing 17th magnitude stars with ease and intricate detail, invisible in a lesser instrument. The Ring Nebula and the Cat's Eye are nothing short of spectacular.

The Mount Wilson Institute allows us to have up to 25 people in the 60-inch dome. The fee is $100 per person. Children must be at least 12 years-old and accompanied by an adult. If you would like to come with us, please send a check made out to PVAA to: PVAA, PO Box 162, Upland CA, 91785.

No one can guarantee that the seeing will be good on any particular night. But the seeing at Mount Wilson has a greater likelihood of being from good to excellent than almost any other place. And sometimes it is beyond excellent up into the extraordinary! September was chosen for our observing session because it offers the best chance of excellent seeing though not of a thick marine layer to hold down the city light. If clouds or wind prevent us being able to observe on our reserved date then we will be given another night on the scope. If you have any questions contact me. I hope that many of you will be able to advantage of this opportunity

Ron Hoekwater

[1]Edwin Hubble certainly had access to the 60-inch scope, but I did not find any mention of his having used it. He used the 100-inch Hooker scope.