nightwatch
Newsletter of the Pomona Valley Amateur Astronomers

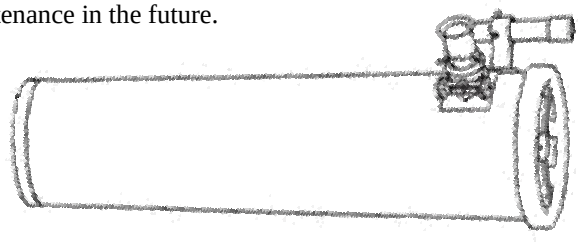
No pessimist ever discovered the secret of the stars or opened a new doorway for the human spirit.
Helen Keller

President's Message

Do you make astronomical New Year's resolutions? I have, for the past three years now, inspired by "Uncle" Rod Mollise, who usually posts his resolutions but unaccountably missed this year (http://uncle-rods.blogspot.com/). In the past, my resolutions have had to do with my own observing, and mostly to do with observing more and mooning over astronomical gear less.

This year I'm doing something different. As you probably know, our club has entered discussions with the Claremont Public Library and the Friends of the Claremont Library about starting a library telescope program. We would be following in the footsteps of the very successful New Hampshire Astronomical Society program, which has placed telescopes in 26 public libraries in and around New Hampshire over the past three years.

I'm happy to report that a memorandum of understanding regarding the program has been passed by the LA County library system (of which the Claremont Public Library is a branch) and by the Friends of the Claremont Library, and the PVAA board will be voting on it soon (we had input on its content, it's just coming to us last for approval because of when each organization has its monthly meeting). A particularly nice aspect is the offer on the part of the Friends of the Claremont Library to cover the entire cost of the telescope, zoom eyepiece, and other physical materials needed to launch the program; all the PVAA would need to provide is know-how, and to cover any maintenance in the future.



There is still much to be decided, such as check-out procedures and rules for using the telescope, and these will require input from all three organizations. But at this point things are going about as well as they possibly could be. As always, I would love to hear your thoughts on the proposed program--please feel free to email me at mathew.wedel@gmail.com or pull me aside at a meeting or star party.

Back to resolutions. I can't make the library telescope program happen by myself, nor would I want to. It has to be something that works for the club. But so far the response has been overwhelmingly positive. So my first astronomical New Year's resolution is to do everything that I can to help make the library telescope program a reality.

My other resolution is to get out and do more sidewalk astronomy this year. I only made it out once in 2011, and I miss it. It was doing sidewalk astronomy in downtown Claremont that first alerted me to the strong community interest in astronomy and started me thinking about a library telescope program in the first place.

So my resolutions this year aren't about my observing at all, they're about helping other people see the wonders of the night sky for themselves. I think I'll get plenty of enjoyment out of them nevertheless.

Fittingly, our speaker this month is Mike Hoffert, who will tell us about the Tierra Astronomical Institute's Manzanita Observatory. TAI is a research institution but it has also had a strong commitment to public outreach from its inception, and I'm looking forward to hearing about the observatory and the work being done there.

Matt Wedel

PVAA Officers and Board

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President .....Mathew Wedel ….....909-767-9851
Vice President ..Joe Hillberg.....909/949-3650
Secretary .....Bill Connelly.....714/329-4080
Treasurer .....Gary Thompson…….909/935-5509
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Ray Magdziarz (2012).....909/626-8303
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Nightwatch .....John Stover….....909/988-9747
Membership ...Ludd Trozpek.....909/624-3679
Programs .....Ron Hoekwater.....909/391-1943
Publicity ....Laura Jaoui.....

Club Events Calendar

January 5 - Board Meeting, 6:15
January 13 - General Meeting
January 21- Star Party - Afton Canyon
January 27 Vinyard STEM Magnet School 6-8pm

February 2 - Board Meeting, 6:15
February 10 - General Meeting
February 18 - Star Party - Mecca Beach Campground
February 28 - Ontario Library Main Branch 7-9pm

March 1 - Board Meeting, 6:15
March 9 - General Meeting - Robert Piccioni
March 24 - Star Party - Mojave River Forks Regional Park

April 5 - Board Meeting, 6:15
April 13 - General Meeting
April 21 - Star Party - Cow Canyon Saddle , Mt. Baldy

May 3 - Board Meeting, 6:15
May 11 - General Meeting
May 19 - Star Party - To Be Announced
May 23 - 28 RTMC
May 31 - Board Meeting, 6:15

June 8 - General Meeting
June 16 - Star Party - To Be Announced

July 5 - Board Meeting, 6:15
July 13 - General Meeting
July 21 - Star Party - To Be Announced

August 2 - Board Meeting, 6:15
August 10 - General Meeting
August 18 - Star Party - To Be Announced

WILTSEY MIDDLE SCHOOL

1450 E. G Street, Ontario, CA. 91764
Phone: (909) 986-5838 Fax: (909) 459-2834
William H. Corrette, Principal
John Walton, Assistant Principal

December 18, 2011

Bill Connelly
Pomona Valley Amateur Astronomer's Club
1227 Grand Canyon
Brea, CA 92821
(714) 329-4080

Dear Mr. Bill Connelly:

On behalf of the entire Wiltsey Middle School staff, I would like to thank you and the other Pomona Valley Astronomers who participated in our Space Science Night on December 5, 2011. We had a wonderful parent and student turn out, and the night was a huge success. We received so many compliments about the evening. The view through the telescopes was the talk of the campus the next day. Even the staff wanted to get out from their classroom activities to get a glimpse through your telescopes. Even though the weather was not the best, your team still came out to help make this one of the best events of the year.

We are so very appreciative that you and your club took the time to be a part of our student's educational experience. Kids in our community don't often get these types of enrichment experiences. This event will be one they will not soon forget. Please express our gratitude to the club and the volunteers who participated.

Sincerely,
William H Corrette
William H. Corrette, Principal

Laura on the Road

Greetings from the Nixon Library…for our astronomy club newsletter you ask? Ron Hoekwater and I recently made a visit to this museum. We found the museum well laid out and interesting as an historical monument but I most enjoyed a part of the exhibit dedicated to spaceflight and the Apollo 17 mission. There is a short documentary titled "Standing on the Shoulders of Giants" (or something to this effect) and recordings of telephone conversations President Nixon had with the astronauts while enroute to the moon. Two moon suits are displayed; one belonging to Young and the other was Armstrong's (I believe). Sadly, while checking the internet, we'd missed an exhibit in 2009 celebrating 40th anniversary of man's landing on the moon.

Perhaps there is a website to which one can subscribe where local exhibits about astronomy and space are advertised. I know of no site like this. If there is one, please share it with me and the club. The exhibit at the Nixon museum is small but interesting- one can see black moon dust stuck on Young's space suit. The cost for entry is $11.95 for adults and $8.50 for seniors.

Laura Jaoui

How Does It Work?

We all want the best resolution from our scopes that we can get. The best any optical system can do is when it is diffraction limited. The diffraction limit for any telescope is determined by the size of the primary mirror or objective lens.

When a beam passes through a circular aperture the resulting diffraction pattern is a bright central disk and alternating dark and light rings around it. When our scopes are collimated properly and we use high magnification, a bright star should look like a bright disk with alternating dark and bright rings. The disk is called the blur circle.

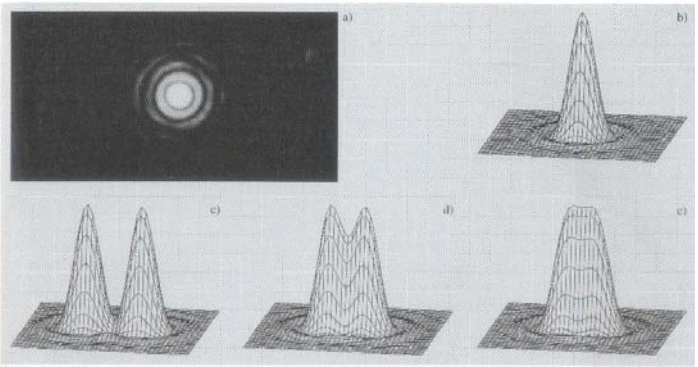

Fig. 3.6a–e. Diffraction and resolving power. The image of a single star (a) consists of concentric diffraction rings, which can be displayed as a mountain diagram (b). Wide pairs of stars can be easily resolved (c). For resolving close binaries, different criteria can be used. One is the Rayleigh limit $1.22\lambda/D$ (d). In practice, the resolution can be written λ/D, which is near the Dawes limit (e). (Photo (a) Sky and Telescope)

When two stars are such that one forms a bright spot and the other falls in the center of the first dark ring they are said to be separated by the diffraction limit. If they are equally bright, they can be distinguished as separate sources. If they are any closer together they will appear to merge into one spot.

The goal of the optical designer is then to achieve a design which is diffraction limited. Any design will produce some aberrations, but the designer's goal is to make them smaller than the diffraction limit. That limit (blur circle radius) is given by L = 1.22 times the wavelength divided by the diameter. When the units are meters, the result is in radians. One arc second is about 5 micro-radians.

For example, my 8 inch scope mirror is about 0.2 meters in diameter. If I use 0.5 micro-meters as the wavelength (green), with the right eyepiece I can barely see two stars that are separated by 3 micro-radians or 0.6 arc second. A 6 inch scope is limited to 0.8 arc seconds and a 12 inch scope is limited to 0.4 arc seconds.

At some point magnification doesn't improve resolution. We are simply magnifying the blur caused by diffraction. A rule of thumb is that this begins at about 25 times the mirror diameter in inches. For my 8 inch scope that would be a magnification of 200.

The very best unaided eye can resolve about 1 arc minute (60 arc seconds). When we look through the eyepiece at low magnification, this will determine the best resolution we can get. In my 8 inch scope a magnification of 120 will let my eye resolve 0.5 arc seconds (60 arc seconds divided by 120).

The best resolution, however, will occur when the image is at least twice my eye resolution. I need my resolution through the eye piece to be 0.3 arc seconds and that requires a magnification of 200.

Our actual limit is also affected by brightness. The eye resolution above refers to bright point sources. As the brightness falls off, so does the eye resolution. A dim double star pair might need more magnification than a bright pair. The less bright star must also be much brighter than the first ring.

This matters to us because it gives a guideline to maintaining our scopes in top condition and also what eyepieces to choose. It puts a limit on breaking out double stars or seeing details on the moon and planets.

Do you have a topic you would like covered? Please send your thoughts to me at lcrowder@roadrunner.com .

Ken Crowder

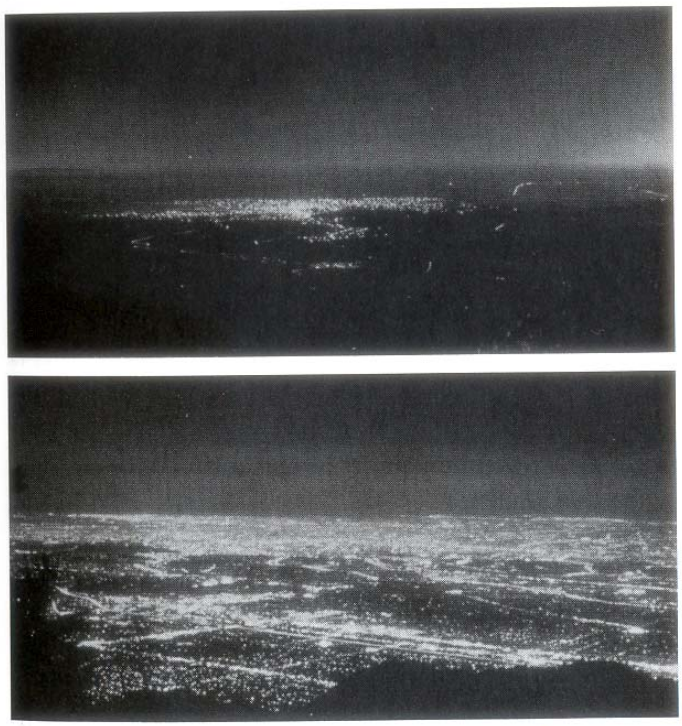

Fig. 3.3. Night views from the top of Mount Wilson. The upper photo was taken in 1908, the lower one in 1988. The lights of Los Angeles, Pasadena, Hollywood and more than 40 other towns are reflected in the sky, causing considerable disturbance to astronomical observations. (Photos by Ferdinand Ellerman and International Dark-Sky Association)

At the Holiday Dinner a guest of Laura Jaoui won the trip to Mt. Wilson. She presented it to Laura who ultimately gave it to Scott Little who will bring one of his children to Mt. Wilson for a night of viewing thru the 60 inch telescope.

What's Up - The Great Ghostly Fuzzy

By "fuzzy" I mean a translation of "nebula" and the great fuzzy is the Great Orion Nebula (pictured). Called "a great ghostly bat" by E. E. Barnard who took pioneer photos in 1894. A diffusion nebula of swirling, collapsing gas and dust clouds over 24 light years in diameter. It's visible even in light polluted skies even though it's 1,344 light years away.

But no mention is made of any visible nebula before 1610 when it was recorded by French astronomer Fabri de Peiresc. Christian Huygens sketched it in 1656 and Messier numbered it (M42) in 1774. Messier was the first to note a central star cluster now called the Trapezium. This lack of notice before the 17th century has led to speculation that it brightened in the last 400 years. It's possible since its hot and cold clouds surge around at speeds of 22,000 miles per hour. Temperatures where new stars have been formed reach 10,000 K but fall into a deep freeze near the edges.

This "great ghostly bat" has an immensity beyond comprehension containing over 2,000 stars. New photos by Hubble Space Telescope show hundreds of proto planetary disks which are seen as early stages of star and solar system formation. There are photo-ionizing massive stars, red dwarfs, and brown dwarfs. As gas collapses with gravity it heats up to form protostars. But hot gas can then expand creating a complex shock waves. Great wavy forms have been given nickname like "Fish's Mouth", "Wings", "Sword", and "The Sail".

It's all part of a larger Orion Molecular Cloud Complex which fills the constellation of the giant hunter. From the red giant star Betelgeuse (shoulder or armpit) to the white giant star Rigel (foot) arcs Barnard's Loop. This faint ionized emission nebula is thought to have come from a two million year old supernova explosion.

Within Barnard's Loop on the "sword" from Orion's Belt lie M42 and M43 which form the Orion Nebula. The smaller M43 (DeMairan's Nebula) is separated from M42 by a dust cloud. Just a ½ degree north is the Running Man Nebula. This pale blue reflection nebula has a shadowy "running" figure dividing it into NGC 1973, '75, and '77.

Up near where the "sword" hangs from left hand belt star Alnitak is the iconic Horsehead Nebula. This dark absorption nebula is so dim it wasn't seen until 1888 on photographic plates. An early Mt. Wilson photo refers to it as a "dark bay", not a bay horse but an bay like indentation into a lighter area. Improved photos revealed it to be just the opposite, a giant chess piece shaped dark absorption cloud in front of an glowing background. Closer to Alnitak is a flashier emission nebula, The Flame. Further north is the fainter reflection nebula M78. Discovered by Mechain in 1780 it's the most outstanding in a group of nearby emission nebulae.

An emission nebula like The Flame emits an ionized light excited by massive hot young stars. Whereas a reflection nebula (like M78) enfolds cooler stars more dimly reflected. A dark absorption nebula (like The Horsehead) neither emits nor reflects light. A diffusion nebula (like M42) is a fluorescing combination of all three types.

This profusion of illuminated nebulae in Orion is linked to the constellation's large number of giant stars. The famous belt stars are all blue giant stars with belt referencing Arabic names Alnitak (800 ly), Alnilam (1,340 ly) and Mintaka (915 ly) form this famous asterism. The three stars lie right on the celestial equator and are mentioned several times in the Bible and other classic texts. They have been called Three Kings or Three Pearls. A California Indian tribe saw them as the Footprints of the Flea People. It explained where fleas went in the winter.

Orion's super blue giant foot star Rigel (700 ly) is 85,000 times more luminous than our sun. It illuminates the wispy Witch's Head Nebula, in nearby Eridanus. Witch's Head is a long reflection nebula, perhaps an ancient supernova remnant. Giant star Saiph (2,100 ly) in Orion's other foot is so blue hot it oozes ultraviolet radiation. Most unstable of the big Orion stars is red giant Betelgeuse (640 ly) in his shoulder. It bleeds mass into its own atmosphere. Mayan calendar end of day's predictions have it going nova on December 21, 2012. But that could be just a giant fuzzy assumption.

Lee Collins