nightwatch
Newsletter of the Pomona Valley Amateur Astronomers

The stars are matter, we're matter, but it doesn't matter.
Don Van Vliet

VIRTUAL CLUB EVENTS
SEE WEBSITE FOR DETAILS

Volume 40 Number 8 ***nightwatch*** **August 2020**

President's Message

First up, two items of club business. One, it's time to get your club dues in, if you haven't already. The rate is $30/year for individuals, $40 for families, and $12 for youth under 18.

Please send your dues to:

PVAA
Attention: Treasurer
P.O. Box 162
Upland, CA 91785

And two, it's election time. You should already have gotten a ballot via email. If you don't mail in a physical ballot, you can vote anonymously in the **Zoom** app at our general meeting this Friday evening—more details on that meeting at the end of this message. Now, on to the sky!

The planets are putting on quite a show this season, with Jupiter and Saturn bright in the southern sky in the evenings, and Mars rising in the east before midnight. To push myself into getting out and observing every evening, at least for a few minutes, I've been completing one of the tasks for the Astronomical League's Galileo Observing Program: to chart the positions of Jupiter's moons for 17 consecutive nights. The goal is to use those 17 nights of observations to determine the identity and orbital period of each moon. It's been a good excuse to get out of the house and under the stars, and I've gotten some rewarding views of Saturn and Mars as well. The opposition of Mars is coming up in mid-October—more on that next month.

In the meantime, if you are curious about the Galileo club or any of the other observing programs offered by the Astronomical League, please visit

https://www.astroleague.org/observing.html.

As a member of the PVAA, you are already a member of the Astronomical League, and if you complete any of their observing programs you'll be awarded a certificate and pin.

For deep-sky observers, this can be a tough time of year. The desert sites are hot, the mountain sites are smoky, and city lights really put the hurt on most star clusters, nebulae, and galaxies. Fortunately, there is one class of deep-sky object that holds up pretty well under moderate light pollution: planetary nebulae. I wrote an observing feature about them that you'll find farther on in this issue.

Watching the dance of the moons around the outer planets has got me thinking about the regularity of celestial mechanics. We can predict eclipses, transits, and other astronomical phenomena with astonishing accuracy, centuries or even millennia in advance. And as a species we've been doing these calculations for thousands of years, as shown by ancient observatories in places as far-flung as Egypt, England, Central America, and the American Southwest. But our ancestors did much more than align their monuments with the equinoxes—starting more than two millennia ago, they also built mechanical computers to compute astronomical phenomena. It sounds unbelievable, like something out of *The X-Files*, but it's true.

We'll learn more about one of these amazing devices, the Antikythera Mechanism, in our first "main event" talk at a virtual meeting. The speaker will be our own club secretary, Ken Elchert, who has been conducting his own research on celestial events and their history for several years now, and publishing his findings. The meeting will be this Friday, August 28, at 7:30 PM, on the Zoom app. Instructions on how to join the meeting will be sent out in advance. I hope to see you there.

Matt Wedel

Summer Observing: Planets and Planetary Nebulae

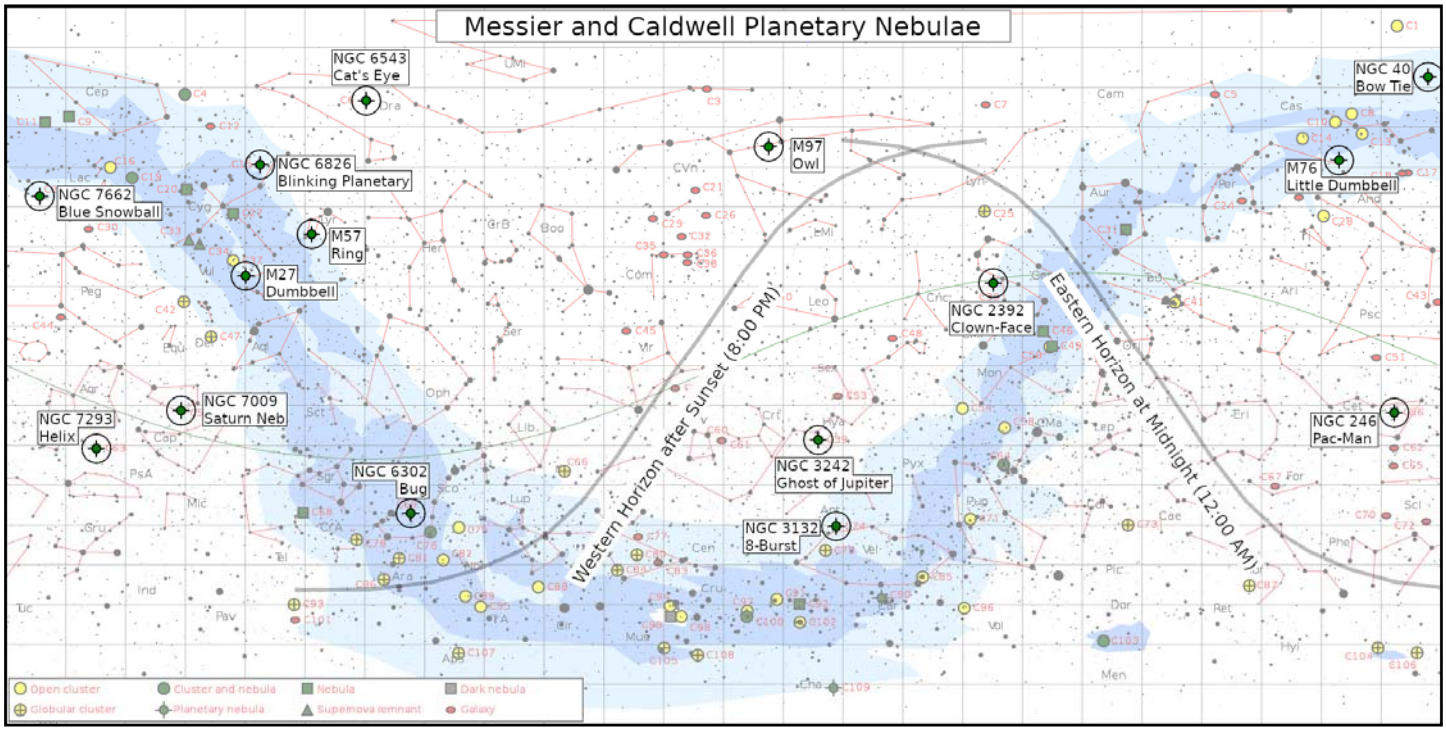
I'm sure you've been keeping an eye on Jupiter, Saturn, and Mars this summer. Jupiter is the very bright star in the southern sky from sunset until after midnight, and Saturn trails just a few degrees behind. Mars is the astonishingly red star rising in the east a little before midnight. Every day brings us nearer to the Red Planet, which we are overtaking in its wider, slower orbit. Our closest approach will come on the evening of October 13, but Mars will be big and bright for the next three months.

So planetary observers have plenty to keep them busy right now, but things are a little rougher for those interested in the deep sky. Most of the nearby dark-sky sites are in the desert, which is too darned hot, or in the mountains, which are fogged with smoke from the wildfires. And unfortunately, most of the faint fuzzies suffer too much under urban light pollution to make for rewarding observing. Most, but not all. There is one class of deep-sky objects that holds up pretty well under city lights: planetary nebulae. And happily, there are a lot of them available to see on summer evenings.

The term "planetary nebulae" is usually credited to William Herschel, who with his sister Caroline made the first systematic survey of deep-sky objects in the late 1700s. But other contemporaneous astronomers were also comparing the appearance of these small and often round nebulae to that of planets, so the origin of the term is a bit, well, nebulous. Herschel thought that planetary nebulae were clouds of vapor in the process of condensing into new star systems. The truth is almost precisely the opposite: planetaries are shells of gas blown off by dying stars.

Stars die in two ways. Those more than 8 times the mass of the sun are destined to blow themselves apart as supernovae. Smaller stars take a different path. As their fusion fires start to sputter, the stars begin to pulsate. Eventually the pulsations become so rapid that as the star expands, the gas at the star's surface exceeds its own escape velocity. When the rest of the star cools and starts to contract, the outermost layer of star-stuff just keeps on going, expanding irreversibly into space. Over time, many concentric shells of gas are blown away into space, until all that is left is a white dwarf. For a time the blown-off gas is still illuminated by the shrinking star, forming the glowing cloud that we see as a planetary nebula. This situation can only persist for a few thousand years; eventually the white dwarf is too feeble to illuminate the ever-expanding cloud of gas. So planetary nebulae are among the shortest-lived deep-sky objects. But they are important, because the expanding gas clouds spread carbon, nitrogen, and other fusion products of the parent star into deep space, where they can be swept up into new generations of stars—and planets. Much of the carbon in your body was formed and dispersed this way, in the stars that were the ancestors of our solar system.

So what makes these thin cloaks of gas around dying stars so tractable for urban observers? The key is that compared to most other deep-sky objects, planetary nebulae are small. That might not be an obvious advantage, but it means that the light of most planetary nebulae is concentrated on a very small patch of sky, giving them a high surface brightness. Planetary nebulae therefore take magnification well, and stand out from the surrounding sky better than most other classes of deep-sky



Messier and Caldwell planetary nebulae, modified from the Caldwell object star chart produced by Jim Cornmell at https://commons.wikimedia.org/wiki/File:CaldwellStarChart.svg. Both the original file and this modified version are released under a Creative Commons Attribution Share-Alike license (CC BY-SA 3.0).

Summer Observing: Continued

objects.

Summer is a good time to observe planetary nebulae, because there are a lot of them out at this time of year. The Messier list includes 4 planetary nebulae, and 11 Caldwell planetaries are visible from our latitude. All of them are plotted on the accompanying all-sky chart, which you can also download at full resolution from

https://10minuteastronomy.wordpress.com/2020/08/25/summer-observing-planetary-nebulae/.

Of those 15 planetaries, two aren't up at night right now (NGC 3132 and 3242), and three others set very quickly after sunset (NGC 6302), rise not long before dawn (NGC 2392), or stay low in the sky for most of the evening (M97). One more, the Helix Nebula, NGC 7293, is actually large and dim rather than small and bright, owing to its close proximity to Earth (only about 500 light years, compared to 1500-4000 light years for the rest). Unlike its mates, the Helix is best seen with low magnification under dark skies.

That still leaves 9 Messier and Caldwell planetaries that are both reasonably bright and well-placed on summer evenings. Here's a list, sorted by right ascension and starting in the western sky:

- NGC 6543, Cat's Eye Nebula, Draco, magnitude 9
- M57, Ring Nebula, Lyra, magnitude 8.8
- NGC 6826, Blinking Planetary, Cygnus, magnitude 10
- M27, Dumbbell Nebula, Vulpecula, magnitude 7.5
- NGC 7009, Saturn Nebula, Aquarius, magnitude 8
- NGC 7662, Blue Snowball, Andromeda, magnitude 9
- NGC 40, Bow Tie Nebula, Cepheus, magnitude 11
- NGC 256, Pac-Man Nebula, Cetus, magnitude 8

M76, Little Dumbbell, Perseus, magnitude 10.1

Want more? Peter Birren's fine observing guide, *Objects in the Heavens*, includes an additional 17 planetary nebulae, all of magnitude 10.5 or brighter. Learn more at

http://www.birrendesign.com/astro.html.

Good hunting!

Matt Wedel

Cloudy Nights

Need a finder chart for that bright comet? Want to know when the next meteor shower will peak? Looking for suggestions on what to observe?

Cloudy Nights is a celestial calendar every month which is a bulletin board for announcements about currently or soon to be observable astronomical events.

Here's a taste of events in late August :

8/28 The dwarf planet/asteroid 1 Ceres is at opposition at 12:00

8/29 The Moon is 1.4 degrees south of Jupiter at 2:00; the Moon is 1.2 degrees south of Pluto, with an occultation taking place in most of western Antarctica and Queen Maude Land, at 11:00; the Moon is 2.2 degrees southeast of Saturn at 18:00

8/31 Venus is 8.6 degrees south of Pollux at 21:00

and a link :

https://www.cloudynights.com/topic/720687-august-2020-celestial-calendar/

Here is their main page so you can see what's coming up in the future :

https://www.cloudynights.com/forum/55-celestial-events/

Ken Elchert

Club Events Calendar

Aug 28 Virtual General Meeting - The Antikythera Mechanism by Ken Elchert

Sep 12 Star Party -- Landers GMARS
Sep 16 Virtual Board Meeting
Sep 19 Star party/swap meet/social get together at Cahuilla Park - 6:30 pm
Sep 25 Virtual General Meeting

Oct 10 Star Party -- Cow Canyon Saddle, Mount Baldy
Oct 21 Virtual Board Meeting
Oct 30 Virtual General Meeting

Nov 7 Star Party -- Cottonwood Springs, Joshua Tree National Park
Nov 11 Virtual Board Meeting
Nov 20 Virtual General Meeting

Starlink Satellites

SpaceX has been in the news a lot lately especially after their successful mission on August 2nd which returned astronauts Doug Hurley and Bob Behnken to Earth after their two month visit to the International Space Station to the Gulf of Mexico in the Dragon Capsule.

The company has recieved less positive publicity, at least from the astronomy community, for the impact of Starlink satellite array on astronomical research and photography. Take a look at the articles below for a discussion of the subject, a Comet NEOWISE photo which includes satellite tracks, and the original images what were used to create his final photo.

https://petapixel.com/2020/07/25/spacex-satellites-ruin-photographers-shots-of-comet-neowise/
https://earther.gizmodo.com/spacex-satellites-ruin-perfectly-good-view-of-comet-neo-1844483615

Ludd Trozpek and *Claire Stover*

Cahuilla Park Star Party

The social get-together at Cahuilla Park on July 31 was attended by Ron Hoekwater, Laura Jaoui, Gary Thompson, Jay Zacks, John Elliot, Mike and Sharal Carter, my daughter, Marissa, and me. Ron had a bunch of astronomy books and magazines along with binoculars which he had on display for anyone to buy at a very reasonable price. Gary and Jay had two telescopes which they set up for viewing Jupiter and Saturn. Even though there was a full moon, the seeing was excellent so we were able to clearly see all four Galilean moons perfectly aligned on one side of Jupiter as well as Saturn's rings and its moon, Titan. I think that Gary tried to get comet NEOWISE in view in his Dobsonian telescope but wasn't able to find it probably due to its faintness and the light from the full moon. It was an excellent night for a get-together in a very nice setting. I think everyone had a good time guessing who was who (since we all wore masks) and listening to Ron's out-of-this-world tales!

Ken Elchert
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This article is distributed by NASA Night Sky Network

The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, and more!

Summer Triangle Corner: Deneb

David Prosper

The Summer Triangle is high in the sky after sunset this month for observers in the Northern Hemisphere, its component stars seemingly brighter than before, as they have risen out of the thick, murky air low on the horizon and into the crisper skies overhead. Deneb, while still bright when lower in the sky, now positively sparkles overhead as night begins. What makes Deneb special, in addition to being one of the three points of the Summer Triangle? Its brilliance has stirred the imaginations of people for thousands of years!

Deneb is the brightest star in Cygnus the Swan and is positioned next to a striking region of the Milky Way, almost as a guidepost. The ancient Chinese tale of the Cowherd (Niulang) and the Weaver Girl (Zhinü) - represented by the stars Altair and Vega - also features Deneb. In this tale the two lovers are cast apart to either side of the Milky Way, but once a year a magical bridge made of helpful magpies – marked by Deneb – allows the lovers to meet. Deneb has inspired many tales since and is a staple setting of many science fiction stories, including several notable episodes of *Star Trek*.

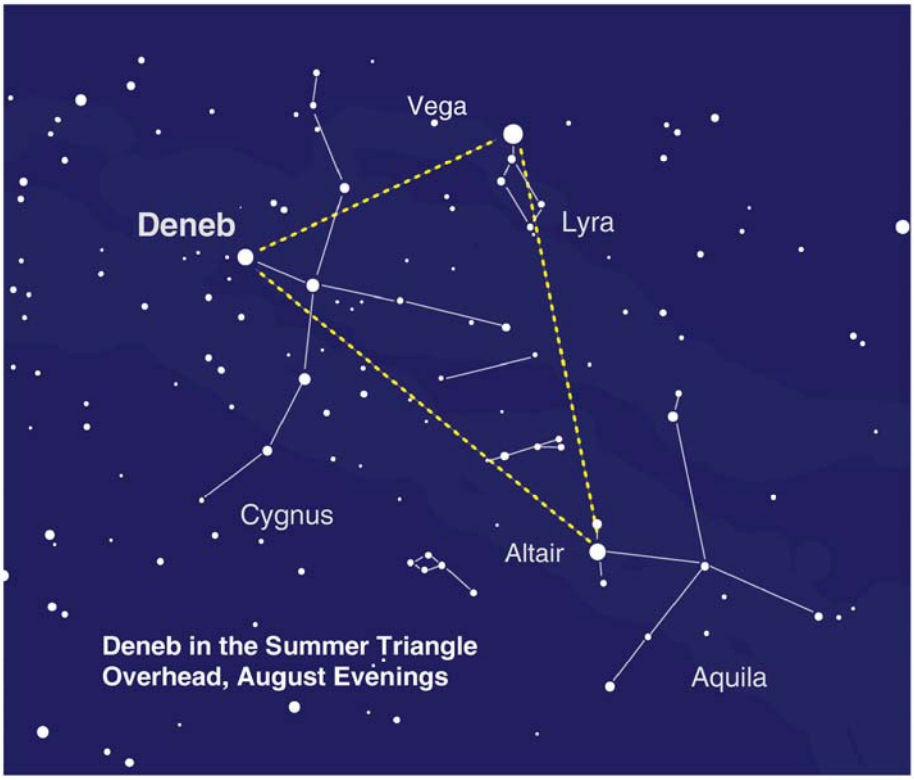
Astronomers have learned quite a bit about this star in recent years, though much is still not fully understood – in part because of its intense brightness. The distance to Deneb from our Sun was measured by the ESA's Hipparcos mission and estimated to be about 2,600 light years. Later analysis of the same data suggested Deneb may be much closer: about 1,500 light years away. However, the follow-up mission to Hipparcos, Gaia, is unable to make distance measurements to this star! Deneb, along with a handful of other especially brilliant stars, is too bright to be accurately measured by the satellite's ultra-sensitive instruments.

Deneb is unusually vivid, especially given its distance. Generally, most of the brightest stars seen from Earth are within a few dozen to a few hundred light years away, but Deneb stands out by being thousands of light years distant! In fact, Deneb ranks among the top twenty brightest night time stars (at #19) and is easily the most distant star in that list. Its luminosity is fantastic but uncertain, since its exact distance is also unclear. What is known about Deneb is that it's a blue-white supergiant star that is furiously fusing its massive stocks of thermonuclear fuel and producing enough energy to make this star somewhere between 50,000 and 190,000 times brighter than our Sun if they were viewed at the same distance! The party won't last much longer; in a few million years, Deneb will exhaust its fuel and end its stellar life in a massive supernova, but the exact details of how this will occur, as with other vital details about this star, remain unclear.

Discover more about brilliant stars and their mysteries at nasa.gov.

NASA Night Sky Notes August 2020

Long exposure shot of Deneb (brightest star, near center) in its richly populated Milky Way neighborhood. Photo credit: Flickr user jpstanley. Source: https://www.flickr.com/photos/jpstanley/1562619922 License: https://creativecommons.org/licenses/by-nc-sa/2.0/



Spot Vega and the other stars of the Summer Triangle by looking straight up after sunset in August!