



Newsletter of the Pomona Valley Amateur Astronomers

Nature guards its secrets zealously,
and it takes grit and determination to shed light on them.
Chris Impey



Volume 45 Number 10

nightwatch

October 2025

President's Message - October 2025

After more than 30 years of being a PVAA member, the board of officers has made Joe Hilberg "Board Member Emeritus". Joe has been Vice President of the PVAA for over ten years so he therefore has lots of experience which has made him a highly valued board member. Although Joe will continue being on the PVAA board, his advancement has caused the Vice President position to become vacant. Therefore, the position is now open to all members in good standing. One member who has thrown his hat into the ring for the Vice Presidency is Ron Hoekwater, the PVAA Director of Programs. If any other PVAA member is interested in running, please send an e-mail to the Nightwatch Newsletter Directors, John and Claire Stover, at pvaanightwatch@gmail.com. The election will be held at the November general meeting. The winner will be PVAA Vice President until the next election of board members in 2026.

We are also looking for a volunteer to help Gary Thompson set up the computer for Zoom and speaker presentations at the general meetings held at Harvey Mudd College. The assistant would assist Gary in setting up the computer prior to the meetings and take his place whenever Gary is unable to attend a meeting. Gary has created a detailed set of instructions for the computer set-up which his assistant can use. If you are interested in this job or know someone who might be, you can contact Gary by e-mail at garynorms@gmail.com.

These are two great opportunities for members to get more involved in the PVAA and help make it better.

In the world of astronomy, the big event this month is the Orionid meteor shower which peaks on the night of October 20-21. If skies are clear and you are viewing from a dark location, this shower typically produces around 15 meteors per hour. What makes this year's shower a particularly promising one to view is that it will take place at the time of a New Moon. So, look toward the eastern sky late on the night of October 20 and see if you can catch a few falling stars!

Ken Elchert

PVAA Officers and Board

Officers

President Ken Elchert thespaceshuttle@aol.com
Vice President .. Open position
Secretary(acting)Ken Elchert 626-541-8679
Treasurer Gary Thompson 909-935-5509

Board

Jim Bridgewater (2026)..... 909-599-7123
Claire Stover(2026)pvaanightwatch@gmail.com
Ron Hoekwater (2027)..... 909-445-9282
Howard Maculsay (2027).....909-913-1195

Directors

Membership / Publicity....Gary Thompson . 909-935-5509
Outreach Jeff Schroeder 909-758-1840
Programs Ron Hoekwater 909-445-9282

September 2 2025 General Meeting

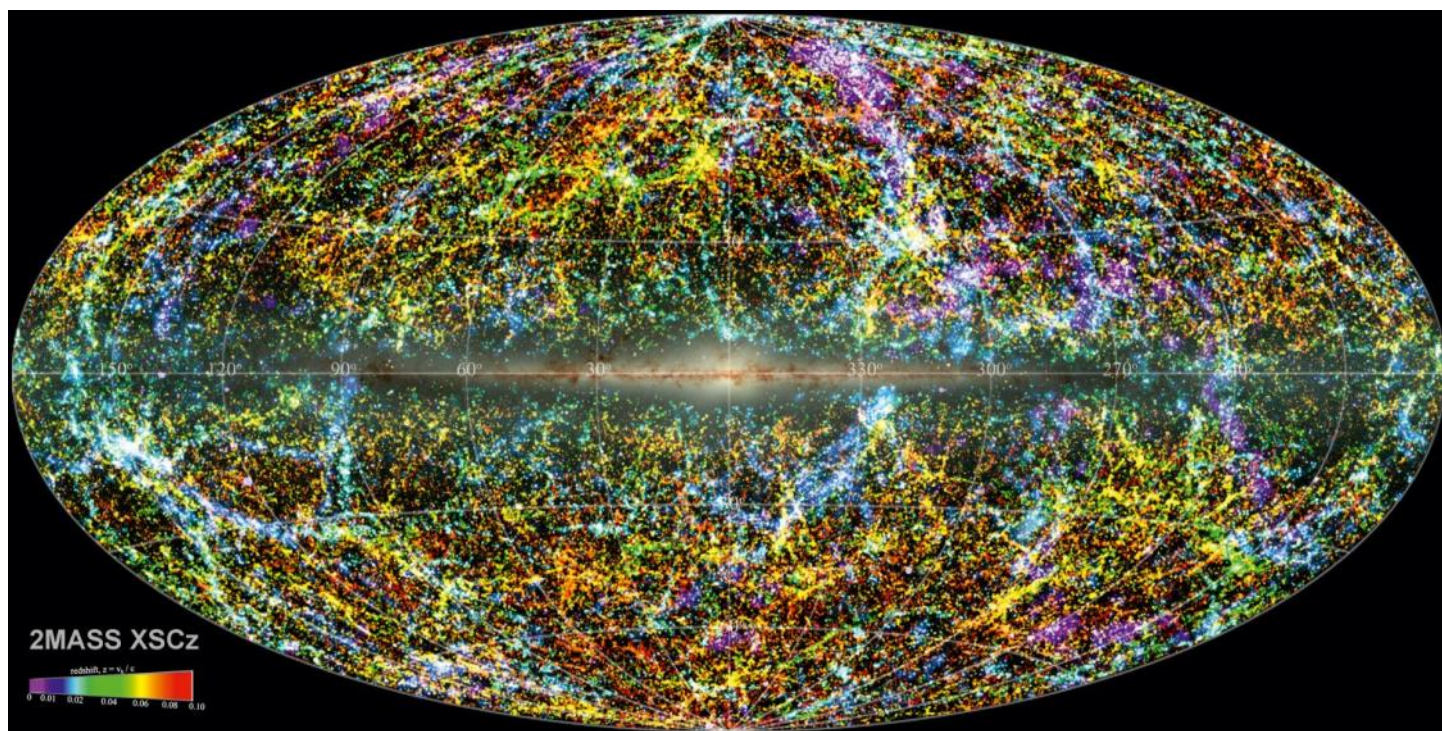
The meeting started by offering the positions of board member and club secretary up for consideration for those who want to get more involved with the club. An election for these open positions is coming soon.

Ken Elchert gave his monthly update on Astronomical and Aerospace events. Saturn's rings are now visible again, as they are no longer edge-on to our view, but they are just a thin line right now. Saturn is closest to us on (at opposition) on September 20th. Ken showed us a map of the observable universe showing galaxies making a jumbled but intricate web-like structure.

The Griffith Observer is having a writing contest. You can get the guidelines here: <https://griffithobservatory.org/about/griffith-observer-magazine/annual-writing-contest/> Everyone is encouraged to participate.

Dave Nakamoto was our main speaker of the night with the subject of: "The Comet that Wouldn't Die - Comet Biela." Dave talked about very early exclamations of comets, followed by Halley's prediction that a comet would return in a certain timeframe. While he did not live long enough to see his prediction pan out, it became known as "Halley's Comet," with the designation of "P1." P1 stands for "Periodic" #1. The first comet found to repeat or return in an orbit around the Sun. Biela was the third periodic comet to be discovered in 1772, with an orbit of 6.6 years. On Comet Biela's second to last documented return in 1846, it had split into two parts. The main part was about ten times bigger than the smaller part. The next couple of orbits the comet was not seen. Then instead of seeing Comet Biela on the on its next orbital pass, a massive meteorite display was encountered as the Earth passed through the comet's orbital path. Reports of over 160,000 meteorites over a 7-hour span by several astronomers were reported. That is an average of 44.4 per second, with a high of 380 meteorites per second. The sky was filled with meteorites. We now believe that there is a chance the Comet Biela now lives as an asteroid, having burned off all the water and other volatile materials.

Gary Thompson

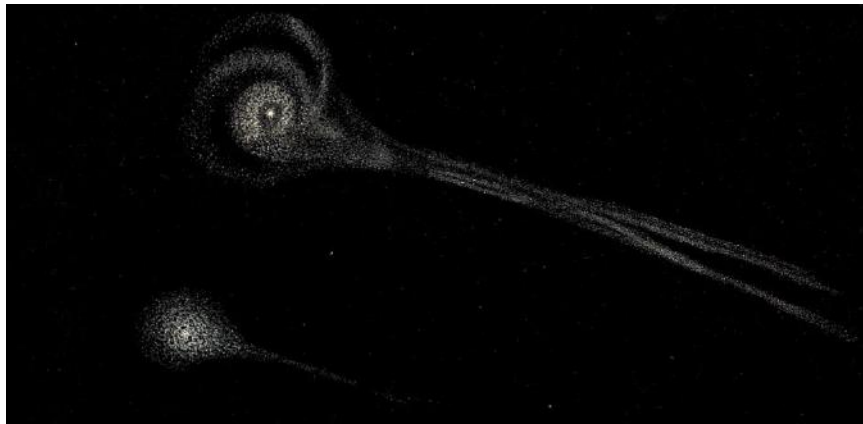


The observable universe from Earth.

Parameters of the Observable Universe

Age	13.787 billion years
Diameter	93.2 billion light-years
Current visibility limit	46.6 billion light-years
Current distance to the event horizon*	16 billion light-years
Circumference	292.2 billion light-years
Volume	$3.58 \times 10^{80} \text{ m}^3$
Total mass of ordinary matter	$1.46 \times 10^{53} \text{ kg}$
Total mass-energy	$4 \times 10^{69} \text{ Joules}$
Density of total mass-energy	$8.5 \times 10^{-27} \text{ kg/m}^3$ (equivalent to 5 protons/m ³)
Speed of electromagnetic & gravitational waves in vacuum	299,792,458 m/s
Average temperature	2.72548 K
Number of galaxies	~2 trillion (2×10^{12})
Number of stars	$\sim 10^{24}$
Number of planets	$\sim 10^{24}$ to 2×10^{25}
Number of atoms	$\sim 10^{80}$ (Eddington number)
Number of photons in extragalactic background light	$\sim 4 \times 10^{84}$

*the largest comoving distance from which light emitted *now* can ever reach the observer in the future. The future visibility limit (62.6 billion light-years) is exactly equal to the reachable limit (16 billion light-years) added to the current visibility limit (46.6 billion lt-yrs).



Comet Biela observed as a pair of comets in 1846.



November 27, 1872

A Sharp Shot of Sharpless

As mentioned, we didn't go to the dark site this month, but I did get reasonable narrowband data from home on that elusive target from July. I've spent more time processing this image than any other I've done in the past. In the meantime, while researching the target, I found that I imaged this target only 2 years ago! Hmmm, how foolish do I feel? In my defense, though, the 2-year-old image is an SHO image whereas this one is HOO, so it does look quite different.



TARGET

The target is Sharpless 91 (SH2-91, also known as LBN147) in Cygnus. It looks very similar to parts of the Veil Nebula, a supernova remnant also in Cygnus. It turns out, this is also a supernova remnant, but in contrast to the Veil, this one is very faint. The nebula is probably about 2,500 light years away, although some sources list it at 6,000 light years and at least one lists it at 1,500 light years and is estimated to be between 20,000 and 400,000 years old. The entire supernova remnant is about as large in the sky as the Veil Nebula, around 3 degrees, and would require a mosaic of at least 3x3 images stitched together to capture the entirety with the equipment I used. The entire supernova remnant spans about 230 light years if it's 2,500 light years away. Along the top of the image is a dark red "star," Campbell's Hydrogen Star. But, it's not really a star, but a planetary nebula, PK064 +05.1. It's quite small as it is reportedly very young, still in the process of expelling the gases that make up the nebula. To see the nebula, I'd have to use a much longer telescope.

IMAGING AND PROCESSING

This image was quite complicated to put together and that's why it took so long to process. It is a composite of 29 hours of data from two cameras. I used my 90mm StellarVue refractor on the Paramount MYT mount for both cameras. I started with 35 10-minute images (5 hours, 50 minutes) taken with the ZWO2600MC Pro color camera at -10C. These are the ones I couldn't process adequately last month, but I found them useful for the RGB stars. Using the ZWO294MM Pro monochrome camera at -10C, I took 71 10-minute images (11 hours, 50 minutes) through the Astrodon 5mm H-alpha filter and 68 10-minute images (11 hours, 20 minutes) through the Astrodon 5mm O-III filter. The color shots were calibrated with 15 dark, flat, and dark-flat frames. The narrowband frames were processed twice, both times with the same 15 darks, but one time with short-exposure flat and dark-flat frames and a second time with long-exposure flat and dark-flat frames.

Little processing was done with the color image other than stretching to get the star brightness and color to my liking. The stars were removed and the background (with the poor-quality nebula) was discarded. I started with the short-exposure calibrated frames

and didn't like that the red flat frames weren't doing a good job of removing the odd, blotchy flat pattern inherent in this camera. I processed as I have been doing, starting with combining the channels mapping HA to red and O-III to green and blue. Then *MultiScaleGradientCorrection* was used to clean up the gradient from imaging at home. I then color-corrected the image with *SpectrophotometricColorCalibration*. I used *BlurXterminator* to sharpen the nebula a little and then the stars were removed. Since I planned on using the RGB stars, the HOO stars were discarded. After star removal, *NoiseXterminator* was applied and *GeneralizedHyperbolicStretch* was used to stretch the starless image. It was at this point I found that there were residual red blotches that the flats didn't remove, but I liked how the nebula itself looked.

So, I started again, this time using the long-exposure calibrated frames. The same processing procedure was used, but while I could significantly reduce the red blotches, I couldn't get the nebula to look as nice as in the short calibration image. Instead of settling for an image I didn't like either because the background was blotchy or the nebula didn't stand out like I wanted, I decided to try to blend the two images together. Using *ImageBlend*, I layered the two images together and darkened the background of the blotchy image. Using the lighten blend mode, I was able to reduce the red in the background and maintain the quality of the nebula. After that, the stretched RGB stars were added, and *Curves* was used to adjust the contrast slightly. It came out much better than I expected.

We're planning to be back under dark skies again in September.

Until then, clear skies,

Ron Ugolick

<https://www.astrobin.com/users/ruccdu/>

Club Events Calendar

Oct 1 **Board Meeting 6:15 PM**
Oct 10 **General Meeting 7:30 PM**
Oct 18 **Star Party – GMARS**
Oct 29 **Board Meeting 6:15 PM**

Dec 3 **Board Meeting 6:15 PM**
Dec 6 **Holiday Party**

Nov 7 **General Meeting 7:30 PM**
Nov 22 **Star Party – GMARS**

Upcoming Celestial Events

events visible in southern California
highlighted in yellow

PST = UTC – 8 hrs
PST = PDT – 1 hr
PDT = UTC – 7 hrs
PDT = PST + 1 hr

Date	Day	Visibility (LA Time)	Event	Direction	Altitude (deg)	Moon Phase/Illumination
Oct 14	Tue	12:30 am – 6:00 am	Moon-Jupiter Close Approach $\delta = 4.17$ deg	ENE	5 - 75	Waning Crescent 42 %
Oct 19	Sun	2:39 pm (closest) vis at 6:00 am – 6:30 am	Moon-Venus Conjunction $\delta = 3.68$ deg	E	14	Waning Crescent 3.4 %
Oct 20-21	Mon-Tue	10:30 pm – 6:35 am best @ 5:00 am	Orionid Meteor Shower 15/hr	—	—	Waning Crescent 0.1 %
Oct 21	Tue	5:26 am	New Moon	—	—	New Moon 0 %
Oct 29	Wed	1:28 pm vis at 6:25 pm – 7:04 pm	Mercury at Greatest East Elongation	SW	5	Waxing Gibbous 54 %
Nov 2-3	Sun-Mon	5:35 pm – 1:40 am	Moon-Saturn Conjunction $\delta = 3.2$ deg	ESE	27 - 40	Waxing Gibbous 89 %
Nov 5	Wed	5:19 am	Full Moon (supermoon)	E-S-W	5 - 74 - 5	Full Moon 100 %
Nov 6	Thu	7:51 am Vis 5:30 am	Moon – M45 Close Approach $\delta = 49'$	W	17	Waning Gibbous 96 %

Daylight saving time will end when we fall back one hour at 2:00 a.m. PDT to become 1:00 am PST on Sunday, Nov. 2, 2025.



This article is distributed by NASA's Night Sky Network (NSN).

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

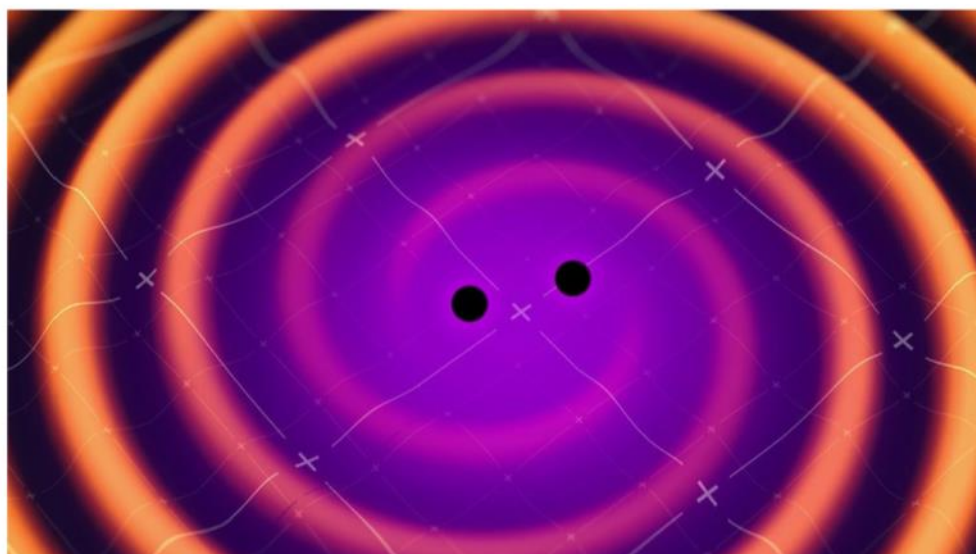
October's Night Sky Notes: Let's Go, LIGO!

By Kat Troche

September 2025 marks ten years since the first direct detection of gravitational waves as predicted by Albert Einstein's 1916 theory of General Relativity. These invisible ripples in space were first directly detected by the Laser Interferometer Gravitational-Wave Observatory (LIGO). Traveling at the speed of light (~186,000 miles per second), these waves stretch and squeeze the fabric of space itself, changing the distance between objects as they pass.

Waves In Space

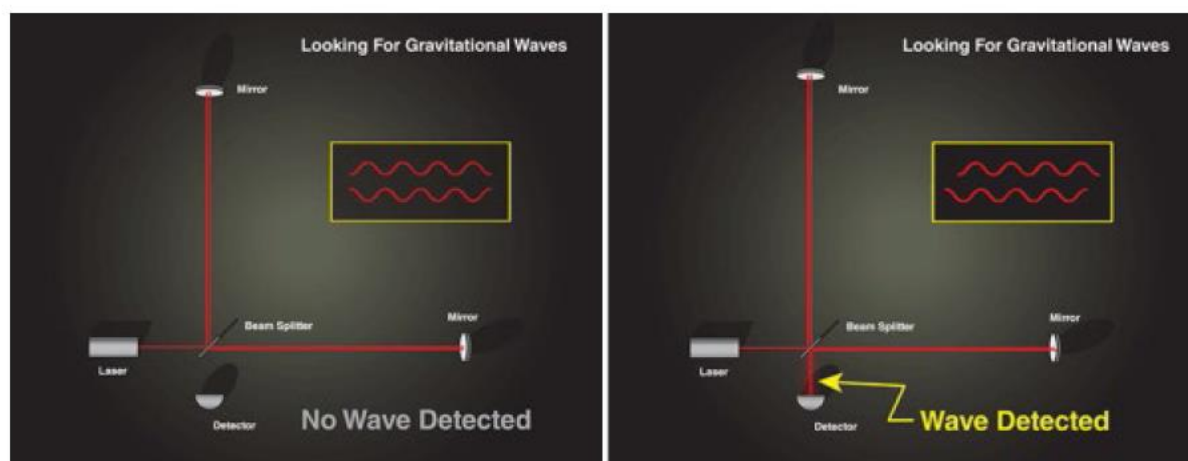
Gravitational waves are created when massive objects accelerate in space, especially in violent events. [LIGO detected the first gravitational waves](#) when two black holes, orbiting one another, finally merged, creating ripples in space-time. But these waves are [not exclusive to black holes](#). If a star were to go supernova, it could produce the same effect. Neutron stars can also create these waves for various reasons. While these waves are invisible to the human eye, [this animation](#) from NASA's Science Visualization Studio shows the merger of two black holes and the waves they create in the process.



Two black holes orbit around each other and generate space-time ripples called gravitational waves in this image. Credit: NASA's Goddard Space Flight Center Conceptual Image Lab

How It Works

A gravitational wave observatory, like LIGO, is built with two tunnels, each approximately 2.5 miles long, arranged in an "L" shape. At the end of each tunnel, a highly polished 40 kg mirror (about 16 inches across) is mounted; this will reflect the laser beam that is sent from the observatory. A laser beam is sent from the observatory room and split into two, with equal parts traveling down each tunnel, bouncing off the mirrors at the end. When the beams return, they are recombined. If the arm lengths are perfectly equal, the light waves cancel out in just the right way, producing darkness at the detector. But if a gravitational wave passes, it slightly stretches one arm while squeezing the other, so the returning beams no longer cancel perfectly, creating a flicker of light that reveals the wave's presence.



Still images of how LIGO (Laser Interferometer Gravitational-Wave Observatory) detects gravitational waves using a laser, mirrors, and a detector. You can find the animated version [here](#). Image Credit: NASA

The actual detection happens at the point of recombination, when even a minuscule stretching of one arm and squeezing of the other changes how long it takes the laser beams to return. This difference produces a measurable shift in the interference pattern. To be certain that the signal is real and not local noise, both LIGO observatories — one in Washington State (LIGO Hanford) and the other in Louisiana (LIGO Livingston) — must record the same pattern within milliseconds. When they do, it's confirmation of a gravitational wave rippling through Earth. We don't feel these waves as they pass through our planet, but we now have a method of detecting them!

Get Involved

With the help of two additional gravitational-wave observatories, [VIRGO](#) and [KAGRA](#), there have been [300 black hole mergers detected in the past decade](#); some of which are confirmed, while others await further study.

While the average person may not have a laser interferometer lying around in the backyard, you can help with two projects geared toward detecting gravitational waves and the black holes that contribute to them:

- **Black Hole Hunters:** Using data from the [TESS satellite](#), you would study graphs of how the brightness of stars changes over time, looking for an effect called gravitational microlensing. This lensing effect can indicate that a massive object has passed in front of a star, such as a black hole.
- **Gravity Spy:** You can help LIGO scientists with their gravitational wave research by looking for glitches that may mimic gravitational waves. By sorting out the mimics, we can train algorithms on how to detect the real thing.

You can also use gelatin, magnetic marbles, and a small mirror for a more hands-on demonstration on how gravitational waves move through space-time with JPL's [Dropping In With Gravitational Waves](#) activity!

