



Be glad of life because it gives you the chance to ...
look up at the stars.

Henry Van Dyke

Newsletter of the Pomona Valley Amateur Astronomers

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nightwatch

February 2017

President's Message

February is the month that makes me most appreciate the generally clear skies we enjoy here most of the rest of the year. Between the clouds and the rain, I've only made it out for a couple of short driveway sessions to look at the moon.

I did have a lovely time at the Salton Sea on the evening of Saturday, January 28, along with fellow PVAA members Kay and Ken Hoevel and Gary Gonella. I drove down with my friend Terry Nakazono from LA and my son London. In the early evening I was bouncing around looking through everyone's telescope. The seeing was only so-so but the transparency was pretty good. We didn't get any of the fog that can come in quickly off the sea. I had a great time talking with Gary for about an hour while we just looked up at the sky with our naked eyes. I think everyone else turned in before 11, but the skies were so good – and I was so starved for observing time – that Terry and I stayed up almost until dawn. I spend a long time observing Omega Centauri, which got up out of the El Centro light dome and spent almost an hour crossing nice dark sky before it started to descend into the near-horizon haze.

The club has accumulated some odds and ends, astronomical accessories and a few books that are gathering dust. So we're going to offer them for sale to PVAA members at friend prices. See a list farther on in this issue for details.

The club star party this month will be held jointly with the Riverside club at the Landers/GMARS site on Saturday, Feb. 25. Hopefully we'll get another clear, dark night. Our speaker at the upcoming meeting is Dave Nakamoto, who will speak to us about "The Planet...Vulcan???" I hope to see you there.

Matt Wedel

Club Events Calendar

Feb 10, 2017 General Meeting - Dave Nakamoto – The Planet . . . VULCAN?"

Feb 25, 2017 Star Party – Landers, GMARS

March 1, 2017 Board Meeting

March 10, 2017 General Meeting

March 25, 2017 Star Party – Mesquite Springs, Death Valley

Mar 30, 2017 Board Meeting

Apr 7, 2017 General Meeting

Apr 22, 2017 Star Party – Cow Canyon Saddle

May 3, 2017 Board Meeting

May 12, 2017 General Meeting

May 25 - 29, Joint RTMC

May 31, 2017 Board Meeting

June 9, 2017 General Meeting

June 24, 2017 Star Party – Grandview

June 29 Board Meeting

July 7 General Meeting

July 22 Star Party -Culp Valley Campground, Anza Borrego

July 27 Board Meeting

August 4 General Meeting

August 12 Star Party - Cow Canyon Saddle, Mount Baldy

August 31 Board Meeting

September 8 General Meeting

September 16 Star Party - Palomar Mountain and Observatory tour

PVAA General Meeting 01/13/17

After a brief welcome and announcements, Alex McConahay of the Riverside Astronomical Society gave the main presentation. The topic for the night was “America’s Solar Eclipse.” A solar eclipse is when the moon gets directly in between the sun and the earth. When it is “spot on” a TOTAL eclipse occurs. The total eclipse will occur on August 21st 2017. Totality will go from Washington state to South Carolina. In Southern California, it will be a partial eclipse with about 60% of the sun blocked out.

In 1919 Sir Arthur Eddington went to the island of Principe not just to observe the solar eclipse, but to use the eclipse to verify Einstein’s theory of relativity. Einstein’s theory predicts that large gravitational objects bend space. The largest object in our solar system is the sun, so if it did bend space, then the stars very close (line-of-site close) to the sun would be observed to be in a slightly different place. So, a star that would not be in view because it was just behind the edge of the sun should be able to be seen. – And it was, confirming Einstein’s theory.

The 2017 eclipse will feature the Citizen CATE Experiment. (CATE = Continental-America Telescopic Eclipse) With telescopes all along the path of totality, this experiment will get (depending on the cloud cover) 90 minutes of totality to study the corona surrounding the sun. You can only do this (when on earth) when you are on the center line of a total eclipse. While we do have space based solar observatories, they do not measure the entire expanse of the corona.

There are several types of solar eclipses. A TOTAL eclipse covers 100% of the sun & requires you to be on the center line. An ANNULAR eclipse is just like a total EXCEPT that the moon is too far away to completely block the sun, and you get a little ring of sun around the moon. A Hybrid is a little of both TOTAL and ANNULAR. – Some of the eclipse is total, while part of it is annular. A PARTIAL eclipse is when the moon only covers part of the sun. For the Los Angeles area – the August eclipse will be partial.

So how does experiencing a partial eclipse compare to experiencing a TOTAL eclipse? – Like the difference of experiencing a world-class meal & watching it on TV. --- SO, GO! – Pick your location on the centerline. Make travel plans NOW. Get your reservations. Check out the accommodations, crowd control, food, water, parking, mobility. Mobility could be important if you need to move away from a cloud.

If this is your first total eclipse don’t waste the precious moments fiddling with your equipment. Just bring eclipse glasses and EXPERIENCE it. (OK, you know you are going to take a picture, but test everything beforehand.)

Gary Thompson

Links:

<https://eclipse2017.nasa.gov/>

http://www.eclipse2017.org/eclipse2017_main.htm

http://www.eclipse2017.org/xavier_redirect.htm

<http://www.alexastro.com/>

<http://www.eclipsewise.com/solar/SEprime/2001-2100/>

[SE2017Aug21Tprime.html](http://www.eclipsewise.com/solar/SEprime/2001-2100/SE2017Aug21Tprime.html)

Spare Gear Sale

We have stuff to sell! Some of these are unused parts that came with library telescopes, some of it was donated by members, and some of it I had lying around. It all needs to go. I’ll bring the bits to the meeting this Friday.

Three brand-new, still in the box Orion Explorer II eyepieces. I’ll have to double-check, but I believe the focal lengths are 20mm, 17mm, and 6mm. These are Kellner eyepieces, with 3 glass elements, offering a 45-degree apparent field of view. I’ve used this type before and they are pretty sharp, especially in longer focal-ratio scopes. These go for \$30-40, we’re offering them for \$15 apiece.

Brand-new Orion red-dot finder, never used. Typically \$30-50, we’re offering for \$20.

We also have some Rigel Quickfinders that were kindly donated to the club by Dave Kary. These are another kind of see-through, red ring finder, similar to a Telrad but smaller. Since they are used, I will put in fresh batteries and make sure they’re functional. I’ll bring as many as I can get checked to the meeting. \$40 new, we’ll offer these for \$15 apiece.

A metal eyepiece rack that can be bolted to a Dobsonian or other wooden telescope mount. \$5.

Uranometria 2000, volume 1. Magnitude 9.5 star atlas. This is a used copy of the first edition from 1987, a little scuffed but otherwise in good shape. Covers the northern half of the sky down to -6 degrees. \$10.

...Plus whatever else I find while I’m cleaning out the closet. And if you have unused astro gear you want to donate to the cause, let me know or bring it to the meeting. Since the PVAA is a tax-exempt charitable institution, donations are tax-deductible!

Matt Wedel



What's Up? Mining Asteroids

Asteroid mining was always a popular idea in science fiction stories. Might it become a reality? Important elements needed for Earth's industry could become exhausted in as soon as sixty years. Asteroids are known to contain gold, silver, lead, copper, phosphorus, antimony, tin and zinc. Many of these, like platinum and cobalt, are well worth the expense of mining them to bring back to Earth.

Obviously near Earth asteroids are the prime choices for mining. They all have a lower escape gravity than larger planets. Some are extinct comets that could provide water (and oxygen) for off world mining operations. Water can be used to grow food for miners.

Smaller asteroids might be put in safe orbits around the Moon or Earth for easy mining access. Or raw asteroid materials could be transported to Earth. Ore might be processed on site to produce only essential materials for return. Mining machinery would first have to be anchored to a space rock, but the low gravity then makes moving it about relatively easy.

Attachment to an asteroid might use a harpoon type projectile which would anchor itself. Unfortunately techniques for refining ore in zero gravity haven't been totally developed yet.

Methods of extraction include surface mining. This would be easiest in those asteroids that seem to be rubble piles simply held together by gravity. Magnetic rakes could collect loose surface materials off space rocks. More solid asteroids would require mine shafts to be dug. NASA has announced a Robotic Asteroid Prospector project to explore the methods and means of asteroid mining. Many private groups with names like the British based Asteroid Mining Corporation, Deep Space

Industries and Kepler Space Mining are now exploring possibilities.

Developing a private infrastructure for altering asteroid orbits could be very profitable however the possibility of a miscalculation that would cause an asteroid to strike Earth is a real worry.

B612 is a private foundation dedicated to preventing Earth from asteroid strikes. It's privately financing an asteroid locating space telescope called Sentinel. Its an infrared telescope to be parked in orbit to identify dangerous near Earth asteroids.

The main Asteroid Belt between Mars and Jupiter contains billions of space rocks in individual solar orbits. This area once held almost a thousand proto planets which failed to conglomerate into a larger planet because of conflicting gravity. Instead they collided with each other and broke down into smaller pieces. This resulted in the formation of many "family" groups held together by gravitational forces.

Famous family groups include the Centaurs between Neptune and Jupiter. The large Trojan asteroid family group shares Jupiter's orbit.

Asteroid mean "star-like object" and comes from the fact that they only appear as starry points in telescopes. Ceres, the largest body in the asteroid belt, could become a transportation hub for mining since it contains a lot of water ice in its diameter of 580 miles. Since it's bigger and rounder than other asteroids, its recently become a Dwarf Planet. It was discovered in 1801 by Italian astronomer Giuseppe Piazzi who named it after a goddess of agriculture. Other larger asteroids like Pallas, Juno and Vesta were then also named after goddesses.

Asteroids are also known as minor planets or planetoids. From analyzing meteorites that have fallen to earth there has been a division of three types. Meteorites being what meteors streaking through the night sky (sometimes called shooting or falling stars) become when they finally crash land on Earth. There are M-type asteroids, made mostly of metal like iron and nickel. The C-type asteroids are mainly Carbon. Then the S-type asteroids are metal and rock. Many can be identified as having come explosively from our Moon or even Mars. But meteor showers are usually from trailing icy pieces left behind by short period comets. I saw an excellent shower with PVAA many years ago.

The business of asteroid mining is still in its infancy and needs heavy capital investment to be truly successful.



Lee Collins

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This article is provided by NASA Space Place.

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Comet Campaign: Amateurs Wanted

In a cosmic coincidence, three comets will soon be approaching Earth—and astronomers want you to help study them. This global campaign, which will begin at the end of January when the first comet is bright enough, will enlist amateur astronomers to help researchers continuously monitor how the comets change over time and, ultimately, learn what these ancient ice chunks reveal about the origins of the solar system.

Over the last few years, spacecraft like NASA's Deep Impact/EPOXI or ESA's Rosetta (of which NASA played a part) discovered that comets are more dynamic than anyone realized. The missions found that dust and gas burst from a comet's nucleus every few days or weeks—fleeting phenomena that would have gone unnoticed if it weren't for the constant and nearby observations. But space missions are expensive, so for three upcoming cometary visits, researchers are instead recruiting the combined efforts of telescopes from around the world.

"This is a way that we hope can get the same sorts of observations: by harnessing the power of the masses from various amateurs," says Matthew Knight, an astronomer at the University of Maryland.

By observing the gas and dust in the coma (the comet's atmosphere of gas and dust), and tracking outbursts, amateurs will help professional researchers measure the properties of the

comet's nucleus, such as its composition, rotation speed, and how well it holds together.

The observations may also help NASA scout out future destinations. The three targets are so-called Jupiter family comets, with relatively short periods just over five years—and orbits that are accessible to spacecraft. "The better understood a comet is," Knight says, "the better NASA can plan for a mission and figure out what the environment is going to be like, and what specifications the spacecraft will need to ensure that it will be successful."

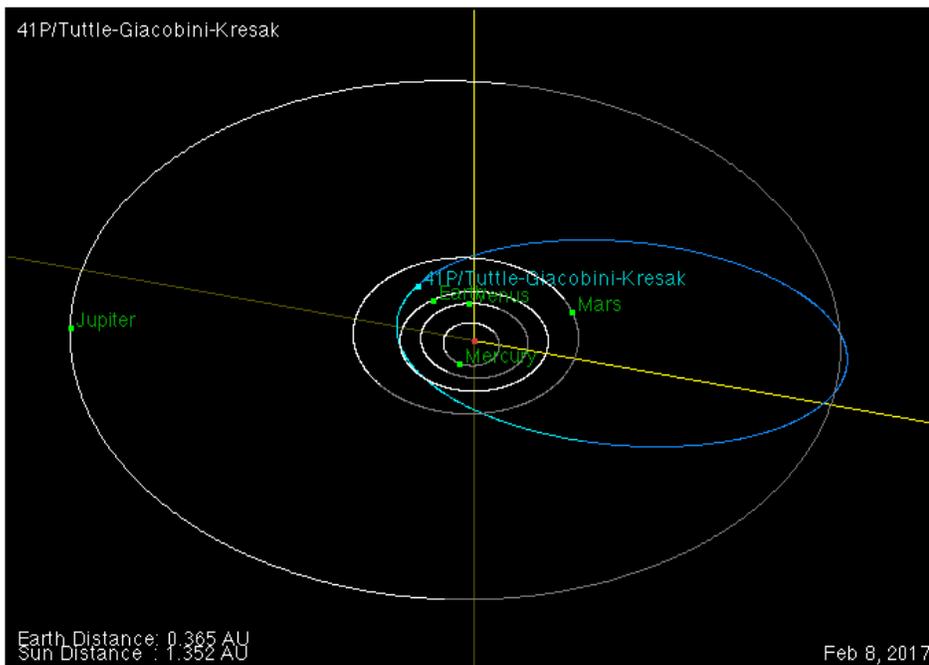
The first comet to arrive is 41P/Tuttle-Giacobini-Kresak, whose prime window runs from the end of January to the end of July. Comet 45P/Honda-Mrkos-Pajdusakova will be most visible between mid-February and mid-March. The third target, comet 46P/Wirtanen won't arrive until 2018.

Still, the opportunity to observe three relatively bright comets within roughly 18 months is rare. "We're talking 20 or more years since we've had anything remotely resembling this," Knight says. "Telescope technology and our knowledge of comets are just totally different now than the last time any of these were good for observing."

For more information about how to participate in the campaign, visit <http://www.psi.edu/41P45P46P>.

Marcus Woo

An orbit diagram of comet 41P/Tuttle-Giacobini-Kresak on February 8, 2017—a day that falls during the comet's prime visibility window. The planets orbits are white curves and the comet's orbit is a blue curve. The brighter lines indicate the portion of the orbit that is above the ecliptic plane defined by Earth's orbital plane and the darker portions are below the ecliptic plane. This image was created with the Orbit Viewer applet, provided by the Osamu Ajiki (AstroArts) and modified by Ron Baalke (Solar System Dynamics group, JPL). <http://ssd.jpl.nasa.gov/sbdb.cgi?orb=1;sstr=41P>



Want to teach kids about the anatomy of a comet? Go to the NASA Space Place and use Comet on a Stick activity! <http://spaceplace.nasa.gov/comet-stick/>