Temecula Valley Astronomer

The monthly newsletter of the Temecula Valley Astronomers Apr 2017

Events:

General Meeting : Monday, Apr 3, 2017 at the Temecula Library, Room B, 30600 Pauba Rd, at 7 pm. What's Up by Skip Southwick. Then Curtis Croulet will present "The History of Palomar Observatory".

For the latest on Star Parties, check the web page.

200" Hale Telescope at Palomar Observatory

WHAT'S INSIDE THIS MONTH:

Send newsletter submissions to Mark DiVecchio <markd@silogic.com> by the 20th of the month for the next month's issue.

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General information:
Subscription to the TVA is included in the annual $25 membership (regular members) donation ($9 student; $35 family).

President: Mark Baker 951-691-0101
<shknbk13@hotmail.com>
Vice President: Skip Southwick
<skipsouthwick@yahoo.com>
Past President: John Garrett <garrjohn@gmail.com>
Treasurer: Curtis Croulet <calypte@verizon.net>
Secretary: Deborah Cheong <geedeb@gmail.com>
Club Librarian: Bob Leffler <bobjleffler@msn.com>
Facebook: Tim Deardorff <tim-deardorff@yahoo.com>
Star Party Coordinator and Outreach: Deborah Cheong
<geedeb@gmail.com>

Address renewals or other correspondence to:
Temecula Valley Astronomers
PO Box 1292
Murrieta, CA 92564

Member's Mailing List: tvastronomers@googlegroups.com
Website: http://www.temeculavalleyastronomers.com/

Cosmic Comments – Apr/2017
by President Mark Baker

Growing up, one of my favorite places to visit was Palomar Mountain and specifically the Observatory. Even as a kid, I marveled at the engineering of such a monumental undertaking…even without computers, 3D printers, or electronics of any kind, it is an amazing edifice.

Recently, I once again visited the site as a potential Docent and was treated to an "insiders" tour. I still am in awe of what was wrought when they put the 200" Hale telescope in place… simply put, "them guys" knew what they were doing!!! And I'm not even talking about the science performed there over the years…

Despite all the years, use, and wear and tear, the "old girl" still points true, which a lot of our more modern 'scopes out there cannot claim. In fact, it was said that users of other facilities often talk in "non-family suitable" manners about pointing capabilities once they have worked with the Hale…

I'd hope that all of you take the opportunity to visit this local wonder in the near future…who knows, maybe you'll even get stuck with me as your Docent!!! It's still worth the trip…

And if you then realize that you can complement and supplement the work being done there with your own telescope and equipment, think how fulfilling that would be…as well as the contribution to the Sciences you can make in your own small way. This is how we add up to being greater than the sum of our parts!!!

Clear, Dark Skies my Friends…

Looking Up – Apr 2017
by Curtis Croulet

First Quarter Moon is April 3 at 1:39 PM PDT; **Full Moon** is April 10 at 11:08 PM PDT; **Last Quarter Moon** is April 19 at 2:57 AM PDT; **New Moon** is April 26 at 5:16 AM PDT.

Mercury will be in the evening sky during the first part of April. This will be its best evening apparition of the year. The messenger planet is highest on April 1.

Venus has already moved into the morning sky. Only a month ago it was riding high in the dusk sky, but Venus is already rising an hour *before* sunrise as April begins. It's a thin crescent. Venus brightens from mag -4.2 to -4.7 during April.

Mars moves from Aries into Taurus during April. Mars is low in the west at sunset, and it sinks lower as the month progresses. The so-called "red planet" shrinks from 4.2 arc sec to 3.9, and it fades even further from mag 1.5 to 1.6.

Jupiter reaches opposition on April 7. On that day it'll rise roughly around sunset. We will finally have a bright planet for outreach events. Jupiter is in Virgo. Jupiter and the full Moon will be close together on the evening of April 10.

Saturn is still a morning object in northwestern Sagittarius. Opposition is June 14. Saturn's position is almost stationary during April.

Uranus and **Neptune** are essentially unobservable in April**.**

Pluto is a morning object in northeastern Sagittarius.

The **Lyrids Meteor Shower** peaks on the night of April 21-22. They will be best before dawn.

Let's look up.

In February's *Looking Up* we talked about the 18th Century British astronomer James Bradley. Bradley attempted to measure *stellar parallax*, the shifting positions of distant stars as the Earth orbits the Sun. He failed. But Bradley found a different shift in the stars, *stellar aberration*. The shift varied with the seasons, creating a deviation in the position of the star, but not in the manner predicted for stellar parallax. Bradley's discovery of stellar aberration, published in 1729, provided proof of the Copernican model of the Solar System. But there remained the problem of stellar parallax, to measure distances to the stars.

We now make our acquaintance with another astronomer you've probably never heard of: Friedrich Wilhelm Bessel (1784-1846). Bessel's professional career began in 1799. He worked as a clerk for a shipping company in Bremen, Germany. Bessel discovered that he actually enjoyed studying the company's ledgers. He liked anything with numbers. He taught himself mathematics and celestial navigation, which was important for the shipping companies that visited Bremen. This led to an interest in astronomy. He studied the mathematics of Kepler, Newton, and Halley. Bessel independently calculated the orbit of Halley's Comet. He

showed his calculations to Bremen's leading scientist, Wilhelm Olbers (1758-1840). Olbers was so impressed, he introduced Bessel to Johann Schröter (1745-1816) in the small town of Lilienthal, northeast of Bremen. Schröter owned a reflecting telescope with an aperture of a bit over 4 inches and a focal length of about 7 feet. Schröter used this scope to study the planets and to make detailed maps of the Moon. Bessel learned observing techniques with this telescope, but he was frustrated by the cumbersome system of pulleys that supported and pointed the telescope. Bessel wanted to measure the positions of stars, and this telescope wouldn't do it. In 1809 Bessel received an invitation from Alexander von Humboldt, advisor to Prussian King Friedrich Wilhelm III, to become director of a new observatory to be built in Königsberg, East Prussia, which is now (since 1945) the Russian city of Kaliningrad.

To begin his assault on the stellar parallax problem, Bessel needed a telescope equal to the task. Previous telescopes for measuring star positions had been refractors mounted in huge machined circles, which were engraved with engraved markings that could be read through dedicated microscopes. Such telescopes weren't good enough. Bessel worked with the greatest optician of the time, Joseph Fraunhofer (1787-1826), to produce a telescope with a precision achromatic lens that had been cut precisely in half. The telescope would work by placing the star to be measured in view of one half of the lens, and then placing a comparison star in the other half of the lens. The lenses could then be displaced to bring the two images together. An adjacent brass scale with fine divisions would then be read to determine the displacement necessary to bring the images together. Measurements would be repeated in subsequent observations throughout the year to determine the change in displacement necessary to bring the images together. This type of telescope was called a heliometer, because its first use had been to measure the apparent diameter of the Sun. The telescope's mounting was a conventional German-style equatorial mount, a style invented by Fraunhofer. Bessel's heliometer was installed in 1829. He spent five years working with it to learn its characteristics.

Bessel also needed a star. Previous observers had attempted – and failed – to measure parallax by studying particularly bright stars, such as Vega. Bessel decided to use a star that was known to have a large *proper motion*, a star that had been determined to be moving rapidly (relatively) across the sky relative to background stars. Bessel reasoned that such a star was probably relatively close to Earth. The star he chose was 61 Cygni, a double star with components of mag 5.20 and 6.05.

Bessel began his work in 1834, but he was called away to other duties. He began again in August 1837. He measured and re-measured the position of 61 Cygni against nearby comparison stars for over a year. Finally, in December 1838 he published his results in the *Astronomische Nachrichten* ("Astronomical Notes"), and at the same time he sent his observations to Sir John Herschel to have them translated into English. Herschel was satisfied that the stellar parallax of a star had finally and accurately been measured.

The parallax value Bessel derived for 61 Cygni was 0.314 arc seconds, equivalent to a distance of 10.3 light years. The current accepted value for 61 Cygni is 11.4 light years.

Clear skies.

Random Thoughts
by Chuck Dyson

On my computer I keep several of the local Clear Sky Charts sights in my favorites tab and almost always consult them before going out to view the sky from my back yard, actually my yard is a Mini-Me of a real yard, for the evening. Because I most often use my classic C-5 Celestron for viewing and images in it tend to degrade rapidly with average to poor seeing conditions, I will, often as not, abort the evenings viewing if the seeing is not above average or excellent. My reasoning is that I have seen most of the deep sky objects dozens of times and being in relatively good health can expect to see them for many more times under conditions of excellent seeing; so, why frustrate myself under less than good skies searching for poorly resolved objects. Yes, I have become an observing snob sort of like being offered a glass of Château Lafite Rothschild and refusing it because although it is from a 1950's vintage it's not the 1953 vintage so it can't be that good. When you don't want to just see an object but you need to see the best view under almost perfect skies of an object or forget it; I think you have lost the excitement of getting to see an object for the first time and with the passage of time you forget the excitement you felt with those first views no matter how bad they were.

I mention all of this because over the last two months our public outreach programs have been more cloud parties than star parties and I do not know about you but for me it got a little depressing to drive to a school, set up, have a pack of excited kids run out to the scopes, and then tell them nothing to see tonight. The whole bad situation came to a head for me the night we were at Clearwater Elementary School, brand new school, a crush of enthusiastic children, excited parents, and 100% cloud cover. Like the cloud cover I was a 100% frustrated individual. What to do? It was at this time that I remembered an article that I had read in the Focal Point column of the Sky and Telescope magazine, the astronomer writing the article was hosting a star party in Israel that was clouded out and was desperate to show the children something so he focused his scope on a single star that was shining through the clouds, at the end of the viewing session, and feeling dejected, the astronomer was leaving with a group of the children who had taken part in the party and he herd one child say to another "Can you believe that we actually got to see an actual star through a real telescope tonight? The moral; if you have never looked through a telescope then everything you see is new and exciting.

Back at Clearwater Elementary and remembering the article I swung my telescope on a nearby street light and had the children first just look at the street light and then look at the street light through the telescope most of the children were amazed at how much detail on the street light they could see through the telescope and this view was followed by an explanation of how the telescope was able to do this. Later on that evening the clouds parted somewhat and everyone there were able to turn their scopes on to some actual stellar objects and I hope that some of the children now understood how the scopes made it possible for them to see objects in the sky that were invisible to the naked eye.

The lesson of "new is always exciting" was reinforced two weeks later when my grandson insisted that my wife and I accompany him to a Star Palooza event at a school near him, it was a fund raiser and I think he just wanted grandma and grandpa there to buy him extra activity

tickets, as anticipated the event was more carnival than star party; however, there were some students from San Antonio college with several Meade 8 inch scopes but over in one corner of the school yard was a refractor. Now I am an absolute and total refractor geek so I snatched a ticket from my grandson's little hand and headed over to the refractor. When I got up to the scope I found out that it was a James Baker design, Mr. Baker designed scopes for NASA and a couple of organizations that don't exist anymore, the owner offered to shift it off of Venus which by now was very low in the sky for me but I really wanted to see Venus so he told me to have at it. Was the view of Venus good? No! Was I thrilled to be operating an 11 inch f16 refractor and looking at Venus from the end of a 15ft long tube that used a Volvo station wagon as its mount? Hell yes! I think the moral of this little column is that if you are not a hard bitten amateur astronomer it's not necessarily the quality of the view but the fact that you actually get to look through a telescope.

Cheers
Chuck

A New Window on Alien Atmospheres
by Chuck Dyson

In the March-April issue of the American Scientist there is an extensive article on the history of and new goals for the James Webb Space Telescope (JWST). The article mentions the very long gestational period of the telescope, 1995 to 2018, with a budget that ballooned from 1.8 billion dollars to 8.8 billion dollars and counting, please note that the 8.8 billion does include the operating expenses over the expected life of the telescope.

Originally the JWST was designed to study the very early universe's composition and formation in infrared especially in the wavelengths that were outside the capacity of Hubble and too faint for Spitzer. In a bit of NASA positive spin the author of the article said that even though the JWST missed its 2013 launch date (must have over slept!) it has turned out to be a good thing as in 2013 we were just starting to study exoplanets and their atmospheres. Now astronomers have gotten measurements of atmospheres and have teased out size and temperatures of some of them and have found the signature of water in others.

The 2018 JWST will be optimized to address two primary research goals; first, the study of the very early universe; and second, the study of exoplanet atmospheres. The telescope will be hanging out at the Lagrange 2 point (L2) and will be about 300,000 to 500,000 miles from Earth, no service missions for this baby, and it has a 5 year mission plan but if all goes perfectly the telescope could be operational for 10 years. My only concern over this mission is that it is the only big science/ticket project that has not been canceled or put on hold by Congress and/or the White House and if the rocket goes kaboom on launch, one can expect Congress to react poorly, let's all keep our astronomy fingers crossed on launch day.

Update - NASA Coral Field Expedition

Compiled by Claire Chambers

Jan. 2016 - NASA began conducting a 3 - year study of coral reefs of the world using advanced instruments on airplanes and in the water to survey more of the world's coral reefs in far greater detail than ever before. Called CORAL – The COral Reef Airborne Laboratory, will aim to develop a database of uniform scale and quality. Very little of the earth's reef areas have been studied scientifically. Expensive, labor-intense diving expeditions have been virtually the only way measurements have been done in the past. Many reefs have never been surveyed, and those studied have been measured at only a few limited dive sites. "Eric Hochberg's team will survey the condition of entire reef systems in Hawaii, Florida, Palau, the Mariana Islands, and Australia. CORAL will use an airborne instrument called the Portable Remote Imaging Spectrometer (PRISM), developed and managed at NASA's Jet Propulsion Laboratory in Pasadena, CA. Concurrent in-water measurements will validate the airborne measurements of reef conditions." [1] Reefs will be analyzed in the context of the current environment that exists, as far as physical, chemical, and human factors are, at the time of analysis. The results will help reveal how environment shapes reef ecosystems, "which respond in complex ways to environmental stresses such as sea level change, rising ocean temperatures, and pollution. "Accurate data collection across many entire reef ecosystems is needed, in order to develop an overarching, quantitative model that describes why and how reefs change in response to environmental changes."[2] PRISM was specifically created for remote sensing of coastal and inland waters. PRISM records the spectra of light reflected upward toward the instrument from the ocean below, allowing researchers to pick out the unique spectral signatures of living coral, algae, and sands below. As corals die, algae increases on reefs, so the ratio of coral to algae is an indicator of overall health of the ecosystem. CORAL will provide not only the most extensive picture to date of the condition of a large portion of the world's coral reefs, but a uniform data set as well. Various team members will each bring a different subject expertise to the project.

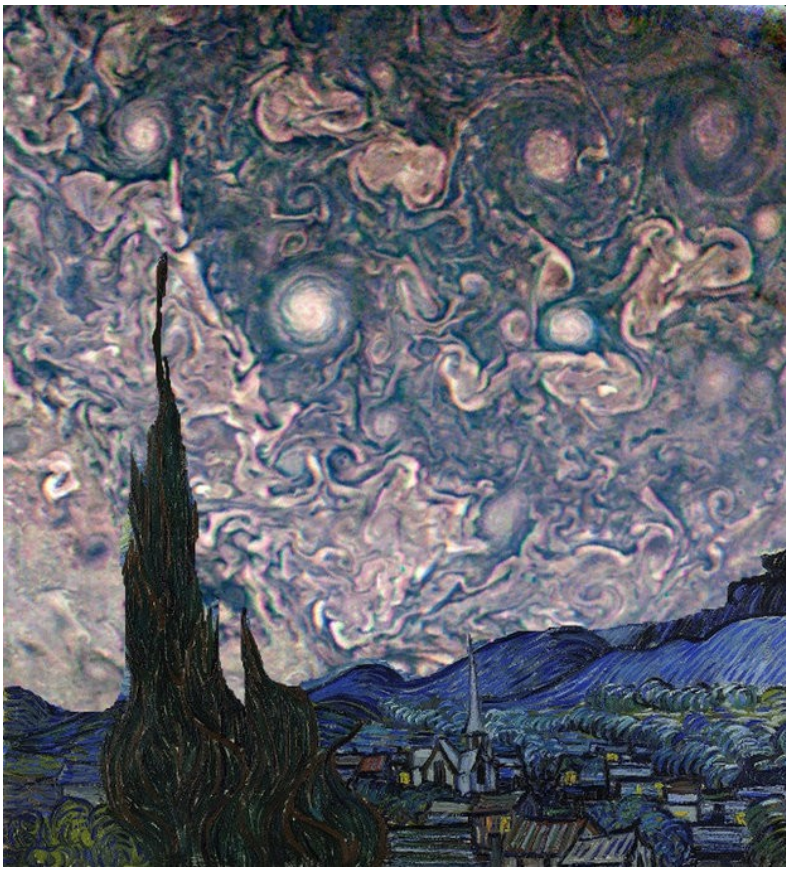
After cataloging new data, the group can start making predictions about the future of our reefs based upon numbers, rather than just ideas. "Ideally, in a decade or so, we will have a satellite that can frequently and accurately observe all of the world's reefs, pushing our understanding even further," [3] said Hochberg.

[1]-[3] Quoted from – NASA CORAL Mission to Raise Reef Studies to New Level

Other information taken from – Nature World News 12 Jan 2016.

Juno - Know What's Happening Around Jupiter
by Chuck Dyson

The Juno mission is settled into its operational routine but it is not the routine that was initially envisioned by the mission planners. The original plan was to have three orbits of fifty three days duration and the over several orbits brake the spacecraft into a fourteen day orbit and start the serious science at that time; however, when it came time to start the braking maneuver the fuel tanks could not be properly pressurized because of the erratic performance of the Helium valves. Juno will stay in the fifty-three day orbit until the end of the mission. Mission planners have said that the longer orbits are actually allowing them to study in greater breadth the magnetic fields of Jupiter and that has been actually a good thing. If there is no extension to the mission then only twelve science orbits will be completed but the science team thinks that this will be enough to accomplish all of the science goals.


Van Gogh meets Jupiter

The Juno probe will do its next Jovian fly-by on March 27 and will then transmit more pictures from the JunoCam, as of this date the JunoCam has provided spectacular pictures of Jupiter especially of the never before seen polar regions, see attached photo, because the Juno probe is in a polar orbit and not an equatorial orbit this is the first time anyone has looked directly down into the polar regions and it don't look nothing like the equatorial regions. As Juno is going to within 4,200 km of the cloud deck of Jupiter, it is going much farther into the radiation belts of Jupiter than anyone, any probe that is, has gone before and the Jupiter field strength is much greater than predicted and this means that the probe is not just confirming what the other probes have reported but is breaking new ground and that is a good reason to extend the mission.

The first science papers should be published this summer so stay tuned for what are sure to be some surprises.

What It's Like on a TRAPPIST-1 Planet

By Marcus Woo

With seven Earth-sized planets that could harbor liquid water on their rocky, solid surfaces, the TRAPPIST-1 planetary system might feel familiar. Yet the system, recently studied by NASA's Spitzer Space Telescope, is unmistakably alien: compact enough to fit inside Mercury's orbit, and surrounds an ultra-cool dwarf star—not much bigger than Jupiter and much cooler than the sun.

If you stood on one of these worlds, the sky overhead would look quite different from our own. Depending on which planet you're on, the star would appear several times bigger than the sun. You would feel its warmth, but because it shines stronger in the infrared, it would appear disproportionately dim.

"It would be a sort of an orangish-salmon color—basically close to the color of a low-wattage light bulb," says Robert Hurt, a visualization scientist for Caltech/IPAC, a NASA partner. Due to the lack of blue light from the star, the sky would be bathed in a pastel, orange hue.

But that's only if you're on the light side of the planet. Because the worlds are so close to their star, they're tidally locked so that the same side faces the star at all times, like how the Man on the Moon always watches Earth. If you're on the planet's dark side, you'd be enveloped in perpetual darkness—maybe a good thing if you're an avid stargazer.

If you're on some of the farther planets, though, the dark side might be too cold to survive. But on some of the inner planets, the dark side may be the only comfortable place, as the light side might be inhospitably hot.

On any of the middle planets, the light side would offer a dramatic view of the inner planets as crescents, appearing even bigger than the moon on closest approach. The planets only take a few days to orbit TRAPPIST-1, so from most planets, you can enjoy eclipses multiple times a week (they'd be more like transits, though, since they wouldn't cover the whole star).

Looking away from the star on the dark side, you would see the outer-most planets in their full illuminated glory. They would be so close—only a few times the Earth-moon distance—that you could see continents, clouds, and other surface features.

The constellations in the background would appear as if someone had bumped into them, jostling the stars—a perspective skewed by the 40-light-years between TRAPPIST-1 and Earth. Orion's belt is no longer aligned. One of his shoulders is lowered.

And, with the help of binoculars, you might even spot the sun as an inconspicuous yellow star: far, faint, but familiar.

Want to teach kids about exoplanets? Go to the NASA Space Place and see our video called, "Searching for other planets like ours": https://spaceplace.nasa.gov/exoplanet-snap/

This artist's concept allows us to imagine what it would be like to stand on the surface of the exoplanet TRAPPIST-1f, located in the TRAPPIST-1 system in the constellation Aquarius. Credit: NASA/JPL-Caltech/T. Pyle (IPAC)

This Article is provided by NASA Space Place.
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