Temecula Valley Astronomer

The monthly newsletter of the Temecula Valley Astronomers Nov 2016

Events:

General Meeting : Monday, Nov 7, 2016 at the Temecula Library, Room B, 30600 Pauba Rd, at 7 pm Pacific Standard Time.

Sharon Flemings will provide the What's Up... Followed by nominations and election for the positions of *President*, *Vice President*, *Treasurer*, and *Secretary/Outreach Coordinator.* Concluding will be a photo Show-n-Tell of the most interesting images captured by TVA members.

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

The M7 Open Star Cluster in Scorpius

NASA APOD 6 Apr 2005

Credit & Copyright: Allan Cook & Adam Block, NOAO, AURA, NSF

The M7 star cluster has been known since ancient times, being noted by Ptolemy in the year 130 AD.

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).

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Cosmic Comments – Nov/2016
by President Mark Baker

While racking my brain to find ways to allow for more participation by TVA members, I must admit I was pretty ecstatic to come up with having a member – or several – contribute a current space related Mission status, domestic or foreign, to our monthly newsletter. I couldn't wait to announce the opportunity at our meeting and be overwhelmed by those wanting to be involved…and the next meeting…and the next meeting!! But not one soul volunteered…

It's not often I succumb to disappointment and say, "Oh well…I tried", and I won't in this case!!! There is sooooo much happening off planet by so many entities and co-op's that I am even more convinced that this is information that is good to know and should be shared. That being my stance, I will try for a volunteer one more time, and then I'll make some personal contacts until I find a party, or parties, that can find the interest and the time to take this on. If nothing else, I'll have to threaten the Club with me doing it, and I'm sure you all hear enough from me already…!!!

Regardless, I so enjoy being a part of this organization and the good it truly does in our communities. I am proud to know you all.

Clear, Dark Skies my Friends…

Looking Up – Nov 2016
by Curtis Croulet

First Quarter Moon is November 7 at 11:51 AM PDT; **Full Moon** is November 14 at 5:52 AM PDT; **Last Quarter Moon** is November 21 at 12:33 AM PDT; **New Moon** is November 29 at 4:18 AM PDT.

Mercury is in the evening sky all of November, but it'll be low until the second half of the month. Greatest eastern elongation will be December 11. The messenger planet will be well to the southwest, but this is a good evening apparition, better toward the end of the month.

Venus is in the evening sky. It brightens from mag -4.0 to -4.2. Greatest eastern elongation is January 12, 2017. Venus reaches inferior conjunction (between the Sun and the Earth) on March 25, 2017.

Mars moves from eastern Sagittarius into Capricornus. Mars remains visible in the evening sky all month. Incredibly it stays ahead of the relentlessly eastward-moving horizon all month by about the same amount. But Mars is very small now, and you won't see any detail in the telescope. It decreases in magnitude from +0.04 to +0.06.

Jupiter is now in the morning sky in Virgo.

Saturn is in southern Ophiuchus. The ringed planet is creeping toward conjunction with the Sun on December 10. By late November, you're going to have a hard time seeing Saturn in the twilight.

Uranus remains in excellent viewing position all night throughout the month. It's in Pisces. The October issue of *Sky & Telescope* has a good finder chart on p.50.

Neptune is in Aquarius. Like Uranus, it's in good viewing position throughout the month. The same p.50 of October Sky & Telescope has a finder chart for Neptune.

Pluto is in eastern Sagittarius. Unless you're really determined to have one last look at Pluto this year, you should probably put it to bed until next May or so. The July issue of Sky & Telescope, pp.48-49, have a detailed chart for Pluto. As I always say, it's very faint, and you'll want a big scope and lots of patience to identify it.

We have only one notable shower for November, the **Leonids**, on the morning of November 17. This is not expected to be a good year for the Leonids. No major outburst is expected, and the bright, waning gibbous Moon will be in the western sky.

Let's look up.

When we speak of "magnitude" in astronomy, we're talking about the brightness of a celestial object. Magnitude numbers run from less than 1 to, potentially, infinity. The brightest stars have low numbers. The faintest stars have high numbers.

The brightest star in the night sky is Sirius, magnitude -1.44. The faintest stars generally visible to the naked eye are about magnitude 6. An 8-inch telescope may reach (visually) to about magnitude 14.5, although much fainter stars can be photographed. The faintest objects detectable by the Hubble Space Telescope are about magnitude 31. The James Webb Space Telescope is expected to reach to magnitude 34.

The curious astronomer may immediately ask, why are low numbers brighter than high numbers, and why are there negative (or minus) magnitudes?

The answer to the first question begins with the origin of the magnitude system. Claudius Ptolemaeus of Alexandria, usually just called Ptolemy (but Ptolemy was a clan; Cleopatra was a Ptolemy), published a book of everything he knew about the cosmos. The book was called the *Almagest*. It was produced sometime in the mid-100s AD. Ptolemy applied a system of brightnesses that originated with Hipparchus. The brightest stars were said to be 1st magnitude. The faintest stars were said to be 6th magnitude. This is the ancient origin of the system we still use in modern astronomy.

For the second question, we need to consider that the difference in brightness between two adjacent whole number magnitudes is about 2.5 times. Ptolemy was probably not consciously aware of this, but, for example, a 2nd magnitude star in his system was about 2.5 times brighter than a 3rd magnitude. It just worked out that way.

In 1856 Robert Pogson applied some rigor to the ancient system. He established the ratio that a star of exactly magnitude 1 was 100 times brighter than a star of exactly magnitude 6. The fifth root of 100 is 2.512, and therefore the difference between two consecutive whole number magnitudes is 2.512. The difference between, say, a magnitude 1 star and magnitude 3 star, is 2.512 x 2.512, or 6.3 times. Pogson pegged the entire scale to the brightness of Polaris, assigning the “North Star” a magnitude of exactly 2.00. But then astronomers discovered that Polaris varied in brightness, so the scale was then anchored on Vega, which was assigned a magnitude of exactly 0.00. Although the magnitude scale was pegged to Vega for many years, the zero point is no longer assigned to Vega, but rather to constant value of “flux.” Vega isn’t always available for calibration. Slight adjustments to the scale have now put Vega at magnitude 0.03.

What about stars brighter than Vega? That’s where the numbers turn negative. There are only four night-time stars currently brighter than Vega: Arcturus (-0.03), Alpha Centauri (-0.27), Canopus (-0.62, and Sirius (-1.44). But there are even brighter things in the sky: the Sun is magnitude -27, and the Full Moon is magnitude -13. Venus at its most brilliant gets to magnitude -4.4.

What we’ve been talking about is *apparent magnitude* – the brightness of objects as seen from Earth. But what if we lined up all of the stars at the same distance, say, 32.616 light years away (this happens to be 10 parsecs)? Well, then we’d see that Deneb, merely the 20th brightest star from Earth, would be magnitude -8.73. Sirius would be reduced to a modest magnitude 1.45. Here we’re talking about *absolute magnitude*, which tells us how intrinsically bright something is, without the errors produced by the chance location of Earth relative to the stars.

We have a bit more to discuss here, which I'll defer to another column.

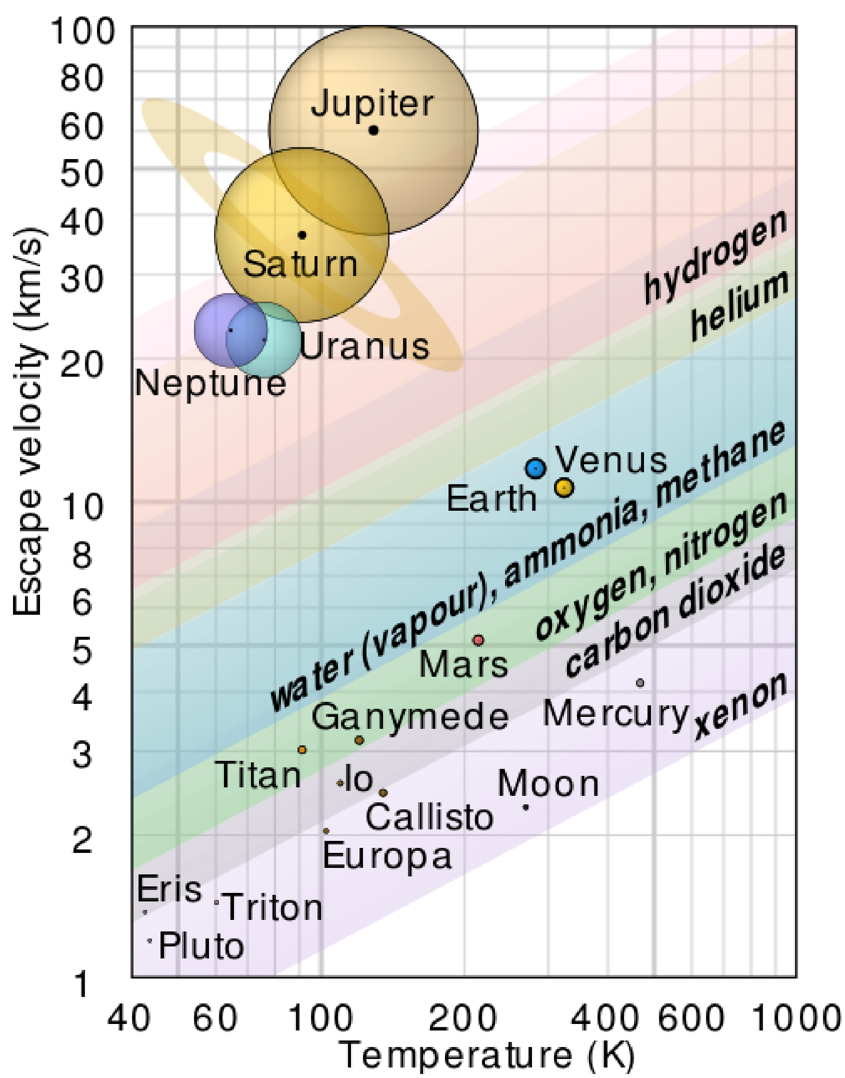
Clear skies.

Random Thoughts
by Chuck Dyson

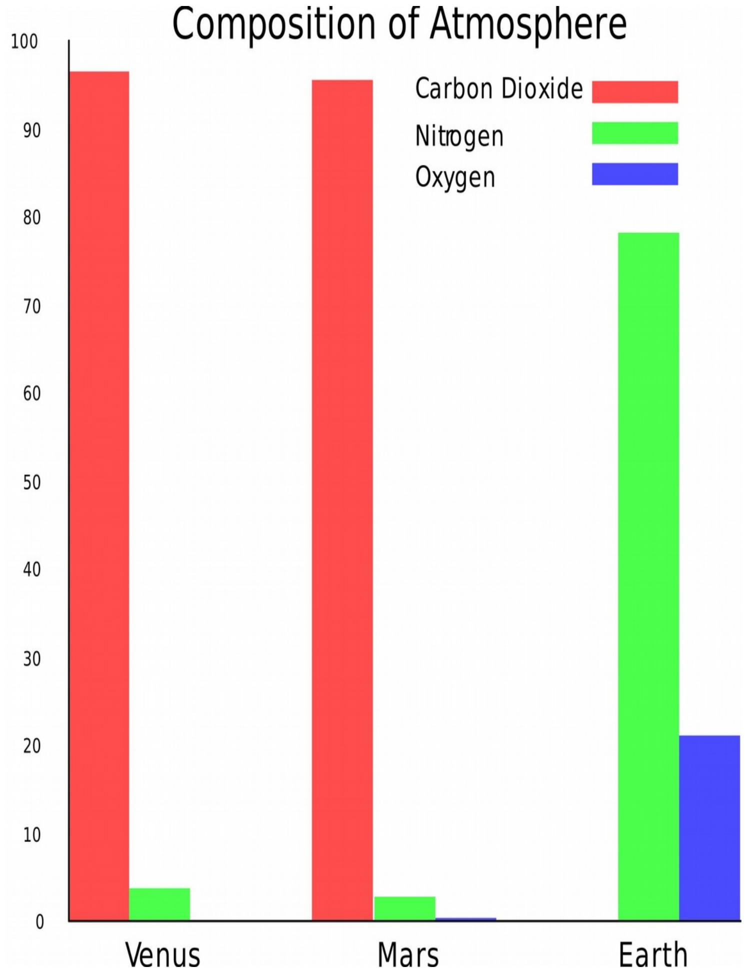
We Must Stop Elon Musk from Killing Mars!

Now do not get me wrong because I am definitely not against the exploration of Mars; however, I am definitely not for colonizing Mars anytime in the near future. Why the dichotomy in my stance here? Let's start with a look back at the history of Mars.

The earliest geologic period on Mars is the Noachian period (named after the most heavily cratered area on Mars) and it is thought to represent the time on Mars from 4.1 to 3.7 billion years ago. In the Noachian period there was volcanic activity, think fresh gases for your atmosphere, and plate tectonics with the possibility of a significant magnetosphere (Mars Global Surveyor and Mars Reconnaissance Orbiter data) but all too soon, after only 400 million years, the rate of volcanism slowed and the and the plates mostly froze and we were in the Hesperian period (named for the Hesperia Planum) that lasted from 3.7 to 3.0 billion years ago. Geologists feel that the Hesperian era was the major period for the formation of canyons, valleys, and outflow networks; also because of the loss of the suspected magnetosphere and the episodic strong solar flares that are known to come from young Sun type stars (T Tauri) the bulk of the Mars atmosphere was presumed to be lost during this period. The latest estimates from isotope data of both deuterium ratios and argon 36Ar/38Ar ratios indicate that as much as 87% of the water that was on Mars has been lost to space.



What the heck happened? If we look at the first graph we see that as bodies get smaller and have less gravity they cannot hold onto lighter gases and as the atmosphere gets warmer, the height of the atmosphere and the speed of the gases increase, the body would move to the right of the graph, and this increases the chances that a molecule of gas will reach escape velocity and be lost to the planet.



A look at the second graph shows that if one does get an atmosphere, it will be 95.3% CO_2 and this is OK because it is what you expect an atmosphere to be on a lifeless planet but I would like to see some methane and ammonia in the atmosphere because without these gases it is a little difficult to make organic compounds and amino acids.

So, why do we think early Earth had lots of methane and ammonia in its atmosphere? Plate tectonics is the leading guess and I say guess because no one really knows for sure why we have an atmosphere that is 78% nitrogen and the other rocky planets have only a trace of the stuff. If plate tectonics and the cooking of minerals deep underground are the means to make and release nitrogen and ammonia compounds then water becomes very important to having life on the planet because water may just lubricate the rocks enough to where they can be dragged along by the movement of the asthenosphere and we have plate tectonics.

Venus is the best example of a hot dry planet that appears to have an active core, volcanoes everywhere, but no plate tectonics. If it is determined that Mars does not have enough residual water to permit plate tectonics to occur then water will need to be imported. Now because we need to bulk up Mars a bit so that it has enough mass and therefore gravity to hold on to an atmosphere of light gases and we could use maybe another 200 million cubic miles of water, remember folks we are talking remodeling a planet there, we need to talk to Jupiter about “borrowing” one of its moons, me I like Callisto.

Another little problem that Mars has is that because of a lack of a stabilizing moon it has the habit of flopping on its side for long periods of time so we may need to maneuver a stabilizing moon into orbit around Mars in order to prevent an arctic night that is thousands of years long and hopefully we can use the dwarf planet Ceres for that purpose.

From 1972 to 1977 we had courtesy of the Apollo astronauts four seismic stations on the geologically dead, or so we thought, moon and after only five years of monitoring the seismometers recorded 28 moonquakes of magnitude 5 or bigger. To date we have no seismic stations on Mars, the first is scheduled to launch in 2018 and I think it would be a really good idea to know a lot more about Martian geology before setting up a permanent colony.

Speaking of Martian geology the other brilliant thought that the Colonize Mars Now movement has come up with is a way to reanimate the Martian core, simple actually, just take the nuclear weapons here on Earth, transport them to Mars, bury them deep underground all over the planet and boom - hot core with a radioactive residual to keep the thing going for a while. As for me, skeptical me, I am giving this one a zero chance of getting off the ground, literally.

While we are on the subject of the Mars core let's talk about what we do know, it is smaller than Earth's as Earth's core is the size of the planet Mars itself and what we suspect, based on the density of Mars, is that the Martian core has a different composition than the Earth's core. Before we nuke the Martian core we may want to know just a little more about it. The final thing that the Colonize Mars Now movement does that annoys me is to show animations of Mars that goes warm, goes wet, and then goes green; it's the wet that I have all the trouble with. Although, I must admit that I do not know what the hydrological cycle on a warm Mars would look like, I do know that on Earth there is nineteen times as much water in the ground as there is in all the lakes, rivers, and streams on the surface. Mars with only about 13% of its original water left and 99.9% of that water underground is, in all probably, not going to be that wet; so, I am thinking of a Mars that is more like the desert world in the science fiction book Dune rather than Kevin Costner's Water World movie.

What to do with Mars? First: I think we should study it with the goal of having a planet that will serve as a long term home for humans and do what is necessary to achieve that goal. Second: we need to realize that this may take a while. Third: we, in all probably, will not have the tools needed to do the job right, i.e. shuffling largish bodies around the solar system, for some time to come and that is OK because it has taken Homosapiens about two million years to really make a dent in the Earth's environment.

Finally let me give you a check list that will help you keep an even keel as they say in the navy as the colonize Mars now hysteria runs its inevitable course.

First: remember your Shakespeare; 'The fool doth think he is wise, but the wise man knows himself to be a fool.' (editors note: *As You Like It*, Act 5 Scene 1) Although the missions we have sent to Mars have taught us much about the planet, we, in fact, still know very little about it. Second: go to Netflix and rent the movie *The Music Man* and watch it. By studying the character Professor Harold Hill you will understand a great deal about Elon Musk and how he operates.

Cheers until next month

Chuck

Is Proxima Centauri's 'Earth-like' planet actually like Earth at all?
by Ethan Siegel

Just 25 years ago, scientists didn't know if any stars—other than our own sun, of course—had planets orbiting around them. Yet they knew with certainty that gravity from massive planets caused the sun to move around our solar system's center of mass. Therefore, they reasoned that other stars would have periodic changes to their motions if they, too, had planets.

This change in motion first led to the detection of planets around pulsars in 1991, thanks to the change in pulsar timing it caused. Then, finally, in 1995 the first exoplanet around a normal star, 51 Pegasi b, was discovered via the "stellar wobble" of its parent star. Since that time, over 3000 exoplanets have been confirmed, most of which were first discovered by NASA's Kepler mission using the transit method. These transits only work if a solar system is fortuitously aligned to our perspective; nevertheless, we now know that planets—even rocky planets at the right distance for liquid water on their surface—are quite common in the Milky Way.

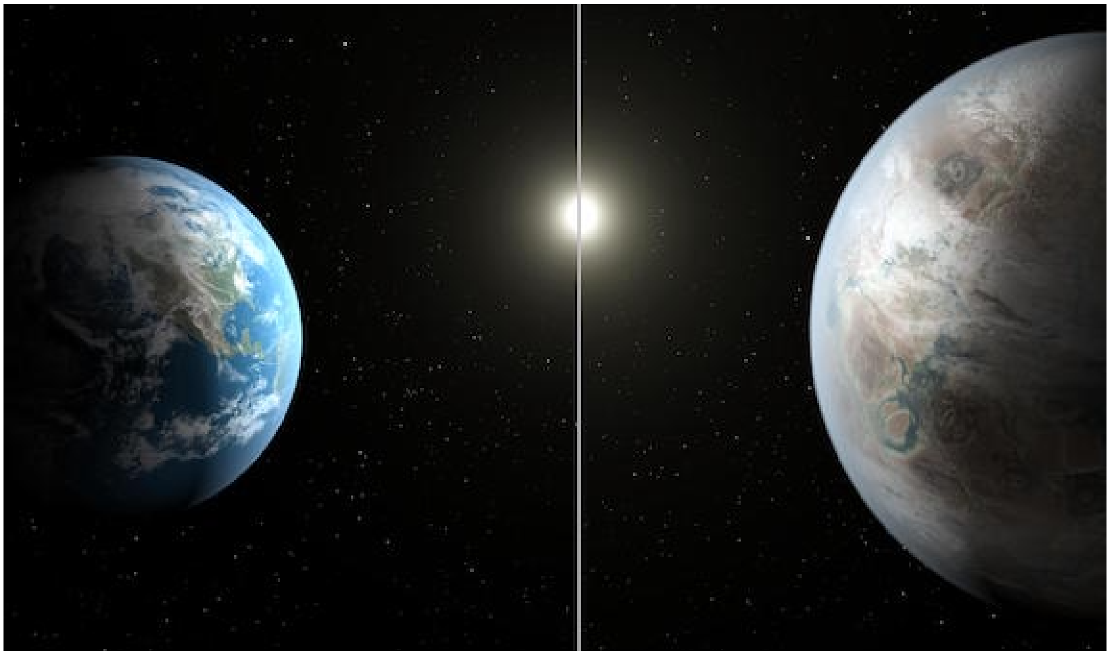
On August 24, 2016, scientists announced that the stellar wobble of Proxima Centauri, the closest star to our sun, indicated the existence of an exoplanet. At just 4.24 light years away, this planet orbits its red dwarf star in just 11 days, with a lower limit to its mass of just 1.3 Earths. If verified, this would bring the number of Earth-like planets found in their star's habitable zones up to 22, with 'Proxima b' being the closest one. Just based on what we've seen so far, if this planet is real and has 130 percent the mass of Earth, we can already infer the following:

- It receives 70 percent of the sunlight incident on Earth, giving it the right temperature for liquid water on its surface, assuming an Earth-like atmosphere.
- It should have a radius approximately 10 percent larger than our own planet's, assuming it is made of similar elements.
- It is plausible that the planet would be tidally locked to its star, implying a permanent 'light side' and a permanent 'dark side'.
- And if so, then seasons on this world are determined by the orbit's ellipticity, not by axial tilt.

Yet the unknowns are tremendous. Proxima Centauri emits considerably less ultraviolet light than a star like the sun; can life begin without that? Solar flares and winds are much greater around this world; have they stripped away the atmosphere entirely? Is the far side permanently frozen, or do winds allow possible life there? Is the near side baked and barren, leaving only the 'ring' at the edge potentially habitable?

Proxima b is a vastly different world from Earth, and could range anywhere from actually inhabited to completely unsuitable for any form of life. As 30m-class telescopes and the next generation of space observatories come online, we just may find out!

Looking to teach kids about exoplanet discovery? NASA Space Place explains stellar wobble and how this phenomenon can help scientists find exoplanets:
http://spaceplace.nasa.gov/barycenter/en/



An artist's conception of the exoplanet Kepler-452b (R), a possible candidate for Earth 2.0, as compared with Earth (L). Image credit: NASA/Ames/JPL-Caltech/T. Pyle.

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