Temecula Valley Astronomer

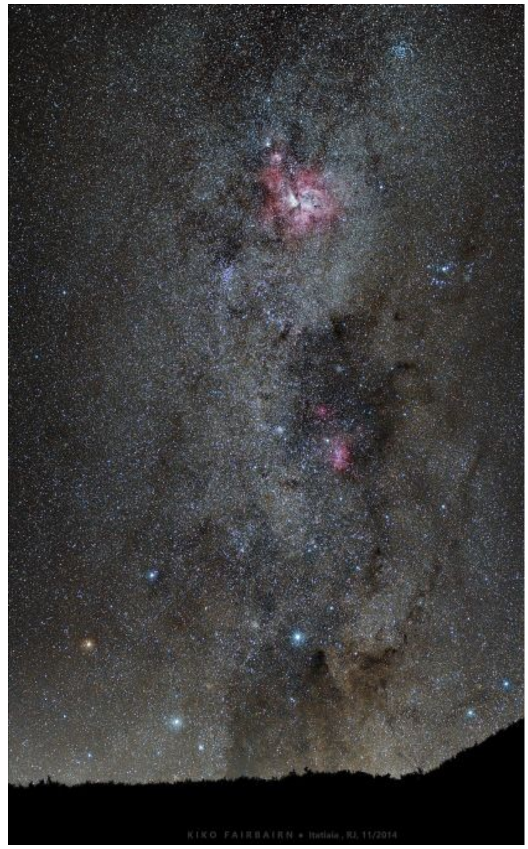
The monthly newsletter of the Temecula Valley Astronomers Oct 2016

Events:

General Meeting : Monday, Oct 3, 2016 at the Temecula Library, Room B, 30600 Pauba Rd, at 7 pm.

"What's up" by Chuck Dyson and the general topic of the night is on Light - can't live without it, hard to live with too much of it. John Garrett will "illuminate" us on the generalities of community lighting, including pollution, followed by a brief recap of my fruitless search for Southern Hemisphere objects to view and photograph from Malaysia and Singapore.

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



NASA APOD: 19 Oct 2015: The Southern Cross in a Southern SkyImage Credit & Copyright: Carlos Fairbairn

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 – Oct/2016
by President Mark Baker

Greetings from Southeast Asia... I was really looking forward to this trip with the hopes of taking in many Southern Hemisphere objects. Unfortunately, both Thailand and Malaysia pretty much were shrouded by cloud cover except for one night, when I was briefly able to pick out Mars, Saturn, parts of Scorpio, and some of The Teapot. At latitude 3 degrees north, Polaris is barely visible in comparison to how we see it at our latitude 33 north.

So, onto Singapore at its latitude 1 degree north and hopes for some clearing up. We met with TASOS and were treated to the nice, city provided facility that they docent and use every Friday night, and the clouds did break up somewhat so even a few Messier objects were visible. But the highlight was the ISS flyover which, at -2.7 magnitude, was exceptionally bright and of the longest duration I can remember ever...but location has a lot to do with that for sure.

Tonight, as I write this, has been the clearest skies of our trip...again, the standard objects were plainly visible, including a very bright Venus also. But here is the catch...Singapore ranks at the very top of light polluting cities in the world. The chance of seeing ANYTHING not on the plain of ecliptic is somewhere between slim and none...how very disappointing, And sad...

I will give it another shot late tonight and even tomorrow night, but the problem with light pollution, unlike clouds, is that it doesn't "clear up"...it just gets worse!!! So next time we bemoan the lack of dark skies in our communities, be grateful for what we have...and commit to standing up for clear, dark skies and oppose any that want to encroach on an already tenuous position. I don't want our area to become another Singapore!!

Clear, Dark Skies my Friends…

Looking Up – Oct 2016
by Curtis Croulet

First Quarter Moon is October 8 at 9:33 PM PDT; **Full Moon** is October 15 at 9:23 AM PDT; **Last Quarter Moon** is October 22 at 12:14 PM PDT; **New Moon** is October 30 at 10:38 AM PDT.

Mercury is in the morning sky as October begins. It should be visible – in the morning – for the first ten days or so.

Venus is in the evening sky. It's still a gibbous shape, mag -3.9. Greatest eastern elongation is January 12, 2017. Venus reaches inferior conjunction (between the Sun and the Earth) on March 25, 2017.

Mars moves zips across Sagittarius from north of the "teapot" to well east of the "teapot." Amazingly, Mars remains viewable – but small – until late in the evening throughout October.

Jupiter moves into the morning sky in October.

Saturn remains in southern Ophiuchus. It sets early, around 8 PM by the end of October.
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 eight meteor showers for October: **Sextanids** (late September-early October); **October Camelopardalids** (October 5); **Draconids** (October 8); **Taurids** (October 10); **Delta Aurigids** (October 11); **Epsilon Geminids** (October 18); **Orionids** (October 21); and **Leo Minorids** (October 24). Most of these are sparse. The Orionids have good years, but 2016 isn't one of them.

Of these showers, the one most worthy of our attention is the **Draconids** (formerly called the Giacobinids). The Draconids have produced rare meteor storms, the last storm as recent as 2005. Even better, the radiant is highest in the evening. The Moon is at first quarter that night.

Let's look up.

Last month we were talking about planetary nebulae. As I explained then, planetary nebulae are unrelated to planets.

One nice thing about planetary nebulae is that many of them are visible in the telescope in less-than-ultimate dark skies. Early in my "career" in amateur astronomy, I observed quite a few of them from suburban San Diego with an 8-inch reflector.

In my September essay I spent some time talking about the Ring Nebula (M57) in Lyra. The Ring Nebula is easily visible in small telescopes. In binoculars it looks like a star. The Ring is much smaller than observatory photographs seem to suggest. You'll find the Ring between the stars at the south end of Lyra's parallelogram pattern. As always, a dark sky helps immensely. Once you've found the Ring, you'll probably want to crank the magnification to over 100x for a better view. The Ring is about 2,300 light years away.

The other standout planetary nebula at this time of year is the Dumbbell Nebula (M27) in Vulpecula. It's just a bit north of the tip of Sagitta's arrow. The Dumbbell is easily visible in binoculars as a small, fuzzy patch. Viewed in the telescope, the Dumbbell may show two lobes within a football-shaped shell. This has never looked to me much like a "dumbbell," as I've always understood the term. Neither *Burnham's Celestial Handbook* nor *Stephen James O'Meara's Deep-sky Companions: The Messier Objects* identify the originator of the nickname. The Dumbbell is about 1,400 light years away.

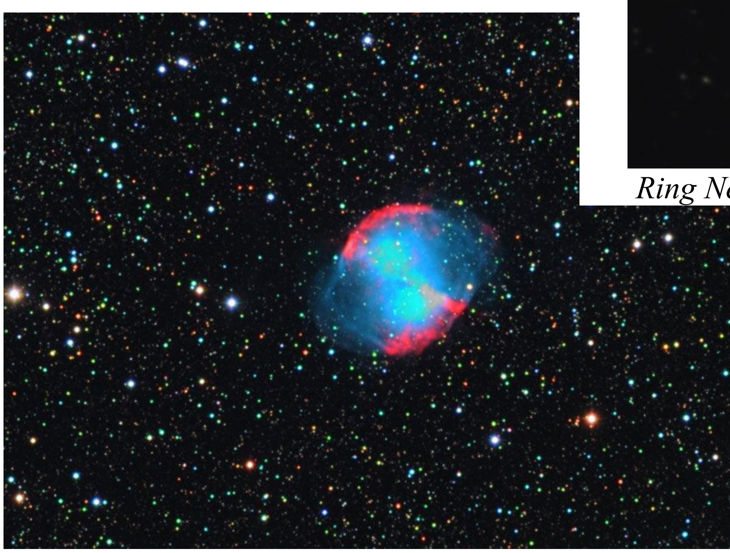
One of my very favorite deep-sky objects is the planetary nebula NGC 7293, often called the Helix Nebula. The Helix is just east of the boat-shaped pattern of Capricornus. At mag 7.3 the Helix is one of the brightest planetary nebulae, but it's so large and spread out that you may not be able to see it in a telescope from the suburbs. Here in Anza the Helix is easily seen in binoculars as a fuzzy blob. In the telescope, an OIII ("oh-three") or UHC filter will do wonders to enhance its contrast. In contrast to the Ring, you'll want to use low magnifications on the Helix, say 50x or 60x at the most. It may disappear at higher powers. In photographs the Helix looks like a giant version of the Ring. The situation is similar: we're looking down a twisted tube of dust and gas that have been ejected from a dying star. As to the name, I'm not sure that I see a "helix" in the nebula. Lately some people have called it the "Eye of God." The Helix is about 700 light years away. It's possibly the closest of the planetary nebulae, although I suppose some dissipating remnants of others could be closer.

There are other, smaller, fainter planetary nebulae scattered around the late-summer-early-autumn sky. An examination of the Milky Way areas of the charts in Sky Atlas 2000.0 will reveal many of them. One very nice planetary nebula is NGC 6781 in Aquila, which looks in the telescope like a small, faint disk. There are many really tiny planetaries that are very difficult to identify visually, because they look like stars. You might try holding an OIII filter between the eyepiece and your eye. Try holding an OIII filter between the eyepiece and your eye, then move it away, going back and forth. The light of the planetary should hold steady, while the field stars go dim with the filter.

This month I've included images of the Ring Nebula (M57), the Dumbbell Nebula (M27), and the Helix Nebula (NGC 7293). The Ring and Helix were shot this summer through my TEC 140 refractor (140mm or 5.5-inches aperture), and the Dumbbell through my TeleVue NP101is refractor (101mm or 4-inches aperture) in 2013. The image of the Ring is an extreme crop from the original image. A larger scope with a much longer focal length would be a better match for this small nebula.

Clear skies.

Ring Nebula (M57) by Curtis Croulet



Dumbbell Nebula (M27) by Curtis Croulet

Helix Nebula (NGC 7293) by Curtis Croulet

Random Thoughts
by Chuck Dyson

"The time has come to talk of many things" the walrus said and in this month's ramble I would like to talk of many things also. The first item on my list is a curious book review that I read on a book of poetry, now I like to read book reviews as a rule but mostly I get reviews on science books and they tend to be one to two columns long, most curiously in the July-August issue of the American Scientist there is a three and a half page review of a small poetry book. What the heck is going on here? The book is called *The Xenotext* and the author Christian Bök is a poet that apparently likes to see his works translated into real life entities and in the case of *The Xenotext* the poems are written so that each line is broken up into two segments and each segment starts with a letter that corresponds to an amino acid and its base pair that make up a strand of DNA or RNA and then the code for the gene strand is sent to a biotech lab where the actual gene is engineered and then to a biological lab where the gene is turned into a plasmid, a complete gene with start and stop sequences added, and injected in to a bacteria. If all goes well the bacteria starts making the protein that the lines in the poem call for and thus produces its own copy of the book. Mr. Bök's ultimate goal is to have the polyextremophile (a bacterium that can live in vary unfavorable environments) Deinococcus radiodurans produce the book in, a protein sort of way, and as D. radiodurans has been around for about three and a half billion years and shows no signs of slowing down and no interest in going on the endangered species list the book then becomes immortal. Now D. radiodurans performs this little trick of survival by having a very good and active gene repair system, in fact Mr. Bök is having great difficulty in getting the bacterium to produce his poems without censoring and editing them. I think you can now see why Mr. Bök's poetry book was reviewed in a science publication and my interest in it is as we edge closer and closer to a real and sustained presence in space we have to face two very harsh realities

The first is the unavoidable fact that chemical rockets are just not what are needed or practical for interplanetary manned missions and supply missions for bases once the bases are established at locations other than low Earth orbit. Although today's rockets have lots of power (the RD-180 engine on the Atlas rocket generates 1688 kN of thrust [a kN is 1000 Newtons and a Newton is the force needed to accelerate a 1 kilogram mass up to a speed of 1 meter/sec in 1 second]) the biggest rockets with multiple engines gulp fuel and oxidizer in the range of one ton per second and although smaller rockets gulp fuel at a smaller rate none of today's rocket engines are going to get the EPA good seal of approval. The main reason that we do not have a Moon base is that resupply with chemical rockets would just be too darned expensive and it would also be good to remember that Mars, the second closest planet to Earth, and the only rocky planet cool enough to land on, is 180 times farther from Earth than the Moon - just imagine the fuel bill to resupply a base there. I think that as soon as mankind understood what the planets and stars were, he has had the dream of traveling to them. But until now human space travel has been just that, a dream. Now we are as the Moody Blues said in their second album "On the threshold of a dream" and the little rocket that could let us finally scoot around the solar system and operate supply lines in an economical fashion is, Ta Da, the ion drive engine. If you want to know anything at about ion engines go talk to Marc Rayman the chief engineer and mission director of the Dawn mission. Marc, he's the guy with the permanent smile on his face, is the god father of the Dawn spacecraft and the smile is because although Dawn was not the first ion drive spacecraft, following its launch in 2007, it has really demonstrated the potential of ion engines, and has done some great science too. The difference between an ion engine and a chemical engine is the ion engine kicks out a small number of atomic nuclei at high speed and a chemical engine kicks out a huge number of atoms at a relatively low speed. The ion engine, by kicking out atomic nucleus at high speed, gets four to seven times more acceleration per kilogram of fuel than a chemical rocket. To be sure Dawn's engine has the power of a sick hummingbird, at full throttle the engine will accelerate Dawn from 0 to 60 mph in four days, now I know that is not a jaw dropping rate of acceleration but remember that because the Dawn engine uses, at full throttle, 0.283 kilograms of fuel per day, it can and has burned for weeks and that little push over time has a very large effect on speed and direction. Dawn is of the first generation of ion engines. The second generation engine (the NEXT engine) is out of prototype testing and should be ready for flight in 2019 and it will have four times the thrust of the Dawn engine, imagine an ion engine that can accelerate the Dawn spacecraft from 0 to 60 in only one day. Before you go and poo poo this new ion thruster that arguably has just the power of a healthy hummingbird it would be good to remember that in 1926, Dr. Goddard's first liquid fueled rocket had a burn time of two seconds, reached a height of 41 feet, and had an average speed of 60 miles per hour; forty three years later the crew of Apollo 11, on top of a Saturn V rocket, had a very different experience. So what will ion and their cousins plasma engines look like in the next forty three years? They will probably be the power plants on the delivery trucks and commuter trains of the solar system.

The second harsh reality that we must face in space is radiation exposure. By convention, the amount of radiation that we receive is measured now in Sieverts (Sv) and this represents a standard exposure independent of the source or type of radiation; in general it is accepted that a one year exposure to 0.05 Sv is acceptable as long as the individual's total five year exposure does not exceed 0.1 Sv (acceptable is a 3% increased risk of dying of cancer). On Earth we are protected from radiation by two magnetic bubbles, one generated by the Earth and one generated by our Sun; however, the strength and effectiveness of these bubbles can and does vary greatly over short periods of time and the best example of this is the different levels of radiation that the astronauts on the six Apollo Moon landings were exposed to over their ten days in space, their exposure ranged from 0.0018 Sv to 0.0114 Sv. If one now considers a five hundred day Mars mission then the problem of radiation exposure becomes huge. What to do? NASA has only a few options; one, faster rockets for shorter transit times; two, better shielding on spacecraft and spacesuits against all types or radiation; three, have the astronauts live underground and explore by operating robots by remote control (sort of defeats the purpose of sending them there doesn't it); four, create Homo sapiens spacii with a DNA like the DNA of the bacterium D. radiodurans that I mentioned in the first random thought and is very efficient at repairing radiation damage and thus is very able to survive for extended periods in space with no ill effects. With all of the fuss over genetically modified organisms (GMO) food there will probably be some moral, ethical, and religious fuss over genetically modified people (GMP) but think of the advantage if GMPs were 10 times less sensitive to radiation than H. sapiens and the shielding of spacecraft and space suits were 10 times more effective, then radiologically safe missions could be 100 times longer than today's missions. As for Mars, forget Mars. With my new radiation resistance and ion engines, I am heading for Jupiter's moon Callisto although I still need to stay away from the other three moons as they are way too radiologically hot even for the new me.

Until the next month

Cheers
Chuck

In Memory of Dr. Robert H. Goddard
1882-1945

In 1920 Dr. Goddard published, in the Smithsonian, a paper entitled "A Method for Reaching Extreme Altitudes". The paper stressed that rockets could be used to go to the Moon. The editorial staff of the New York Times read the paper and denounced Dr. Goddard as a fool and declared this theories folly.

On July 16 1969 Apollo 11 launched for the Moon.

On July 17 1969 the New York Times published the following retraction: "it is now definitely established that a rocket can function in a vacuum as well as in an atmosphere. The Times regrets the error."

The book mentioned in Random Thoughts is: *The Xenotext: Book 1*. Christian Bök. 200pp. Coach House, 2015.

One Incredible Galaxy Cluster Yields Two Types of Gravitational Lenses
by Ethan Siegel

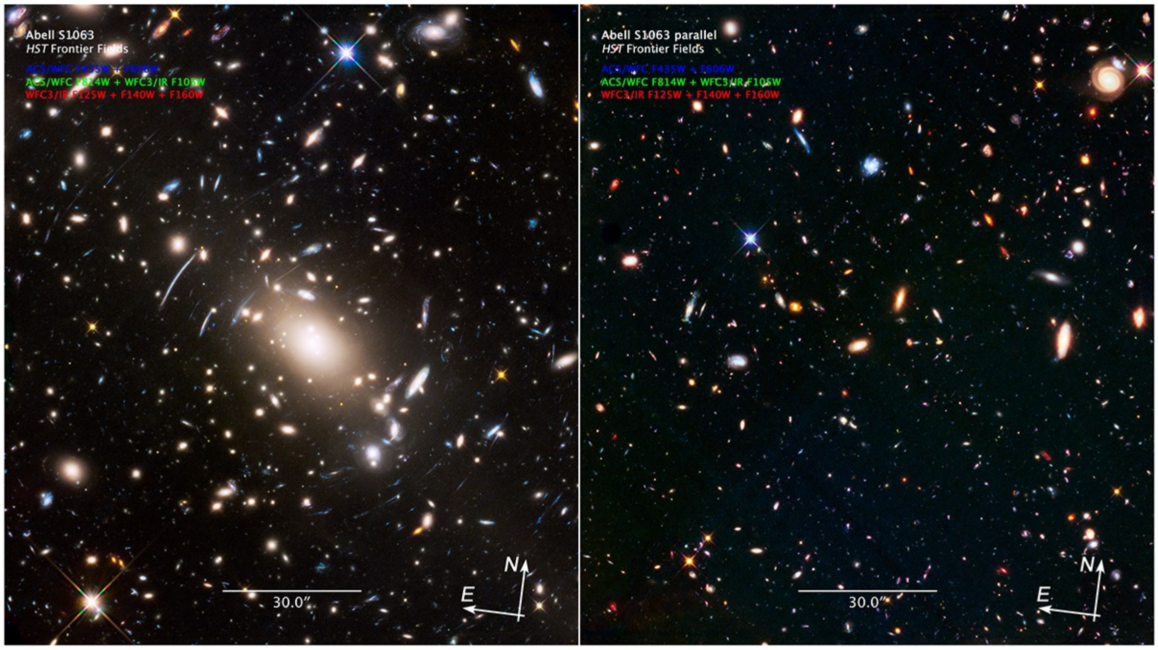
There is this great idea that if you look hard enough and long enough at any region of space, your line of sight will eventually run into a luminous object: a star, a galaxy or a cluster of galaxies. In reality, the universe is finite in age, so this isn't quite the case. There are objects that emit light from the past 13.7 billion years—99 percent of the age of the universe—but none before that. Even in theory, there are no stars or galaxies to see beyond that time, as light is limited by the amount of time it has to travel.
But with the advent of large, powerful space telescopes that can collect data for the equivalent of millions of seconds of observing time, in both visible light and infrared wavelengths, we can see nearly to the edge of all that's accessible to us.

The most massive compact, bound structures in the universe are galaxy clusters that are hundreds or even thousands of times the mass of the Milky Way. One of them, Abell S1063, was the target of a recent set of Hubble Space Telescope observations as part of the Frontier Fields program. While the Advanced Camera for Surveys instrument imaged the cluster, another instrument, the Wide Field Camera 3, used an optical trick to image a parallel field, offset by just a few arc minutes. Then the technique was reversed, giving us an unprecedentedly deep view of two closely aligned fields simultaneously, with wavelengths ranging from 435 to 1600 nanometers.

With a huge, towering galaxy cluster in one field and no comparably massive objects in the other, the effects of both weak and strong gravitational lensing are readily apparent. The galaxy cluster—over 100 trillion times the mass of our sun—warps the fabric of space. This causes background light to bend around it, converging on our eyes another four billion light years away. From behind the cluster, the light from distant galaxies is stretched, magnified, distorted, and bent into arcs and multiple images: a classic example of strong gravitational lensing. But in a subtler fashion, the less optimally aligned galaxies are distorted as well; they are stretched into elliptical shapes along concentric circles surrounding the cluster.

A visual inspection yields more of these tangential alignments than radial ones in the cluster field, while the parallel field exhibits no such shape distortion. This effect, known as weak gravitational lensing, is a very powerful technique for obtaining galaxy cluster masses independent of any other conditions. In this serendipitous image, both types of lensing can be discerned by the naked eye. When the James Webb Space Telescope launches in 2018, gravitational lensing may well empower us to see all the way back to the very first stars and galaxies.

If you're interested in teaching kids about how these large telescopes "see," be sure to see our article on this topic at the NASA Space Place: http://spaceplace.nasa.gov/telescope-mirrors/en/



Galaxy cluster Abell S1063 (left) as imaged with the Hubble Space Telescope as part of the Frontier Fields program. The distorted images of the background galaxies are a consequence of the warped space dues to Einstein's general relativity; the parallel field (right) shows no such effects. Image credit: NASA, ESA and Jennifer Lotz (STScI)

To teach kids more about Venus and Jupiter, visit the NASA Space Place webpages titled “All About Venus” [http://spaceplace.nasa.gov/all-about-venus/en/] and “All About Jupiter” [http://spaceplace.nasa.gov/all-about-jupiter/en/].

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The TVA is a member club of The Astronomical League.