Desert Skies

Tucson Amateur Astronomy Association

Observing our Desert Skies since 1954

Fall 2016 Volume LXII, Issue 3

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## Take Note!

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# *Sharpless 2-112—Emission Nebula*

***This is Sharpless 2-112 as photographed by TAAA member Larry Phillips. This emission nebula is 5670 light years away. At this distance, it is 25 light years across. Although appearing in the sky near Deneb in Cygnus, it's actually twice as far away as is the star.***

***This narrowband image required 22 hours of exposure. Larry used the Hubble color palette (SII is mapped to red, H-alpha mapped to green, OIII mapped to blue). Larry used an Astrophysics Starfire 140EDT f/7.5 telescope and a SBIG ST-10XME camera. For more information about this image (and more astrophotos), visit Larry's website at http://www.sonorandarkskies.com/. Used by permission. © 2014 Larry Phillips***

***The Sharpless catalogs were compiled by American astronomer Stewart Sharpless while at the US Naval Observatory in Flagstaff, AZ. He published his first catalog, abbreviated Sh1, in 1953. It contained 142 HII emission regions in the Milky Way. The Sh2 catalog, published in 1959, consisted of 312 nebulae. These catalogs were based on the Palomar Sky Survey which was completed in 1958. Many of the objects in the Sharpless catalogs have Messier, NGC, and other designations.***

*Sources: Wikipedia, sonorandarkskies.com*

Our mission is to provide opportunities for members and the public to share the joy and excitement of astronomy through observing, education and fun. We fulfill this by providing Astronomy Services to schools, church groups, scout troops, and convention organizers. We support many organizations in the Tucson area that are involved in Science, Technology, Engineering and Mathematics (STEM) programs. Our members enjoy observing the night sky under the dark skies that our observing sites offer. We are an all-volunteer, tax-exempt, non-profit, 501(c)(3) organization.

**Frequency**

*Desert Skies* is published quarterly by the Tucson Amateur Astronomy Association, PO Box 41254, Tucson, AZ 85717.



**Publishing Guidelines**

*Desert Skies* is published quarterly, near the dates of solstice and equinox. The deadlines for publication are March 1st, June 1st, Sept 1st, and Dec 1st. Email submissions to the editor at taaa-newsletter[at]tucsonastronomy.org. Submissions should be in the form of a text or Microsoft Word compatible file. Photos and artwork are encouraged. Please send these as separate attachments with resolution of at least 200 dpi (higher is preferred). Submissions are retained by the editor unless prior arrangements have been made. Copyrighted materials will not be accepted unless permission to use is clearly stated. We will not publish slanderous or libelous material. All copyrights retained by Tucson Amateur Astronomy Association, Inc. or the original author.

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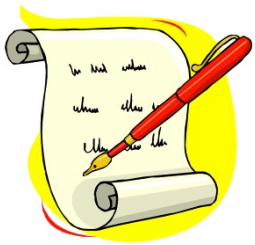


# From Our President

Welcome to the Fall observing season. The Fall Constellations will soon be rising at a convenient hour and we still have the magnificent Summer Constellations to view as well. I hope that the coming viewing season finds you all ready to enjoy the excellent observing opportunities to come. The TAAA continues to work to improve your astronomical experience by looking to improve our facilities and club structure.

Ground has been broken on the Reynolds-Mitchell Observatory at the Chiricahua Astronomy Complex (CAC)! This exciting facility will provide members with views from a magnificent 40" Dobsonian telescope along with a superb facility to house it. The current forecast is for First Light in early 2017. Many thanks to TAAA member Bob Reynolds for his generous donation. Bob has also contributed generously towards the completion of the Large Roll Off Roof Observatory, which is moving from concept to reality. This structure will include four mounted scopes, including a fine 9" folded refractor donated by Bob.

In order to build on the momentum provided by Mr. Reynolds' donations, the TAAA has engaged the services of "Raise The Bar", a consulting firm with extensive experience in the field. We are currently making plans for a fundraising campaign to amass significant donations to be applied towards the completion of the CAC Master Plan. Working closely with our consultants, members of the Fund Raising Committee are crafting strategies and materials and will soon begin the campaign in earnest.

TAAA is also moving to address the need to manage elections and volunteer opportunities by creating the "Nomination and Volunteer Resource Committee". This standing committee will replace the ad hoc "Nominations Committee" and manage the TAAA Board of Directors nomination and election process. In addition, the committee will be charged with creating and managing a database of potential volunteers. This is expected to greatly assist the TAAA Board of Directors and our various leaders when resource needs arise by quickly matching them to suitable candidates. Please be responsive to the members of this committee as they begin to work and reach out to the TAAA membership for potential volunteers.

As you can see, things are moving forwards for TAAA. Please do not hesitate to contact myself, or any TAAA Board of Directors member or leader with feedback and ideas for the future. Let's all work together to make TAAA the best organization possible.

*Ben Bailey*

# Observing and Imaging

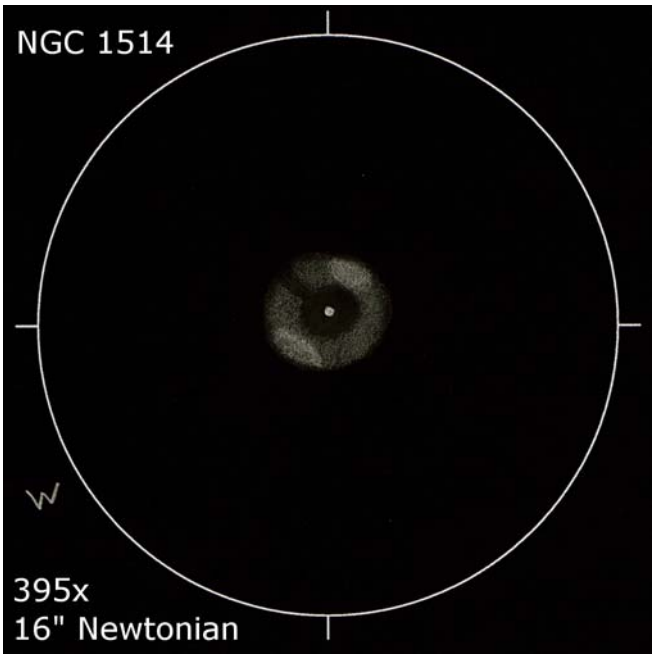
## Planetary Nebulae of the Quarter – Fall 2016

Text and Drawings by Christian Weis (weis[at]astroweis.de)

Planetary nebulae (PN) are fascinating objects which come in numerous forms or appearances. Besides the well-known grand four Messiers (M27, M57, M76 and M97), there are hundreds more to explore. This article suggests two PNs, a pretty bright and easy-to-observe one, and a harder one for the more ambitious observer who is equipped with a bigger scope.

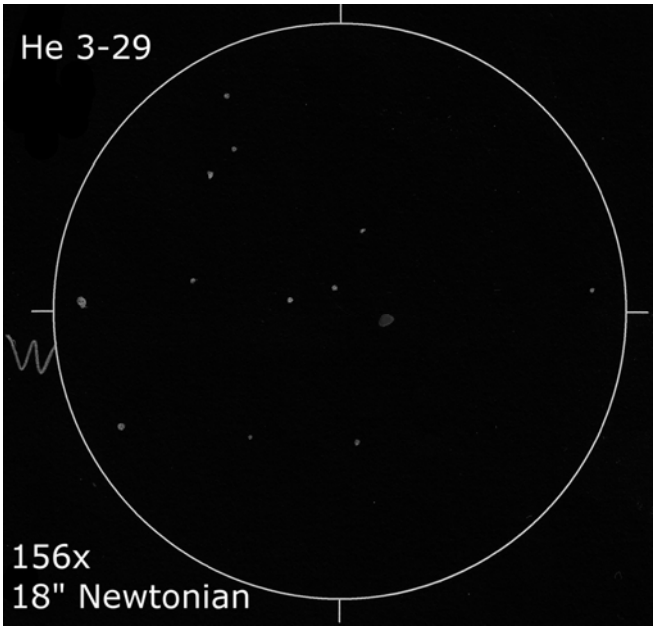
To the best of my knowledge, there are six planetary nebulae in Taurus. Only one has made it into the NGC list: NGC 1514. This object was discovered by William Herschel in 1790 and is also called the Crystal Ball. Smaller telescopes will first show the bright central star that can easily outshine the nebula. Inserting a nebula filter (UHC or OIII) will reduce the brightness of the glaring central star and will enhance the contrast of the nebula itself. Larger telescopes reveal a wonderful example of what mother nature is capable of. The PN appears ring-shaped and full of structure. I observed NGC 1514 on several occasions, e.g. in October 2010 at Kitt Peak and noted: Very bright central star, ring-structure, medium in size, low magnification already reveals ring-structure, best seen at 395x, circular, open in the S; E and W a little brighter, [OIII] helps by reducing the central star's brightness; 395x, fst 6m5 (Cet)

**NGC 1514**
RA: 4h 9.3min
Dec: 30° 47´
Constellation: Taurus
Brightness: 10m9
Central star: 9m5
Size: 2 arcmin
Distance: 2000 ly




PK 174-14.1 is one of the other planetary nebulae in Taurus. This object was discovered by the US-American astronomer and astronaut Karl Gordon Henize, who compiled a list of more than 2000 planetary nebulae in the 1950s. Therefore, this object is also called Henize 3-29 or short He 3-29. This object is rather dim and you will need some aperture in order to be able to see it. Assuming that 15m3 is correct, an 18" telescope should show this object when sky transparency is very good (faintest star >7mag). However, since I saw this object with my 18" "only" having a faintest star of 6m8, I believe that He 3-29 is brighter than 15m3. A friend of mine has even seen it with a 16" Dobsonian, so if you have that large an aperture: give it a try. PK 174-14.1 is a rather unknown PN off the beaten paths. My notes to this object: Pretty faint object that can barely be seen with averted vision at 94x when the exact position is known, good response to UHC at 156x, but OIII is too strong, using averted vision, the object can be seen permanently but only a fraction of the time directly, higher magnifications as well as filters do not help any further; 156x, fst 6m8 (Gem)

**PK 174-14.1 (He 3-29)**
RA: 4h 37.3min
Dec: 25°03´
Constellation: Taurus
Brightness: 15m3
Central star: 15m7
Size: 20 arcsec
Distance: no data



# Observing and Imaging


## The Central Trio

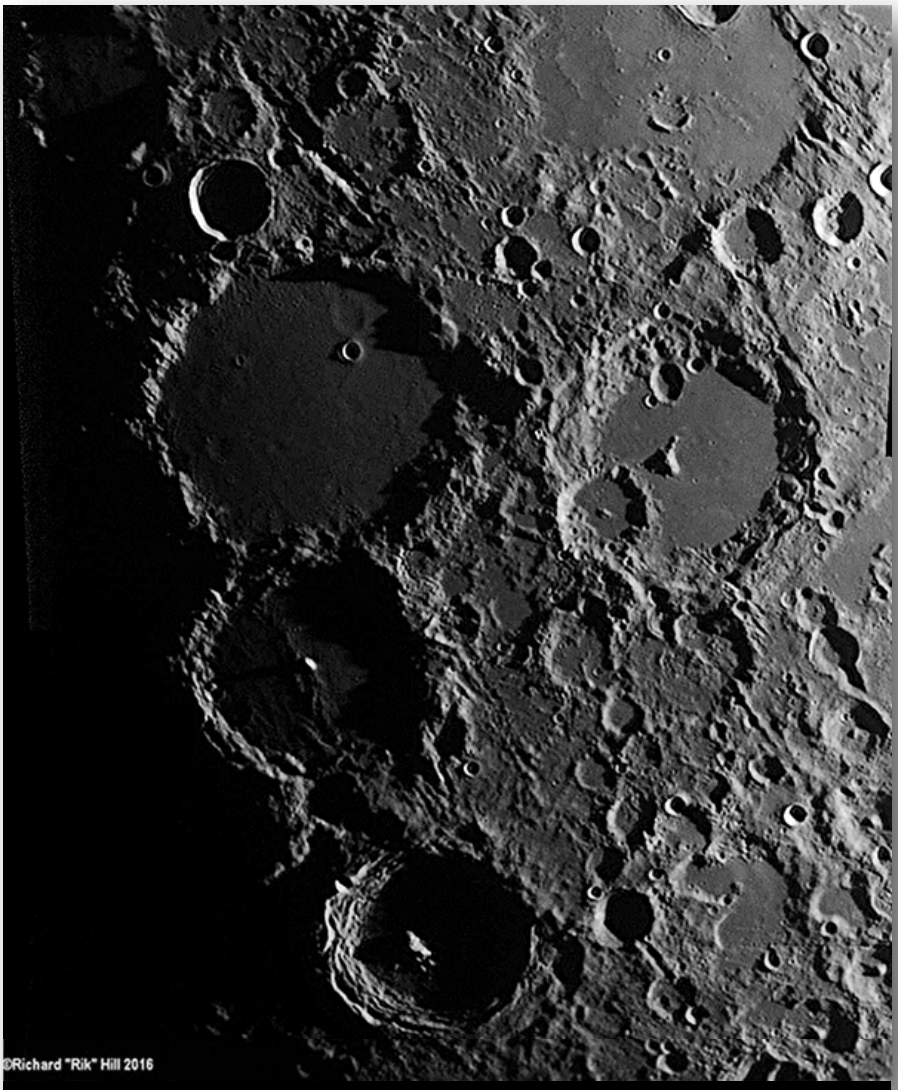
Text by Rik Hill (rhill[at]lpl.arizona.edu)

In my last article I pointed you to lunar software and website. Now let's use it.

About a day after first quarter you can catch sunrise on this trio of craters just southwest of the center of the moon. For those just starting lunar observing these three are often the first craters identified. I know that was true for me. The largest crater with the flat floor is the 158km diameter Ptolemaeus. These big flooded craters used to be called "walled plains". The little crater inside of Ptolemaeus is Ammonius. Back in the 1960s when I was the tyro lunar observer, this was called Lyot which, thanks to the IAU is now a large crater near Mare Australe. Below Ptolemaeus is the 121km crater Alphonsus. This crater has been famous several times over. Two astronomers at Pulkovo Observatory reported an emission flare near the central peak of this crater on Nov. 3, 1958. It was attributed to the escape of gas of a fluorescent nature. The observation has never been repeated and thus remains anomalous. Then on March 24, 1965, Ranger 9 impacted the floor of Alphonsus with live images being broadcast on television. I remember the excitement as we watched image after image come in. The bottom crater is the 100km Arzachel with its great terraced walls.

Just to the right of Ptolemaeus is the 139km Albategnius with the 46km Klien on the lower left wall. You can see most of Hipparchus (155km) at the top of this image. Notice the diagonal scaring (lower right to upper left) across the illuminated region to the right of the trio. These were carved by boulders, city sized boulders at that, that were thrown out during the great Imbrium impact. What a sight that must have been!

The image capture information is provided to the right. Further processing was done with Registax6, GIMP and IrfanView with final assembly of the two images done with AutoStitch.




The Trio. North is up. Photographed by Rik Hill on June 13, 2016 at 0244UT using a TEC 8" f/20 Maksutov Cassegrain and a SKYRIS 445M Camera operating at 656.3nm. This image is a compilation of 600 out of 3000 separate images. The seeing was 9 out of 10. Used by permission © Richard "Rik" Hill 2016, Loudon Observatory, Tucson, AZ.

# Observing and Imaging

## Constellation of the Season: Gemini - The Twins

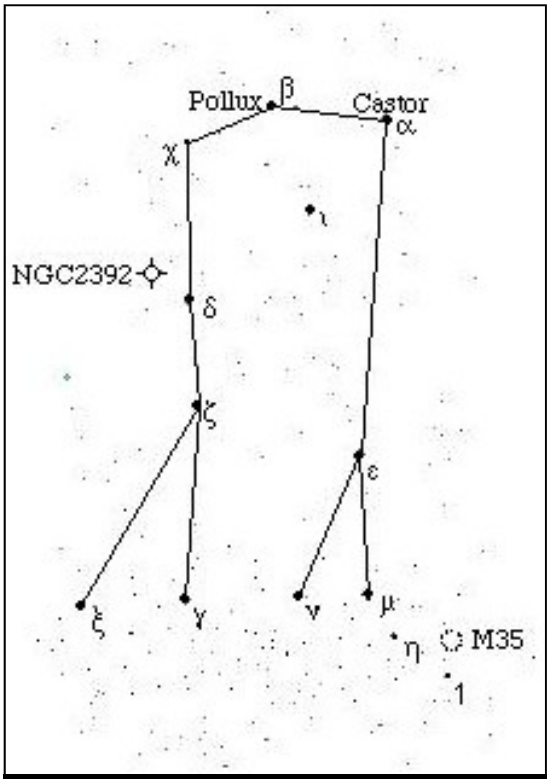
Text and artwork provided by Chris Lancaster

To the Chinese, they were yin and yang, the dual forces of nature. In ancient Rome, the pair was sometimes seen as Romulus and Remus, the founders of that city. Classical mythology gives us the traditional names of the two bright stars that represent the twins Castor and Pollux, who were hatched from an egg created by the seduction of Leda by Zeus while he was in the form of a swan. After Castor and Pollux were raised by Chiron, a centaur, they joined Jason and the crew of the Argo on his journey to find the Golden Fleece. The twins helped to calm a terrible storm that they encountered while at sea, and, as a result, became known as protectors of sailing vessels.

Gemini stands above Orion's left shoulder with the twin's feet within the winter Milky Way. If you ever confuse the two stars of Castor and Pollux (Alpha and Beta Geminorum, respectively), just remember that Castor is nearer to Capella (in Auriga), and Pollux is nearer to Procyon (in Canis Minor), or that Pollux has a Pinkish tint since it is a K type star while Castor is of a bluish white type A. At first glance, Castor may appear as a single star, but it is actually a system of six stars, divided into three pairs which can be split with just about any telescope. The closest pair are 2" apart, and so require magnification of perhaps 180X or more, and appear like two brilliantly white beacons of magnitudes 2 and 3. The third pair appears as a 9th magnitude star 73" from the main quartet. None of these can be resolved individually.

Due to Gemini's proximity to the Milky Way, the constellation is rich in star clusters and nebulae but lacks any significant galaxies. The most impressive star cluster is the 5th magnitude open cluster M35. Located at RA 6h 08.8' Dec +24d 20', or approximately 2.5 degrees to the northwest of Eta Geminorum, this cluster, about 2,800 light years distant, contains about 120 stars in an area spanning half of a degree. Just on the edge of M35 is a small open cluster, NGC2158, that is easy to overlook if you become lost in the splendor of M35, but you will see a separate fuzzy patch of less than 10' in size that just overlaps M35 on its southwestern limb. Two other similarly sized open clusters are nearby. IC2157 is about 2' west of NGC2158, and NGC2129 is about 3' west of 1 Geminorum. These small clusters are a nice challenge even under dark skies.

An interesting planetary nebula resides in Gemini one degree south and 9' east of Delta Geminorum. Designated NGC2392, the popular name of this object is the Eskimo Nebula because of the way it resembles a face wrapped in a fur lined hood in photographs. Through a telescope, however, don't expect to see much more than a faint 8th magnitude fuzziness about 45" wide at RA 7h 29.2' Dec +20d 55'.



Gemini

If you find yourself observing Gemini in December, remember that the Geminid meteor shower peaks on the 13th, with the radiant very near Castor. These 22 mile-per-second meteors may produce 15-20 bright meteors and up to 40 additional fainter ones per hour.

*The Constellation of the Season, written by Chris Lancaster, is the basis of his book, "Under Dark Skies - A Guide to the Constellations, Trafford Publishing (http://bookstore.trafford.com/Products/SKU-000158114/Under-Dark-Skies.aspx). While the information was accurate at the time of the original writing, the reader should be aware that the sky does change over time. In particular, separation and position angles of double stars may have increased or decreased. This article is presented as originally written. Consult current observing resources for correct separations and position angles. ©2008 Used by permission.*

## Featured Article

# Skyward—October 2016

Text and Photo by David H. Levy, TAAA Past President

## A Streak of Light

It was a flash, a single streak, of light that got me started in astronomy almost sixty years ago. I have written in this column about this event before, but in thinking about it, I want to refer to it again. The streak could not have lasted more than a second that clear evening of July 4, 1956. I was terribly homesick. At age 8, just four days into my first summer away from home, I had already written to beg Mom and Dad to rescue me from that lonely place. I did not understand at the time that they needed a break from me, and that no matter what happened, I wasn't going home until the end of the summer.

The sky was clear that warm summer evening as children and staff gathered around the softball field to enjoy a fireworks display in celebration of the fourth of July. As a young Canadian I didn't know anything about what the United States Day of Independence stood for. As the fireworks wound down the youngest groups, including mine, were dismissed for the night. We began walking up the hill towards Bunk B.

As we strolled up the hill, my glance accidentally turned toward the darkening sky above me. Stars were coming out. I saw one bright star high in the east, and many fainter stars around it. It was beautiful, though I had no idea yet what this beauty would eventually mean to me. I just gazed upward.

Then it happened. A streak of light scratched the sky flying towards that brightest star. Startled, I asked the others if they had seen it too. Since none of them had been looking upward, they all said no. Interestingly, none of the other children teased or made fun of me or my observation. Far ahead of its time, this particular camp had no place for bullying, and the children were always treated with respect. I looked again at the sky. Is it possible, I thought, that this shooting star was meant just for me?

I simply placed that little memory in my 8-year-old brain where it rested for about a year until October 4, 1957. I recalled it when I was told that the Russians had launched a rocket into orbit around the Earth. To me, that dawn of the space age was intensely private because I could relate it to something I had seen personally. The image of the meteor rested again until June of 1960, when a bicycle accident and a get-well present of a book about astronomy brought the memory to the forefront again. This time it stayed there. This time I was hooked.

I know now that my first meteor was from the Omicron Draconid meteor shower, an annual event confirmed at about that same time by a young astronomer named Brian Marsden. It is possible that my shooting star was the first visual sighting of an Omicron Draconid meteor. I've seen more since, and on July 4, 2005, photographed one that happened to be passing in front of Comet Tempel just minutes after the Deep Impact Spacecraft crashed into the comet.

**July 4, 2005—Less than an hour after the Deep Impact spacecraft crashed deliberately into Comet 9P Tempel, David Levy captured this meteor, probably an Omicron Draconid similar to the one he saw in 1956, crossing directly in front of Tempel's comet.**

Over the next several decades I saw thousands more meteors. But I'll never forget that distant night, at the dawn of my life, where I saw my first shooting star that ushered in a lifetime passion for the night sky.

*Read more issues of David Levy's "Skyward" article on his website at http://jarnac.jarnac.org/*

# Featured Article

## *Is Proxima Centauri's 'Earth-like' planet actually like Earth at all?*

By Dr. Ethan Siegel

Permission to use this article granted by the NASA's Space Place.

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.**

*This article is provided by NASA Space Place.*
*With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology.*
*Visit spaceplace.nasa.gov to explore space and Earth science!*

# TAAA News

## TAAA Financial Statement for End of Fiscal Year

Text by Ed Foley, TAAA Treasurer (treasurer[at]tucsonastronomy.org)

The Tucson Amateur Astronomy Association is a financially sound club with substantial activities that each year are fully covered by dues and donations. A typical year is represented by some of the highlights of our fiscal year ending June 30, 2016, shown at right.

Our many activities such as school star parties, the Grand Canyon Star party, and maintenance on our owned property have been more than supported by the annual income generated by members and our paid Astronomy Services events. All costs of our ordinary activities have been fully covered by our regular income.

In addition, we have been developing our dark site the Chiricahua Astronomy Complex for the past seven years using donated funds for capital projects at the site. Funds are collected from donors for specific projects and undertaken when they are fully funded. Over the years, the investment at CAC has grown to over $600,000.

The organization has no debt and maintains cash in our operating checking account in excess of double the operating costs of the past year. Our excess cash is held in a reserve account and in our Tucson Astronomy Endowment Fund to support the long term needs of TAAA.

Highlights of Fiscal Year Ending June 30, 2016

*Income*

| | |
|---|---|
| Member Dues collected for the year | $7679 |
| Astronomy Services Income (paid star parties) | $5105 |
| Gain on sale of Aged Assets | $1721 |
| Unrestricted Cash Donations to TAAA | $909 |

*Expenses*

| | |
|---|---|
| Insurance covering property and volunteer activities | $1757 |
| Maintenance of our owned property | $1608 |
| CAC utilities and TAAA support | $1554 |
| Supplies | $1231 |
| TIMPA maintenance fee | $1200 |
| Bulletin postage/printing (monthly bulletin and Fundamentals course) | $538 |

## Classified Ad

**For Sale: Celestron NexStar SE 8** $1,400 (originally purchased in Dec 2016) Price includes: original Celestron packaging and shipping materials; telescope with mount and computerized drive; 2-year factory warranty; AC adapter with 50 ft extension cord; CDs and Owner's Manual with Celestron NexRemote sotware CD; Tel-Rad spotter scope (w/base mounted on tube); Celestron 1.25" eyepiece and filter kit in aluminum case containing five Plossl eyepieces (6mm, 13mm, 17mm, 25mm, 32mm, 2X Barlow lens, six colored filters, 1 1/4" Star Diagonal. For more information, see Owner's Manual at http://www.ou.edu/lunarsooners/index/Member_Resources_files/orange.pdf. Contact Spence Howell, 912-658-6008 (cell)

## Upcoming Globe at Night Campaigns


***Nov 20 - Nov 30***

***Dec 20 - Dec 30***

**http://www.globeatnight.org/**

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