

# Temecula Valley Astronomer

The monthly newsletter of the Temecula Valley Astronomers

October 2014

## Events:

**General Meeting :** We will be meeting at the Temecula Library, 30600 Pauba Rd, Rm. B on Monday, October 6, 2014 at **7 pm**.

**What's Up :** Tim Deardorff

**Presentation :** John Garrett on Paleo-astronomy, the presentation that took the recent Julian Starfest by storm.

For the latest on Star Parties, check the [web page](#).



*APOD: Hubble's Messier 5*

(2014 Apr 25) Image Credit: HST, ESA, NASA

## WHAT'S INSIDE THIS MONTH:

### Cosmic Comments:

by President Mark Baker

### Adventures of an Amateur Astronomer

by Ray Stann

### Looking Up:

by Curtis Croulet

### M5's Cepheid Variable Observations –

A Summer Project!

By Will Kramer

### Art's Night Out

by Art Cobb

### Teen's Eye on the Sky: The Moon and its

Shading

by Emma Garrett

Send newsletter submissions to Mark DiVecchio ([markd@silogic.com](mailto:markd@silogic.com)) by the 20<sup>th</sup> of the month for the next month's issue.

Like us on [Facebook](#)

### 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](mailto:shknbk13@hotmail.com))

Vice President & [Facebook](#): Tim Deardorff 951-775-1036

([tim-deardorff@yahoo.com](mailto:tim-deardorff@yahoo.com))

Outreach: John Garrett 951-609-3021

([garrjohn@gmail.com](mailto:garrjohn@gmail.com))

Treasurer: Curtis Croulet ([calypte@verizon.net](mailto:calypte@verizon.net))

Secretary: Linda Croulet

Club Librarian: Bob Leffler 951-541-5400

([bobjleffler@msn.com](mailto:bobjleffler@msn.com))

Star Party Coordinator: John Garrett

([garrjohn@gmail.com](mailto:garrjohn@gmail.com))

Address renewals or other correspondence to:

Temecula Valley Astronomers

PO Box 1292

Murrieta, CA 92564

Website: <http://www.temeculavalleyastronomers.com/>

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## Cosmic Comments – October/2014

by President Mark Baker

The TVA stands on the verge of great things I believe... regional observatory facility and foundation, growing member list, increased demand for our Outreach and school Club program, more submitters to the newsletter, just to name a few!! All things we can take pride in... heck, we even have a banner with a QR code now!!! Who'd a thought...!!!

Hopefully, as things change though, we can hang on to the "old school" ways that makes the TVA such a comfortable place to be, whether at meetings, Star Parties, Star-B-Q's, or just gabbing about stuff. As long as we continue to get gasps and oooooh's from those truly seeing the Celestial Wonders for the first time, I know I'll enjoy being around...

Really intrigued at the possibilities before us... hope you all are too. Pretty sure I'll never get my ride to Mars, but this ride looks pretty exciting and worthwhile. But it will be much better with y'all taking in the trip as well... Nuff Said !!!

Clear and Dark Skies, my friends...



## Adventures of an Amateur Astronomer

– or –

## How to Squander your Kids Inheritance

by Ray Stann

Isn't astronomy fun? Yep, you get outside, set up your new telescope, and view everything that the Hubble space telescope can see. All in living color! You can really WOW your neighbors. Or not.

Of course none of that is even remotely true but that's our perception. And that's how I got my start. Actually, upon thinking about it, getting into amateur astronomy can be frustrating at first, but years later all that would seem rather humorous, if you had any money left!

I'm a long time subscriber to Astronomy and Sky & Telescope magazines so I thought I knew all about the sky, so before retirement I purchased my first telescope. I had read that aperture was critical, so I bought the biggest scope that I thought could lift. That turned out to be a Celestron NS11GPS. Do you know now much a 65 pound scope weights when you're hovering over the tripod and can't get it seated correctly? It's closer to 100 pounds!

I soon discovered that I'd rather image then view, so I bought my first (of many) astro cameras. It was a SAC 8, which was a mono camera (B&W). I also bought a cheap filter wheel and the appropriate not-cheap filters for converting the image to color. I was on my way! But not so fast. My NS11GPS scope worked in what's call "Alt-Az" mode. That is, it would track my

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target in the sky, but everything around the center of the image would rotate like a clock. This wasn't noticeable for short exposures, but was pronounced for anything more than a couple of minutes.

So, my next expense was to buy a heavy duty wedge that would fit between the tripod and the scope. This changed my setup from Alt-Az mode to what's called "Ra-Dec" mode. Without getting into details, this removed the rotation problem. However, that 65 pound telescope that became a 100 pound telescope when trying to mount it on the tripod became a 150 pound scope while trying to mount it on the wedge that was tilted up 67 degrees. Boy was I having fun!

My next issue was tracking the target. The scope tracked accurately enough for visual observing, but needed help for long exposure astrophotography. So I ended up buying an 80mm "guide scope" that I mounted on top of the main scope. Of course, that required yet another camera. Both of these cameras were controlled by different software on my laptop. Yep, I needed a better laptop. And more money.

Finally I'm all setup and ready to match the Hubble! At the time I lived in Huntington Beach so I joined the Orange County Astronomers club. They have a dark site out near Anza, plus a house where you could crash when finished for the night. So I'm out there one night, with probably 30 other amateurs, and I was "lucky" enough to be set up next to a member of one of the local Indian tribes. Envision this: I'm trying to get all this stuff setup, get my computer working correctly, and working with my cameras, when this Indian dude, who was otherwise a nice guy, decided that I needed to learn one of the Indian dances and songs. So he goes dancing and singing around and insisting that I watch and learn. I am distracted so much that I dropped and broke my SAC 8 camera. So much for imaging that night.

My next move was to buy another camera. This time it was a SAC 10, which is a one shot color camera (OSC). OSC cameras are, in effect, what your typical snapshot cameras are. It was a good camera but its sensor was really small which limited my field of view. So, I ended up buying what's called a HyperStar. That greatly increased my FOV but further damaged my bank account. All this time my wife is probably wondering if I knew what I was doing (actually, so was I).

This setup actually lasted me for a couple of years, but then the laptop gave out so I had to buy another one. Well, Billy Gates decided that some of my drivers shouldn't work with his new Windows operating system, and one of those drivers was for the SAC 10 camera. So, I ended up selling the SAC 10. By this time, SAC had gone out of business so I decided to buy a QHY8 OSC camera. This camera has a very large sensor. In fact it was too large for my current HyperStar, so I ended up selling that HyperStar and buying another. And the money kept going out. I'm fast learning that nothing in astronomy is cheap.

The next problem was the NS11GPS scope. I was taking my life in my hands putting that beast on the wedge, so I talked my wife into letting me buy a German Equatorial Mount (GEM). I then disassembled the NS11GPS, took the optical tube off, and then I could mount it on the

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new GEM. So, instead of a tripod, wedge, and the NS11GPS, I now had a different tripod, the GEM, and then the optical tube (scope). Although the GEM was heavy, it was lighter than the NS11GPS and it mounted flat on the tripod. I was really going to do some great astro imaging now! Or so I thought.

Yes, I was doing some fairly good stuff, especially compared to what I was doing before, but the quality of my images were far below what I was seeing in magazines and, for that matter, what other amateurs were doing at Anza. My stars weren't really round, I sometimes didn't have a great Polar alignment, and the "depth" of my images left a lot to be desired.

To solve the Polar alignment issue, I had to change from setting up the tripod every time I went to Anza. That required a new alignment and I sometimes took shortcuts that hurt more than they helped. So I leased a private "pad" out there. I had a steel pier built and installed on the pad that I used instead of the tripod, and it was permanently set to north. That helped a lot, but my stars still looked funny. That's when I realized that, with the much larger sensor in the new camera, the optical tube off the NS11GPS didn't have a flat enough image circle to handle it. The stars towards the corners became a bit elongated.

I fixed that by putting the optical tube back on the NS11GPS and buying Celestron's new Edge HD11 scope. That solved the problems at the corners and produced some great results, but totally emptied my bank account. But I was having fun! Oh yeah, I needed a modification to my new HyperStar for it to work with the new scope. More money.

However, I still wasn't achieving the results I wanted. Although the new camera had a great FOV with its large sensor, my images still didn't compare with the "experts". Solution? Yep, buy another camera. This time it was a QSI 583wsg. I was now back to a B&W camera with color filters. One of the good things about this camera, or so I thought, was it had a built-in guide port so I didn't need the guide scope. But I needed another guide camera that would fit. I gotta tell you now, my wife sure had patience with my hobby and, more importantly, its cost.

This setup sort of worked, but the guide camera was very hard to focus and finding a guide star was even harder. So, my next purchase was a replacement part for the camera that removed the guide port, and I bought what's called an Off Axis Guider (OAG). That went in front of the camera and solved a lot of problems. But more money. Always more money. But things were about to get more expensive. Much more expensive.

So, at this time, I had the pad, the pier, the GEM mount, the good scope, and the good camera, and I was imaging fairly well. Life was good. Oh, by this time we had moved from Huntington Beach to Temecula, and this is when I joined TVA. I was still going to the OCA Anza site quite regularly and crashing overnight in the club's house.

But I really wanted to image more often the once or twice a month at the Anza site, and the observatory bug was biting me. So, I decided to build an observatory in my front yard. Like I said, we had moved to Temecula, and into Meadowview. Meadowview is really a great spot for astronomy in Temecula because there are no street lights. We had almost an acre of land,

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including a huge front lawn with a rose garden. That rose garden was the perfect spot for my proposed observatory which would be ringed by the roses.

This, of course, required buy-in by my wife, so I debated for several months on how to approach her. Finally I just bit the bullet and asked the question. Much to my surprise she said go for it! The only great objection came from my wallet, but I blindly marched on. The concrete was poured and the structure setup. I had a custom made pier fabricated and installed. Next I needed such minor things as a new mount, telescope, etc. I didn't want to use the setup I used at the Anza site, so I bought new, more expensive stuff. So much for my kid's inheritance! So I thought I was beyond the heavy expenses! Not even close.

The observatory worked out well and I use it a lot, but I still wanted to go to the darker skies at the Anza site once in a while. However, crashing in the club's house was not working out. It was too far from my pad and, since I had to tend to the equipment periodically, I decided to just sleep in the back of my wife's SUV. Well, that SUV's "bed" was about 6' long, but I'm 6'4". Also, in the winter it gets mighty cold out there and it occasionally snows, so I froze in my short bed. This wasn't going to work. So, last year I bought a used VW camper. It felt like a palace compared to my alternatives! It even had a forced air propane heater. You think used VW campers are cheap? Ha!! The ones in good condition are worth their weight in gold (which is about what I paid).

All this brings us up to the present. Have I purchased everything I need now? No, that part never ends. There's always something else that you simply must have. But was it worth it? Absolutely! I wouldn't change a thing. But the best part is getting to know and talking to some great people. I learn more every month.

Well, at least the kids know where their inheritance is: mostly in the observatory and VW!

Clear Skies, Ray Stann



From <http://www.raysuniverse.com/>

<https://www.youtube.com/watch?v=FyxPQmODJcQ> Ray's Meadowview Observatory

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## Looking Up – October 2014

by Curtis Croulet

**First Quarter Moon** is on October 1 at 12:33 pm; **Full Moon** is on October 8 3:51 am; **Last Quarter Moon** is on October 15 at 12:12 pm; **New Moon** is on October 23 at 2:57 pm; and **another First Quarter Moon** is on October 30 at 7:48 pm.

**Mercury** will be in the morning sky in the last half of October, having gone through inferior conjunction on October 16. It'll reach its greatest western elongation on November 1. This is Mercury's best morning apparition of 2014. "Western elongation" means it's in the morning sky.

**Venus** reaches superior conjunction with the Sun on October 25. At the beginning of the month, you might catch it low in the morning sky just before sunrise. I look forward to Venus's return to the evening sky. It's always a good appetizer for star parties.

Through the end of September and into October, **Mars** slides past the 1<sup>st</sup> magnitude star Antares. You'll perhaps remember that "Antares" means "enemy of Mars, "Ares" being the Greek equivalent of Mars. So the enemies meet at last. But at their closest, they'll still be about 3 degrees apart. For much of this passage, Mars will be in Ophiuchus, the zodiac constellation astrologers have never heard of.

**Saturn** will still be viewable at the beginning of October, but it'll be gone by the end of the month. Conjunction with the Sun is November 18.

**Jupiter** is a morning object. It rises around 2:30 am on October 1, and shortly before 1 am on October 31.

**Uranus** and **Neptune** are ideally placed for evening observation now. Uranus reaches opposition on October 7. They're in Pisces and Aquarius, respectively. After I wrote last month's column about Neptune, I took several opportunities to view it, first in my 10-inch Meade SCT, then in my TeleVue NP101is refractor (4-inch). It was easy to see in both scopes, but at low power it looks like a star. It helps to have a chart to identify it. A good chart is in the September 2014 issue of *Sky & Telescope*. It's good to have a chart for Uranus, too. A good one is in the same issue of *S&T*. But Uranus, being about half the distance of Neptune, is easy to recognize.

**Pluto** is in Sagittarius. It's very faint at magnitude 14.1.

The **Draconid meteors** peak on the evening of October 8. On rare occasions, the Draconids have produced spectacular displays. Other minor showers during October are the **Taurids** (October 10), **Delta Aurigids** (October 11), **Epsilon Geminids** (October 18), **Orionids** (October 21), and **Leo Minorids** (October 24). Of these, your best bet for casual viewing is the Orionids, which come from the area of Orion's "club."

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Let's look up.

Stepping outside tonight, you may notice that bright, lonely 1<sup>st</sup> magnitude star deep in the southern sky, seemingly "miles" from anything else.

That's Fomalhaut, 25<sup>th</sup> brightest star in the night sky. Fomalhaut is the loneliest of all the 1<sup>st</sup> magnitude stars, meaning it is the most isolated in angular distance from other 1<sup>st</sup> magnitude stars. Achernar is almost as lonely as Fomalhaut, but we're just a bit too far north to see Achernar, the sixth brightest star in the night sky. A trip to Ensenada or San Felipe would be sufficient to see Achernar peek briefly above the horizon. The closest 1<sup>st</sup> magnitude star in angular distance to Fomalhaut is Altair, 59 degrees away. Antares is 83 degrees away. There's not much of anything going on in the area of Fomalhaut. Fomalhaut's companions in the constellation of Piscis Austrinus are no brighter than 4<sup>th</sup> magnitude. Capricornus, northwest of Fomalhaut, has a couple of 3<sup>rd</sup> magnitude stars. Grus, south of Fomalhaut, has stars as bright as 2<sup>nd</sup> magnitude, but you might not even notice them, especially if hills or trees hide your southern sky. If you're into deep-sky observing, Piscis Austrinus has a few faint galaxies.

One thing we need to get out of the way is how to pronounce "Fomalhaut." It's "FOHM-uh-lawt" (FOAM-a-lot?). As with most of our stars, the name Fomalhaut, comes from Arabic. In Arabic, it's *fam al-hut*, "mouth of the fish." In languages that use the Roman alphabet, it's been spelled many ways over the centuries, but Fomalhaut is the approved spelling now. Being that Fomalhaut is the mouth of the fish, sometimes it's illustrated as scooping up water poured from the "water jar" of Aquarius. Piscis Austrinus is one of the "heavenly waters" constellations that include Cetus, Aquarius, Pisces, Delphinus, Eridanus (proper name of a mythical river), Equuleus (a sea horse), Carina (keel), Puppis (poop deck), Vela (sail), and Pyxis (compass). Those last four are parts of the obsolete constellation Argo, the ship.

Fomalhaut is slightly over 25 light years away, almost exactly the same distance as Vega. Both are also spectral class A, which are white and bluish-white stars. But Vega is spectral class A0, while Fomalhaut is spectral class A3. The seeming slight difference is enough that Vega is the fifth brightest star in the night sky at magnitude 0.03, while Fomalhaut is much dimmer at magnitude 1.17. Fomalhaut is only slightly less massive than Vega, but it's physically much smaller. Vega is about 2.5 times the Sun's diameter, whereas Fomalhaut is a more-modest 1.7 times bigger than the Sun.

Fomalhaut has two companion stars, TW Piscis Austrini and LP 876-10. TW Piscis Austrini is only 0.6 light years from Fomalhaut. TW Piscis Austrini is a variable star, fluctuating slightly from magnitudes 6.44 to 6.48. LP 876-10 is magnitude 12.62. If you want to look up TW Piscis Austrini in a program like Software Bisque's *TheSky X*, search for HIP 113283 (its designation in the Hipparcos catalogue). For LP 876-10, which is also in Piscis Austrinus, search for GSC 06964:01226. Fomalhaut has a debris ring and at least two planets. As seen from one of these planets orbiting Fomalhaut, TW Piscis Austrini would be a very bright magnitude -0.5. But from TW Piscis Austrini, Fomalhaut would be a dazzling magnitude -6.0.

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I am much indebted to Fred Schaaf's *The Brightest Stars* for most of the foregoing. This book has been an invaluable reference for lore and data about the 1<sup>st</sup> magnitude stars. But I did find that some of the information in Schaaf's book about Fomalhaut's companions is obsolete.

Clear skies.



## Quiz Answer from the last Newsletter

I was discovered by Giuseppe Piazzi in 1801. For a while, before the discovery of Neptune, I was considered the 8<sup>th</sup> planet. I am the largest object in the asteroid belt between Mars and Jupiter. Later on, I joined Pluto as a dwarf planet. Who am I?

Ceres

## Quiz

We all know that the first dog in space was named Laika. Whatever happened to her, anyway?

If you know the answer (without Googling it!) post it to <[tva@mrh.org](mailto:tva@mrh.org)>.



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## **M5's Cepheid Variable Observations – A Summer Project!** **by Will Kramer**

This past spring, I was trying to plan some structured observing ideas, when I saw Howard Banich's great article in the June, 2014 Sky & Telescope magazine, which tells all about observing the globular M5 in Serpens and its two bright type II Cepheid variable stars, V42 and V84.

These two stars change their brightness from magnitude 10 to 12 and then back again with periods of less than a month, and because the brighter stars in M5 seem to be arranged in little asterisms which also happen to include V42 and V84, they also make the two Cepheids quite easy to identify even in the globular! (as you read this, look at the diagram on the next page)

So, after studying the photos and drawings in the article, I was ready to view the real M5 in June out in Anza, where I was able to first locate and identify the two variable stars, and get used to how they would appear in my recently acquired 15" Dob. Within a couple weeks after that I viewed M5 from home and found that I could see V42 and V84 from my back yard also, and that they were easily visible in my 10" reflector, too! So, by mid-July, I was ready to begin my official observations where I would sketch the brightness of the two stars in relation to each other, and to the stars around them in their little groups. I could compare the relative brightness of V42 and V84 using lower magnifications, but I found that I had to go closer to 200X to see the asterisms clearly enough to compare the Cepheids to them also. Each time I observed, the globular became more and more familiar, and by my third observation on 7/26, it became apparent that V84 was getting dimmer! The following week, V84 continued to dim, while V42 started getting noticeably brighter, so by 8/6, I had already seen V84 change from near maximum to minimum, while at the same time V42 went from near minimum to almost maximum!

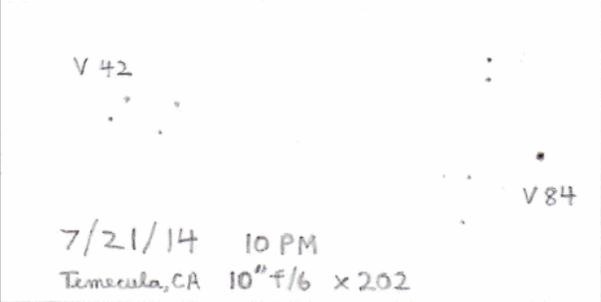
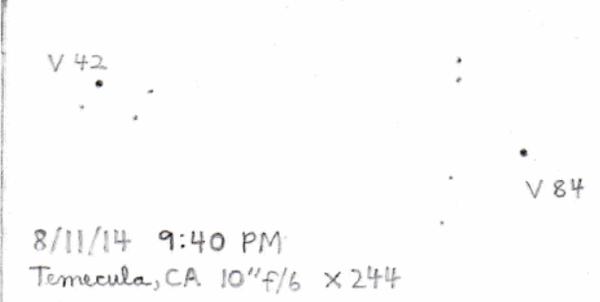
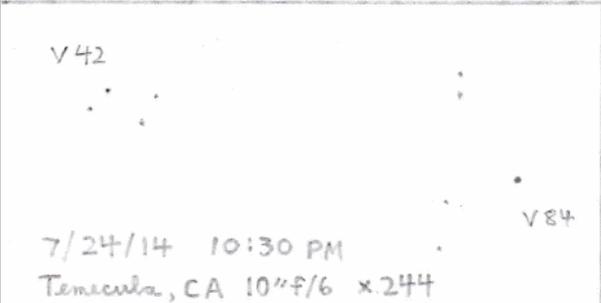
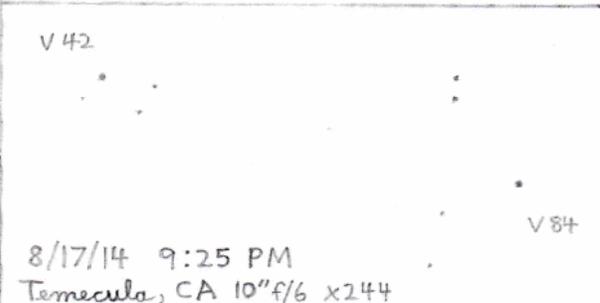
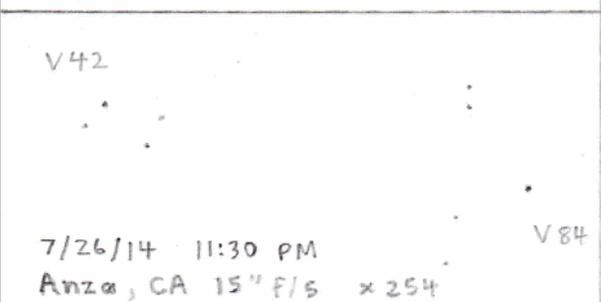
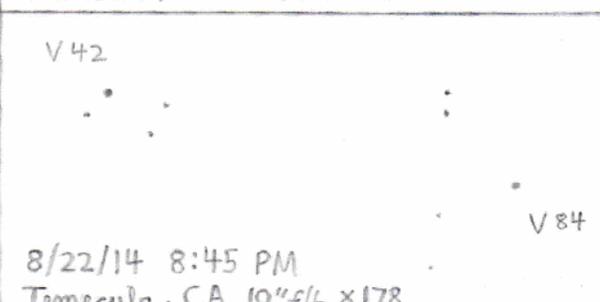
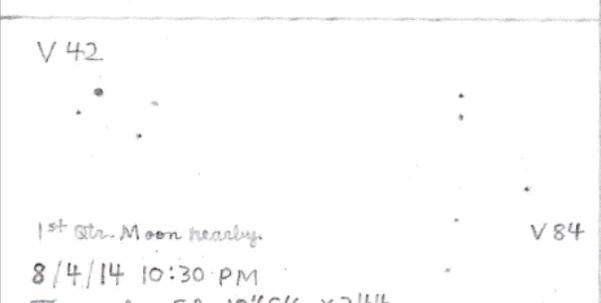
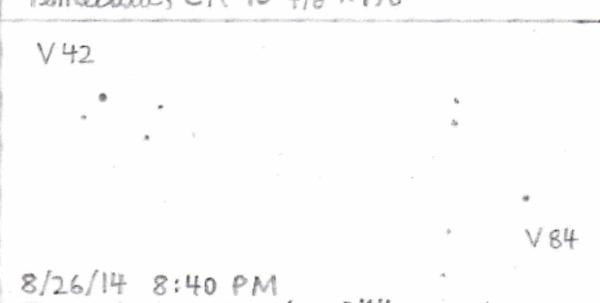
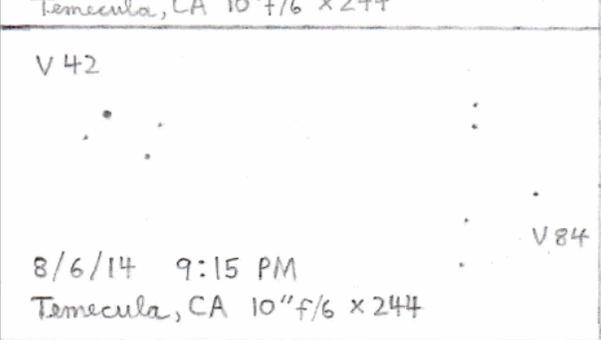
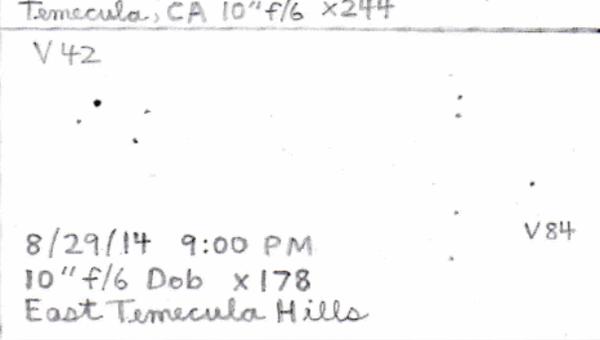
During the remainder of August, I did not notice much of a change in V42, but V84 started dimming again by the end of the month. (Please see the drawings on the next page.) Looking back, however, there are some large gaps between observations (7/26-8/4 and 8/11-8/17 etc.), where I could have missed a min. or max., and it would have been great to witness V42's full increase in brightness between 8/6 and 8/11. I can see now that in order to measure the periods of V42 and V84, observations would have to be made almost EVERY night for about a month to record the full cycle of both stars, but even what I did get is interesting to look back at and clearly shows how the two variables changed in brightness throughout the month.

During the weeks I observed, it was also neat to notice how the look of M5 itself changed as two of its brightest stars went from being dominant to just blending in with many of the other stars in the field!

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<p>V 42</p>  <p>V 84</p> <p>7/21/14 10 PM Temecula, CA 10" f/6 x 202</p>	<p>V 42</p>  <p>V 84</p> <p>8/11/14 9:40 PM Temecula, CA 10" f/6 x 244</p>
<p>V 42</p>  <p>V 84</p> <p>7/24/14 10:30 PM Temecula, CA 10" f/6 x 244</p>	<p>V 42</p>  <p>V 84</p> <p>8/17/14 9:25 PM Temecula, CA 10" f/6 x 244</p>
<p>V 42</p>  <p>V 84</p> <p>7/26/14 11:30 PM Anza, CA 15" f/5 x 254</p>	<p>V 42</p>  <p>V 84</p> <p>8/22/14 8:45 PM Temecula, CA 10" f/6 x 178</p>
<p>V 42</p>  <p>V 84</p> <p>1<sup>st</sup> Str. Moon nearby. 8/4/14 10:30 PM Temecula, CA 10" f/6 x 244</p>	<p>V 42</p>  <p>V 84</p> <p>8/26/14 8:40 PM Temecula, CA 10" f/6 x 244</p>
<p>V 42</p>  <p>V 84</p> <p>8/6/14 9:15 PM Temecula, CA 10" f/6 x 244</p>	<p>V 42</p>  <p>V 84</p> <p>8/29/14 9:00 PM 10" f/6 Dob x 178 East Temecula Hills</p>

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All in all, this observing project has been a very rewarding experience, and I feel like it has helped make me a better visual observer again. Now, whenever I view another globular or open cluster, I find myself looking not just at the cluster as a whole, but I am noticing the different shapes the stars form with one another, and I have also found that these clusters can handle much higher magnification in my scopes to see more details than I used to before! Though M5 and its two Cepheid variables are moving closer to the western twilight in the evenings now, next year by springtime will be a great opportunity to get an earlier start to observing this ever changing globular!

Here I have only presented a brief summary of my observing project, but for those visual observers and photographers who may find this fascinating, I urge you all to look at the June, 2014 Sky and Telescope magazine, where Howard Banich's article gives such complete information, that you will discover how easy it is to identify M5's two Cepheid variables, and probably wonder why you hadn't heard about them before!

Will



## Art's Night Out

Article 152 October 2014

Last month we looked at the constellation Sagittarius, now setting into our western horizon. Even though Sagittarius gave us numerous beautiful open star clusters, nebulae and globular star clusters, we still have several magnificent objects to find and enjoy elsewhere.

This month I will focus our viewing almost straight over head. We have two constellations that house more of the same beautiful objects as we had viewed in Sagittarius and Scorpius. I'm referring to the constellation Cygnus and Pegasus. Both of these are located almost overhead. Cygnus (The Swan) is overhead with most of it entering the western part of the sky. Pegasus is south and east of Cygnus.

I would like us to start with an object found in the constellation Pegasus. This is a beautiful globular cluster called M-15. This will be the only object in Pegasus that we will attempt to view. There are several galaxies that can be seen in Pegasus that requires dark sky conditions. For this viewing, I'll stick to what we can see from our local skies. Okay, let's first identify Pegasus. If you look overhead and slightly east, you should see four stars forming a large square in the sky. The N/E star is actually part of the Andromeda Constellation and is called star Alpha-Andromeda. The star that is in the N/W part of the square is Beta-Pegasus. The star in the S/E is Gamma-Peg. And the star in the S/W corner is Alpha-Peg.

M-15 is easily seen using a pair of binoculars. However, you will need a moonless, clear sky to see it. I had trouble locating this while in Sage at Mark Baker's new plot of land. I'll explain

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why in just a bit. Okay, find star Alpha-Peg again. If you look off to the West or right (depending upon which direction you are facing) you should see a line of stars. Three stars are forming a line straight out towards the S/W. A fourth star is out and up (or N/W) from the third star in our line. This fourth star is named Enif or Epsilon (in case you have a star map). All four of the stars are about the same distance apart. If you look out past Enif about 2/3 the distance from the third star (Delta) and Enif, you should see a nice hazy ball of light. This is M-15.

Oh yah, my problem. I was trying to find M-15 from memory and thought that I had to look to the left of Enif instead of straight out. I started looking for M-15 using a pair of binoculars. Normally this would not be a big deal. However, I was showing off my astronomical viewing skills with our vice president, Tim Deardorff.

So much for my skills. At any rate, I was pleasantly surprised to see it when I was panning the skies around Enif. I quickly swung my telescope over to where I saw M-15 with my binos and "bingo", there it was. In a telescope, this is a gorgeous view. Most of the larger globular clusters in viewing sky are magnificent to gaze at. The higher the power, the more stars can you see. In cluster language this is called "resolve".

Straight north to north/west you can see the constellation Cygnus. Cygnus has an asterism called "The Northern Cross". An "asterism" is a group of stars forming a familiar object. In this case, there are several stars forming what appears to be a "Cross". Star "Deneb", which is the brightest star in this constellation, forms the "top" of the cross. Deneb faces N/E. There are three stars forming the 'cross beam' or horizontal beam of the cross. These are: star Epsilon facing S/E, star Gamma in the middle, and star Delta facing N/W. The bottom of the cross is located by star Albireo or Beta. In between Albireo and Gamma are two other stars that are about in the middle between these two stars and are fairly close together. They are: star Eta on the N/E side and star Chi on the S/W side. Have you got the "Cross"? It really is easy to see.

Before we start our observing, I want to give you a quick review on measuring using degrees. I'll use degrees as a measurement of distance between objects. So, if you hold out your hand at arm's length, I'll use your fingers as degree guides. These aren't exact, but will get you into a close proximity. Your "pinky" is One degree. Your first three fingers represent 5 degrees. Your fist is about 10 degrees.

And, your extended thumb and pinky will give you about 25 degrees. Of course, these all will vary a little due to the size of your hands.

Let's find a few beauties up there in Cygnus. I'll start us near the star Deneb. Deneb, being the top of the vertical beam of the 'Cross', is the brightest star in the asterism. Look out to the N/E about 5 degrees, and slightly S/E. In this area is the open star cluster M-39. M-39 is a nice loose cluster spanning across the sky at about the same size as our moon. Most open star clusters are best observed with binoculars or telescopes at low power. This one is no exception; a nice binocular view on moonless, clear dark skies. I enjoy the view using my 4.5" refractor at about 35 power.

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Now, go to the bottom of the vertical beam line of stars, and locate Albireo. Albireo is a “double star”. Double stars and multi-star systems are called ‘binary star systems’. There is one main or ‘primary’ star that rotates around our galaxy with one or more stars rotating around it. The gravitational pull from the ‘primary’ star is so great that the other smaller stars have been pulled into the primary’s orbit. Albireo is one of the prettiest double stars we can see. One of the stars is a gold color and the other is blue. This makes a nice visual treat. The two stars are separated or “split” by 34 arc seconds. This distance is a nice split for binoculars or small scopes at low power. A challenge in looking for and at double or “binary” star systems is to “split” the two stars visually. The following is a general minimum guide to use in ‘splitting’ binaries. Binoculars= 9 arc seconds. 4” refractor= 2 arc seconds. 6” reflector= .8 arc seconds. Generally, this is the range we usually will look for in the ‘binary’ systems. Using a larger scope will allow you to ‘split’ closer binary stars.

Look at the middle beam-star, Gamma. Now look due south about 3 degrees. Here you will see another open star cluster called M-29. This cluster is smaller in size than M-39, not as bright, and has 1/3 less stars in the cluster. However, it is still one of Messier’s objects that you will need to find in order to complete your Messier check list.

In dark-sky areas, there are numerous planetary nebulae and other nebulae to find.

For this viewing segment, I will keep us to our area of Temecula and Murrieta skies. But, I will challenge you to get out into a darker sky area. You will see so much more and will be ‘awe’ struck at the increase in detail.

Now find the S/E side cross-beam star Epsilon. If you look in the area S-S/W from that star about 4 to 5 degrees, you will find the “Veil Nebula”. This nebula has two gaseous formations making up this dual nebulae. This is best seen in darker sky areas. I have picked this up from my back yard in Murrieta on a moonless night, fairly late at night with clear crisp skies. It can be seen up on the Santa Rosa Plateau and in Anza. We will have to see if Mark’s new pad will give us good viewing of this as well. I usually will switch my eyepiece to contain a nebula filter. I use an O-III filter. These filters bring out a lot more detail in the gaseous areas. The “Veil” gets its name from the long finger-like streams of light running down from the main body of light. This a gorgeous sight. This nebulae is a favorite for photographing and imaging.

If you have the opportunity to gaze in a dark-sky area, get a good star guide and locate some of the nice nebulae and clusters in and around this area of the sky. You can spend hours enjoying the view.

Until next time, Art



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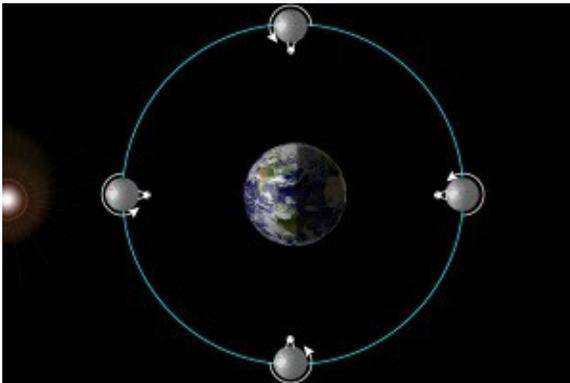
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## Teen's Eye on the Sky: The Moon and its Shading by Emma Garrett

The moon is Earth's only natural satellite, revolving eastward around us. As one of the brightest objects in the sky, second only to the sun, we expect the moon to influence us. The word "lunatic" comes from when doctors thought the moon affected the insane. But the fact is, the moon does not influence us, not one little bit, but its motions are profound.

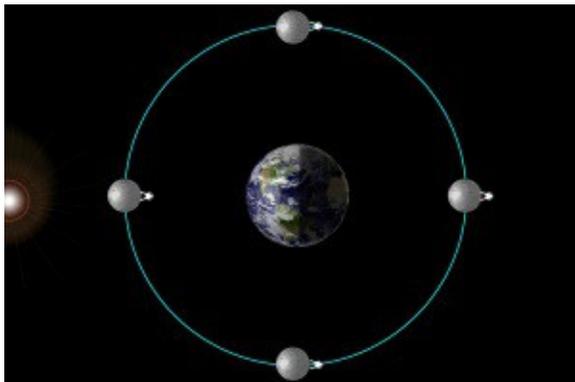
As viewed from Earth, the moon progresses eastward around the sky. You may notice, if you view it for several nights in a row, that the markings on its face never change. This is because the moon's period of rotation is one month long. The moon rotates to keep the same side facing Earth at all times.



In this image (left), a lunar lander stands on one side of the moon. The lander does not change position, but the moon rotates over the course of a month to keep the lander facing Earth

The diagram (below) does NOT show the moon's motion correctly! This is what would happen if the moon did not rotate. The lander is still not moving, but since the moon is not rotating, the lander changes its location relative to an observer on Earth.

The side of the moon that we see doesn't change, but the amount that we see does. This is caused by the moon's location on its orbit. Just as sunlight always illuminates half of the Earth, sunlight always illuminates half of the moon. Notice in the diagram below that when the moon



is between the Earth and the sun, its illuminated half faces away from the Earth, and we see only darkness. The next stage in the moon's orbit is the waxing crescent, where half is still illuminated, but we can now see about one-fourth of that side. The next phase is commonly known as "half moon," but astronomers name it after the fraction of the moon's orbit. Half of the illuminated side is visible. At the waxing gibbous, we can see about three-fourths of the illuminated side, and at full, the Earth

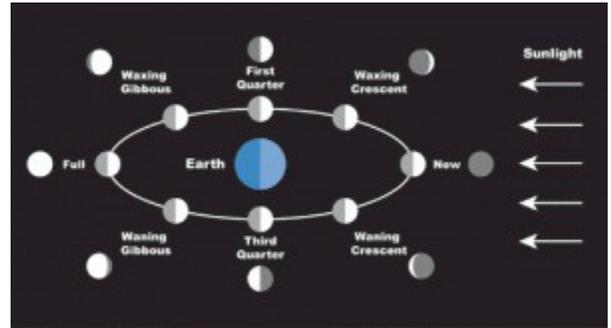
is between the sun and the moon and we see the entire illuminated side. For the rest of the moon's orbit, the phases reverse back to new.

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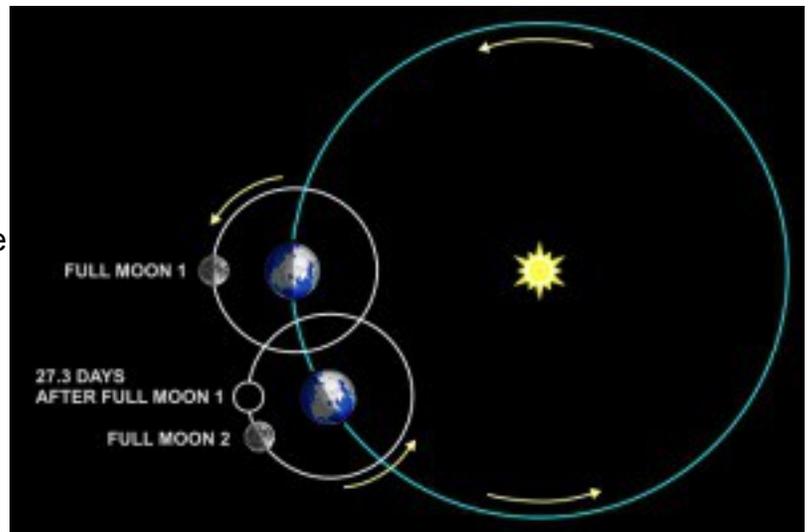
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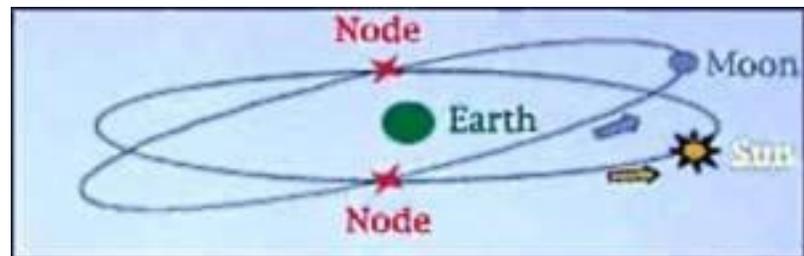
It is possible to see the new moon if you know where to look; have you ever noticed you can see the “dark side” of the moon if you have a telescope or binoculars aimed at a crescent or gibbous moon? (There is no dark side because every side of the moon gets a chance at both daytime and nighttime.) Notice that because the new moon is between the Earth and the sun, it’s impossible to see it during the day without looking at the sun (and never do that, I’m warning you now). The full moon is easy to see during both night and day because even as it rises and sets, it’ll always be opposite the sun in the sky. The term “month” is literally “moonth.” One complete cycle of lunar phases is the moon’s synodic period, and takes 29.53 days. One complete eastward lunar revolution is the moon’s sidereal period, and takes 27.32 days. Why is the synodic period longer than the sidereal period? Take a look at the diagram below.



In this diagram (left), the blue circle is Earth’s eastward orbit. The white circles represent the moon’s eastward orbit when the Earth is in two different locations. Now focus on only Earth and the moon’s orbit. In the upper circle, the moon is at full. As the moon moves along its orbit, so does the Earth. By the time the moon reaches the same place on its orbit (the open circle), one sidereal period, it is no longer directly across the Earth from the sun and the phase is not at full, but rather at waxing gibbous. About two days later, the moon moves farther along its orbit and reaches full, and one synodic period is complete.



The moon’s orbit is inclined 5° with respect to the ecliptic, as shown in this diagram. The two points where the moon’s orbit crosses the ecliptic are called nodes, and the imaginary line between them is the line of



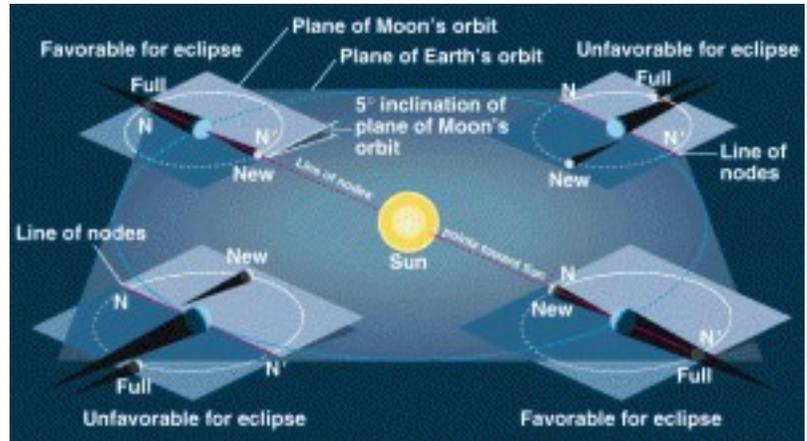
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nodes. Often, full and new moon occur when the moon and sun are both far from the nodes, but sometimes they will each be on a node during those phases. What happens is a sight no observer wants to miss.

This is a very complicated diagram. To make sense of it, let's look at it piece by piece. The Earth is shown at four points around its orbit, which is shown as the plane of the ecliptic. The plane of the moon's orbit is also shown, at a  $5^\circ$  inclination with respect to the ecliptic. The full and new moons of each point of Earth's orbit are also drawn in. Now take note of the line of nodes for each point of Earth's orbit.



For the bottom left and upper right, the line of nodes is perpendicular to the shadows of the Earth and the moon, and the shadows don't line up. But look at the upper left and bottom right!

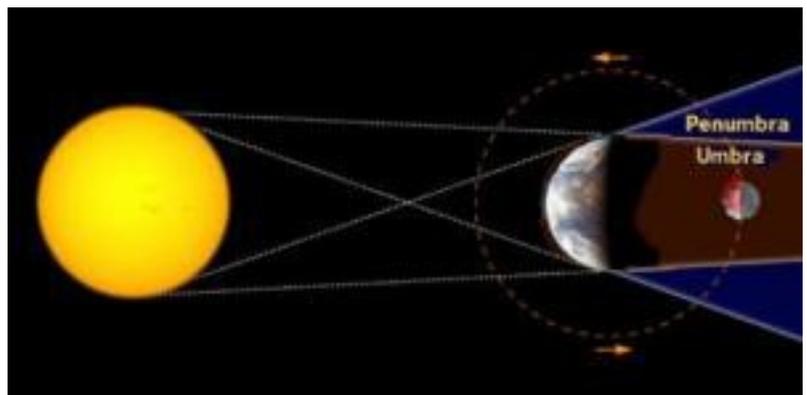
The line of nodes lines up perfectly, and the shadows of the moon and Earth overlap.

Depending on whether the moon is at new or full, two different events can occur. Because an observer can't easily see the new moon, let's focus on what happens at full.

You've probably seen an image like this before. You might even have seen the actual event before. You know how special this sort of full moon is. It's a lunar eclipse, and it doesn't happen every month—only when the moon is at one node and the sun is at the other. But before we go into that, let's take a look at why the moon is red.



This diagram shows two important vocabulary terms: the umbra and the penumbra. Both are part of Earth's shadow. The umbra is the darkest part of Earth's shadow, where no light shows through...except that which is



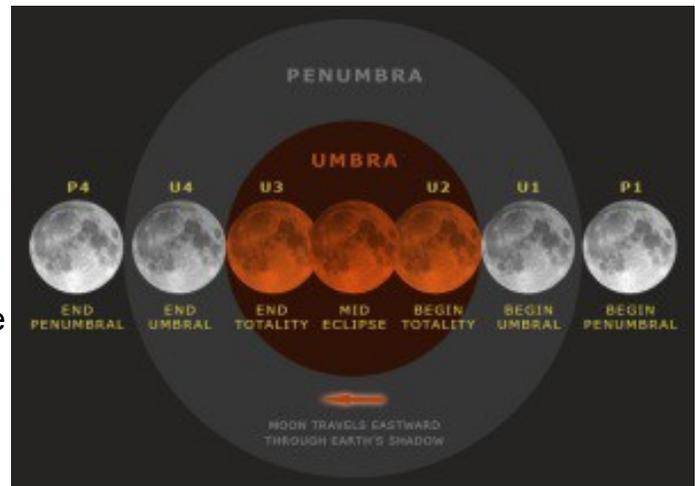
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refracted through Earth's atmosphere. Because blue light is scattered more easily than red light, the Earth's shadow is red, and the umbra is the darkest red. Blue light scatters around the umbra, creating the lighter section of the shadow, known as the penumbra.

Remember that during a favorable time for an eclipse, the moon and sun are at opposite nodes, not too high or too low. The Earth's shadow is cast straight on the node that the moon will pass by as it revolves. As the moon passes through the penumbra, it begins to darken. It will be at its darkest as it passes through the umbra. Then it will emerge into the penumbra again, and finally leave the Earth's shadow altogether. A lunar eclipse can last as long as 1 hour 40 minutes. Lunar eclipses actually played an instrumental role in



determining that the Earth is round. Astronomers observed that the Earth's shadow is always a circle, and only a sphere can cast a shadow that is always circular.

You don't need the moon to view the Earth's shadow. Just before sunset or just after sunrise, when the sun is low enough to interfere with your vision, it can be interesting to look at the opposite horizon from the sun. You'll see a steadily rising purplish-blue haze. This can be thought of as the half-sphere of night slowly rotating over your position on the planet. This is also a good time to take notice of the blue on Earth's shadow; red is the more obvious color during lunar eclipses.



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A lunar eclipse doesn't have to take place during the darkest part of the night. The sun and moon have to be at opposite nodes, and the Earth's shadow will rise over the moon. Realize that during the night, the Earth's shadow is being projected all around you. You just don't notice it in the darkness unless something illuminated like the moon crosses into view. In this photograph, the observer is lucky enough to clearly see both the lunar eclipse and Earth's shadow.

The next lunar eclipse will occur on Wednesday, October 8 at 1:16 a.m. PDT, and the moon will enter the umbra completely at 3:25 a.m. PDT.



Emma

