nightwatch

Newsletter of the Pomona Valley Amateur Astronomers

*Keep your eyes on the stars, and your feet on the ground.*
***Theodore Roosevelt***

**Volume 32 Number 05** ***nightwatch*** **May 2012**

## President's Message

The PVAA has a longstanding commitment to public outreach. It's stated right in our mission: "The PVAA is a group of about 100 amateur astronomers who enjoy the mystery and beauty of the night sky and wish to share it with each other and with local schools and the community." But as a club, we're facing a minor crisis over outreach right now. We've been without an outreach coordinator for the past year. That hasn't stopped outreach requests from coming in, and it hasn't stopped the work of coordinating outreach events from getting done. It's just meant that our club secretary, Bill Connelly, has been pulling double duty, which is exhausting for him, and unfair as well. So I'm using this month's president's address to ask if someone will please step forward to take on the role of outreach coordinator.

I'm not going to lie, it is work, but it's not an unbearable amount of work (assuming you don't already have the normal duties of another club office to fill). We usually have outreach events every month or two, which means arranging 10-12 events a year at most, and perhaps turning down a few requests that we simply can't meet (we do get a few of those). The people who call and ask for us to do school visits and moonwatches and so on will do most of the work for you; most of your work will be matching requests to available dates and saying yea or nay. You won't be thrown to the wolves, you'll have the guidance and support of your club officers and board, and as a newly-minted officer myself, I can tell you that their help is invaluable and it will be a surprisingly smooth ride. We just need someone to do it.

If you're interested in the job—or, heck, even if you're uninterested or even put off by it, but still willing to volunteer your time over the next year—please let me know. If after a year you don't want the job anymore, fine. At least we'll have survived another year, and when you step down, you'll have the moral high ground from which to harangue the masses next year. Which will free me up for my usual blather in this column, and help get everything fully back to normal. I have faith that someone's going to do it—every time I've made an impassioned plea for help, someone has come forward—so give it some thought, and if you're the one who says yes, thank you in advance.

Our speaker this month is UCR Physics professor Dr. Allen Zych, who will talk about Gamma ray astronomy with stratospheric balloons .

***Matt Wedel***

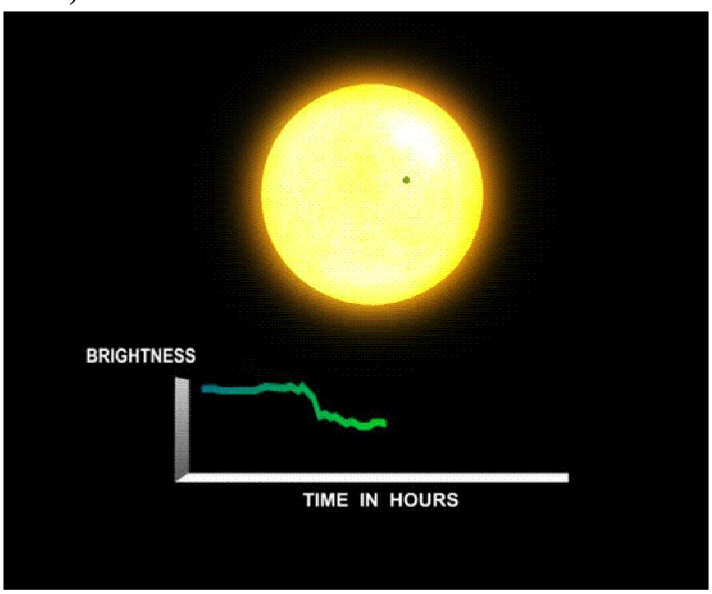
## April General Meeting

Tim Thompson, past president of the Los Angeles Astronomical Society, was the featured speaker at PVAA's April General Meeting. Tim has been with the Jet Propulsion Laboratory since 1981. His presentation was on The Kepler mission and how it works.

According to NASA's Kepler website:

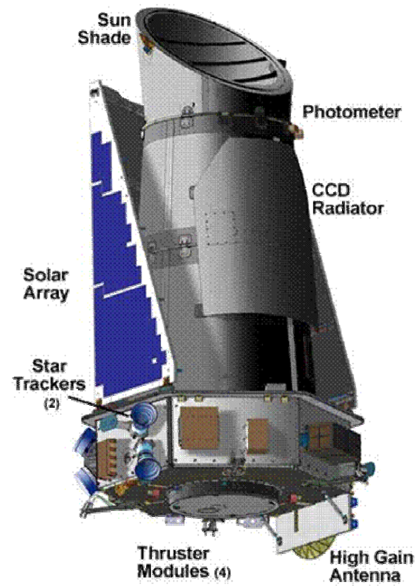
> **The Kepler Mission, NASA Discovery mission #10, is specifically designed to survey our region of the Milky Way galaxy to discover hundreds of Earth-size and smaller planets in or near the habitable zone and determine the fraction of the hundreds of billions of stars in our galaxy that might have such planets.**

The Kepler spacecraft does this by detecting the miniscule light variance of a star when a planet passes between it and earth. Kepler continuously monitors the same patch of sky. To remove any chance that the readings are caused by “dead” pixels or noise, the spacecraft is rotated 90 degrees every 3months. The telescope is a wide-angle .95 meter that looks at the same 105 square degrees of the sky all the time. With this wide field of view Kepler is continuously monitoring the brightness of over 100,000 stars. (There are over 13 million stars in is field of view.)




**The Transit Method of Detecting Extrasolar Planets**

When a planet crosses in front of its star as viewed by an observer, the event is called a transit. Transits by terrestrial planets produce a small change in a star's brightness of about 1/10,000 (100 parts per million, ppm), lasting for 2 to 16 hours. This change must be absolutely periodic if it is caused by a planet. In addition, all transits produced by the same planet must be of the same change in brightness and last the same amount of time, thus providing a highly repeatable signal and robust detection method. Credit: NASA

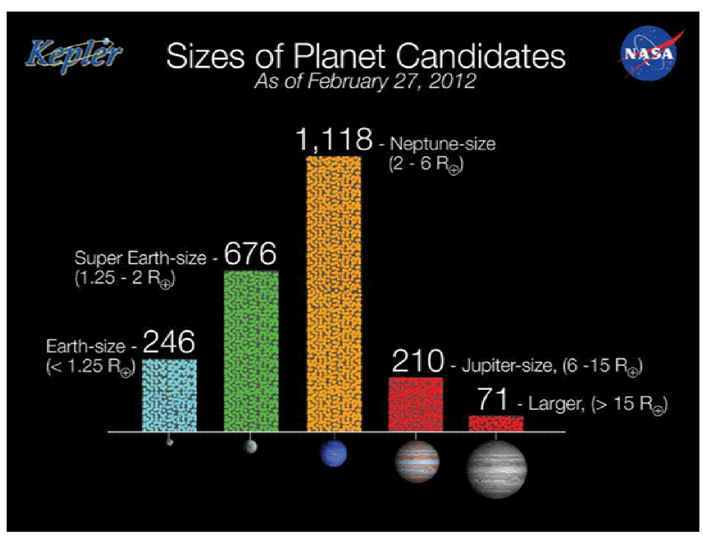



**Kepler Spacecraft**

The Kepler photometer is a simple single purpose instrument. It is basically a Schmidt telescope design with a 0.95-meter aperture and a 105 square degree (about 15 degree diameter) field-of-view (FOV). It is pointed at and records data from just a single group of stars for the entire duration of the mission. The spacecraft provides the power, pointing and telemetry for the photometer. Pointing at a single group of stars for the entire mission greatly increases the photometric stability and simplifies the spacecraft design. Other than the small reaction wheels used to maintain the pointing and an ejectable cover, there are no other moving or deployable parts.

Credit: NASA

***Gary Thompson***



## How Does It Work?

In the past three articles we looked at how we can deal with air glow when it exists. Now let's look at how it works and what conditions of the weather we should look for to get the best results.

My intent in this article is to help prepare for an effective night of star gazing even when the night isn't perfect. There are still things we can do besides looking for those faintest stars and fuzzies. It helps to know what to expect.

First we should look at the types of particles involved. The majority in most cases will be water. The surface tension of water confines an air borne droplet to less than 1 mm. If it tries to get any larger it may break in two or fall as rain. Ice particles may get a bit larger since they have lower specific gravity – ice floats in water. In the category of aerosols we find smoke and dust as the most common particles.

Back scatter always occurs when light hits a solid surface. In the case of water, however, most of it passes through after refraction. The spherical surface causes a large amount of forward scattering. The density of water droplets will determine how many times this happens before we see it as air glow. The density also affects how much attenuation occurs on the stars and fuzzies.

When we check the weather we want to see low relative humidity. Warm air, however, will hold far more water than cold air. That's why we sometimes see so well on winter nights even though the relative humidity isn't remarkable. Clouds are often opaque. That is because the typical droplet size is larger and the density is high. But sometimes there are very high altitude clouds which spoil our view and we can't even see them. But these are important to the airline pilots and are often mentioned in aviation weather forecasts and reports.

Dust, smoke and other solid aerosols are not transparent. They attenuate the stars but have very little forward scattering. They mostly cause back scatter. That implies that we don't expect much air glow from the stars, but any surface lights can cause a big problem. It will also attenuate the light from the stars. We need to know the source of these aerosols and the wind direction. Knowing the winds aloft from an aviation forecast may be needed to avoid disappointment.

Scattering from ice acts more like dust than water but is somewhere in between in most cases. It produces very interesting special effects, like halos, moon dogs and sun dogs. The size of the halo depends on the crystal face of the ice. If the angle is too small or too large, you won't see the halo.

In the next article I will try to explain how the rainbow is created after a storm.

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If you have a topic you would like me to discuss, please let me know at lcrowder@roadrunner.com .

*Ken Crowder*

## PVAA Officers and Board

**Officers**

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Membership ...Ludd Trozpek...............909/624-3679
Programs ........Ron Hoekwater............909/391-1943
Publicity .... ...Laura Jaoui.............

## Club Events Calendar

**May 11 - General Meeting**
**May 19 – GATE-Together–Townsend Jr High School, Chino**
**May 20 - Annular Solar Eclipse**
**May 23 - 28 RTMC**
**May 26 - Star Party - RTMC**
**May 31 - Board Meeting, 6:15**

**June 5 - Venus Transits Sun - starting 3:06pm**
**June 8 - General Meeting**
**June 16 - Star Party - White Mountain**
**June 22 - Star Party - Cottonwood Springs - joint with Palm Springs Braille Institute**

**July 2 - School Star Party - Colony High School, Ontario**
**July 5 - Board Meeting, 6:15**
**July 13 - General Meeting**
**July 21 – Star Party – Cottonwood Springs**
**July 24 - Ontario Library Main Branch - Dark to 9pm**

**August 2 - Board Meeting, 6:15**
**August 10 - General Meeting**
**August 18 - Star Party - Mojave River Forks Regional Park**
**August 30 - Board Meeting, 6:15**

**September 7 - General Meeting**
**September 15 - Star Party - To Be Announced**
**September 27 - Board Meeting, 6:15**

**October 5 - General Meeting**
**October 13-Star Party–Nightfall/Anza-Borrego Desert State Park**
**October 23 – Ontario Library Main Branch 7 – 9pm**
**October 25 - Board Meeting, 6:15**

## What's Up - Spherical Starballs

Once, at the north rim of the Grand Canyon when I was walking back to my cabin at midnight, I gazed up to see what I could see. Directly overhead in black velvet was a fuzzy sphere of stars. I was amazed it was so clear at 5.8 magnitude. A brightness of 6th magnitude is about the threshold of naked eye visibility. Of course it was directly overhead, the brightest of its kind north of the equator. It was the Great Hercules Globular Cluster (M13). Near by in Hercules lie another globular, M92. But at 6.3 mag. I could just barely see a blurry spot. Messier catalogued the most luminous 29, and there are about 160 now known in the Milky Way Galaxy.

Globular clusters are symmetrical star systems with gravitationally bound concentrations near their centers. They swarm in a spherical halo around our Milky Way's core. This means a majority of them are in Scorpio, Sagittarius, and Ophiuchus near our galactic center. Spectroscopic studies show them to all be about the same age, about 13 to 15 billion years old. They are similar in other ways, roughly 150 light years across and containing several hundred thousand very ancient stars. But there are no interstellar gas clouds and few planetary nebulae. This is probably the result of star density. This same density causes violent interactions that create a lot of white dwarfs, neutron stars, pulsars and blue stragglers. Blue stragglers are stars rejuvenated by fresh matter falling from a binary star companion. Globulars have a large number of binary and variable stars.

In the final analysis the easiest way to catalogue globular clusters is by their degree of central compaction. Some have very bright concentrated cores while others are loosely constructed. A few are mysteriously huge.

The two largest, globular clusters are so big they were originally classified as stars. Huge Omega Centauri (3.68 magnitude) in Centaurus (Centaur) was never seen by Messier, it was identified as a "spherical nebula" by Edmund Halley who traveled more. Even this giant globular (NGC 5139) wasn't seen as a star cluster until the advent of the larger telescopes of William Herschel and others. Omega Centauri rises briefly above our horizon in Southern California, easily spotted by an unaided eye.

The second largest globular lies far south near one of the Milky Way's two satellite galaxies, the Small Magellanic Cloud. Called by its star number 47 Tucanae (pictured) because it perches in the constellation of the Toucan bird at a magnitude of 3.95. Another bright southern globular, NGC 6397 (5.5 mag) in Ara the Altar, is much too close to our horizon to view.

But now let's consider the 29 Messier globular clusters. Far to the north is M3 (6.1 mag.) in Canes Ventici (Hunting Dogs) with a shining center. This is a far out location because a majority are near the galactic center. An easy one to find is M4 (5.6 mag) right next to the red star Antares in Scorpio (Scorpion). Here an extra-solar planet has been discovered orbiting a star near the edge of M4. Imagine living on a planet next to a globular glow. North of that is M5 (5.61 mag) in Serpens Caput (Serpent's Head). Here Ophiuchus (Serpent Bearer) contains M10, M12 and M9 and many others. But the largest number are concentrated around Sagittarius (Archer). Just above the "teapot's" lid is the third brightest globular M22 (5th mag) which can be eyeballed in dark skies. Farther out from the galactic halo in Aquarius (Water Bearer) is M2 (6.4 mag), the first catalogued by Messier. Also farther away is M15 (6.2 mag) in Pegasus.

This brings up the question of how globular clusters were formed with all of their similarity of star number and age. Why do they contain some of the oldest stars known? One theory suggests that globular clusters were gravitationally strong enough to survive the cannibal merging of galaxies into larger and larger ones. They may even be the left over cores of smaller galaxies that were stripped of their outer stars by galactic collisions and their explosive starburst activities. An earlier galactic environment was very hostile to open weaker star clusters. Globular clusters are also in other galaxies. Over 500 have been found in the Andromeda Galaxy. They can be seen as compact stellar fossils from a distant past.

Two rare events are coming up! On May 20th there will be an annular eclipse of the Sun. This Annular type will have a sunbright ring. Then on June 5th there will be a solar transit of Venus. Don't miss it, the next one is in 2117! So there's always something going on up there whether it's a current event in our own solar system or a distant and ancient globular cluster.

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***Lee Collins***