I've loved the stars too fondly to be fearful of the night.
Galileo Galilei

Newsletter of the Pomona Valley Amateur Astronomers

Volume 29 Number 5 ***nightwatch*** **May 2009**

President's Address

There has been much interest shown in our PVAA trips this summer to Mount Wilson and Palomar Mountain. In fact the Palomar Observatory tour is full to overflowing. If you are signed up but will not be able to attend, let Claire know as there is a waiting list. The Mount Wilson 60-inch observing session on June 20 is filling up too. If you want to join us in observing with a that great and historic instrument then you had better sign up soon.

To amateur astronomers May means one thing, the Riverside Telescope Makers Conference Astronomy Expo. The 41st annual RTMC Astronomy Expo will be held Friday through Sunday on Memorial Day weekend (May 23-25). It is one of the highlights of the astronomical year. This will be my 17th year to attend the conference, which every year keeps getting better and better.

RTMC is a great place to try out and buy astronomical equipment. I bought my 22-inch Starsplitter telescope there. I have also purchased binoculars, several eyepieces, and filters at RTMC. The prices are generally better than what they are elsewhere. If you have all the equipment you need (that's hard to imagine) there are books, back issues of magazines, tee shirts, meteorites, fossils, astro-photos, paintings, jewelry, chess sets, and anything might turn up at the swap meet on Saturday morning.

Every year RTMC has legions of interesting speakers and presentations to hear and see and this year (I'm sure) will be no exception. Dr. E. C. Krupp will be the Keynote Speaker. Dr. Krupp has been Director of Griffith Observatory in Los Angeles since 1974.

But, what we all love to do is look at the sky and RTMC is one giant star party. In fact if it isn't the biggest in the world it must be very close. There are hundreds of telescopes and binoculars out on Friday and Saturday nights. And this year (for those of us interested in deep sky observing) the moon will not rise until morning twilight. A few years ago I looked through a pair of 13-inch binoculars someone had constructed. What a thrill! During the day there are solar telescopes set up, often with H-Alpha filters. The last few years I have seen a few solar spectroscopes as well.

Another great thing about RTMC is getting to visit during the day and observe the heavens at night with old and new friends. Each of the last several years up to Camp Oakes I have met up and camped with Joe Hillberg, Bob Akers, Jim Bridgewater, and Ludd Trozpek. It will be a chance to catch up with some people I haven't seen for a year and some that I have seen more recently.

I would strongly encourage anyone with any interest in astronomy to attend the Riverside Telescope Makers Conference, May 23-25. It truly is a wonderful experience!

Ron Hoekwater

April General Meeting

In April we were joined by several students from Dave Kary's astronomy classes at Citrus College. While they were attending for extra credit in their courses, I hope they also enjoyed themselves and will consider joining us again at another science lecture or nighttime observing session.

Next we were treated to a preview presentation from our main speaker – mild mannered CPA by day, Bob Stephens is a demon with a camera by night. Bob attended the Riverside Club's Messier Marathon star party and from Friday, March 27th to Saturday, March 28th managed to not only see all 110 Messier objects but to photograph them as well. He shared a couple dozen of his photos as well as pictures of the event itself; from the telescope setups to the barbequed meat to the yummy potluck side dishes. Our Club members have a standing invitation to the RAS Club star parties. If you get the chance to attend, I highly recommend it – they look like lots of fun.

Claire Stover

Club Events Calendar

May 8, General Meeting – Tim Thompson on Herschel/PlanckTelescopes
May 22 - 25, RTMC
May 28, Board Meeting

June 5, General Meeting
June 13 - 19, Ron plans to be at White Mountain
June 20, Mount Wilson viewing with 60" - Contact Ron
June 20, Star Party -Claremont Hills Wilderness Park
June 24, – Galster Park, West Covina 7 – 9 PM

July 2, Board Meeting
July 10, General Meeting - Speaker Phillip Choi, Professor, Dept of Physics & Astronomy, Pomona College
July 11, Tour of Mt Palomar 2 PM.
July 18, Star Party - Mojave River Forks Regional Park
July 25, Public Star Party at Griffith Observatory 2 – 9 PM
July 30, Board Meeting

August 7, General Meeting - Speaker Greg Lyzenga, Geophysics Professor, Harvey Mudd College on Asteroid Occultations
August 22, Star Party - Helipad at Camp Angeles
August 25, Ontario Library Main Branch, 7 – 9 PM
August 27, Board Meeting

September 4, General Meeting
September 19, Star Party
September 24, Board Meeting
September 26 - 27, Second Annual PATS, Pasadena

October 2, General Meeting
October 17, Star Party
October 22, Board Meeting
October 27, Ontario Library Main Branch, 7 – 9 PM

November 6, General Meeting
November 14, Star Party
November 19, Board Meeting

December 4, - Holiday Party
December 12, Star Party
December 17, Board Meeting

Palomar Observatory

On Saturday, July 11th at 2:00 PM, the PVAA is touring Palomar. The limit of 30 people have signed up, but if you are still interested, please contact **Claire Stover** .

If you have signed up for this event, but cannot attend, please let us remove you so that others may sign up.

Mojave River Forks Campground

A Quick Observing Get Away

After one rain delay last November the much anticipated star party at the Mojave River Forks campground was conducted with much success.. This spot was of particular interest to PVAA as it is an easy one hour, or less, drive from most of our homes. The sky conditions are as good as Mount Baldy and according to Ron Hokewater "better than Baldy in some parts of the sky."

I had reserved the campground's equestrian area to assure us a private spot for evening under the stars. Located across the highway from the campground, the equestrian area has paved roads and parking, picnic tables, a tent area as well as restroom facilities.

Jim Bridgewater was once again our advance scout and arrived before all of us. He was soon joined by me and other PVAA members; Bill Connelly, Ken Crowder, Ron Hokewater, Bob Griffith, and new member Gary Thompson.. This group produced a large array of telescopes.

The week prior to this star party kept us guessing whether the star party would happen or not. Of course the weekend before our event was perfect. Warm, clear skies with little wind. That changed 5 days before our star party to cloudy skies with a chance of rain the day of the event. However the day of the star party we had blue skies becoming clear at night. The only issue remaining was a cold gusty wind which dissipated as soon as the sun went down. This produced a cool but pleasant evening.

We only had one "oops" in as much as two of us forgot to bring the needed aluminum foil to block the light produced by the bathroom light. Lucky for us Gary Thompson had a remedy. With a chair and some kind of cover he was able to reach the light fixture and block most of the stray light. Thank You Gary! The evening progressed with enjoyable conversation and observations of many galaxies.

One of my favorites which I saw with my intergrated video system was NGC 4565. This is a large edge on galaxy near Canis Venatici. Meanwhile Ron was displaying some great views of the triplet in Leo with a 10 inch Dobs and Jim was enjoying a wide field view of M81 and M82. Saturn continued to show its rings in a rare edge on orientation making the planet look like an apple with an arrow stuck through it.

We continued observing until 1100 PM when all of us began to pack up for a short drive home and a real bed.

Mojave River forks campground has a good mix of tent site and RV sites with hook ups. Both have access to hot showers. Summers at the campgrounds can be crowed with spill over campers and boaters from the nearby Lake Silverwood. Calling in advance is always a good idea and I've been told you can reserve a campsite in advance. The tent sites have trees so ask for those with a clear shot to the sky.

I am looking forward to our next star party at this location in July when we have the equestrian area reserved, all to our selves. This time I'll be sure to bring something to block the bathroom light

Frank Busutil

Given that Bob is a CPA, it was an extra treat to have him at our meeting on April 10th, since crunch time is upon all those in the accounting field so close to the 15th of the month. We had a tour of not only the history of amateur astronomer William Herschel and his sister Caroline, record keeper and observer in her own right, but we saw pictures from where the two did much of their work.

Bob visited Bath, England where the Herschels lived for 15 years. We saw photos of his home as well as of the basement telescope workshop and the garden in back where the observing was done. His excellent skills as a telescope maker allowed him to make observations which included the discovery of Uranus in 1781 from that little garden in Bath. It also enabled him to earn a living in the field of astronomy, supplementing the income he earned as the King's Astronomer and replacing the wages he earned performing and composing music.

Herschel knew how to make a good impression and the name he proposed for the new planet was Georgium Sidus (George's Star). It was soon after that William was given the position of King's Astronomer, charged with showing the sky to the King, his court, and royal visitors at any time the monarch wished. An English king was not considered by all countries to be the one who should be honored by this discovery, though, and the planet for awhile was called Herschel. In the end, however, a family name of another sort was chosen. Uranus is the Latin name for the Greek god of the sky, Ouranos. He was the father of Saturn who in turn was the father of Jupiter. So, no need for the fancy mnemonics that school kids use to remember the order of the planets – just keep in mind the parentage of the Greek gods and you'll ace your exams. Another individual liked that name as well and in 1789, Martin Klaproth discovered a new element which he called uranium. Her Majesty's Nautical Almanac Office was the last to be convinced but it finally changed its records from Georgium Sidus to Uranus in 1850.

Another location Bob visited on his travels in the Royal Observatory in Greenwich Park, London. The Observatory was commissioned by King Charles II in 1675. In addition to tracking the motions of objects in the heavens, the job of the observatory's director, or Astronomer Royal, was to aid in determining the longitude of as many places as possible. Since sea travelers of the day didn't even have accurate maps or reliable clocks, much less a GPS system, knowing the longitude as accurately as possible helped the sea faring English to know as accurately as possible where they were so they could end up where they intended to go.

It was built of mostly recycled brick and wood and used the foundation of an existing tower. This resulted in the alignment of the building being off true North by 13 degrees, forever upsetting the precise record keeping astronomers who worked there.

For centuries, the building has been used by the British as a starting point for measuring their way around the world. In 1851 their zero point for longitude, the Prime Meridian, was centered upon the observatory. In 1884 most other countries adopted it as well, with the notable exception of France, which continued to use the Paris Meridian for several decades. Oddly enough, they would have joined the crowd at the time had Great Britain agreed to adopt the metric system. The Meridian was indicated by a brass strip, which was later upgraded to stainless steel, running through the courtyard outside. Since December of 1999 the Meridian has also been indicated by a strong green laser which shines north through London at night. Modern science now uses a more global reference system which places the Prime Meridian 102.5 meters east of the steel strip, which is now 5.31 arcseconds West instead of at 0.

Greenwich experienced another downgrade from its historical prominence. Greenwich Mean Time (GMT) was based on observations made at the Observatory until 1954 when it was no longer active at that location. GMT has been replaced by the more accurate Universal Time that is determined by measuring radio sources from outside of our galaxy and bases a second on the radiation emitted by a Cesium-133 atom. The Observatory is located on the Thames River. Since time was so important to those who sailed the seas, in 1833 a time ball was placed in the building which could be seen from the river. It was dropped at exactly 1 PM (GMT) daily so everyone could "synchronize their watches" or their historical equivalent. One thing hasn't changed, though – the ball still drops at 1 PM to this day.

The Royal Observatory at Greenwich is today a museum of astronomical and navigational tools. Exhibits include John Harrison's longitude marine chronometer, H4, which won the Longitude prize in 1714, as well as the three which came before it - H1 to H3, I presume.

I'd like to think we own just a small piece of the long history of the Greenwich Observatory ourselves. In the early 1980s, John and I visited London, and the Observatory. It was being remodeled during our visit, as I recall the brass strip and the surrounding cobblestones were being replaced. A pile of old bricks lay nearby, headed for the rubbish bin. We picked one up and carted it off home – a souvenir of the notable astronomers who worked there and of the discoveries that they made.

Much better than an old brick, though, was the item brought to our meeting by member Jay Master. At the meeting where we learned from Bob about Sir William and Catherine Herschel, was one of the books actually used by the pair during their observations in the 1700s and 1800s. The leather bound book contained data gathered by the Herschels but the best part is that it contained notes and corrections in the margins done by Catherine Herschel herself. The volume was in excellent condition and Jay was generous enough to not only let us see but to carefully leaf through the two-hundred year old book. Catherine's writing was still clear and compared to William's, which we saw in photos of a few of his letters, quite legible.

Thanks to Bob for such an interesting story about these early amateurs who did so much to further the field of astronomy and to Jay for sharing his wonderful book.

Claire Stover

References:

http://en.wikipedia.org/wiki/William_Herschel
http://en.wikipedia.org/wiki/Uranus#Naming
http://en.wikipedia.org/wiki/HM_Nautical_Almanac_Office
http://en.wikipedia.org/wiki/Royal_Greenwich_Observatory
http://www.greenwich-guide.org.uk/meridian.htm

Asteroids (starlike objects) have always been the orbiting underlings of our solar system. When discovered two hundred years ago they were so small they had no planetary shape but appeared as "starlike objects." These unconsolidated "leftovers" were soon reviled as space junk. They attracted cracks like "up your asteroid," because they got in the way of hunting for glamorous new comets. However our era of space probes and powerful telescopes has awakened a new interest in these pieces of "cosmic trash."

The largest object in the Asteroid Belt, Ceres, is just visible in binoculars at its brightest. Now quite close in Leo (Lion) its still only 6th magnitude. It gets much dimmer. Ceres was the first asteroid to be discovered.

It was found in 1801 by a Sicilian, Guiseppe Piazzi. When he realized it was orbiting the Sun he named it after a favorite saint of Sicily, Ceres B the goddess of cereal. It's only 480 miles in diameter, about the distance from Arizona's Kitt Peak Observatory to Ceres, California, a rural suburb of Modesto. The discovery of Ceres fit neatly into a theory called "Bode's Law" which proclaimed that there was a "missing" planet somewhere between Earth and Mars. So Ceres was at first honored as a brand new planet. But soon three newer and smaller bodies would be discovered: Pallas, Juno, and Vesta. Although they continued the use of female goddess names, astronomers were disillusioned by the diminishing size of each discovery. Soon, Ceres, slighter than a score of moons, was demoted to the position of #1 asteroid. Eventually the discovery of thousands of asteroids would fill bulging catalogues. So many puny orbiting objects were found in the area between Earth and Mars that it would be named the Asteroid Belt.

Was this Asteroid Belt the remains of a planet that had exploded? The theory now is that this belt of pieces represents an area half way between Jupiter and the Sun where gravitational forces prevented the consolidation of a larger planet. So uncollected pieces remain, many in groups orbiting around each other. Most asteroids are city or county sized, pocked with impact dents like potatoes. Science fiction stories often show the Asteroid Belt as an obstacle course for astronauts, but the objects are all so far apart, and so well catalogued, that they offer no serious threat to voyaging spacecraft. Now a discoverer can name them after anything an international committee approves of (none named Hitler). One group of four is named after the Beatles. I know someone who named one after his cat, Mr. Spock.

Still Ceres remains the only asteroid big enough to have a truly round shape. So in 2006, when Pluto was sadly demoted to dwarf planet, Ceres was proudly promoted to dwarf planet. A current probe, called DAWN will visit Vesta in 2012, and Ceres in 2015. Then many questions will be answered: does Ceres have ice on its surface, does it have little mini-moons?

One of the main reasons for an increasing interest in asteroids is the realization that a near earth asteroid (NEA) could be a real asteroid hazard to life on Earth.

It has been generally agreed that 65 million years ago the rapid demise of the dinosaurs was caused by the impact of a monster asteroid, probably in what is now Mexico's Yucatan Peninsula. There may also have been previous extinction catastrophes but even a small impact can cause earthquakes and tsunamis.

A public fear is often formed by a swarm of disaster oriented movies, such as three in the late nineties with titles like Asteroid, Armageddon, and Deep Impact. Nevertheless, asteroid impact is probably the only natural disaster that could be prevented.

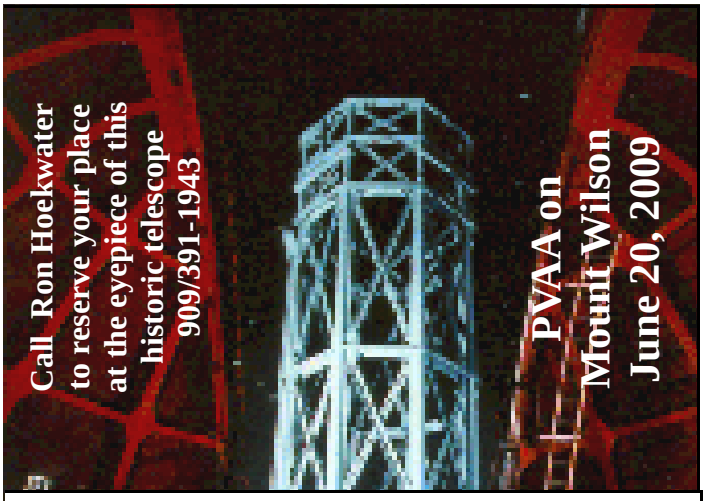
The first well documented large impact was in the remote Tunguska region of Siberia in 1908. This mysterious space traveler violently exploded just as it reached the ground, but it knocked down a huge forest of trees. It aroused a lot of interest among scientists who thought today's Earth just wasn't subject to big impacts. Some still believed the craters on the Moon to be volcanic rather then impact. But, in the last one hundred years the discovery list of giant eroded impact craters on Earth has grown and grown. One has only to visit the excellent impact museum at Meteor Crater near Flagstaff, Arizona. This well preserved 50,000 year old, 2.4 mile wide crater is enough to impress anyone. The possibility of an asteroid impact is a frightening reality.

The first step in avoiding a destructive event is to find the approaching object.

A serious search for "Earth-crossing" asteroids began in 1973 and escalated in 1998 with the formation of NASA's Spaceguard Survey. Since the establishment of this program almost a thousand suspicious objects have been catalogued. This accelerated searching has lead to a lot of recent reports of "a killer asteroid headed for earth" only to have the unpredictable thing safely veer aside as it gets closer. Currently the Mt. Lemmon Telescope is looking for NEAs in the University of Arizona's Sky Survey, but a new 1.8 meter telescope called Pan-STARRS 1, to be located on Maui's Haleakala peak, will devote itself to an intensified search for evil asteroids.

What to do if we find a real menace? The worst thing would be to blow it up leaving a lot of little killer fragments. No, the best plan would be to try to hit it with a spacecraft to knock it into a different course that would miss Earth. Other ways would be to attach a grappling claw to tug it into a safe orbit. Whatever happens it will certainly be the most co-operative and expensive space mission in human history. An effort the dinosaurs could never hoped of launching.

Lee Collins



Get info about Mt. Wilson at http://www.mtwilson.edu/60in.php

Introduction

Cepheids are generally divided into two classes. Type I or "classical" Cepheids are bright, large and massive stars - from five to fifteen solar masses - that vary in brightness very regularly over time intervals usually ranging from 1 to 50 days. However, some can have periods as long as 200 days. In a cycle Cepheids can change their brightness by as much as two magnitudes, however, the magnitude change of most Cepheids is usually less than one magnitude.

Cepheid's spectral class also varies over the same time interval. Although all Cepheid's spectral classes fall in the range between F6 and K2 the spectral class changes occurring during a single cycle are normally not as far reaching. (Note our sun - not a Cepheid - is of spectral type G2 where G falls between F and K in the ***Harvard Spectral Classification System***.).

At one time the term Cepheid was applied to all continuously variable stars with periods less than 35 days which were not eclipsing binaries. However, that category was too broad because it encompassed many types of variable stars which currently have other designations.

Type II Cepheids are not as massive as the Sun and are older stars. The light curves of these Cepheids are not as reproducible as the classical, Type I, Cepheids

In what follows we will be dealing essentially only with Type I Cepheids.

Galactic Cepheids

The prototype star is delta Cephei, a naked eye star. The current Hipparcos catalogue specifies its distance at about 300 parsecs from our sun. Delta Cephei has a period of 5.37 days wherein it varies in magnitude from a maximum brightness of 3.71 to a minimum of 4.43 magnitudes. The velocity, surface temperature and spectra also vary with an identical period.

Another well known Cepheid is Polaris, - the North Star AKA: Alpha Ursa Minor – which has a period: 3.97 days and is of spectral type, F7. Its magnitude varies from 2.5 to 2.6. Polaris is the nearest Cepheid variable to the Sun and lies at a distance of about 132 pc or 430 LY. Polaris has a 9th magnitude companion (alpha UMi B, F3V) orbiting at 2400 AU and a third component, alpha UMi Ab, a dwarf orbiting at 18.5 AU.

Are Cepheids Double Stars or Single Pulsating Variables?

Initially, to explain the light variation a binary system was proposed. However, Harlow Shapley criticized that interpretation and proposed instead a stellar pulsating theory which has now been universally accepted[1].

In arguing against a binary theory of Cepheids Shapley made the following points:

1. "Geometrical explanations of the light-variation fail completely…"
2. The absence of any spectra from the secondary,
3. The low mass function of the binary, $m_2 \sin(i)/(m_1 + m_2)$, where m_1 is the mass of the primary and m_2 is the mass of the unseen component and i is the orbital inclination angle. The low mass function indicates that the mass of the secondary - if it exists at all - is of extraordinarily small mass.
4. Observed oscillations in the period of several cluster type variables. (cluster type variables are another name for short period (Period < 1 d.) AKA RR Lyrae type) stars which are actually short period Cepheid variables. Indeed Shapley along with others whom he cites presents convincing arguments that these short period variables are all Cepheids.)
5. The continual changing form of the light curve from one maximum to the next. That is, the normal Cepheid light curve appears to rise very steeply to maximum and then fall more gradually to minimum. However, this light curve is not repeated exactly during each cycle but tends to vary in the time required to reach maximum light. In the case of SW Andromedae varying by as much as ten to fifteen minutes over the 0.442 day period.

Thus the conclusion reached by Shapley is that the Cepheid and cluster variables are not binary systems, but rather single pulsating stars[1]. Eddington deduced that these stars were pulsating radially[2].

The Period Luminosity Relationship

Cepheid variables are important in the history of astronomy because the period–luminosity relation for Cepheids - discovered by Miss Henrietta Swan Leavitt (1868-1921) and reported by Edward C. Pickering in 1912 - enabled astronomers to calculate the distance to far away star groups such as the Large and Small Magellanic Clouds (LMC and SMC)[3]. Leavitt plotted the relative magnitude of 25 variable stars versus the $\log_{10}$ of their period in days and showed that a linear relation existed with increasing period for both the maximum and minimum magnitudes. The slope of the line she obtained was 2.08. Leavitt recognized that the variables are all at approximately the same distance. Using Leavitt's data a plot of mean relative magnitude versus the log of the period is presented in Figure 1.

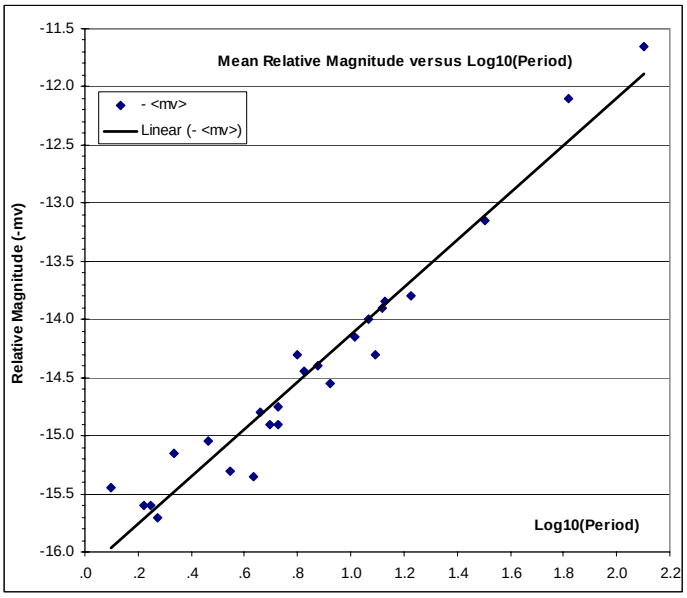


Figure 1. Plot of Mean Relative Magnitude versus $\log_{10}$ of Period in days using Leavitt's 1912 data.

To be useful for determining star distances this plot must be converted from relative to absolute magnitudes by specifying the zero point for a plot of Cepheid absolute magnitudes versus period. The zero point is where the line crosses the ordinate and for which the period equals one day.

To determine the absolute magnitude plot one must know the period and the distance to the star. In essence this requires the cepheids to be in this galaxy. Harlow Shapley made such a determination and calculated the distance to SMC.

Recent measurements of galactic Cepheid parallaxes by the

Hipparcos satellite give a Period–Luminosity relation in the visible band[4]:

$$M_v = -2.81 \log_{10}(P) - 1.43$$

where the period is given in days. A recent formula for determining the distance to Cepheids in our galaxy is given by Majaess, Turner and Lane and is[5]:

$$5\log_{10} D = V + (4.42)\log_{10} P - (3.43)(B-V) + 7.15$$

where D is the distance in parsecs and V and B are the magnitudes as observed through visual and blue filters respectively and V-B is the color index.

Thus, once the period is known and the period-luminosity curve is calibrated then it is straight forward to determine the distance to the Cepheid. And if the Cepheid is part of a distant galaxy such as LMC or SMC then the distance to that galaxy is also known because distances within any given galaxy - except of course the Milky Way - are insignificant compared with distances to that galaxy.

To conclude Cepheids are not only interesting brightness varying sky objects but also they form a critical rung in the cosmic distance ladder.

Frank Murray
Claremont, CA 91711

References:

1. Shapley, Harlow, *On the Nature and cause of Cepheid Variation*, Astrophysical Journal, 40, pp 448-465, 1914. Note also "Following theoretical studies of stellar pulsations by August Ritter, Harlow Shapley in 1914 showed that brightness, temperature and velocity variations in Cepheids were consistent with radial pulsations" in John R. Percy's, *Understanding Variable Stars* Cambridge, Cambridge, p 147, 2007
2. Sterken and Jascheck, *Light Curves of Variables Stars*, Cambridge, New York, p 87, 1996
3. Henrietta S. Leavitt as reported by Edward C. Pickering, *Period of 25 Variable Stars in the Small Magellanic Cloud*, Harvard College Observatory, Circular 173, 1912
4. Feast, M.W. & Catchpole, R. M., Monthly Notices of the Royal Astronomical Society, 286, L 1-5, 1997
5. Majaess, D.J., Turner, D.G. and Lane, D.J., *Assessing potential cluster Cepheids from a new distance and reddening parametrization and Two Micron All Sky Survey photometry*, Monthly Notices of the Royal Astronomical Society, 390, pp 1539-1548, 2008

References for further reading:

Cecilia Payne-Gaposchkin,
Introduction to Astronomy, 1954, Chapter 14

Cecilia Payne-Gaposchkin and Sergei Gaposchkin,
Variable Stars in the Small Magellanic Cloud,
Smithsonian Contributions to Astrophysics,
Volume 9, 1966

Madore, B.F., Editor,
Cepheids; Observation and Theory,
Cambridge University Press 1985.

Pasachoff and Kutner
University Astronomy
Saunders, Philadelphia, 1978, Chapter 7

Zeilik & Smith
Introduction to Astronomy & Astrophysics,
1987, Chapter 18

PVAA Officers and Board

Officers

President .....Ron Hoekwater….....909/391-1943
Vice President ..Joe Hillberg.....909/949-3650
Secretary .....Claire Stover.....909/988-9747
Treasurer .....Ludd Trozpek...…….909/624-3679
VP Facilities .....Bob Akers.....909/946-0228

Board

Lee Collins 626/852-9442
Ray Magdziarz 909/626-8303
Jim Bridgewater 909/624-4893

Directors

Nightwatch .....John Stover….....909/988-9747
Membership ...Ludd Trozpek.....909/624-3679
Publicity .....Dorene Hopkins.....909/983-5584

PVAA at
Mojave River Forks Campground
April 25, 2009

Photos by Ron Hoekwater