



Newsletter of the Pomona Valley Amateur Astronomers

There was no "before" the beginning of our universe,  
 because once upon a time there was no time.  
*John D. Barrow*

Volume 31 Number 05

*nightwatch*

May 2011

### President's Message

Our speaker for the May club meeting is Dr. Albert Di Canzio, who will speak on, "Remembering Galileo: An Astronomer's Legacy."

I think about Galileo a lot, especially when I am doing sidewalk astronomy or other outreach activities. Often the biggest crowd-pleasers are the moon and the bright planets, which don't require large, fancy, or expensive gear. People always seem surprised that they can see lunar craters or the rings of Saturn through a small telescope. I think most people must have those things filed away with Mount Everest and Komodo dragons under the mental heading of "natural wonders I know about but will never see". I try to imagine how much greater was Galileo's surprise on seeing such things for the first time. Today even the complete novice approaches the telescope armed with the knowledge that these things are out there to be seen, but nothing in Galileo's previous life—or in fact in the entire intellectual tradition to which he belonged—could have prepared him for the sight of mountains on the moon, satellites around Jupiter, or the phases of Venus.

I wonder how many of us would have the courage to take on the entire educated world based on observations made with a homebuilt telescope. Galileo would probably pass out if he could see the telescopes even beginners have access to today. Even the most suspect of the department store junkers are at least no worse than what he had to work with: 1- and 2-inch refractors with single objectives and pathetically narrow fields of view. But they were his Palomar, Keck, and Hubble all rolled into one, and they were enough to ignite a scientific revolution that is still going on. I think it would be interesting to find a long 30mm spyglass and mount it above or alongside one of my bigger scopes. Anything I can find on the market today will probably have at least an achromatic objective and a 3-element or better eyepiece, but such a spyglass would give people at least a taste of Galileo's view of the universe. And it would be a useful

antidote for anyone who feels that their telescope isn't good enough for stargazing—a sentiment I have often come across in online forums.

Clearly there are some companies that turn out poorly-made telescopes designed to ensnare the unwary buyer with inflated claims. But on the other hand, I know a lot of people who wouldn't be in amateur astronomy if it wasn't for some rickety old refractor. And I have also read of several poor souls who spent thousands or even tens of thousands of dollars on huge computerized rigs and then gave up because the gear was too frustrating and the views were insufficiently impressive. Both extremes confirm the old adage that the most important parts of the telescope are the eye and mind behind the eyepiece. I doubt if that saying goes all the way back to Galileo—he was too busy discovering the universe to fret about saving up for a monster dob with GoTo—but I'm sure he'd agree with it nonetheless.

*Matt Wedel*

### PVAA Officers and Board

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## April General Meeting

Mathew Wedel opened the meeting for the first time as the new PVAA president. He announced that that we won't be starting the meetings as late as the 7:40 start we had for April. Matt made a few announcements like signing up for the Mount Wilson night of viewing through the 60 inch telescope on Saturday, September 24th. The per person fee is \$100.00 for the night. He also encouraged everyone to participate in the 5th International Sidewalk Astronomy Night on Saturday May 7th.

Lee Collins gave his usual informative talk on what's up in the sky, centering on Ursa Major. If you like to look at galaxies, there are plenty to be found in this part of the sky. It also contains M40, which is not a nebula, open or globular cluster or a galaxy, but a double star. Lee concluded that Messier must have gotten a little lazy to make that one of his objects.

Our guest speaker for the night was Christie Pearce. Christie is the Center Manager of the Columbia Memorial Space Center in Downey. <http://www.columbiaspacescience.org/> While the center does commemorate the astronauts that were lost in the Columbia explosion, it focuses more on continuing the teaching of science and getting the public involved through interactive exhibits. The globe pictured shows the movement of Jupiter's



belts. It also can show other planets. There is a paper airplane launcher, that, after you make your paper airplane, you launch your design and try to make it fly through a hoop. Using both levels of the two-story building, they have an exhibit called "Soft Landing." It takes payloads up to the second floor and

drops them using a parachute, air bags or wings. The Center has an aircraft Flight Simulator, and a Robotics Lab using the Lego Mindstorm system. They also have a Shuttle Simulator that everyone can use. The Center is a great place to watch a launch, as they have a 12 foot TV, and host a "Launch Party." There are many more exhibits, like a Rocket Launcher, all for only \$5 per person, or \$3 per person for groups of 10 or more. For larger groups they have Return to the Moon in their space mission simulator. Participants will have the opportunity to become both mission controller and spacecraft astronaut. Crew members must solve real-life problems in math, science and technology to successfully complete their mission. Each team is critical, and the success of the mission is dependent upon the work of all teams. The two-hour simulation takes place in a realistic mock-up of a spacecraft and mission control room." While the current fee for Return to the Moon is \$350, the per-person fee is only \$10 - \$20.

Downey is closer than you think.

All I know is: ... *I want to GO!*

*Gary Thompson*

## PVAA is Spotlited in Book

**Everyone's Universe** is a unique guide on the technology and the astronomy places available for people with disabilities who want to explore the universe. In the educators section of **Everyone's Universe**, PVAA is spotlighted as the founder of project Bright Sky which makes it possible for blind individuals to see and and explore the universe.

PVAA's coverage is extensive and covers Project Bright Sky's history and the unique use of technology which makes it possible for individuals who are blind to participate in the enjoyment one gets when we explore a beautiful universe.

**Everyone's Universe**  
**A GUIDE TO Accessible Astronomy Places**  
 by Noreen Grice

**Everyone's Universe** will be available at Amazon in June 2011

*Frank Busutil*

## Club Events Calendar

**May 13 – General Meeting - Our speaker will be Dr. Albert Di Canzio. The Title of his presentation is "Remembering Galileo: An Astronomer's Legacy." Dr. DiCanzio is a mathematician and professor at Webster University. He is author of**

*Galileo: His Science and His Significance for the Future of Man*

**May 14 - Girl Scout Camporee, 4:30**

**May 25 - 30 [RTMC](#)**

**June 3 - Project Bright Sky - Cottonwood Springs**

**June 4 - Star Party - Cottonwood Springs**

**June 9 - Board Meeting, 6:15**

**June 10 - Columbia Memorial Space Center, 7:00-9:30 PM**

**June 17 – General Meeting**

**July 7 - Board Meeting, 6:15**

**July 12 - Star Party - Galster Park Nature Center**

**July 15 – General Meeting**

**July 30 - Star Party - White Mountain**

**August 4 - Board Meeting, 6:15**

**August 5 - Columbia Memorial Space Center, 7:00-9:30 PM**

**August 9 – Main Branch, Ontario Library, 7 – 9 PM**

**August 12 – General Meeting - Vatche Sahakian**

**Aug 27 - Star Party - Angelus Oaks**

**September 1 - Board Meeting, 6:15**

**September 9 – General Meeting**

**September 24 - Mt. Wilson Observing**

**October 8 - International Observe the Moon Night,**

**Claremont**

**October 14 – General Meeting**

## How Does It Work?

A lot of mystery seems to surround the subject of eyepieces. Many named designs exist and each one seems to offer adequate performance. This series will attempt to solve some of the mystery and help in understanding how to select the eyepiece you will need.

The term "first order" correction refers to the level of approximation to a perfect solution. If we consider a thin lens, the first order approximation can be drawn with a line drawing in two dimensions. A line is drawn horizontally (the optical axis) across the paper. The lens is illustrated in the center, symmetrically about the axis. Two foci, one on each side, are drawn. Then the rays may be drawn. The object is often shown as a vertical arrow on the left side. A horizontal line from the object tip to the lens will pass through the focus on the other side. A line through the focus on the near side will hit the lens and exit the other side as a horizontal. Where the two lines intersect will be the arrow tip of the image. It will be inverted. This results in the first order approximation of the image.

The real design problem is much more complicated. Each ray from the tip of the object will hit the lens at a different point. Some photons will be reflected and some will be refracted. The refracted rays will then pass through the lens to the second surface. There again some photons will be reflected and some refracted. All rays from a point on the object to the corresponding point or volume on the image is called a bundle.

In the early days the optical designer had to trace many rays through the design using hand calculations. Several points on the object were selected and each corresponding bundle was represented by selecting rays from within the bundle for calculation. For any real lens the resulting image was found to lie on a curved surface, not a plane. All calculations had to be done in three dimensions. The "second order" and higher effects were determined by an increasing number of rays. Today software programs will do that on a home PC.

For any thin lens made with spherical surfaces, each bundle of rays will pass through a small volume around the corresponding point of the image. We call the result of this volume an aberration. If the volume is due to the spherical surfaces, we call it spherical aberration. The size of the aberration always increases as the reference point moves away from the optical axis.

For any real glass the index of refraction varies with wavelength. If the volume is due to the index variation we call it chromatic aberration.

The entrance aperture of any telescope determines the diffraction limit of that scope. The goal of the optical designer is to reduce all aberration volumes to become less than the diffraction limit.

As mentioned above, each of the two surfaces of a thin lens will reflect some photons. The optical designer must take that into account as well. Anti-reflection coatings will reduce these losses. But any loss results in reduced contrast of the image.

Another consideration is the eye relief of the exit pupil. This refers to where the eye must be in order to see the image. Short focal length eyepieces will normally result in short eye relief. In the early designs this was typically 5 mm to 10 mm depending on the focal length.

Today we can find eyepieces with 20 mm eye relief. That is very nice for those of us who require glasses. But it comes with a cost. It requires more elements and thus more surface losses. Anti reflection coatings are needed to have an acceptable contrast.

Many techniques have been developed over the years to improve the quality of the image. In this series we will look at various designs in an attempt to understand what we find when we go shopping for that perfect eyepiece.

*Ken Crowder*

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## Club Events

On May 14 the Girl Scouts will be having a Camporee at El Potrero (see our calendar). They will have 140 people there both scouts and adults. We should probably arrive around 5pm as they will serve dinner to us. Tent camping space is available, and a large "kitchen" building is available for those who have cots. Set-up south of the flag-pole and fire-pit. This is a large open area. No fires will be permitted because of the current danger. We'll be working with groups of 10 to 12 girls per scope. Our primary contact is Karen Lopez and also Desiree Beyea. Both will be on site. There is NO cell coverage on site.

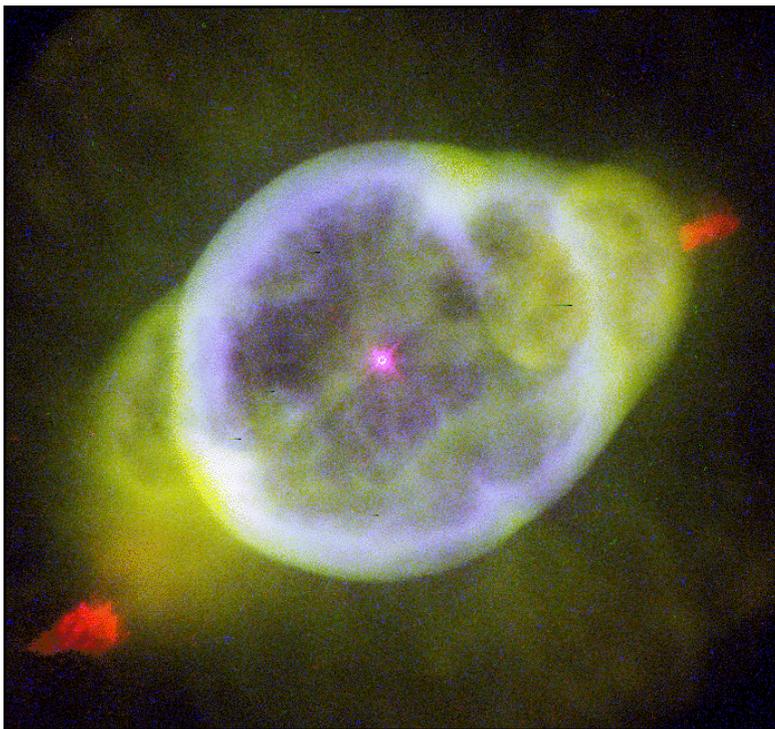
RTMC is Wednesday, May 25, through Monday, May 30, at Big Bear. Please see the [RTMC website](#) (also linked from the club calendar online) for details.

There are two club events at Cottonwood Group Area 3 on the first weekend in June. Friday, June 3, is a Project Bright Star outreach. The following evening is the club's monthly star party.

The Columbia Memorial Space Center in Downey (about 30 miles away) is hosting a public outreach on Saturday, June 10, 7:00-9:30. Christie Pearce, who spoke to us at our April meeting, said that anyone from our club would be most welcome to attend or set up a scope. It's not an official club function, but it should be a lot of fun. I'm going to try to make it myself, and if you have the time and inclination, I encourage you to join me. We are going to the Columbia Memorial Space Center in Downey to have Star Parties on June 10 and August 5 from 7:00-9:30pm. If anyone would like to bring their telescopes out, please join us?

## What's Up - Royal Lion Weddings?

Leo the lion has always been a royal constellation crowned by its bright “little king” star Regulus. In ancient days all the constellations along the ecliptic zodiac line were seen as stellar royals. Why else would the Sun, Moon, and godly planets travel in a procession among them? The Leo constellation has been seen as a royal lion by many different cultures.



The best deep space objects in Leo are two wedded trios of galaxies. The famous “trio in Leo” is beneath the lion’s butt not far from the star that means lion’s tail, Denebola. Here’s the grouping of M65, M66 and a fainter NGC 3628. Messier saw a duo in Leo, the third dusty edge-on stands off from the others. This gathering of galaxies is 30 million light year away.

The second galaxy trio is beneath the lion’s belly. Here are M95, M96 and M105. Again the third member of the wedding is the faintest having been added by Messier to increase his 100+ listing. In these apparently wedded groups the closest any galaxies get to each other is 400,000 light years. There are other dimmer galactic groups, especially in the tail triangle of three stars: Denebola, Zosma (girdle), and Chertan. Leo is made up of two forms, the tail triangle and the head sickle shape. In the sickle we find the first magnitude king star Regulus and Algeiba (Arabic for lion’s mane). Algeiba is a very attractive close double star with a color difference sometimes described as orange and yellow-green. Algeiba’s binary wedded couple orbit each other every 600 years. In front of Regulus is a red-giant Mira variable (from 5th to 10th magnitude) called R Leonis. An odd star near Leo’s border with Sextans is Wolf 359. It’s the third closest star to our Sun (7.75 light years), but also a red-dwarf at 13th magnitude.

Sextans (The Sextant) is a tiny constellation made up dim stars. It was a “fill-in” to charts in the 17th century by Johannes

Helelius who loved to use the instrument with its small telescope. A thin edge-on galaxy NGC 3115 can be found in Sextans.

But beneath Sextans is the largest of all 88 constellations, Hydra (The Water Snake). It stretches across the sky and has a fainter confusing mate Hydrus (Small Water Snake) near the South Pole. Near Hydra’s head lies its only bright star, Alphard (The Solitary One). The “seashell” galaxy M83 can be found at the other end near Hydra’s tail. But the spookiest deep sky object is NGC 3242, The Ghost Of Jupiter (pictured). This planetary nebula, also called the Eye Nebula, was discovered by John Herschel during his South African observations of 1830. John went to South Africa to observe and catalogue areas not already covered by his famous father, William Herschel.

All the constellations in this area linked to the mythology of Hercules. Leo is the lion that Hercules killed in one of his famous twelve labors. Another battle was with the giant water snake Hydra. When one head was cut off two new ones grew in its place. This is the origin of the scary phrase “hydra-headed monster.” Cancer the crab also fought Hercules. But Corvus the crow brought a friendly cup of water represented by the cup constellation Crater. Both Corvus the crow and the Crater cup seem to ride on the back of snaky Hydra. An interesting deep sky object in Corvus near Crater is a pair of colliding galaxies called the Antennae (NGC 4038 & 4039). They are 11th magnitude so only long exposure photographs show the twin streamers of stars and gas that extend like insect antennae. It’s the best known of several violently interacting galaxies and was once know as the Ring-Tail.

Its disturbed nature causes it to radiate strong radio telescope signals. The two galaxies started to interact a hundred million years ago with shock waves that led to the intense star formation and supernovae seen in the object today. A similar wedding collision of galaxies occurs with The Mice (NGC 4676) in Coma Berenices.

Now I can’t leave the Leo area without mentioning the prolific Leonid Meteor Shower that radiates from Leo every November. This famous event inspired the use of the term “meteor shower” and is linked to material from the orbit of comet Tempel-Tuttle. The Leonids have sometimes been among the most spectacular of showers. In 1833 the entire eastern half of the U.S. was amazed by a fall of hundreds of thousands of meteors an hour. It caused people to confess their sins in the belief that it was a dire warning from God. In Missouri it was seen as a sign that the Mormons should be driven out of the area. But it also inspired an intense scientific study into the true nature of the phenomenon. Strong showers have reoccurred in 1866, 1868, 1966 and they should continue in the twenty first century.

So the area around the royal lion Leo is full of natural and violent galactic weddings. In spite of the laborious efforts of Hercules to rid the sky of beasts, hydra-headed monsters still exist. Here’s Jupiter’s Ghost and other fuzzy objects so far away they seem to be drifting spirits guarding their spacy secrets.

*Lee Collins*

## A Long Time Ago In a Galaxy Far, Far Away

Ah, spring, that wonderful time of year when the amateur astronomer's thoughts turn to quasars. *Er, say what now?*

Yes, believe it or not, several quasars--the fiery hearts of long ago, far-off galaxies--are within reach of small-to-middlin' amateur telescopes. Quasars were mysterious for decades, appearing as star-like points of light with highly redshifted spectra and usually massive output in the radio portion of the electromagnetic spectrum. They are now understood to be caused by energy emitted from the accretion disks that form around the super massive black holes at the centers of most galaxies. As matter spirals into the accretion disk, there is tremendous friction. Imagine rubbing your palms together...at relativistic velocities! Friction in the accretion disk heats it to unimaginable temperatures, and that heat is radiated away as light and other electromagnetic waves.

The brightest quasar as seen from Earth is 3C 273 in Virgo. From a distance of 33 light years, it would shine as brightly as the sun. A planet in the core of the host galaxy would have at least two "suns": the star around which it orbits, and the quasar shining equally brightly in the sky. I don't know if anyone would be around to see it. It seems quite likely that any planets close enough to see the quasar as a sun would be heavily irradiated by it.

Spring is the prime time for hunting galaxies, because we look up out of the plane of the Milky Way toward interstellar space, with less gas and dust to obscure the light from distant galaxies. The rich fields of Virgo, Coma Berenices, Leo, Canes Venatici, and Ursa Major are home to dozens of Messier galaxies, hundreds more on the Herschel 400 and Herschel II lists, and thousands of less impressive specimens that are nevertheless within reach of amateur telescopes. Since quasars are galaxies, it should come as no surprise that we find the best and brightest in the same parts of the sky.

I didn't know any of this just a month ago, beyond having a nodding acquaintance with the nature of quasars. I assumed that they were simply well beyond the reach of my telescopes. But a

couple of posts at the blog Washed-Out Astronomy set me straight. Follow these links:

<http://washedoutastronomy.com/content/3c-273-quasars-are-easy>

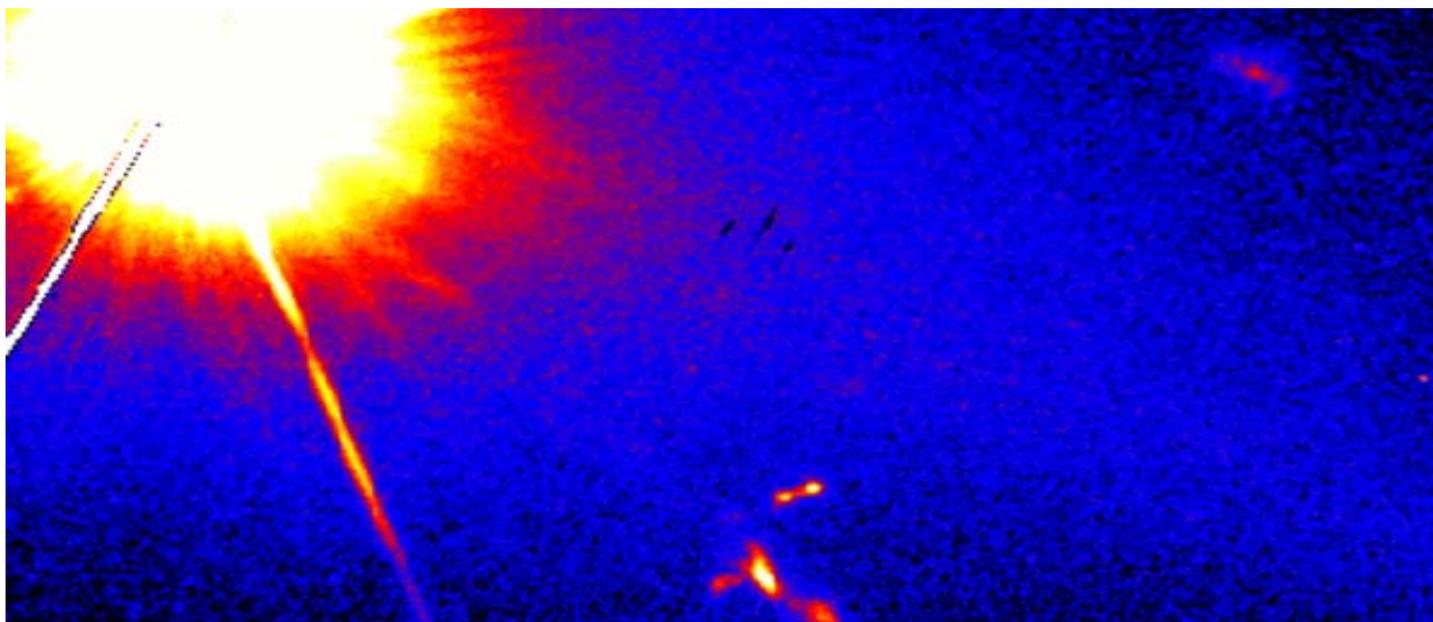
<http://washedoutastronomy.com/content/fist-full-quasars>

or just search for "quasars are easy" and "a fist full of quasars."

The aforementioned 3C 273 in Virgo is the brightest and easiest quasar, shining at magnitude 12.8. It's also quite impressively distant, about 2.5 billion light years away. So the light from this quasar is more than half as old as the Earth itself; when these photons started their journey, bacteria were still working up to producing an oxygen atmosphere, a task they would not complete for another 800 million years. Markarian 421 in Ursa Major and Markarian 501 in Hercules are magnitude 13.2 and 13.9, respectively, but they are much closer at 400 million and 500 million light years (why, our fishy ancestors had already evolved backbones by then!). Among the easy quasars, OJ 287 in Cancer is the most distant at 3.5 billion light years, but still not punishingly faint at magnitude 14.2. AAVSO-style finder charts for all four of these quasars are available at the Washed-Out Astronomy links given above.

I've tracked down two of the four so far. On the evening of Friday, April 29, I ran a Messier Marathon at the Salton Sea. I did okay, too, finally cracking into triple digits for a total haul of 104 Messiers. After plowing through the Virgo-Coma "clutter" I switched to quasar-hunting. 3C 273 was an easy catch, just below an M-shaped asterism of faint stars not far from Porrima. Markarian 421, in Ursa Major, was even easier to find, since it sits right off the shoulder of a bright, 6th magnitude star. I made both observations with a 10" dob, but the quasars would have been visible in much smaller scopes; even a 4" ought to show them clearly. OJ 287 had set by the time I switched from Messier-hunting to quasar-hunting, and I skipped Markarian 501 because the rising wind was visibly rocking my vehicle and throwing sand horizontally through the air. But I'll definitely go after them on my next dark-sky trip, and I urge you to do the same.

*Matt Wedel*



## Astronomy Calendar, May 13 – June 17

This is one of my favorite times of year for exploring the deep sky. Between sunset and midnight it's a festival of springtime galaxies. But it pays to move quickly, because soon Leo is plunging toward the western horizon and the summer Milky Way is rising in the east. All of the wonders of Scorpio and Sagittarius are well away from the horizon by the wee hours of the morning. You can pass the evening hunting galaxies, reward yourself with a tour of the best and brightest the summer constellations have to offer, and still get several hours of sleep - a happy alignment of heavenly enticements if ever there was one.

### Moon Phases

May 17 (Tues) 4:07 AM PDT / 11:07 UT - Full moon  
 May 24 (Tues) 11:51 AM PDT / 18:51 UT - Last quarter moon  
 June 1 (Wed) 2:02 PM PDT / 21:02 UT - New moon  
 June 8 (Wed) 7:09 PM PDT / 2:09 UT (June 9) - First quarter moon  
 June 15 (Wed) 1:12 PM PDT / 20:12 UT - Full moon

### Moon Conjunctions

May 13-14 (Fri-Sat), waxing gibbous moon passes Saturn (13<sup>th</sup>) and Spica (14<sup>th</sup>), but not particularly closely.

### Planet Positions

Mercury waxing gibbous in the morning sky in late May and early June, greatest western elongation May 7, superior conjunction with the sun on June 13, waning gibbous in evening sky for the rest of the month.  
 Venus waxing gibbous in the morning sky, following greatest western elongation on Jan 8.  
 Mars rises before dawn, but stays close to the horizon.  
 Jupiter rises before dawn, following conjunction with sun on April 6.  
 Saturn in the eastern sky at sunset, following opposition on April 3.  
 Uranus rises before dawn, in Pisces.  
 Neptune rises before dawn, in Aquarius.

### Planet Conjunctions

May 7-15, Mercury, Venus, and Jupiter within 5° of each other.  
 May 15-25, Mercury, Venus, and Mars within 5° of each other.  
 June 9 (Thurs), Saturn 15.5' (~0.25°) from Porrima (Gamma Virginis), and within 0.5° of Porrima all month.

### Meteor Showers

June 16 (Thurs) June Lyrid meteors. Active June 11-21. Predicted to be unimpressive, possibly even undetectable against nearly-full moon.

Claremont High School

the Wolfpacket  
Friday, April 1, 2011

# CHS Outdoors Club Gazes Up At the Night Sky

By ALISA CHEN  
REPORTER

Stargazing has captured many people over the centuries and even today, the stars still capture the attention of many, including Claremont High School (CHS) students. The first records of stargazing date back to ancient Grecian times. Since then, it has been practiced by many star enthusiasts including members of the CHS Outdoors Club and the Pomona Valley Amateur Astronomers (PVAA). Outdoors Club member freshman Odette Finn began stargazing as a child and has been an avid stargazer ever since.

"When I was four, my dad took me up to the mountains near Mt. Baldy to see the stars, and that was when I fell in love with stargazing," Finn said. "Sometimes, if I am really interested, I research on certain constellations and try to find them in the sky."

The Outdoors Club has continued to keep this ancient activity alive by planning stargazing trips. This year, the Outdoors Club took a trip near Mt. Baldy to watch the glow of the stars against the night sky.

"Members of the Outdoors Club wanted to take a stargazing trip and everyone liked the idea," junior Abigail Ernst said. "Stargazing is fun and easy. Unlike hiking, you do not have to get up early in the morning and do physical exercise that makes you sweaty."

Many Outdoors Club members went on this trip to learn more about astronomy while others went to get a close up look at the stars. Some individuals like to search for constellations among the clusters of stars in the sky or discover new stars so they can name them, while others just want to see the grandeur of the universe.

"When you look at the stars, it feels as if you can see the world. You know that other people in the world are looking up at the same stars as you are," Finn said.

Another group of star lovers are the PVAA. PVAA is a local club that also holds stargazing trips, along with other astronomy related activities. PVAA was launched around 1969 by a group of El Roble Intermediate School students. CHS alumna, Laura Jaoui, has been a member of PVAA for eight years and has been actively participating

in the club's monthly meetings and events.

"I really love our events. I feel our club's star parties and other activities serve both our own curiosity about the cosmos and our love and knowledge of the night sky with others," Jaoui said. "I personally feel that hosting star parties and public events is actually a way to be part of real space exploration by helping others become interested about the subject. If more young people got interested in astronomy and really understood the scale of

our universe, then I bet more students would learn math and science with more enthusiasm because astronomy is amazing once you learn a few things about it."

PVAA stargazing trips, also known as "star parties," are open to anyone that has an interest in the activity. Equipment such as telescopes are not necessary, as the stars are visible with the naked eye. However, individuals planning to attend a star party are advised to dress warmly. On Apr. 2, the PVAA will be hosting a star party at the Mt. Baldy RV Park near Glendora Ridge Road. PVAA members hope that many will come and enjoy the view of the stars.

"I went to Joshua Tree all alone on my first star party. The sun had set, but one of our members [Ron Hoekwater], had an eight foot tall telescope, so I found our club because his telescope was so tall," Jaoui said. "Even though I did not know anyone, everyone was nice — especially since I was the only woman there. I thought I might be ignored, but everyone wanted me to look at what they were seeing through their telescopes. I did not have any telescopes or binoculars, but that just encouraged everyone to show me theirs."

The CHS Outdoors Club hosts their meetings in science teacher Randall Dingwall's classroom, 407. Meanwhile, PVAA meetings and event postings can be found online at [www.pvaa.us](http://www.pvaa.us). Members of PVAA encourage CHS students to visit their star parties and attend special meetings and presentations on astronomy.

For thousands of years, the beauty and mystery of the night sky has captivated stargazers around the world. As time goes on, and as the stars change their alignment, CHS students continue to explore the wonders of the stars with new technological advancements.



photo courtesy of PVAA

**Stargazers join around a telescope at a night watch.**