VAAS Website: www.vaas.universeii.com/ 2, June 2018

Vandenberg Amateur Astronomical Society presents The Sidereal Times

Messier 13 (see page 5)

Meeting *News:*

At the May meeting we discussed some general VAAS Business and events we supported during the month of May. Had an excellent presentation by Dr. Bassi on the history of Rockets.

Reminder: VAAS club meeting Friday June 8th at Manzanita school teachers lounge 7:00 PM.

Notice: This is the last club meeting until September So try to attend, we have some activities scheduled that we might support. Also this June News Letter is the last until September. However, there will be notices each month (July and August) for star party schedule and scheduled outreach events.

Lunar Calendar:

New Moon 13th
Full Moon 28th

Presidents Message

Well, the month of May proved merry indeed for VAAS. Our MARS InSight program at the Lompoc Library on May 3rd, brought together a capacity crowd of over a hundred people. The JPL engineers were marvelous presenters and the audience questions were excellent; a lot was made perfectly clear about the mission on the eve of the launch two days later. Comments and questions about VAAS still come back to me on a weekly basis, many saying they were unaware of our group until now. One benefit we garnered is that Victor Jordan, publisher of the monthly Lompoc Vision newspaper, has taken a personal interest in VAAS and is ready to give us a boost. He did a great job of publicizing the Mars talk, and he is putting an article about us in the June issue; Victor said got all he needed from our information card which he found at the Chamber of Commerce!

Speaking of the launch, we all know how that turned out visually, but I want to tell you: when that rumble finally reached Saint Mary's Church, the joy that burst from the JPL people I was standing with was as good as seeing the flames. All their long work was finally moving toward its destination, a dream they had held for a long time. I had been recruited to be at Saint Mary's beginning at 2AM, not an easy thing for me to do, but got a major energy boost when I saw none other than Vahan come through the doors to Fitch Hall at 2:30! I think he enjoyed the all-night party!

We should each extend our thanks to Vahan, Dave and Craig for the extensive work they have put in recently at the Observatory, updating the telescope and sprucing up the facility itself. The Observatory is now in top condition to welcome any astronomer, no matter their level of experience.

Our June 8th meeting will be our last before September. The business portion of the meeting will be conducted quickly. We will have a video to show if time and interest allow, using the new VAAS Blue-Ray player. ATTENTION, KEN SPRAKER: you WILL be fully reimbursed for the player at this meeting! YES!

Sadly, this will be our last meeting with the Wallaces, as they depart for Florida. Don't miss this opportunity to tell them farewell, share memories, and snacks. Yes, bring your favorite treat to share with all and plan to hang out and send our friends off to their new adventures with great memories of VAAS.

Skyward, Y'all,
Tom

Events

June 9th ***Star party at the Observatory.***
Yea!

June 16th ***Star party at Figueroa and /or the Observatory.***
Yea!

June 21st June Solstice occurs at 10:07 UTC. The North Pole of the Earth will be tilted toward the Sun which will have reached its north most position in the sky and will be directly over the tropic of Cancer at 23.44° North latitude. First day of summer in the Northern hemisphere and first day of winter in the Southern hemisphere.

June 23rd ***Star party at the Observatory.***
Yea!

June 27th Saturn at opposition and will be at its closest approach to Earth and its face will be fully illuminated by the Sun. It will be brighter than any other time of the year and will be visible all night long. Good time to view and photograph the planet.

Solar day Manzanita School

VAAS Zaca Winery visit

Star party's and Events

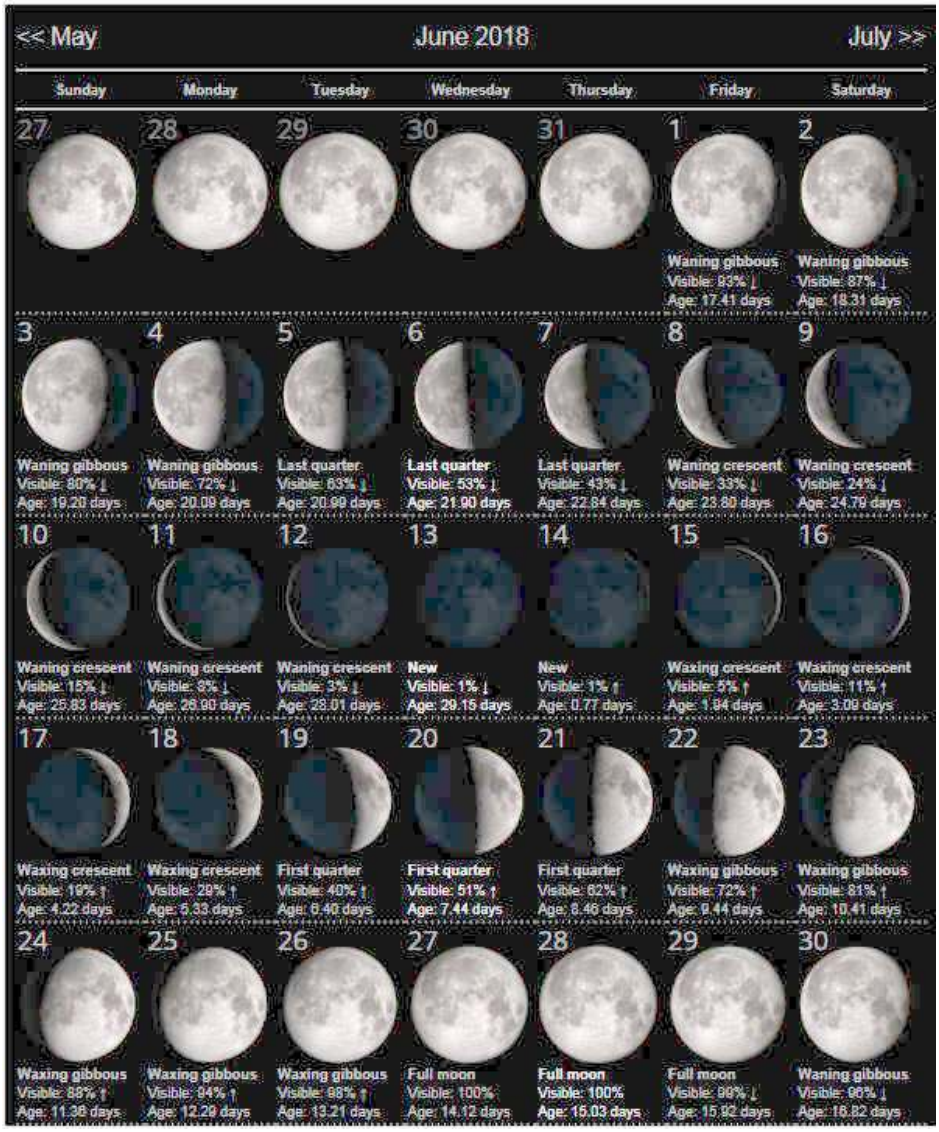
May 5th In late afternoon Dave, Craig, Vahan and Edmund Burke at the Observatory. The purpose being to show the upgrades and improvements made to the 14" telescope that Edmund so graciously funded.
Cool !
May 5th Star party at the Observatory. Cancelled due to Weather.
Nuts!
May 12th Star party at Figueroa and / or Observatory. Cancelled due to weather, (again).
Nuts!
May 19th Star party at the Observatory. Cancelled due to weather.
Nuts!

May 19th Vince Tobin attended the Los Flores Ranch astronomy event along with members from several other astronomy clubs. The weather was not cooperative. On occasion the Moon peaked out of the clouds for a brief few minutes as did the planet Jupiter. Viewing them was very short lived but it was a good gathering of astronomers and guests for the evening.
Ugh!

Reps from JPL / NASA at Library for Insight Launch VAFB

Astronomy night Hancock College

June 2018 Moon



Full 28th, New 13th, Last Quarter 6th, First Quarter 20th.

Moon Facts

A full day on the Moon, one sunrise to the next, lasts about 29.5 Earth days.

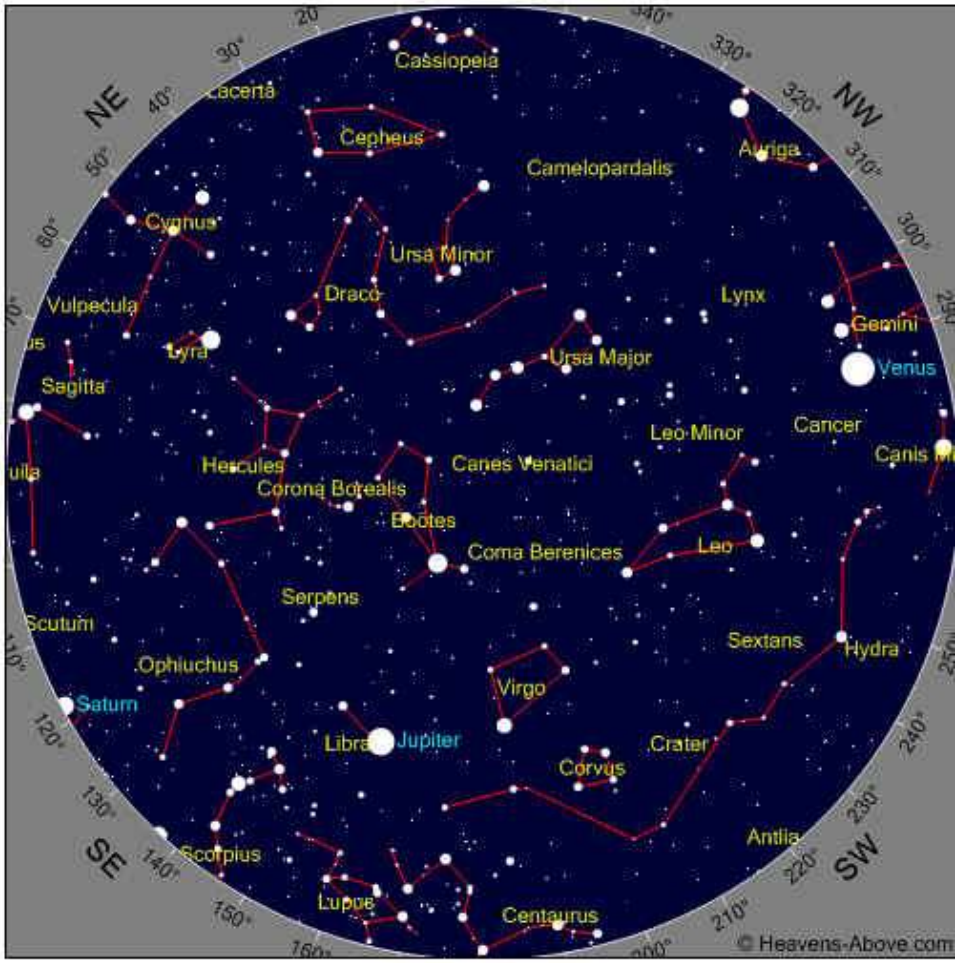
The Moon is moving away from Earth by 3.8cm (1.48 inches) per year.

It there are 2 full Moons in the same month the second one is called a Blue Moon.

The ring around the Moon is caused by refraction of Moonlight from ice crystals in the upper atmosphere. Folklore has it that a ring around the moon signifies bad weather is coming.

June 2018 Sky

Some Objects of interest, M13, M57, M27, Jupiter, Saturn



Time

Year	2018	Month	6	Day	10	Hour	21	Minute	24

Solar Star Party

Photo Courtesy Gary Satterfield

Messier 13, NGC 6205 also known as the Great Globular Cluster in the constellation of Hercules. M13 is one of the brightest and best known Globular in the Northern sky. It has an apparent magnitude of 5.8v and lies at a distance of 25,100 light years from Earth. It has an age estimated to be 11.65 billion years and contains about 300,000 stars. The estimated mass is half million solar masses. M13 stretches across 20 arc minutes of sky that corresponds to a linear diameter of 145 light years. The brightest star in M13 is V11, a red giant classified as a Cepheid variable and has a visual magnitude of 11.95. The cluster contains an unusually young B2 type star designated as Bernard 29. The star does not really belong to the globular cluster but was presumably picked up by M13 on its orbit around the Milky Way. Other stars in the cluster are very old and only have about 5% of the Sun's iron content as they were formed before stars in our galaxy created metals. M13 also contains about 15 blue stragglers, old stars that appear younger and bluer than their neighbors. M13 is a class V globular cluster, one with intermediate concentration of stars toward the center. In other words stars in the clusters core region are about 500 times more concentrated than those in our immediate stellar neighborhood. Globular clusters orbit the Milky Way outside the Galactic disk at tens of thousands of light years away. Image capture 8 inch RC scope, canon 500D camera, hypertuned CGEM mount and images plus camera control and guiding with Mini Borg and PHD guiding. Integration time 0.7 hrs.

For What its Worth

When, after a long day of running around, you finally find the time to relax in your favorite armchair, nothing seems easier than just sitting still. But have you ever considered how fast you are really moving when it seems you are not moving at all? When we are on a smoothly riding train, we sometimes get the illusion that the train is standing still and the trees or buildings are moving backwards. In the same way, because we "ride" with the spinning Earth, it appears to us that the Sun and the stars are the ones doing the moving as day and night alternate. But actually, it is our planet that turns on its axis once a day -- and all of us who live on the Earth's surface are moving with it. How fast do we turn? To make one complete rotation in 24 hours, a point near the equator of the Earth must move at close to 1000 miles per hour (1600 km/hr). The speed gets less as you move north, but it's still a good clip throughout the United States. Because gravity holds us tight to the surface of our planet, we move with the Earth and don't notice its rotation in every day life. The great circular streams of water in our oceans and of air in our atmosphere give dramatic testimony to the turning of the Earth. As the Earth turns, with faster motion at the equator and slower motion near the poles, great wheels of water and air circulate in the northern and southern hemisphere. For example, the Gulf Stream, which carries warm water from the Gulf of Mexico all the way to Great Britain, and makes England warmer and wetter than it otherwise would be, is part of the great wheel of water in the North Atlantic Ocean. The wheel (or gyre) that the Gulf Stream is part of contains more water than all the rivers of the world put together. It is circulated by the energy of our turning planet.

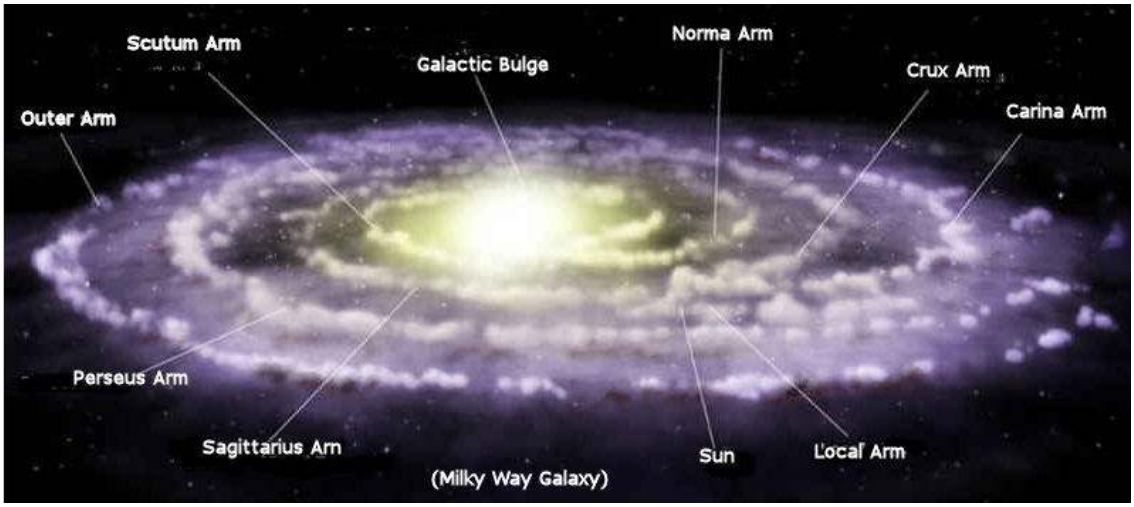
Our Sun is just one star among several hundred billion others that together make up the Milky Way Galaxy. This is our immense "island of stars" and within it, each star is itself moving. Any planet orbiting a star will share its motion through the Galaxy with it. Stars, as we shall see, can be moving in a random way, just "milling about" in their neighborhoods, and also in organized ways, moving around the center of the Galaxy. If we want to describe the motion of a star like our Sun among all the other stars, we run up against a problem. We usually define motion by comparing the moving object to something at rest. A car moves at 60 miles per hour relative to a reference post attached to the Earth, such as the highway sign, for example. But if all the stars in the Galaxy are moving, what could be the "reference post" to which we can compare its motion? Astronomers define a ***local standard of rest*** in our section of the Galaxy by the average motion of all the stars in our neighborhood. (Note that in using everyday words, such as "local" and "neighborhood", we do a disservice to the mind-boggling distances involved. Even the ***nearest*** star is over 25 thousand billion miles (40 thousand billion km) away. It's only that the Galaxy is so immense, that compared to its total size, the stars we use to define our Sun's motion do seem to be in the "neighborhood.") Relative to the local standard of rest, our Sun and the Earth are moving at about 43,000 miles per hour (70,000 km/hr) roughly in the direction of the bright star Vega in the constellation of Lyra.

This speed is not unusual for the stars around us and is our "milling around" speed in our suburban part of the galaxy. In addition to the individual motions of the stars within it, the entire Galaxy is in spinning motion like an enormous pinwheel. Although the details of the Galaxy's spin are complicated (stars at different distances move at different speeds), we can focus on the speed of the Sun around the center of the Milky Way Galaxy. It takes our Sun approximately 225 million years to make the trip around our Galaxy. This is sometimes called our "galactic year". Since the Sun and the Earth first formed, about 20 galactic years have passed; we have been around the Galaxy 20 times. On the other hand, in all of recorded human history, we have barely moved in our long path around the Milky Way. How fast do we have to move to make it around the Milky Way in one galactic year? It's a huge circle, and the speed with which the Sun has to move is an astounding 483,000 miles per hour. The Earth, anchored to the Sun by gravity, follows along at the same fantastic speed. (By the way, as fast as this speed is, it is still a long way from the speed limit of the universe—the speed of light. Light travels at the unimaginably fast pace of 670 million miles per hour. As we discussed the different speeds of our planet so far, we always needed to ask, "Compared to what are you measuring this motion?" In your armchair, your motion compared to the walls of your room is zero. Your motion compared to the Moon or the Sun, on the other hand, is quite large. When we talk about your speed going around the Galaxy, we measure it relative to the center of the Milky Way. Now we want to finish up by looking at the motion of the entire Milky Way Galaxy through space. What can we compare its motion to -- what is the right *frame of reference?* For a long time, astronomers were not sure how to answer this question. We could measure the motion of the Milky Way relative to a neighbor galaxy, but this galaxy is also moving. The universe is filled with great islands of stars (just like the Milky Way) and each of them is moving in its own way. No galaxy is sitting still! But then, a surprising discovery in the 1960s showed us a new way to think of our galaxy's motion.

To understand this new development, we have to think a little bit about the Big Bang, the enormous explosion that was the beginning of space, time, and the whole universe. Right after the Big Bang, the universe was full of energy and very, very hot. In fact, for the first few minutes, the entire universe was hotter than the center of our Sun. It was an unimaginable maelstrom of energy and subatomic particles, slowly cooling and sorting itself out into the universe we know today. At that early time, the energy in the universe was in the form of gamma rays, waves of energy like the visible light we see, but composed of much shorter waves with higher energy. Today on Earth, it takes a nuclear bomb to produce significant amounts of gamma rays. But then, the whole universe was filled with them. You can think of these gamma-rays as the "flash" of the Big Bang -- just like fireworks or a bomb can produce a flash of light, the Big Bang resulted in a flash of gamma rays. But these gamma rays were everywhere in the universe. They filled all of space, and as the universe grew (expanded), the gamma rays expanded with it. When people first think about the expansion of the universe, they naturally think of other expansions they have experience with: how the American colonies eventually expanded to become the 50 states of the U.S. or how an exploding bomb might throw shrapnel in every direction. In these situations, the space into which the colonies or the shrapnel is expanding already exists. But the expansion of the universe is not like any other expansion. *When the universe expands, it is space itself that is stretching.* The

galaxies in the universe are moving apart because space stretches and creates more distance between them. What does this mind-stretching idea of stretching space mean for our gamma rays? The gamma rays are waves of energy moving through space. As space stretches, the waves that are in space must stretch too. Stretched gamma rays are called x-rays. So as the universe expanded, the waves of energy filling space stretched out to become less energetic (cooler) x-rays. As the universe continued to expand, the same waves became ultra-violet light. Later they became visible light, but there were no eyes in the hot compressed universe to see them yet. (When we take the lid off a hot pressure cooker, the steam will expand into the room and cool down. In the same way, we can think of the waves of energy in the expanding universe as cooling down -- getting less energetic.) Today, some 12 to 15 billion years after the Big Bang, there has been a lot of stretching. Space has expanded quite a bit. The flash of the Big Bang has stretched until it is now much longer, lower energy waves -- microwaves and other radio waves. But the waves have stretched with the space they occupy, and so they still fill the universe, just the way they did at the time of creation. Astronomers call the collection of all these stretched waves the cosmic background radiation or CBR. Physicists back in the late 1940's predicted that there should be such a background, but since no one had the equipment to find it, the prediction was forgotten. Then, in the mid 1960s, two scientists working for Bell Laboratories, Arno Penzias and Robert Wilson, accidentally discovered the CBR while helping to get communications satellite technology going for the phone company. After astronomers used other telescopes and rockets in orbit to confirm that the radio waves the two scientists had discovered were really coming from all over space, Penzias and Wilson received the Nobel Prize in physics for having found the most direct evidence for the Big Bang.

What, you might be asking yourself, does all this have to do with how fast we are moving? Well, astronomers can now measure how fast the Earth is moving compared to this radiation filling all of space. (Technically, our motion causes one kind of radiation we observe in the direction that we are moving and another in the direction opposite, (Doppler shift.) Put another way, the CBR provides a "frame of reference" for the universe at large, relative to which we can measure our motion. From the motion we measure compared to the CBR, we need to subtract out the motion of the Earth around the Sun and the Sun around the center of the Milky Way. The motion that's left must be the particular motion of our Galaxy through the universe! And how fast is the Milky Way Galaxy moving? The speed turns out to be an astounding 1.3 million miles per hour (2.1 million km/hr)! We are moving roughly in the direction on the sky that is defined by the constellations of Leo and Virgo. Although the reasons for this motion are not fully understood, astronomers believe that there is a huge concentration of matter in this direction. Some people call it *The Great Attractor*, although we now know that the pull is probably not due to one group of galaxies but many. Still the extra gravity in this direction pulls the Milky Way (and many neighbor galaxies) in that direction.



"Astronomy compels the soul to look upward, and leads us from this world to another". (Plato)

Club Meeting

Reminder Club meeting June 8th 7:00Pm
Manzanita School Teachers lounge.

Star Parties (as always weather permitting)

Other Astronomy Club Meetings

Central Coast Astronomical Society
Link to web site…
http://www.centralcoastastronomy.org/

Santa Barbara Astronomical Unit
Link to web site…
http:// www.sbau.org/#AU_EVENTS_Calendar

Night Time Bright Objects (no scope required)

Link to "Heavens Above" web site
http:// www.heavens-above.com/

(Iridium Satellite)
(ISS Visible Pass)
Be sure to set the nearest location from their pull-down menu.

The web site link below will take you to some Great Milky Way interactive images and how It was developed. (Type it in the search box.)
http://skysurvey.org/

Dave McNally is the VAAS Web Site Serf/Minion

Dave