November-December
2015
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Issue 6

# The Observer

The Newsletter of Central Valley Astronomers of Fresno

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## Observer Object of the Month

No winter sky viewing is complete without at least one detailed look at the Pleiades, also known as the Seven Sisters, the Daughters of Atlas, the Maia Cluster, or, in popular culture, the Christmas Card Cluster. In stellar listings it goes by M45, and also Melotte 22. This is a recently formed (with the last 100 million years) cluster of hot B type stars, some of which are still in their gas "cocoons." The cluster is 43 light years away, and contains over 1,000 stars; the seven brightest ones have an apparent magnitude of 1.6 and can easily be seen from Earth. Astronomers estimate that within 250 million years, the cluster will disperse and be no more. In the meantime, astronomers and the general public can enjoy the beauty of this best known of all winter objects.
Image-NASA/ESA/AURA/CalTech

### Astronomy Quote of the Month

A wild sea-
In the distance,
Over Sado,
The Milky Way.

Haiku by Matsuo Basho, Japanese writer b.1644– d.1694

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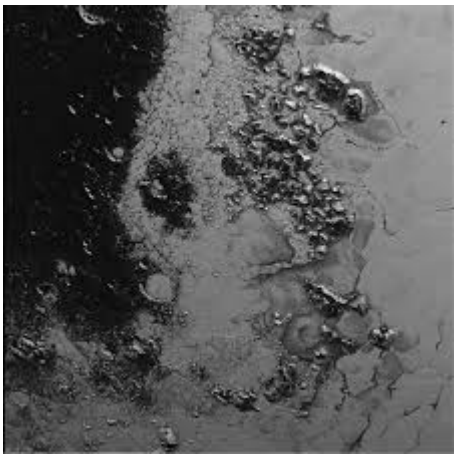
# Latest Images of Pluto and its Moons from New Horizons



Above-Images of Pluto's surface-mountains and dark/light areas

Left-Pluto's large moon Charon

Below-the smaller moons-Nix and Hydra


Left-a closer view of Charon

All images by NASA/JPL/NH

# Important Dates and Events in November and December

November 1-Daylight Savings time ends

November 3-Sputnik 2, carrying the dog Laika, launched-1957

November 11-Veterans' Day; Tycho Brahe views supernova subsequently named for him-1572

November 12-Voyager 1 flies by Saturn-1980

November 13-Mariner 9 goes into orbit around Mars-1971

November 26-Thanksgiving Day; France's first artificial satellite, Asterix, launched-1965

December 2-Galileo views the Moon with his new telescope-1609

December 3-Pioneer 10 flies by Jupiter-1973

December 6-Hanukkah begins

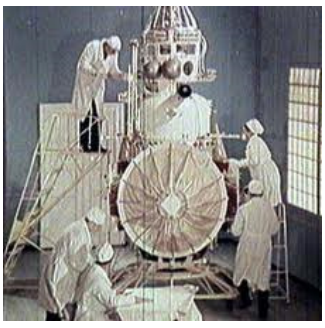
December 14-Mariner 2 flies by Venus-1962

December 15-USSR's Venera 7 soft-lands on Venus-1970

December 20-Carl Sagan dies-1996

December 22-Winter Solstice

December 24-Apollo 8 orbits the Moon-1968



December 25-Christmas Day

December 26-Boxing Day in Canada and the UK; Kwanzza

December 31-New Year's Eve

## Profiles in Astronomy

### George Gamow 1904-1968

Gamow, whose birth name was Georgii Antonovich Gamow, was born and raised in Odessa, Russia. Both of his parents were teachers, and he inherited a love of knowledge from them. After primary and secondary school, he attended Novarussiya University in Odessa, and then Leningrad University, where he studied mathematics and physics under Alexander Friedmann. At Leningrad, he met and became friends with Lev Landau, and the two, along with several others, worked on problems related to the newly emerging field of quantum mechanic. Afterwards, Gamow spent two years at Gottengin in Germany, and then at Copenhagen under Neils Bohr, and also at the Cavindish Laboratory in Cambridge, England, under Ernest Rutherford, all the time working on quantum theory. By 1931, he was back in Leningrad, where he and another physicist designed the first cyclotron in the Soviet Union.

Starting in 1932, Gamow and his wife, also a physicist, began to make plans to leave the Soviet Union, due to government oppression. They were eventually allow to attend a conference in Belgium in 1933, and never returned to Russia. They lived in England for a time, then in 1934, moved to the U.S., where Gamow became a professor at George Washington University in Washington, D.C. In 1940, he and his wife became American citizens. He taught at GWU until 1954, when he moved to the University of California, Berkeley. In 1956, he again moved, to the University of Colorado, where he taught and did research until his death.

Gamow was a polymath who distinguished himself in several fields. In particle physics, he worked on and solved the problem of alpha particle decay through the idea of "tunneling," which became one of the main principles of quantum mechanics. This idea alone won him many awards. In biology and genetics, he worked with Francis Crick and James Watson, who discovered the double helix shape of DNA, on how the four bases(adenine, cytosine, thymine, and guanine) could work to form proteins. From Gamow's work, Crick and Watson were the first to understand the idea of genetic coding.

Gamow, though, is best known for his work in astrophysics and cosmology. He and his doctoral student Ralph Alpher did pioneering work in how the heavier elements were formed, that is, in stellar reactions and supernova explosions. Gamow also did work in planetary and galactic formation, and laid out what are now the standard equations for the mass and radius of a galaxy. It was in his cosmology research, though, that he made a name for himself. He was a strong believer in Georges Lemaitre's "primordial atom," and also in his teacher Alexander Friedmann's equations, based on Einstein's theory of relativity, that the universe consists of curved space and is in motion. Using the ideas of both, Gamow, in 1948, came up with the idea that the early universe was made primarily of radiation, not matter, and began as a quantum singularity of almost infinite temperature and density. This would be verified in 1965, when Arno Penzias and Robert Wilson found evidence of the Cosmic Background Radiation, which Gamow learned about shortly before he died. Virtually all cosmological work done today is based on Gamow's "Big Bang" research from the 1940s.

In addition to his scientific work, Gamow was also a writer of several science fiction novels and many non-fiction books that made science accessible to the general public. He won numerous awards for his scientific work, and also for his writings. An asteroid and a crater on the Moon are named after him. Many scientist believe that he should have been awarded the Nobel Physics Prize for either his ideas about the "Big Bang," or his role in understanding how heavy elements were formed.

Source-Wikipedia

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# CVA Calendar Corrections-

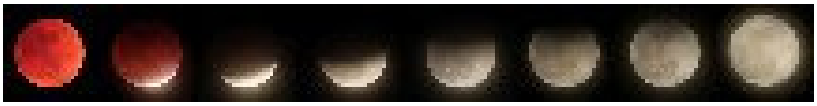
## No monthly meeting on November7; instead a starwatch will be held at Eastman Lake on that date

## Last Riverpark public starwatch of the year will be on November 21

## The next monthly meeting will take place on December 5

# Images of the Lunar Eclipse on September 27-by CVA members

A very ethereal image taken at Glacier Point by Chad Quandt



A sequence taken by Fred Ringwald-taken with a Canon DSLR and a 400mm lens

Two images taken by Larry Parmeter, using a Nikon DSLR and a 300mm lens.

## And also, an earlier eclipse image

Bryan Spicci's image of the lunar eclipse on April 4, 2015

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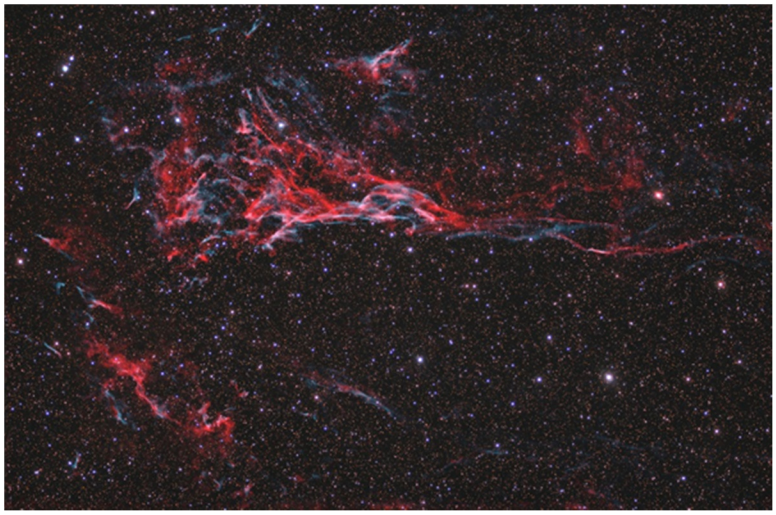
# The number of extra-solar planets found as of October 2015-1,969

## How many more are out there-Tens of thousands?

## Hundreds of thousands?

# Steps to Produce a Great Astrophotograph

By Scott Davis



In today's linguistic world, there exists a virtually countless number of jokes that begin with, "how many *somethings* does it take to screw in a light bulb?" I think of this whenever a family member or friend looks at one of my astrophotos and says, "that's nice." It occurs to me that many of those family and friends have no idea or appreciation of the amount of work it takes to produce that single picture. For the enjoyment and education of all who read this newsletter, I will now answer this question using one of my images as an example.

For the purposes of this discussion, I will be using my image of Pickering's Triangle, acquired in June of this year. This image is a combination of RGB data acquired from Big Stump in Kings Canyon National Park and narrowband (Ha & O3) acquired from my backyard in Clovis.

The story begins on June 13, when I spent an hour driving from my home to the Big Stump parking lot. Once there, an additional 45 minutes was spent setting up my imaging gear – mount, telescope, guide scope, two cameras, and almost 20 connection cables. After the sun went down, I took 15 minutes to get my scope aligned and, once the sky was completely dark, spent two and a half hours to acquire an hour and 40 minutes of RGB data. This data would be the foundation for the completed image. At the end of the night, calibration frames were captured, and I spent another 30 minutes putting my gear away and made the hour-long journey back to my house. The next morning, I set up my gear in my backyard in preparation for a week of imaging, much to the dismay of my water-deprived back lawn. Over the course of the next five days (June 15 – 19) I captured an additional 10 hours of Ha data and 8 hours of O3 data. Each of the three data sets had to be stacked (20 minutes each) and processed individually (1 hour each). Finally, they were combined and processed into the final image, which took another half-hour.

The final image is a combination of 20 hours of integration time from six nights of imaging. The integration time, however, only tells part of the story. When combined with the time required for travel, setup, alignment, teardown, and even some waiting, I can easily attribute over 30 hours of total time required to create this image.

Astrophotography, to be sure, is not for the impatient. It is only by choosing subjects well, finding a dark place, setting up gear properly, and capturing an appropriate amount of data that one can end up with a quality image. While the investment is great, the end reward – having a great final image – is worth every second, minute, and hour spent to achieve it.

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# A Couple of Lesser Known but Well Worth Seeing Fall and Winter Objects

Left-NGC 2339, a small barred spiral galaxy in the constellation Gemini. Its magnitude is 11.8. Center-NGC 1700, an elliptical galaxy in Eridanus, with a magnitude of 11.2. Right-NGC-1647, an open cluster of about 500 stars in Taurus. It has a magnitude of 6.4. All three of these objects were first seen by William Herschel in the 1780s.
Images-Wikipedia

# What's New in Space

## New Horizons' Next Visit: PT1

On September 1, New Horizons mission managers and scientists announced that the spacecraft's new target after Pluto will be a small asteroid-like object known at 2014 MU69, The object, which is also being called PT1(for Potential Target number 1) is far out in the Kuiper Belt, over a billion miles from Pluto, and, if all goes well, will receive a flyby visit from New Horizons on January 1, 2019. 2014 MU69 has tentatively been chosen, scientist say, because it is so unlike Pluto or any of the other known Kuiper Belt objects: it is only about 30 miles in diameter and has 1/10,000th the mass of Pluto. They believe that it may be part of the original material which created the planets and other objects in the solar system, which is why they're so excited about it. The proposal to visit MU69 still has to be approved by NASA's planetary exploration committee, and then funding needs to be found for the extended mission. If New Horizons is to visit MU69 in 2019, it needs to have an official go ahead by November in order to change its trajectory. Official approval for an extended mission was not expected to occur until February 2016, but NASA may speed thing up in light of this new and very interesting goal.

## Amazon's Blue Origin to be Based in Florida

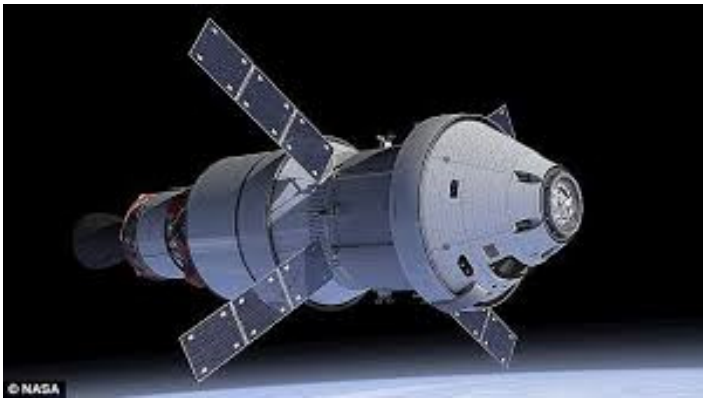
On September 15, Jeff Bezos, the billionaire founder of Amazon, announced that his spaceflight company Blue Origin will have its permanent location near the Kennedy Space Center in Florida, and will use the old Atlas launch pads to launch its own rockets and capsules as early as 2020. Bezos said the Blue Origin will team up with the United Space Alliance, which itself is a partnership between Lockheed and Boeing, to build and launch commercial rockets from Launch Complex 36, which was used during from the 1960s to the 1990s to launch Atlas rockets. USL's interest in the Blue Origin program stems from the fact that the first state of its Atlas rockets use Russian-built engines, which the State Department is banning due to political tension between Russia and the U.S. The Blue Origin booster, which does not yet have a name, will launch and land vertically, with the first stage being reusable, according to Bezos. The rocket will launch unmanned payloads first, then start launching crews sometime after 2023. The crew capsule, named New Shepard(at right), is currently being tested at Blue Origin's facility in Texas. Bezos' announcement adds another playing in the burgeoning commercial spaceflight business, which already includes Elon musk's Space-X, Richard Branson's Virgin Galactic, and Boeing's CTS-100 program. Up to now, Blue Origin has been shrouded in secrecy, with the company saying very little about its spacecraft or future plans.

## NASA and ESA team Up to Deflect Asteroids

On October 8, NASA announced that it and ESA, the European Space Agency, are planning a dual mission to deflect an asteroid, paving the way to hopefully deflect more Near-Earth Objects. The two stage mission, known as AIDA, for Asteroid Impact and Deflection Assessment, will begin in 2020 with ESA's AIM(for Asteroid Mission) spacecraft. AIM will be launched from the French Guiana Spaceport, and will go into robit around a moon of the asteroid Didymos. It will release four mini-landers on the moon as part of the program. In 2022, NASA will launch the DART(for Double Asteroid Redirection Test) spacecraft. The DART spacecraft will crash into the Didymos moon, and the miniprobes on it will detect and analyze the extent to which it is pushed ut of its regular orbit around the asteroid. According to experts, the DART should be able to [push the moon enough to change its orbit and trajectory. A successful mission will give the space programs the ability to detect possible Earth-threating asteroids and be able to change their trajectories enough to miss our planet instead of crashing into it. Several near-misses in recent years have prompted the mission.

# NASA Outlines Plans for Going to Mars in the 2030s

In early October, NASA released a study that gives a three stage process to reaching the Red Planet by the 2030s. It is by far the most definite proposal for deep space travel that the space agency has made public in many years, and some of it is already being achieved. The first step is long term space missions, to understand the physical and psychological adaptations that humans will have to make for a trip lasting up to two years. This is already being done aboard the International Space Station. Currently, an American astronaut and a Russian cosmonaut are spending a year in space. They are scheduled to return to Earth in March 2016. The second phase is planned to be manned missions in what is known as cis-lunar space, that is, in the area of the Moon. This will be a series of missions working in near-lunar space; currently an unmanned robotic craft(known as the Asteroid Redirect Mission) is being designed to rendezvous and take samples off of nearby asteroids , and then carry them to cis-lunar space. Then a manned mission will gather them up and return them to Earth. This is envisioned as taking place around 2025. Another goal in this phase would be to establish a semi-permanent presence in far-lunar space by the year 2030 with regular missions, and possibly a mini-space station that would first host short stays by astronauts and then longer ones, to study the cis-lunar environment. The cis-lunar missions would use the Orion spacecraft and the giant heavy lift rocket now being developed, known as the SLS. The third step is a manned mission to Mars itself. This would take place sometime after 2030, and would probably involve an international effort, due to the cost and the technology. NASA first sees an international crew landing on one of the Martian moons, then a trip to the surface of Mars itself for a period of several months before leaving to return back to Earth. This is, of course, highly dependent on funding and relations with other countries. The American people have always been supportive of the space program, but balk at the overall costs of it, and other nations, friendly as they are with the U.S., have their own space agendas, mostly involving ego trips of getting there "first."




Left-The Orion; Right-the SLS-The Orion-MPCV(Multi Purpose Crew Vehicle) is based on the Apollo spacecraft of the 1960s and 70s, and will carry up to five astronauts. The SLS(Space Launch System) is based on the Saturn 5, only larger, and will generate up to 12 million pounds of thrust in its first stage booster rockets.

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# Psst? Want to Hear Some Scandalous Astronomy Gossip?

Geoffery Marcey, who discovered the first exo-planets in the 1990s, developed the techniques for finding them, and became one of the best known and most lauded astronomers in the world, resigned his professorship at UC Berkeley after an investigation showed a pattern of harassing female students for almost fifteen years. The resulting report was released on October 7, and Marcey apologized for his actions, but, despite his admissions, the university pressured him into leaving his position on October 13.

Marcey was born and raised in California and received his doctorate in astronomy from UC Santa Cruz. He was a staff astronomer at the Mount Wilson Observatory, then became a professor of physics at San Francisco State University. In 1995, he confirmed the discovery of the first known exoplanet, 51 Pegasi b., and In 1996, he discovered the first multiple exoplanetary system, around the star Upsilon Andromedae. He has also discovered a number of other exoplanets. In 1999, he became a professor of Astronomy at Berkeley, while keeping his position at SFSU There are no indications as to what he will do or where he will go after the revelations that removed him from Berkeley.

# The Pic du Medi Observatory

*Part of a continuing series on lesser known-but still important -observatories throughout the world*

The Pic du Medi Observatory, located on the mountain of the same name in the Pyrenees, on the border between France and Spain, is part of the Midi-Pyrenees Observatory, owned and operated by the government of France and the French Academy of Sciences. It is at 9,400 feet above sea level.

Pic du Medi was established in 1878, but taken over by the French government in 1882 due to funding problems. It was originally a weather station(and still is), but soon proved to be ideal for astronomical observations as well. It first major astronomical job was observing the transit of Venus in 1882. The first major telescope on the mountain was a .5 meter equatorial reflector, completed in 1909, and used to extensively study Mars for the next few years. After World War II, in 1946, a .6 meter telescope was built; in 1958, a spectrographic was installed; and in 1963, a 1.1 meter telescope, funded by NASA, was built to map the Moon for future Apollo landing sites. After the Moon program ended, the 1.1 meter scope was used for scientific research. In 1980, a 2 meter telescope was built, and is still in use.

Today, the observatory has six operational telescopes: the .5 meter telescope, upgraded and still in use; the .6 meter telescope, which is now for use by amateur astronomers; the 1.1 meter scope, which is used for planetary studies; the 2 meter Bernard Lyot Telescope, which is used for stellar and deep sky research; and two chronographs to study the Sun. Two other domes housing older, obsolete telescopes, are no longer used.

Pic du Medi has had a long history of planetary research. In 1909, the newly built .5 meter reflector provided the first evidence that Mars did not actually have canals, which would be proven 50 years later by the Mariner spacecraft. In the early 1960s, scientists using the 1.1 meter telescope were able to provide the first detailed analysis of the atmospheres of both Venus and Mars, and concluded that neither planet could have conditions for life as it is known. In 1980, Saturn's moon Helene(also known as Saturn VII or Dione B) was discovered using the same 1.1 meter telescope at Pic du Medi. The observatory has also been responsible for the discovery of several asteroids, one of which is named 20488 Pic-du-Medi.

Source and images-Wikipedia

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# Another Space Pioneer Leaves the Earth

## George Mueller 1918-2015

On October 12, NASA and his family announced that George Mueller, the man behind the success of the Apollo Moon landing program of the 1960s, died at his home in Southern California. He was 97 years old.

Mueller was born and raised in St. Louis, Missouri, and received a degree in engineering at the Missouri School of Metals and Mining(now the University of Missouri-Rolla). He later earned a master's degree from Purdue, and a doctorate from Princeton. He worked on radar for Bell Labs during World War II, and after the war, taught at Ohio State for a time, then during the 1950s, worked for Ramo-Wooldridge(wehich eventually became TRW). In 1963, he was hired by NASA and made the Director of Manned Space Operations. Under Mueller's leadership, the Apollo Moon program came to fruition; he pushed all divisions to put men on the Moon by the 1970 deadline, and personally instituted the "All-Up" testing method; that is testing all the main components; the Saturn 5 rocket, the Apollo capsule, the Lunar Lander, and their hardware; together rather than separately. According to experts, this saved years of research and testing. When Apollo 11 landed n the moon in July 1969, many gave credit to Mueller for the triumph. He also played a major role in the Skylab program, and was one of the early supporters of the Space Shuttle.

After the Apollo 12 mission in November 1969, Mueller left NASA , reportedly due to conflicts over the manned space program budget, and returned to private industry. He first worked for General Dynamics, and later for Burroughs, and also for Kister Aerospace, a small private rocket company. He was still with Kister up to only a few years before his death.