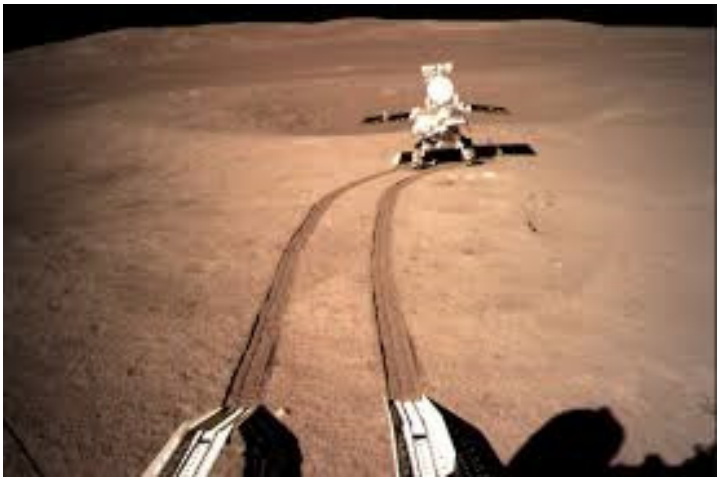
THE OBSERVER

The Newsletter of Central Valley Astronomers of Fresno March-April 2019

China's Moon Probe Lands on the Lunar Far Side



In an historic first, the Chinese Chang'e 4 spacecraft soft-landed on the Moon's far side, and deployed a small rover to trundle over the lunar surface. The landing, which occurred on January 4, 2019, was at the von Karman crater in the Moon's far southern hemisphere. The mission is expected to last three months, during which time both the lander and the rover will study the moon's geology and morphology, as well as solar particles that fall on it. Many experts believe that this is just another step in the Chinese lunar program, leading to a possible manned Moon base by the 2030s.

Image from nasaspaceflight.com

Observer Quote of the Month-

"If I were giving a young man advice on how to succeed in life, I would say to him to pick out a good father and mother, and begin life in Ohio."*

-Wilbur Wright

***See inside**

In this Issue-

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To All CVA Members-

The big news right now is that the United States is finally getting back into manned space flight. The first mission of Space-X's Dragon V2 will be launched unmanned on March 2. If that goes well, and even if it doesn't go 100%, the first crewed launch may come in mid-summer. The Same for Boeing's Starliner spacecraft. An unmanned launch in April, followed by a crewed launch in August.

In the meantime, actually two manned spacecraft have been launched from U.S. soil in the past three months. On December 13, 2018, Virgin Galactic's VSS Unity SS2, with two pilots aboard, reached 51 miles above the Earth, the first American manned spaceflight since July 2011, when the shuttle made its last flight. To follow up, VSS Unity made another manned space flight on February 21, 2019, with two pilots and a passenger reaching 55 miles above the Earth. Several more test space flights will follow in the next several months, and, if all goes well, operational tourist flights may begin in the fall-and a lot of people have been waiting a long time for them.

Things are finally starting to move.

-The editor

Image from Virgin Galactic

***Since the Wrights, John Glenn and Neil Armstrong, as well as seven American presidents+, were born and raised in Ohio, there may be some validity to this statement.**

+William Henry Harrison, Ulysses S. Grant, Rutherford Hayes, James Garfield, Benjamin Harrison, William McKinley, Warren G. Harding

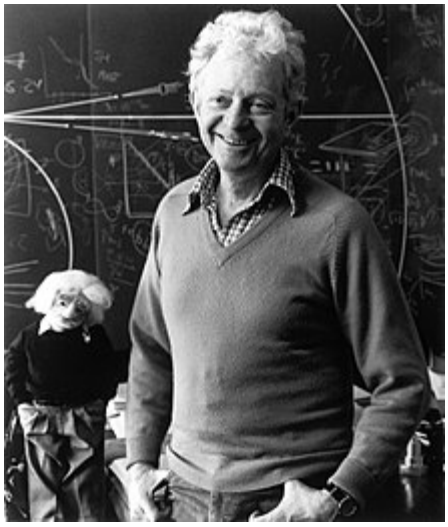
Number of exoplanets found as February 2019- 3,946

How many more are out there?

Tens of thousands? Hundreds of thousands?

Profiles in Science

Leon Lederman 1922-2018



Lederman was one of the world's most accomplished physicists, responsible for the discovery of two elementary particles which are essential to the standard particle family today, and also an advocate of the Higgs Boson, the key component of modern particle physics.

Lederman was born in New York City, the son of Ukrainian-Jewish immigrants. After high school, he attended New York City College, and, following Army service in World War II, went to graduate school at Columbia, receiving a doctorate in physics in 1951. He taught at Columbia for several years, then worked at CERN, the European Center for Physics, and afterwards at FermiLab in Chicago. In 1979, he became the director of FermiLab, a position he held until 1989. At the same time he was at FermiLab, he was also a physics professor at the University of Chicago. In the 1990s through the early 2000s, he taught at the Illinois Institute of Technology. The last few years of his life, he lived in quiet retirement with his second wife near her hometown in Idaho, where he died on October 3, 2018.

Lederman is one of the giants in modern particle physics. In 1956, he and two other researchers, using a modified cyclotron, proved parity violation in weak particle interactions. In 1962, he discovered and verified the muon neutrino, and in 1977, he discovered the bottom quark. For these findings, specifically for the discovery of the muon neutrino, he was awarded the Nobel Prize in physics in 1988. A gifted writer, he wrote several books promoting the so-called "God Particle," the Higgs Boson, and advocated its eventual discovery. He was also a strong supporter of the proposed Super Conducting Super Collider, and saw its eventual cancellation as a major mistake in American science. For several years in the 1990s, he was president of the American Association for the Advancement of Science, and argued for physics being the first course, rather than the last, in the traditional high school science curriculum of biology, chemistry, and physics.

Besides the Nobel Prize, Lederman won many other awards, including the Enrico Fermi Award, the Wolf Prize in Physics, the National Medal of Science, and the Vannevar Bush Prize in Science. He was also a member of the National Academy of Sciences, the American Academy of Arts and Sciences, and the American Philosophical Society.

Astronomy Short

In 1885, Edward Pickering, the autocratic director of the Harvard Observatory for almost forty years, hired a Scottish immigrant, Williamina Fleming, to be a housekeeper. Even though she had little formal education, he was extremely impressed with her intelligence and motivation, and within a few years, she was the head of his household staff. Around 1890, Pickering was having troubles with one of his male astronomical assistants, considering the man to be lazy and incompetent. Reportedly, he told him, "My housekeeper can do a better job than you!" and fired him. He asked Fleming to take his place. Teaching herself physics and mathematics, Fleming proved to be an excellent and dedicated scientist, as well as an able administrator. Eventually, she became the supervisor of Pickering's corps of woman mathematicians and astronomical assistants, who said she ran the office like a drill sergeant. Fleming made many discoveries before her death in 1911, the most famous being the Horsehead Nebula in Orion.

What's New in Space

Mars One is Finished. This is News?

Mars One, the Dutch-Swiss venture to send people on a one way trip to Mars, has filed for bankruptcy in a Swiss court, according to the social media news platform Reddit, which has since been verified by other sources. All of this indicates that the Mars One program is effectively dead. Mars One promised that, using technology such as Space-X's Dragon One spacecraft, a number of people would fly to Mars and set up a sustainable colony, where they would live the rest of their lives. Several unmanned craft would precede them and help to get them started. The promoters claimed that this would begin as early as 2018, then pushed it back to 2022, and then to almost 2030. The venture was originally to be financed through contributions, and when that was determined not to be enough, a deal was made to make it into an ongoing reality television show, which would follow though the choosing of the first Mars travelers, their training, their flight to Mars, and their lives on the Red Planet. Even then, the best estimates were that the whole project would cost well over $100 billion, and many experts predicted that all of the initial travelers would be dead within three months after landing. Nevertheless, over 30,000 people signed up to be candidates, and Mars One officials were planning to announce the top 100 later this year. Even though Mars One leaders claim that this is only a temporary setback, they have no money, technology, or firm contracts for television shows, leading some to believe that it was nothing but a scam all along.

Right-a painting of the proposed Mars One colony

NASA and the World Say Goodbye to Opportunity

On February 12, the Jet Propulsion Laboratory made one last call to the Mars rover Opportunity, which has not been heard from since a huge Martian duststorm last June. It received no reply, and turned off the transmitters shortly afterwards, declaring the rover dead. It is believed that Opportunity's solar panels became too encrusted with dust, killing its electrical power. While some cynical publications declared Opportunity a failure, the facts are that, with an expected three month operational lifespan, it lasted almost fifteen years, traveled 28 miles across the Martian surface, and took well over 100,000 images. A whole generation of NASA engineers and scientists grew up with Opportunity, and many people around the world who had followed Opportunity over the years compared its loss to a death in the family. Opportunity's twin, Spirit, functioned for over seven years, until its demise in 2011. Mars Curiosity rover, which landed in 2013, is still going strong, the Mars InSight stationary lander, which landed in 2018, is currently active, and the Mars 2020 rover, which is similar to Curiosity, is being prepared for launch next year.

In the meantime, the European Space Agency is preparing its Mars rover for a 2020 launch as well, and recently named it after Rosalind Franklin, the British biologist who paved the way for the discovery of the double helix structure of DNA in the 1960s.

Top-opportunity Right-ESA's Mars Franklin rover

Space Odds and Ends

On February 21, NASA and Space-X officials met for a readiness review, and gave a go-ahead for the March 2 launching of Space-X's Dragon V2 on its first unmanned mission to ISS. The flight, known as Demo-1, will last seven days before the capsule splashes down in the Atlantic about 200 miles east of the Kennedy Space Center.

NASA and RKA announced that the crew for next Soyuz mission, MS-12, has been changed. Cosmonaut Aleskei Ouchinin and American astronaut Nicholas Hague, who were aboard Soyuz MS-10 when it was aborted in October 2018 will make up the crew, along with another American, Christina Koch. The original crew for MS-12 will be reassigned to a future flight. MS-12 is now scheduled to be launched on March 14, 2019

More Soyuz News: NASA's contract with RKA to send Americans to ISS aboard Soyuz expires in July, but now the space agency is considering buy two more Soyuz seats, for flights in the fall of 2019 and winter of 2020. This is in the event that the manned Space-X Dragon and Boeing Starliner flights scheduled for the summer and fall are further delayed. If NASA does go through in buying more seats, they won't be cheap-about $80 million each(A lot of this is NASA's own fault. It has dragged its feet over the Dragon and Starliner programs for years, and now it's up against a wall, with no proven operational spacecraft to get Americans to and from ISS after July 2019. RKA knows it, and will make NASA pay).

Beresheet, Israel's privately funded (well, actually with a little bit of help from the government) lunar spacecraft was successfully launched on February 20 aboard a Falcon 9 rocket. The probe will follow a round-about way to the Moon, taking almost eight weeks to get there. I will make several loops around the Earth in order to pick up speed before finally heading for the Moon and landing on April 11. Beresheet was designed and built by Space IL, an Israeli company which was originally competing for the Google Lunar-X Prize.

A Galaxy for the Winter Months

This issue's featured star is Sirius, so why not another great, but lesser known, object not far from it? NGC 2283 is a spiral galaxy only about two degrees below the Dog Star; it is classified as an Sc galaxy with an apparent magnitude of 12.9(so it can probably be seen in most small scopes), and is about 32 million light years from Earth. Next time you're out in the dark sky with your telescope-see if you can find it!

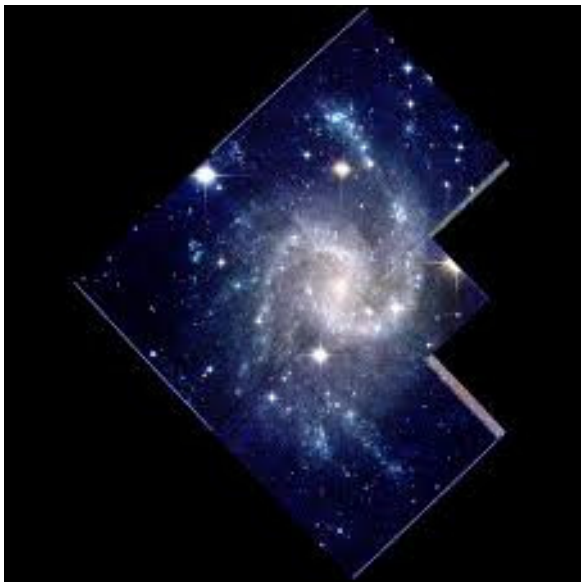
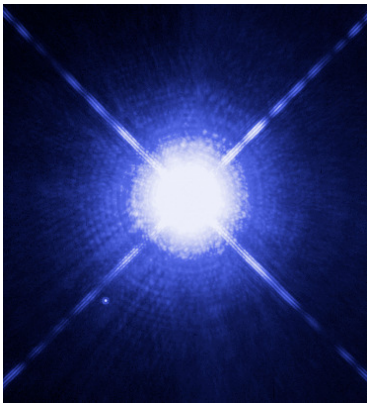


Image of NGC 2283 from Wikidata

Star Stories

Sirius, the Dog Star



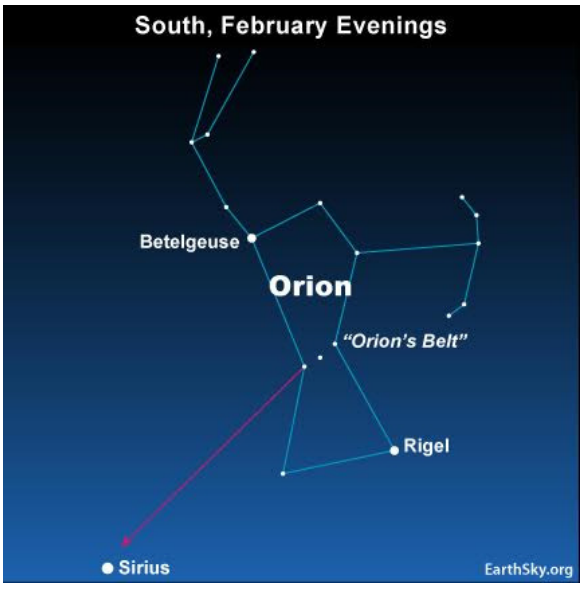
Sirius is, of course, the brightest star in the night sky. But that's mainly because it's so close to Earth, relatively speaking. If it were further away, it would probably be just another star, no different from dozens of others.

Sirius is the alpha star in the constellation Canis Major, the Large Dog. It is classified as an A1 star, and is 8.6 light years from Earth. As such, its apparent magnitude is -1.46, the brightest of any star in the sky. However, its absolute magnitude is only 1.42. It has a temperature of about 9,900 degrees kelvin. It is about twice the size of our Sun, and is estimated to be between 250 and 300 million years old.

Sirius has a very small companion star, formally known as Sirius B. It was first theorized and calculated by Friedrich Bessel in 1844, but was not observed until 1862, by the famous telescope maker Alvan Clark, who found it while testing an 18.5" refractor that he had built. By the early 1900s, Sirius B was determined to be a white dwarf star about the size of the Earth, with a mass almost identical to that of our Sun. Sirius B has an apparent magnitude of 8.4, an absolute magnitude of 11.1, has eight times the gravity of the Earth, has a surface temperature of 25,000 degrees kelvin, and revolves around Sirius A once every six years. For many years, it was theorized that a very small third star was also part of the Sirius system, but it has never been found, and is now believed to be nonexistent.

Sirius B has a controversy attached to it. Some people claim that the Dogon tribe of West Africa has known about Sirius B for hundreds of years, long before it was discovered in the mid-1800s. They relate ancient tribal stories of a star that they say corresponds to Sirius B, and a few even suggest that extraterrestrials gave them the description and location of it(readers can take this for what it's worth). Modern scientists question how the Dogon could be aware of Sirius B, which obviously cannot be seen without telescopes, and there is some evidence that European explorers around the turn of the century may have transferred knowledge of the star to them, which they incorporated into their tribal legends.

Like most other bright stars, Sirius was well known to the ancients. The name originally comes from the Greek word *Seirios*, meaning glowing or scorching, a reference to its brightness, and was first used by the Greek poet Hesiod around 800BC. Sirius is also alluded to in Homer's *Iliad*. In Sanskrit, it was known as *Mrdavyhadha,* and represented the Hindu god Shiva. The ancient Persians called Sirius *Tishtrya*, the Rain Maker(a reference to the winter rains in that part of the world). The Chinese referred to it as *Tiangang*, the celestial wolf, and many native American Indian tribes called it the Sky Dog(or variations of that name). To the Arabs, Sirius is found in the Koran as *Ash-Shira*, the Mighty Star or the Lead Star. The ancient Polynesians used Sirius for their calendar, and also as a main navigation marker while on their oceanic voyages.



Sources: Wikipedia, EarthSky
Top right-Sirius, with Sirius B at its bottom left. image from NASA/HST

Bottom right-a neat trick: Sirius can be easily found by drawing a line through the three "belt" stars of Orion and pointing it straight down. Image by EarthSky

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

The Custer Observatory
Sluthhold, New York

Custer Observatory is operated by the Custer Institute on Long Island, not far from Shelter Island(the site of the famous physics conference in 1948) at the eastern tip of the island. It is a public observatory whose purpose is to enrich knowledge of astronomy and space sciences; as such, it is open to the public and is also used by amateur astronomy groups in the long Island area.

The observatory has an interesting background. It was founded in 1927 by Charles Elmer, the co-founder of the technology and optics company Elmer-Perkin, and an avid amateur astronomer. His wife was May Custer Elmer, the grand-niece of General George Armstrong Custer of Little Bighorn battlefield infamy. Elmer and other members of his astronomy group honored Mrs. Elmer by naming the observatory after her, and in 1942, established the Custer Institute to officially finance and operate it as a non-profit educational association.

Most of the facilities for the observatory were built in the 1940s, including the main dome, several smaller buildings with pull-off roofs for private telescopes, a lecture hall, a library, and classrooms. The observatory has collected a number of telescopes over the years, most of which are still used by amateur astronomers. They range from a 20″ Obsession reflector to a 6″ Alvan Clark refractor. The largest telescope, which is housed in the main dome, and is used for public viewing, is a 10″ refractor made by Zerochromat Telescopes of England. Every Saturday night, weather permitting, the observatory is open to the public. It also offers regular science lectures and workshops on many different topics related to astronomy, physics, and other sciences. The public can also check out books from the library.

Right-the main dome with the 10″ refractor at the Custer Observatory

From The Observer Archives-

Black Holes Do Not Suck

"Even professional astronomers occasionally lapse into the description of black holes as 'cosmic vacuum cleaners,' sucking up everything in sight, but there's nothing special about a black hole's gravity. If the sun turned into a black hole tomorrow(retaining all its mass), the Earth's orbit would be unaffected. Most people think the Earth would start spiraling into the sun if this occurred.

The special thing about a black hole is that it is possible to get close to a significant gravitating mass without first hitting a solid surface. It would actually be quite hard(because of angular momentum constraints) to actually fall into a black hole. It's MUCH easier to hit, and stick to, a normal star since it has so much more surface area to strike."

From the *Observer,* November 1990

Editor's comment-I wonder if Disney read this before making its movie on black holes