

May 15 Total Lunar Eclipse-Don't Forget It

Covid Restrictions Easing



THE OBSERVER

The Newsletter of Central Valley Astronomers of Fresno

May-June 2022



NASA's Next Major Target: Uranus

On April 19, the National Academy of Sciences recommended, as part of its once-a-decade review of American scientific goals, that NASA focus on the planet Uranus as a major priority for the 2030s. It proposes a \$4.2 billion program whose centerpiece will be a spacecraft that may be launched as early as 2032 and reach the gas planet in 2045. The spacecraft, to be called Uranus Orbiter Probe, or UOP, will go into orbit around the planet and drop a probe to study the composition of its atmosphere. The spacecraft will also fly by the five large moons of Uranus: Miranda, Oberon, Ariel, Umbriel, and Titania; and study them for possible signs of life. The only time Uranus has been visited by Earth craft was in 1986 when Voyager 2 flew by it on the way to Neptune.

Image by Voyager/JPL/NASA

Quote of the month-

"The local swimming hole"

-Walter Baade's description
of our Sun and the stars
nearest to it

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The Editor's Message- To All CVA members-

Indications are that the Covid Pandemic is, cross our fingers, pretty much over. There will no doubt still be people testing positive and coming down with what are hopefully only mild cases. Of course, Covid will probably be around for a long time to come, but the worst of it appears to be behind us. Nevertheless, please continue to take precautions.

As such, CVA will be resuming public activities, as safety and health measures permit. The Riverpark monthly public starwatch in April was successful and more are planned. Summer events are going ahead. See the CVA website for details.

The major astronomical event in the next few months will be the May 15, 2022 total Lunar eclipse-see Fred Ringwald's article in this issue. Lunar eclipses are always fun to watch; seeing the moon turn a pinkish-red color is a magical and eerie experience; no wonder the ancients freaked out when they occurred.

Speaking of eclipses, more solar eclipses in the United States are not that far away. It seems like the great 2017 total solar eclipse was ages ago, and now two more are coming up. One is on October 14, 2023, a partial eclipse that will blanket the American Southwest, and only six months later, on April 8, 2024, the US will host another total eclipse that will sweep up from Mexico, and go through Texas and the Midwest. Yours truly will return to southern Missouri on April 8 to witness almost five minutes of totality, It's going to be a sight to behold.

As we go into summer, be safe and aware, but also be glad that things are loosening up and everyone will be able to enjoy the beauty of the heavens once again.

Clear skies always-
Larry Parmeter, *Observer* editor

**Number of exoplanets found as of April 2022-
5,011**

How many more are out there?

Tens of thousands? Hundreds of thousands?

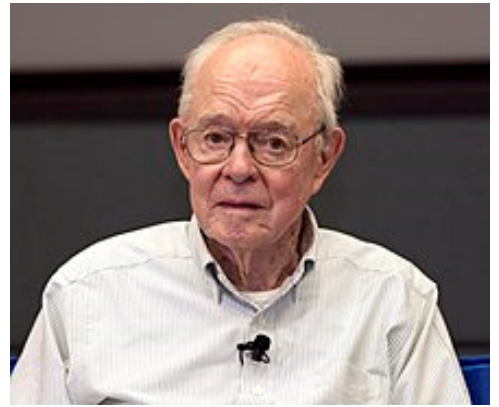
Maybe millions?

Profiles in Astronomy

Eugene Parker 1927-2022

Eugene Parker, one of the world's foremost solar physicists, who first proposed the idea of the solar "wind," died on March 15, 2022. He was 94.

Parker was born and raised in Houghton, Michigan, attended Michigan State University and then Caltech, where he received his doctorate in plasma physics in 1951. After four years as a post-doc at the University of Utah, he settled in at the University of Chicago in 1955, where he would stay for the rest of his life. Over the years, he was chairman of the astronomy and physics department and also headed the Enrico Fermi Institute. At the time of his death, he was the Subrahmayan Chandrasaker Professor *Emeritus* of Physics at the University.



During his long career at Chicago, Parker made the Sun his study of interest. In 1957, he proposed that the Sun expelled massive amounts of particles, which were flung into the solar system as a kind of solar "wind," and that the Earth's magnetic field protected it from their radiation. At first, the scientific community ridiculed his idea and even tried to restrict his papers on the subject. But Chandrasaker, then the head of the physics department and the editor of *The Astrophysical Journal*, overruled several negative peer reviews and published them anyway. When the space era began only a few years later, early satellites carrying particle detectors confirmed and vindicated Parker's theory, one of the major findings in solar physics. In particular, Mariner 2, launched in 1962, found strong evidence for solar particles streaming out from the sun's surface. Many other satellites have since reinforced the idea of the solar wind and how it works. In the 1980s, Parker theorized that the mystery of why the Sun's corona was so hot could be explained by tiny "nanoflares," as he called them, bursting out of the Sun's surface. Although these have not yet been definitely proven, one of the purposes of the Parker Solar Probe, which was launched in 2018 and will fly to within four million miles of the Sun in 2025, is to see if they exist. Parker, who was 90 at the time, was the first person to have a scientific satellite named after him while still alive and see it launched.

Parker won many awards during his lifetime; the most prestigious being the Crafoord Prize, given by the Swedish Academy of Sciences and considered the equivalent of a Nobel Prize in astronomy. He was also awarded the National Medal of Science and the James Clark Maxwell Medal, given by the American Physical Society.

From the Observer Archives

"Have you noticed lately that you are getting dizzier? Or do you get dizzy sooner? Or is it the other way around? It could have something to do with the spinning universe or then on-spinning universe. Is the universe shaped like a ball or a wheel? Is it shaped like a spindle or maybe the vortex of a giant whirlpool? There just may be a way to find out!

Paul Birch, a British radio astronomer and a graduate student at the University of Manchester, has deduced that the universe may be rotating. At his estimated rate, it would turn once on its axis about every 60 trillion years. That's about 3,000 times the currently accepted age of the universe, which means that it has turned just 7' 12" of arc..."

From the January 1983 *Observer*

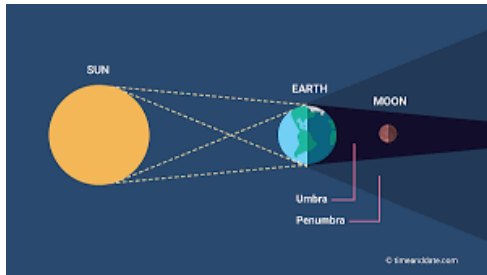
I've always wondered why there's so many strange-acting people in the world today. It's all the universe's fault.

The May 15 Lunar Eclipse

By Fred Ringwald

In any lunar eclipse, Earth casts a shadow on the Moon. A lunar eclipse can't hurt your eyes. This is because during a lunar eclipse, we on Earth are looking away from the Sun. You can hurt your eyes by observing a solar eclipse improperly. In a solar eclipse, the Moon casts a shadow on Earth, so we on Earth are looking toward the Sun. That doesn't happen in a lunar eclipse, so lunar eclipses are safe to observe even through telescopes.

The lunar eclipse of May 15 will likely be a dark one. This is because it will be a total eclipse, with the entire Moon passing through Earth's umbra. The umbra is the darkest part of Earth's shadow, in which the Sun is completely shadowed by Earth. The umbra is noticeably round to the eye. Earth always casts a round shadow on the Moon during a lunar eclipse, so the ancient Greek philosopher Aristotle deduced that Earth must be round.



The May 15 eclipse is also likely to be dark because it will be a central eclipse, with the Moon passing through the center of Earth's shadow. The Moon is therefore likely to turn deep red, called a "Blood Moon," or even very dark red or even black, called a "Black Moon." The red color is because, as Earth casts a shadow on the Moon, the light from the Sun that shines on the Moon will first pass through dust in Earth's atmosphere. This dust is only transparent to red light: this is the same reason that sunsets are red.

This will also be a supermoon eclipse. This means that the Moon will appear larger than average in the sky, because it will be relatively near us in its elliptical orbit around Earth.

It will be visible in Fresno after Moonrise, which will be at 7:53 p.m. Pacific Daylight Time (PDT).

Penumbral eclipse will begin (P1) at 6:32 p.m. PDT, which is before Moonrise.

Partial eclipse will begin (U1) at 7:28 p.m. PDT., which is before Moonrise.

Sunset will be at 8:00 p.m. PDT.

Total (umbral) eclipse will begin (U2) at 8:29 p.m. PDT.

Greatest (maximum) eclipse will be at 9:12 p.m. PDT.

Total (umbral) eclipse will end (U3) at 9:55 p.m. PDT.

Partial eclipse will end (U4) at 10:56 p.m. PDT.

Penumbral eclipse will end (P4) at 11:52 p.m. PDT, which is before Moonrise.

All these times are for Fresno State's Campus Observatory, on the lawn of the Downing Planetarium with a local time correction of +1m 01.3s to the times from Fred Espenak's EclipseWise.com webpage (linked to his older "Mr. Eclipse" webpage) for this eclipse, here:

<http://www.eclipsewise.com/lunar/LEprime/2001-2100/LE2022May16Tprime.html>

And of course, I can't predict the weather this far in advance. Whether you will actually see any of this will depend on the weather.

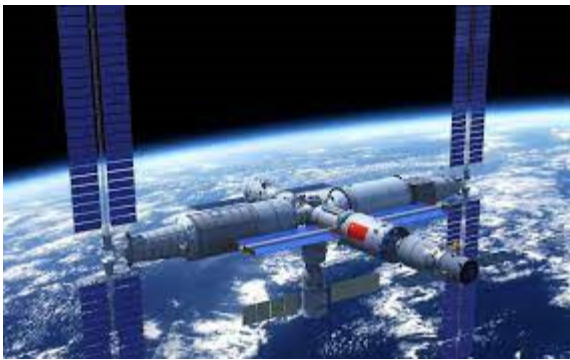
What's New in Space

Mars Ingenuity Keeps on Ticking

On March 16, NASA announced that the Mars Ingenuity mini-helicopter will operate through September 2022. First flown on April 21, 2021, Ingenuity has now made twenty-seven successful test flights when it was initially expected to last only five. NASA and the Jet Propulsion Laboratory have now decided to help it decide the Perseverance rover's next target. This spring and summer Ingenuity will fly ahead of the rover and scout out several dry river beds in Jezero Crater to determine which one has the most potential for possible ancient life. If Ingenuity is still operational by the Fall, it will be programmed to undertake other missions as well, as part of the overall effort to prepare for the Mars Soil Sample Return mission, now scheduled to be launched in 2026.



China to Allow Commercial and Tourist Operations aboard its Space Station



In Early March 2022, the Chinese Space Agency said that it will start taking reservations for commercial companies to lease time, space, and equipment aboard its Tiangong space station, perhaps as early as 2025. It also said that it would allow private tourist flights by the end of the decade. This comes on the wake of several U.S. companies, such as Blue Origin, Grumman, and Axiom, saying that their proposed space stations will open to commercial interests by the late 2020s. According to sources, the Tiangong will be completed by the end of next year and will hold up to six crewmembers at a time. It is widely believed that

China will use the space station as a jumping-off point for eventually missions to the Moon by the late 2020s, and using the Tiangong for commercial purposes will be a way to raise money for those endeavors. Space experts say that the commercial spaceflight business, especially related to operations aboard space stations, will explode in the 2020s, and may be a \$1 trillion market by 2030. Many Earth-bound companies are eager to develop and test new products in micro-gravity environments, including plastics, electronics, pharmaceuticals, composite materials, metals, communications, agricultural foodstuffs, and other areas.

ESA Drops Russia from the Franklin Rover Program Following Ukraine Invasion

The European Space Agency has decided to end Russian participation on the Franklin Mars Rover Program, formally known as ExoMars, due to the Russian invasion of the Ukraine and Russian Space Agency head Demetri Rogozin's threatening comments about the future of Russian-Western space cooperation. The Franklin Rover, named after British chemist Roselyn Franklin, was scheduled to be launched aboard a Proton rocket in September after a delay of over two years. ESA has not yet decided who will eventually launch the rover, or when or from where. In the meantime, RKA has lost several other launch contracts due to the invasion, leading space experts to wonder if it can survive in the long run.



The main beneficiary of the space fallout from the invasion appears to be Space-X. In the weeks following the incursion, it signed contracts with major European space companies to launch satellites which were originally scheduled aboard Russian rockets. In response to one of Rogozin's tweets claiming that after all the years that the Russians launched Americans to ISS aboard Soyuz spacecraft, the U.S. had nothing but "broomsticks" for rockets, Space-X head Elon Musk tweeted back an image of a Falcon rocket launching 50 Starlink internet satellites with the comment, "Here's our broomstick!"

So far, NASA is taking Rogozin's bluster and threats to end the ISS program with a grain of salt. NASA head Bill Nelson put out a message effectively saying, "Rogozin is just being Rogozin," and the space agency reports that Russian ISS personnel in Houston and at the Gagarin Space Center in Moscow remain totally committed to continuing the space station program. Russian cosmonaut Anna Kikana is still scheduled to fly aboard a Crew Dragon mission to ISS in September 2022 and American Francisco Rubio is still on line to be launched aboard a Soyuz in October 2022.

Spaceflight Short-

The seven Mercury pilots, chosen in April 1959, are widely considered to be America's first astronauts. But they weren't. In 1958, the Air Force and the NACA chose nine pilots to fly the Man in Space Soonest(MISS) missions, which were scheduled to begin in 1960. Most were well-known test pilots such as Ivan Kincheloe, Robert White, Joe Walker, and Scott Crossfield. But the group also included a former Navy pilot turned test pilot for the NACA, Neil Armstrong. As it was, the Air Force dropped out of Project MISS and the newly formed NASA took it over and renamed it Project Mercury.

The Crafoord Prizes

As mentioned in this issue's Profiles in Astronomy, Eugene Parker was a recipient of the Crafoord Prize. But other Americans have won the Crafoord Prize as well, and it has become increasingly known as another Nobel Prize. In fact, it is linked to the Nobel Prizes, and those who are awarded it are mentioned in the same breath as Nobel laureates.

The Crafoord Prize was established in 1980 by Holger Crafoord, a wealthy Swedish businessman, and his wife Anna-Greta Crafoord, and is managed through the foundation of the same name that they set up. It recognizes achievement in one of four areas: astronomy, mathematics,* geosciences, and biological sciences. The prizes are meant "to complement the Nobel Awards," and the winners are chosen and announced each January by the Swedish Academy of Sciences. The King of Sweden officially awards the prize. The categories are rotated in four-year cycles; only one prize is given each year, to either one or two people. The first prize was awarded in 1982 to two mathematicians, Vladimir Arnold of Russia and Louis Nirenberg of Canada, for their work on non-linear equations. The 2022 prize, in geosciences, went to American Andrew Knoll of Harvard University for his geological research on Earth's early history. Since Holger Crafoord suffered from severe polyarthritis, every few years the Foundation and the Academy award a special prize for studies in that area. Two women have won a Crafoord Prize, Tomoko Otha of Japan in 2015, for her discoveries in genetics, and Susan Solomon of the United States in 2018 for her research on atmospheric chemistry. With the Crafoord Medal, which is also very similar to a Nobel Medal, comes a cash prize; this year it was \$700,000.



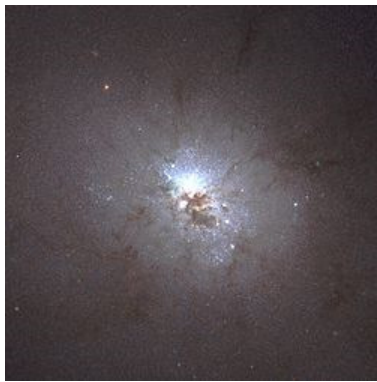
*An often-told story, which may be apocryphal, says that Alfred Nobel, when he was a university student, dated a young woman, hoping to eventually marry her. But she left him for a mathematician, which is sometimes given as the reason why he never established a Nobel Prize in mathematics. Nobel never did marry, and gave most of his fortune to set up the Nobel Foundation and the Prizes.

A Cheaper Way to Visit (Almost) Space

Over the past few years, a company called Space Perspective has been advertising balloon trips to the edge of space. In April 2022, it released details on its program, which has already signed up over 600 people for trips starting as early as 2024. A Space Perspective flight will use a circular pressurized passenger capsule, called Neptune, which will hold up to ten people and will be lifted by a balloon to an altitude of between 100,000 and 120,000 feet. There, it will float for up to two hours before returning to Earth. Flights will originate at the Kennedy Space Center in Florida, where Space Perspectives has leased facilities and a launch site. Passengers will not experience zero-g, but according to the advertising, will be able to see the curvature of the Earth. Space Perspectives is touting its price, which compared to Blue Origin's estimated \$25 million and Virgin Galactic's \$450,000, is an economical \$125,000 per person.



Galaxy in the Eyepiece: NGC 3077



M81 is one of the best known galaxies in the Messier Catalogue, and its nearby companion, M82, called the "Cigar Galaxy," is also popular. A favorite goal of many amateur astronomers is to view both of them in a low power or wide field-of-view eyepiece. But they are only two of a cluster of several galaxies known as the M81 Group. Occasionally, a third galaxy in the Group can also be seen in the same field-of-view on dark nights; it is NGC 3077. 3077 was first observed by William Herschel in 1801; John Dreyer included it in his listing of New General Catalogue objects in 1888. In 1943, Carl Seyfert made it a member of his catalogue of galaxies which have active nuclei, which he felt accounted for its diffuse irregular shape.

Today, though, it is no longer considered a Seyfert Galaxy; its shape is now believed to be caused by gravitational interactions with its neighbors, especially the giant M81. It is officially classified as an Irregular 0 Peculiar galaxy. NGC 3077 has an apparent magnitude of 10.6, and, based on the latest distance-finding methodology, is about 12.8 million light years from Earth.

The CVA Marketplace

For sale-a 1990s Telescope-A Meade 8" Quartz SC 2080 LX3. Never really used, owner bought it and left it sitting in his living room for over 30 years. Is in pristine condition. All parts are there, some are still in the packing boxes. He is now moving back East and would like to sell it. Originally bought at the old Boots Camera on Blackstone for \$1,500-he will accept any reasonable offer for it. Sounds like it might be a good second scope in case the primary one goes kaput. If interested, call Oliver Riemer at 652-7075

The Antikythera Mechanism comes into Focus-Literally

The mysterious gear-driven mechanism discovered in a shipwreck in Greece in the early 1900s is revealing its nature and purpose, and today scientists and engineers believe they know its secrets. Not only what it was used for, but possibly who designed and built it, and what its starting point was.

In 1901, a shipwreck dating to approximately 70 BC was found off the island of Antikythera in the Aegean Sea. Among the many things found in the wreckage was a heavily encrusted device that contained gears and dials. For many years, no one really knew what it was. But in the 1950s, research revealed that it was a mechanical analog computer used to predict the motions of the Sun, the planets, and the moon, which shocked scientists, who believed that even the ancient Greeks were not capable of building such a device. In 2002, using advanced scanning devices, British scientist Michael Wright of the London Science Museum determined that it worked according to epicycles based on a geocentric solar system. Furthermore, markings on the device were found to be instructions describing how it worked. In 2008, a team from Cardiff University showed that it predicted solar and lunar eclipses. Another study, released in 2019, from a research team at King's College London, showed that the device not only demonstrated the Saros cycle—the seventeen-year motions of the Sun and the moon relative to Earth, but also the 462 year cycle of Venus and the 442 year cycle of Saturn. Also, the Kings College team believes that the “starting” calibration date for the mechanism was December 22, 178 BC, which would have been the winter solstice. However, other scientists dispute this date. The mechanism also details the ancient Greek, or Metonic, calendar, and predicts dates for the Greek athletic competitions, such as the Olympic Games.

A second major question that has been tackled is who designed and built the Antikythera mechanism, and many scientists believe they know the answer. Strong evidence, they claim, points to the Greek scientist and mathematician Archimedes of Syracuse (287-212 BC). He had, they say, the knowledge and skills to develop such a device, and it is known that he worked with lunar and planetary calculations. Archimedes was accidentally killed in 212 BC by a Roman soldier during the siege of Syracuse, so most say he could not have built the machine himself, whose construction has been dated to between 150-80 BC. But writings by Cicero (106-43 BC), the famous Roman orator and essayist, reveal that Archimedes designed and built a device which calculated the motions of the moon, the Sun, and the known planets and that the Roman general Marcus Claudius Marcellus (268-208 BC) owned one of them. Other Roman writers also say that Archimedes designed and built clock-like mechanical devices similar to the Antikythera mechanism. Related evidence suggests that, after Archimedes, other Greek craftsmen* built several Antikythera-type mechanisms over a period of about a hundred years, leading up to the one that was found in the shipwreck in 1901. Then, where are the others? If another one can be found, perhaps in much better shape than the first, it will be a major discovery showing that the ancient Greeks were even more advanced than we moderns thought.



*Some experts dispute the Archimedes origin and claim the mechanism came from Pergamon, the site of a Greek library and learning center similar to the great Library at Alexandria. Others say that it originated on the island of Rhodes and was built at a school founded by the Greek philosopher Posidonius (135-51 BC).

Sources-

Ouellete, Jennifer, "Researcher Hone in on Possible 'Zero Day' for Antikythera Mechanism, " *Ars Technica*, April 11, 2022.

"Antikythera Mechanism," *Wikipedia*, c. 2019

The Table Mountain Observatory

The Table Mountain Observatory is located in the San Gabriel Mountains, northeast of Los Angeles, at a site called Big Pines near the town of Wrightwood. At 7,500 feet above sea level, it has been used by a number of different institutions using many telescopes but is currently managed by NASA's Jet Propulsion Laboratory.

The Observatory had its beginnings in 1924, when it was established by the Smithsonian Institution to conduct weather, solar, and atmospheric studies. Over the years, other institutions such as Claremont College, Pomona college, and Harvey Mudd College, all members of the Claremont Colleges, used it for various astronomical studies. In 1962, JPL took over management of the facility and has run it ever since, conducting studies involving space science and satellite projects, and comet and asteroid research. Several asteroids have been found at the Table Mountain facility, the most notable being Asteroid 84882 Table Mountain. A total of over 260 near-Earth objects have been found at the Observatory.

Today, the observatory has two operational telescopes. The first is a 1.02m reflector, known as the Pomona College Reflector. The second is a .6m Ritchey-Chretien reflector; both are considered excellent for finding and studying near-Earth objects.



Star Stories

Cor Caroli

Cor Caroli, also known as Alpha Canum Venaticorum, is the brightest star in the constellation Canis Venatici, "the "Hunting Dogs," in the northern hemisphere. Cor Caroli is actually a binary star system; its primary star is known as α^2 CVn. It has an apparent magnitude 2.3 and is classified as an A0 star. It is also a variable star, with a variability period of 5.5 days. The smaller binary companion is known as α^1 CVn; it is an F2 star with an apparent magnitude of 5.6. Together, the two stars have an absolute magnitude of 1.6.

Cor Caroli's primary star, α^2 CVn, is of interest to scientists because it has a very strong magnetic field, over 5,000 times that of Earth's, and produces massive sunspots during its rotation cycle. It also has a superabundance of certain elements, such as silicon and mercury in its atmosphere. As such, some scientists believe that unusual processes, which are not totally understood, are going on deep inside it.

The name *Cor Caroli* is Latin for "Charles's Heart;" it was first mentioned in 1660, used in 1673 on a star map in England, and formally added to the lists of stellar names in the 1700s. Scholars are divided as to whether it refers to the English King Charles I, who was executed in 1649, or to his son, Charles II, who restored the English monarchy in 1660 after the downfall of the Puritan Protectorate.



Astronomy (Bad) Joke-

What kinds of songs do the planets sing? Nep-Tunes!

From AstronomyTrek

