THE OBSERVER

The Newsletter of Central Valley Astronomers of Fresno November-December 2023

The October 14 Annular Solar Eclipse

The October 14 annular solar eclipse, from Stallion Park in northwest Fresno. Images by Larry Parmeter

Astronomy Quote of the Month-

"The purpose of life is the investigation of the Sun, the Moon, and the heavens…"

-Anaxagoras, Greek philosopher

In this Issue-

Central Valley Astronomers

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CVA's Star-B-Que and Informal Meeting on October 14

CVA held its annual Star-Be-Que at Eastman Lake on October 14, attracting a large turnout of members and their families. While they were there, vice-president Brian Bellis conducted a kind of informal meeting, in some ways taking the place of the one that was cancelled in September due to the Fresno State football game. Brian related that he and Lynn Kliewer went down to Bakersfield a few weeks earlier to attend a meeting of the Kern County Astronomical Society to get ideas on improving CVA activities. Brian explained that the Kern groups meets the first Friday of every month, regardless of the Moon's phases, at a local pizza place. Members and families arrive at 6:30, order food and drinks, and the meeting starts at 7. Speakers are often from outside the club, in one case, a scientist from the Jet Propulsion Laboratory in Pasadena. As such, the meetings usually have strong attendance, which is something that CVA wants to work on. Also, Brian and Lynn noticed that a good number of young people attended the meeting, something else that CVA is trying to encourage. It was mentioned that about 20 years ago, CVA met at the DiCicco's in Old Town Clovis for a time, but for whatever reason did not continue it. Meeting at a local eatery on a Friday night is something that will be looked into and discussed further.

Another thing brought up was the fact that Eastman Lake is CVA's "official" star watch site, prominently mentioned on its website and Facebook page, but, with the popularity of Big Stump, few members use Eastman Lake anymore. Brian said that he's had calls from members of the public who drove to Eastman Lake and found no one there(and that does make CVA look bad. Editor's note: I prefer Eastman Lake, and there have been times, when, on official star party dates, I was the only one there, but I can't always go every month). However, Big Stump as an "official" publicized site has problems, given that a private group inviting the public to an event inside a national park might lead to legal and liability issues. One suggestion was to make sure that at least a few people are at Eastman on each star watch date, and also to designate Eastman for certain times of the year and Big Stump for other times. Again, this will be discussed further.

Number of exoplanets found as of October 2023-

Confirmed-5,535 Possibles-9,913

Confirmed planetary systems-4,258

How many more are out there?

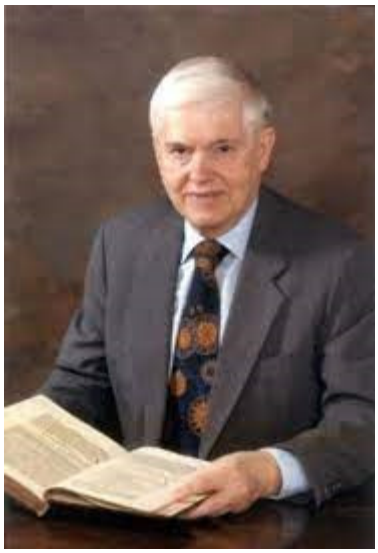
Tens of thousands? Hundreds of thousands? Millions?

(From NASA's Exoplanet Exploration Website)

The October 14 Star-B-Que and CVA meeting

Images by Alan Englund

Profiles in Astronomy



Owen Gingerich 1930-2023

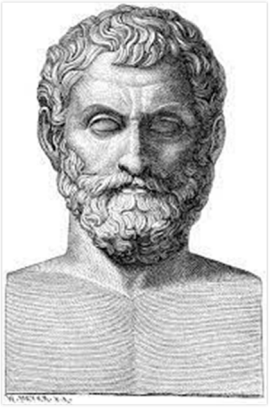
Owen Gingerich, who died on May 28, 1023, was one of the world's foremost astronomical historians. He was born in 1930, in Iowa, to a Mennonite family, but spent most of his childhood in North Bethel, Kansas, where his father taught at Bethel College. He never finished high school(however, in 2004, he was awarded an honorary diploma by his old high school); after his junior year, he enrolled at Goshen College, then transferred to Harvard University, earning both bachelor's and graduate degrees in astronomy. His thesis advisor was Cecilia Payne-Gaposchkin. He would end up spending his entire career at Harvard, teaching there for over sixty years, and eventually being honored with the designation of *professor emeritus* of astronomy.

Over the years, Gingerich conducted research in stellar formation, but his real interest was in the history of astronomy. In the 1950s, he researched the original notebooks of Charles Messier, discovered several previously unknown papers by Messier, and used them to identify two new objects, M108 and M109, which were subsequently added to the famous catalogue. He concluded that M101 and M102 were the same object, and that M91 was probably a comet(but this was eventually disproven by American amateur astronomer William C. Williams, who showed that M91 was actually NGC 4548). He studied Copnericus's *De Revolutionibus,* using an original first edition, and wrote a highly acclaimed book on it. He also researched and wrote on the life of Johannes Kepler and became a recognized authority on Galileo's discoveries and ideas. In 2005, he was the chairman of the International Astronomical Union's committee on planetary definition, which eventually concluded that Pluto should be demoted to a minor planet, a decision with which he personally disagreed.

As both a dedicated astronomer and devout Christian, Gingerich wrote several books on the intersection of science and religion. As such, he was sometimes blasted by both sides, but gained respect among the larger scientific community for his arguments to reconcile the two seemingly unrelated disciplines.

Gingerich, who wrote over twenty books, was honored by many organizations and given numerous awards for his research and publications. The asteroid 2658 Gingerich, discovered at the Harvard College Observatory, is named for him.

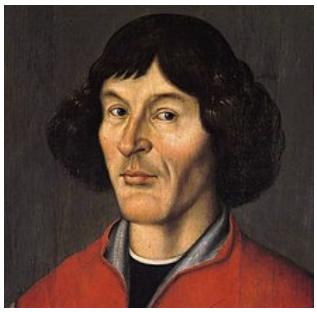
Astronomy Short



Stories go that a Greek scientist, Thales of Melita, predicted a solar eclipse for May 28, 585 BC. This has been disputed by some, but several Greek and Roman scientists and historians attest to its validity. Exactly how he did it is not known, since the laws of planetary motion would not be developed for almost 2,000 years. Some say he studied what is today known as the Saros Cycle, a 19 year cycle that the moon goes through relative to its position with the Earth. Other say that he had knowledge of Babylonian astronomy, which also kept track of the Saros Cycle. In any event, he and others at the time did not know that the eclipse was caused by the Moon coming between the Earth and the Sun; that would be discovered over a century later by another Greek scientist Anaxagoras, who discovered the fact during the solar eclipse of 463 BC.

Right Thales of Melita c.626 BC– c.545 BC

Copernicus and *De Revolutionibus*

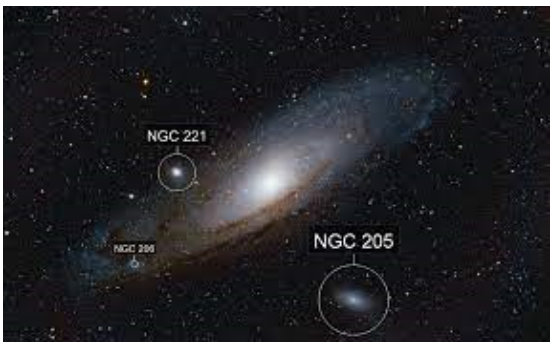


As mentioned earlier, Owen Gringerich's writings on Nicholas Copernicus are among the most lauded in the academic world. But what do we know about Copernicus himself and his most famous work, *De Revolutionibus*? Copernicus was born in Torus, Poland in 1473 as Mikolaj Kopernik. He attended Cracow University, then the University of Bologna in Italy, where he became interested in mathematics and astronomy. His family wanted him to become a priest, but when he returned to Poland, he took the position of canon, a kind of lay minister or deacon, and never took full priestly orders. However, he spent most of his life working for the Catholic Church. He was a true polymath, excelling in mathematics, medicine, diplomacy, economics, and languages. While serving the Church, he researched a topic that first interested him at Bologna: how was the solar system arranged? He recognized flaws in Ptolemy's geocentric model, which had been accepted doctrine in Europe for over a thousand years. As early as 1503, he made observations of the planets and the Moon and spent the next several years gathering data to support the idea of a heliocentric solar system. In 1514, he published an early version of his theory, known as the *Commentariolus*. He spent the next several years gathering more evidence as well as doing work in economics and medicine. In 1533, a revised version of his theory was given to Pope Clement VII, who initially supported it. By 1539, his work on the solar system was known throughout Europe, and he was urged to publish it. He, though, delayed it, fearful of attacks on it. In 1542, publication began under the title of *De Revolutionibus orbium coelestium(On the Rotations of Orbital Bodies).* In the meantime, he was seriously ill. It is said that he approved the first printing while in bed, and died a few days later, in May 1543. It was not generally accepted by European scientists for many years afterwards and was eventually attacked by the Catholic Church. Galileo became one of his strongest defenders, and, with time his system became accepted throughout Europe.

Galaxy in the Eyepiece-NGC 205

NGC 205, also sometimes known as Messier 110, is often overlooked as being "only" a satellite galaxy of M31, the Great Galaxy in Andromeda. Yet, it has an interesting history and its own particulars which make it stand out from the larger galaxy. When Charles Messier described M31 in 1773, he briefly noted a smaller galaxy near it, but never gave it much thought or made it part of his famous catalogue(which was strange, considering that he described another even smaller dwarf galaxy near M31 and designated it M32). It was first officially recognized as a distinct object by Caroline Herschel in 1783. Her brother William Herschel confirmed her sighting and description in 1785. John Dreyer made it part of his NGC catalogue in 1887, and in 1967, American astronomer Kenneth Glyn Jones suggested that it be designated M110, the last of the Messier objects.

NGC 205 is classified as an E5 peculiar dwarf elliptical galaxy. It is considered peculiar because it has dust clouds and masses of young blue stars near its center, which is unusual in elliptical galaxies. Also,(at least so far) it does not show any evidence of a black hole at its center. The latest measurements show it to be 2.7 million light years from Earth, with an apparent magnitude of 8.5 and an absolute magnitude of -16.5. It is the largest of at least thirteen dwarf galaxies that are associated with M31.



NASA Scientist Discusses JWST and Future Projects at Town Hall Meeting

On October 18, Amber Straughn, an astrophysicist with NASA, spoke at the San Joaquin Town Hall on the James Webb Space Telescope. Dr. Straughn explained that she had been involved with the JWST since 2008, and in a sense even before that, since it was the main project of her doctoral thesis advisor at the University of Arizona. She started off by discussing the Hubble Space Telescope and all the new knowledge it brought in(and reminded the audience that HST is still very much operational and making discoveries regularly) before going over the history of the JWST up to its launch at the French Guiana spaceport on Christmas Day, 2021. It took almost six months to set up and align the telescope, and when the first images came back and were released in July 2022, they were far beyond anything Hubble or any other telescope had delivered. JWST's main goal over its almost twenty-year lifespan, she said, is to look back to the earliest years of the universe; scientists are already finding surprises, such as very early galaxies that are much brighter than expected, and trying to fit them into current cosmological theories. Dr. Straughn then looked to the future, talking about NASA's next big space telescope, the Nancy Grace Roman Telescope, which will launch in 2027, will take closer looks at exoplanets, and try to understand the nature of dark matter and dark energy, among other goals. She also discussed the Habitable Worlds Observatory, also known as the HabEx, or Habitable Exoplanets Observatory, the successor to JWST, which is now scheduled to be launched in 2040, and will look for biochemical "signatures" of life on exoplanets. She closed the talk by answering questions, especially emphasizing that the JWST is far more inclusive than earlier space projects by having a "blind" proposal system that has allowed far more women, little-known younger astronomers, and even graduate students to have their James Webb research proposals accepted.

About the Nancy Grace Roman Telescope and the Habitable Worlds Observatory

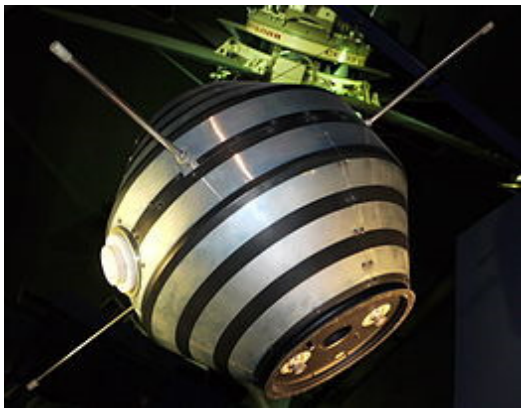
The Nancy Grace Roman Telescope, originally known as the Wide-Field Infrared Survey Telescope, is a space-based 2.4 meter mirror telescope that will conduct detailed studies of exoplanets and try to ascertain the nature of dark matter and dark energy, among other goals. It was first proposed in 2010 by the National Academy of Sciences as part of its decadal study of scientific projects, and officially approved and funded in 2016. Named after Nancy Grace Roman, a NASA astronomer who played a major role in the development of the Hubble Space Telescope, it is now scheduled to be launched in 2027 and put into an L2 orbit for a 5-10 year mission.

In 2016, NASA commissioned a study of its next Great Observatories program, and, in 2019, submitted four proposals for space telescopes to the National Academy of Sciences for its decadal study of scientific projects. In 2021, the NAS recommended that NASA proceed with a space telescope using a 6 meter mirror to be put into an L2 orbit similar to the JWST. The proposal, originally called the Habitable Worlds Observatory, is also known as HabEx, or Habitable Exoplanets Observatory, and will use a radical type of "starshield" to block out starlight in order to study exoplanets' atmospheres for biochemical activity. It has a tentative budget of $11 billion and a tentative launch date of between 2035 and 2040.

Right-an artist's conception of the Habitable Worlds/HabEx Observatory

Space Age Archeology

Asterix



Asterix 1 was the first satellite launched by France, which became the third nation, after the Soviet Union and the United States, to launch a satellite using its own home-built rockets(England, Canada, and Italy launched their own satellites before France, but used American rockets and technology to do so).

The Asterix project began in early 1963, while CNES, the French Space Agency, was developing its own orbital booster-carrier rocket, the Diamont. The satellite was also known as FR-2; it was to be the second of a series of satellites proposed and encouraged by then French President Charles DeGaulle, who wanted to show the world that France was just as technologically capable as the U.S. and the Soviet Union. CNES designed and bult Asterix quickly, by aerospace standards, and it was ready before FR-1, so the decision was made to launch it first. Its original French Army designation was A-1; it was named Asterix after a popular French cartoon character.

Asterix was shaped roughly like a child's top; it was 22 inches in diameter and weighed 96 pounds. Most of its power came from solar panels placed in concentric rings around the outside of the craft. Its main scientific goals were to study the ionosphere and the Earth's magnetic field. Before the launch, CNES and the French Army launched two suborbital prototype Asterix satellites in May and June of 1965, and both were successful. The orbital launch of Asterix came on November 26, 1965, from the Hammaguir Launch Center in Algeria, putting the satellite into a highly elliptical orbit of 327 miles by 1,054 miles. Unfortunately, the payload fairing jettisoned earlier than expected, causing damage to the communications and telemetry systems; as a result, the satellite stopped transmitting data after two days. Nevertheless, American radar scans showed that it successfully entered and was in a stable orbit. It is still in orbit today. Despite its early demise, Asterix was a huge propaganda victory for the French, and led the way for future French successes in the space race.

Star Stories

Zosma

Zosma is also known as Delta Leonis, one of the brighter stars in the constellation Leo Major. It is designated an A4V star, meaning that it is larger and hotter than the Sun; it is now known to be a main sequence star. It is about twice the size of the Sun but is almost fifteen times more luminous, indicating that it is burning its hydrogen rapidly. Scientists estimate that it is about 500 million years old, and in another 600 million years or so, will go off the main sequence and enter the red giant phase. It has an apparent magnitude of 2.56 and an absolute magnitude of 1.29. The latest measurements show it to be 58 light years from Earth. It does not have any known companion stars.

Zosma is known to be spinning very rapidly; as such it has a noticeable budge at its equator and is considered an oblate spheroid shape. Scientists now believe that it is one of the Ursa Major Moving Group, a large loose cluster of stars, also known as Collinder 285, that probably originated in the same gas cloud, have a common proper motion, and are all the same age.

The name *Zosma* comes from Greek and means "girdle, a reference to the star being near the hind quarters of the Lion. Zosma is also derived from Arabic, Al-Zubra, the shoulder or mane of the lion. In Chinese, the star went by the name of Tae Wei Zou Yuan wu, the Fifth Star of the right Wall of the Supreme Palace Enclosure, a reference to an asterism involving six stars in Leo and their resemblance to a wall.

What's New in Space

Several years ago, this newsletter featured articles about America's two major space launch centers: The Kennedy Space Center and Cape Canaveral, and Vandenburg Air Force Base. But there is a third American space launch center that was not covered, one that few people outside the aerospace industry know about, and consequently attracts little attention. That place is Wallops Island, Virginia, which has been used by the Navy and NASA since the 1940s. This is its story.

Wallops Island-NASA's Wallops Flight Facility and the Mid-Atlantic Rocket Spaceport

Wallops Island, which was originally called Kegtonk Island, is one of several barrier islands off the east coast of Virginia on the southern end of the peninsula that is part of Virginia and part of Maryland. It was named Wallops Island after John Wallops, who was deeded it by King William III of England in 1692. Through the 1800s, it was owned off and on by the state of Virginia, and also by a private trust. In 1945, the NACA(National Advisory Committee for Aeronautics, the forerunner to NASA) leased the southern part of the island for jet and rocket testing. In 1947, the Navy leased another part of the island as a bombing range and ordinance storage site. By the 1950s, The NACA was launching sub-orbital sounding rockets from Wallops Island to study the upper atmosphere and near-space. When NASA took over the NACA in 1958, it continued to use the facility as both a sounding rocket launch site, as well as a high-altitude balloon launch site. In 1959, NASA took over the island completely, buying the Navy test site and integrating it into its facilities. From 1959 to 1961, unmanned test versions of the Mercury spacecraft were launched from Wallops Island, and in 1961, Explorer IX became the first Earth orbital satellite launched from Wallops. (in the early 1960s, NASA considered Wallops Island as a launch site for the Apollo/Saturn moon rocket program, but eventually chose Cape Canaveral instead). In 1974, the facility was renamed the Wallops Flight Center and in 1981, it was taken over by the Goddard Space Flight Center, when its name was slightly changed to the Wallops Flight Facility.

In 1995, the states of Virginia and Maryland signed an agreement with NASA to use the southern part of the test facility as a commercial space launch center, to be known as MARS-Mid-Atlantic Regional Spaceport, which is administered by the Virginia Commercial Spaceflight Authority (below, an arial view of the Wallops Island complex on the Atlantic coast. The MARS facility is closest, with the NASA facility in the background).

Today, the Wallops Flight Facility has three launch pads for orbital spacecraft. They are located at the southern end of the flight facility and are under the management of the Mid Atlantic Regional Spaceport. The MARS facility, at 37.8 degrees north, is ideal for putting payloads into high inclination orbits, such as the International Space Station. Launch Pad 0A is built to launch Northrop-Grumman's Antares rockets, which carry Orbital Sciences Cygnus uncrewed cargo spacecraft to ISS. Since 2011, seventeen Cygnus cargo spacecraft have been launched from the MARS facility. Launch Pad 0B launches the Northrop-Grumman Minotaur rockets, one of which, in 2013, sent

the LAYDEE lunar orbiter to the Moon. The newest launch pad, built in 2019, is 0C, also known as LC-2, and is used by Rocket Lab to launch its orbital payloads. The first successful launch from 0C/LC-2 occurred on January 24, 2023, when an RL Electron rocket put three communications satellites into Earth orbit. NASA's launch center, on the north side of the facility, has launch pads for Terrier-Black Brant sub-orbital sounding rockets, used for scientific research. Wallops also coordinates with the White Sands Missile Range in New Mexico and the Poker Flat Research Range in Alaska for their sounding rocket launches and research. As well, the NASA facility has a 7,000 foot runway, which carries out a full schedule of experimental aircraft research and flight testing.

Osiris-REX Comes Home

After a seven-year mission to an asteroid, the Osiris-REX spacecraft returned to Earth on September 24, landing in the Utah desert with a payload beyond price: a part of what scientists suspect is the primordial material that formed the planets. Osiris-Rex was launched on September 8, 2016, and its main objective was to visit the asteroid named Bennu. It reached Bennu in December 2018 and spent the next two years orbiting and studying the asteroid. Then, on October 20, 2020, it landed on Bennu and collected samples of the dust and soil from the asteroid's surface. In May 2021, it lifted off the surface and began a long winding journey back to Earth. As Osiris-Rex flew past Earth on September 23, 2023, it released its sample container, which flew through the atmosphere and landed without incident at an Army testing site west of Salt Lake City on September 24. The capsule was retrieved by NASA officials and taken to the Johnson Space Center in Houston, where its contents, about a half pound of dust and soil, will be studied in a specially designed "clean room." This is not the first time samples from an asteroid have been collected and returned to Earth. A Japanese spacecraft, Hayabusa, landed on an asteroid in 2010 and returned a few micrograms of soil to Earth in 2010. A second craft, Hayabusa 2, did the same thing in 2020. But the Osiris-REX soil samples are much larger and hint at being much older, dating back to the formation of the Solar System itself.

After dropping off the soil sample capsule, Osiris-REX is now heading for a rendezvous with a second asteroid, Apophis, which it will fly by and study in 2029.

Amazon Gets into the Internet Satellite Market

On October 5, Amazon launched its first two satellites, designed to compete with Space-X's Starlink system, for the internet satellite business. Amazon's system, known as Kuiper, after the Dutch-American planetary astronomer Gerard Kuiper, has been in the works since 2019; the two launched on a United Launch Alliance Atlas 5 rocket from Cape Canaveral, are prototype test models which will determine the viability of the system. If they are successful, over 3,000 more will be put into orbit in the next few years. Amazon has signed deals with United Launch Alliance, Blue Origin, and Arianespace for 77 launches over the next five years to put the Kuiper system in Earth orbit. So far, Amazon has been close-mouthed about the Kuiper project, but some details have leaked out. Unlike Starlink, the Kuiper satellites will be much larger and more powerful and will be used to provide internet service to every part of the globe, using portable receiving dishes the size of large books. Amazon and Jeff Bezos's associated space launch company Blue Origin, which is also part of the Kuiper project, hope to have the entire internet system operational by 2028.

Another in a continuing series on lesser known-but still important-observatories throughout the world

The Iranian National Observatory

The Iranian National Observatory is one of the world's newest astronomical facilities, with first light occurring on October 15, 2022. It was the cumulation of a project that began in 2000, when the Iranian Institute for Research in Fundamental Sciences(IRFS) realized that astronomical research in Iran was far behind other nations, the few available observatories were overtaxed with researchers and students, and the telescopes themselves were obsolete.

The INO project was officially approved and funded in 2004; its main purpose was to meet the growing demand for telescope time and to build a world-class astronomical facility in Iran. The project team considered over thirty possible sites over several years, narrowed them down to two, and eventually chose Mount Gargash, in the mountains in the west-central part of the country, for its dry climate, elevation (11,800 feet), and low atmospheric turbulence. A road was built to the summit in 2016 and construction began on the telescope shortly afterwards.

The new telescope on Mount Gargash is a 3.4m(135") Ritchey-Chretien design with an f11 focal ratio. It can be remotely controlled from IRFS's main offices in Tehran. Its primary goals are to continue research into the structure of the universe, the understanding of galaxies and their roles, nature of the Hubble Constant and the age of the universe, and the origin of Dark Matter and Dark Energy.

Although the 3.4m R-C telescope is the only one on the mountain so far, indications are that several more, possibly larger, telescopes will also be built at the same site, to develop and expand Iran's involvement in the astronomical sciences.

Image-the 3.4m dome on Mt. Gargash

From the Observer Archives

"To the Variable Stars of A.A.S.V.O.

Twinkle, twinkle N-type star
Oh my! Oh My! How red you are!

And changing sometimes night to night
We estimate your changing light!

And changing sometimes day to day
We estimate your beams and rays!

Twinkle, twinkle RR Lyrae
Oh My! Oh My! How fast you vary!

And changing often in less time
From dusk until the morning shines!

Twinkle, twinkle ol' UV Ceti
Oh My! Oh My! How you've flared the sky!

And twinkle, twinkle, supernova
Oh, wow! Now you're a nebula!

And sometimes bright as magnitude three
You fill the A.A.V.S.O.'s heart with glee!

And as we observe year after year
We continue to be vital gear
In both research and new theories
As amateurs in Astronomy! "

By Matt Mazurek
In the August 1988 *Observer*