

Due to the COVID-19 virus, all CVA activities have been suspended for the near future-We will keep members informed as to when they might resume



THE OBSERVER

The Newsletter of Central Valley Astronomers of Fresno

May-June 2020



Hubble's 30th birthday image. Nebulas NGC 2014 and NGC 2020, taken on April 25, 2020-30 years to the day that it was released from space shuttle STS-31. The latest of 1.5 million images over the years. More Hubble info and images are inside.

NASA/HST

Hubble Celebrates Thirty Years in Space-and What an Amazing Trip it's Been

Quote of the month-

"...my ribs hurt like hell, my vision is still blurry, I'm really hungry, it'll be another 211 days before I'm back on Earth, and I smell like a skunk took a shit on some sweat socks.
This is the happiest day of my life."

The last paragraph of *The Martian* by Andy Weir

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A look a planetary astronomy over 100 years ago

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Profiles in Science-Freeman Dyson

Spiders in Space(but not from Mars)

Most powerful supernova ever recorded

Shelter-in-place astronomy

Central Valley Astronomers**Web address****www.cvafresno.org****Webmaster-Scott Davis****Officers and Board- 2020****President-****Ryan Ledak****1st Vice-President-****Steve Britton****2d Vice president-****Scott Davis****Secretary/Treasurer-****Steve Harness****Star Party Coordinator-****Brian Bellis****Historian/Observer Editor-****Larry Parmeter****Education Coordinator-****Scott Davis****Director- Warren Maguire****Director- Clarence Noell****Director-Joe Griffin****Director-Lynn Kleiwer_****Larry Parmeter is the editor of *The Observer*****He can be contacted at****559-276-8753 or at
lanpar362@gmail.com****To all CVA members:**

As we head into May and June, and hopefully the COVID-19 virus is starting to settle down, the space sciences world has two things to be happy about. The first is the fact that the Hubble Space Telescope is thirty years old. In 1990, it started off its then fifteen year mission under very suspect circumstances, with people convinced it was a \$1.5 failure. Since then, though, it has redeemed itself many times over and given humanity a vision of the cosmos beyond belief. Hubble is no longer at the forefront of astronomical observation; there are now a number of Earth-based telescopes which are far larger and more powerful than it, (A future *Observer* article will detail some of these giants, and even bigger ones to come. Think of a telescope with a 74 meter diameter primary mirror-it's being planned right now), but it is unique. It still holds the public in awe of its mind-blowing imagery of the cosmos, it is still hugely in demand by scientists, and it is still special in the annals of astronomical sciences. A second article later in this newsletter will tell more about Hubble, but may it have many more years of productive life.

The second thing to celebrate is that the U.S. is (finally!) going back into space after almost ten years of inactivity. Space-X's Crew Dragon, with two NASA astronauts aboard, is now scheduled to be launched from Pad 39A at the Kennedy Space Center on May 27. This is the same pad that launched the Apollo Moon flights and most of the space shuttle missions, so it's appropriate that the New Era, and let's hope it's a new era, begins at Pad 39A. NASA and Space-X are encouraging people not to come to Florida to watch the liftoff in person, due to the virus, but it will be carried on television and the internet, and yours truly will be watching it, just as I watched Apollo 8, Apollo 11, and STS-1 lift off from the same piece of concrete and steel. Let it be the first of many missions to carry the American banner into space where it has always belonged.

May you be healthy and may all your skies be clear-
Larry Parmeter-Observer editor

P.S-the eclectiveness of this issue shows how much spare time I've had in the last six weeks or so.

Number of exoplanets found as April 2020**4,255****How many more are out there?****Tens of thousands? Hundreds of thousands?**

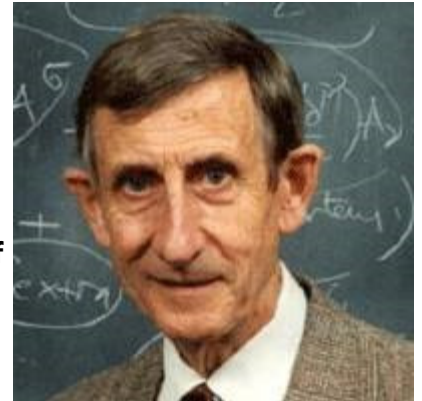
Freeman Dyson 1923-2020

Freeman Dyson, who died on February 28, 2020, was one of the world's most accomplished mathematicians and scientists. His interests ranged from astronomy to particle physics and engineering to climate change and problems associated with hunger and overpopulation. He was a leading voice in science and a world-wide influence during much of the later half of the 20th century.

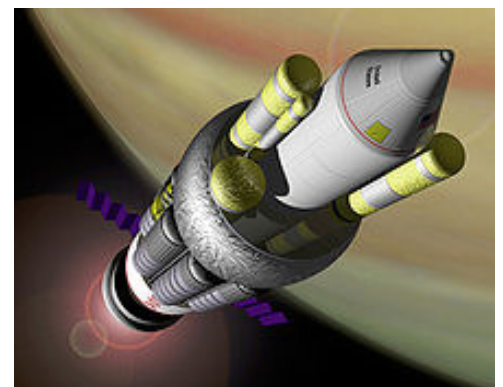
Dyson was born in Berkshire, England, and showed an early proficiency in mathematics and physics. He entered Cambridge University at age fifteen, and after graduating, worked for the Royal Air Force during World War II. After the war, he came to the United States, eventually earning a doctorate in physics at Cornell under Hans Bethe. It was there that he formed a life-long friendship with the legendary physicist Richard Feynman. He briefly returned to England, but then came back to the U.S., where Robert Oppenheimer offered him a lifetime appointment at the Institute for Advanced Studies at Princeton, where he would stay until his retirement in 1994. Afterwards, he became involved in solar energy research and was on the boards of several companies.

Dyson's contributions ranged across a huge spectrum of interests. In the late 1940s, along with Feynman, he helped to build the theory of quantum electrodynamics. In the 1950s and 60s, he was a leading spokesperson for Project Orion, which proposed using nuclear bombs to allow spacecraft to reach relativistic speeds. He also promoted small portable nuclear reactors for use in hospitals and schools. He took an interest in space travel, advocating privately owned and funded spacecraft, which he claimed would be down the cost of space travel to the point where ordinary people could afford it. He also criticized government involvement in spaceflight, saying they were too risk averse and afraid of failure. He urged scientists to look for evidence of "Dyson Spheres," huge artificial constructs built by alien civilizations to tap energy from stars, and advocated "Dyson Trees," growing plants on comets to provide food for interplanetary journeys. In mathematics, he made a number of contributions, including what is called Dyson's Transform, which is related to number theory. Dyson was most controversial for his ideas concerning climate change; he claimed that it could be a positive thing in that it would increase agricultural output, and also that focus on it took away from other pressing problems facing humanity, such as hunger and overpopulation. Many people believed that he should have won a Nobel Prize, especially for his work in physics, but he once said of that, "I never stayed with any one project for any amount of time to investigate it fully. I just kept going on to other things that interested me."

Dyson won a number of honors during his lifetime, including the Wolf Prize, the Max Planck Award, the Oppenheimer Award, the Fermi Award, and the Lorentz Prize. Among many other positions, he was a member of England's prestigious Royal Society.

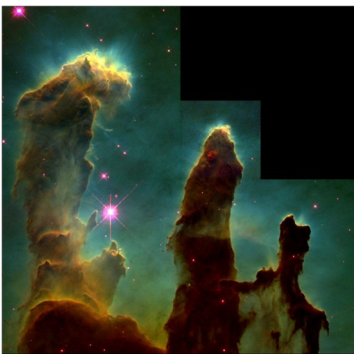


Left-Dyson's Project Orion spaceship, powered by nuclear bombs. They would be pushed out the back and exploded against a reactor plate. According to the concept, the spaceship would eventually be able to travel at up to 10% the speed of light, making a trip to Alpha Centauri possible in forty years. The nuclear nonproliferation treaty, signed in 1967, outlawed nuclear weapons in outer space, and thus outlawed the Orion as well.



Thirty Years of Hubble

On April 24, 1990, Space Shuttle STS-31, carrying the Hubble Space Telescope, was launched into orbit, and a few days later it was released into space. At first, there was major disappointment when scientists learned that the primary mirror had been wrongly polished and images came out blurry. Even with that flaw, it could still do about 75% of its intended mission. In late 1993, the first telescope repair and service mission installed new optics to correct the visual aberration, and from that time on, the scientists were blown away by the clarity and brilliance of the cosmos. Subsequent service missions in 1997, 1999, and 2003, brought even more astonishing visualizations of our universe. NASA originally cancelled a 2005 service mission in wake of the Columbia tragedy, but pressure from scientists and the realization that there would be no more shuttle flights after 2011, caused it to be reinstated. In 2009, a fifth service mission upgraded the telescope for what was thought to be the final time. Hubble, whose original mission life was expected to be fifteen years, was then in its nineteenth year of operation. Since then, it has added eleven more years of scientific observations and research. Today, 2020, NASA has been given the go-ahead by the Trump Administration to study the possibility of using Sierra-Nevada's Dreamchaser mini-shuttle for a repair and service mission in 2024 or 2025. NASA and the Space Telescope Science Institute would like to see Hubble operational until at least 2030. In the meantime, Hubble is thirty years old, and still going strong. To celebrate Hubble's "birthday," here are some images that have changed the way we look at the cosmos.



The iconic "Pillars of Creation," gas clouds with new stars in the Eagle Nebula



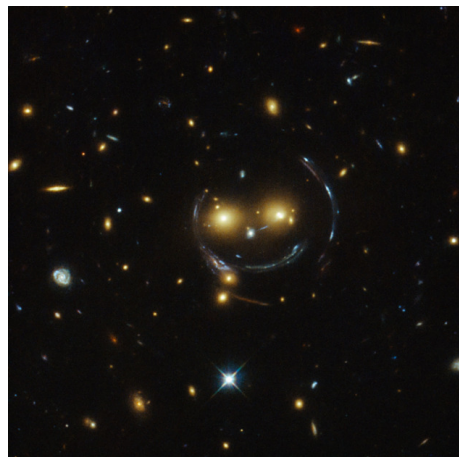
The Celestial Rose-Arp 273 in Andromeda



The Horsehead Nebula in Infrared-Bernard 33



The Helix Nebula-NGC 7293, also known as Caldwell 63



The "Cosmic Grin"-galaxy cluster SDSS J1038+4849 showing gravitational lensing-"Einstein Rings"



The Einstein Cross-another example of gravitational lensing

What's New in Space

Crew Dragon 2 Ready for First Manned flight; Starliner Prepares for Second Uncrewed Mission

On April 17, NASA and Space-X announced that the first manned flight of the Crew Dragon will be launched on May 27, carrying NASA astronauts Robert Behnken and Douglas Hurley. NASA is considering the possibility of Behnken and Hurley spending up to three months aboard ISS rather than the currently scheduled two weeks. This is to offset the delays in sending crews to ISS by both Space-X and Boeing, whose vehicles are three years behind schedule. Hurley revealed earlier this year that he has been training for spacewalks, an indication that the mission will probably last longer than the scheduled time frame. NASA wants the commercial crew vehicles to become operational as soon as possible; it has had to purchase two more seats at \$80 million each aboard Soyuz spacecraft for 2020; it does not want to shell out for any more. NASA has also announced that the second manned Dragon 2 mission, now scheduled for sometime in the fall, will have four crew members aboard; it will carry Shannon Walker and Japanese astronaut Soichi Noguchi in addition to the previously announced crew of Michael Hopkins and Victor Glover. Walker and Noguchi will stay aboard ISS for at least six months and return to Earth via a future Crew Dragon 2 flight. In the meantime, Boeing and NASA announced that the Boeing Starliner will make a second unmanned test flight. This is in the wake of problems with the first flight in December 2019, which showed major flaws in the software system. Boeing says that these are being worked out and should be corrected soon. The best estimate for the second trial mission is June or July. If it goes well, the first crewed flight may take place as early as November.



Franklin Mars Rover Delayed to 2022



ESA and Roscosmos announced in March that the Franklin Mars Rover, which had been planned to be launched later this year, will be delayed until 2022. Both space agencies said that more testing of the rover is needed, and also hinted that the coronavirus epidemic is also playing a role. The Franklin rover was scheduled to be launched aboard a Russian rocket from the Baikonur Cosmodrome later this year for a landing on the Red Planet in 2021. Its goal is to study possibilities of life and search for water on Mars.

Another Space Pioneer Passes from the Scene: Alfred Worden 1932-2020

Al Worden, one of the Apollo Moon program astronauts, died on March 14, 2020 at the age of 88. The cause of death was not given, but it was believed to be from natural causes.

Worden was born and raised on a farm in Michigan, and attended the U.S. Military Academy at West Point before entering the Air Force. In 1966, he was chosen as one of the fifth group of astronauts by NASA. He was the primary pilot on Apollo 15, along with commander David Scott and lunar module pilot Jim Irvin. Apollo 15 was launched on July 26, 1971, and while Scott and Irvin were on the lunar surface, Worden gained the title of the "world's loneliest man;" he was farther away from Earth than any other human being. On the



way back to Earth, he performed the first “deep space” spacewalk, retrieving cameras, film cannisters, and scientific experiments from the Apollo service module while almost 200,000 miles from Earth. After Apollo 15, Worden worked at NASA’s Ames Research Center in California. In 1975, he left NASA and the Air Force and became a business executive. He also wrote several books about space exploration, and was involved in organizations to promote spaceflight and space research. With Worden’s passing, of the 24 astronauts who went to the Moon between 1968 and 1972, only 12 are still alive today.

Biggest Supernova Explosion Ever Found Revealed

On April 13, scientists at the Smithsonian Center for Astrophysics and Harvard Observatory announced that they had detected and studied the most powerful supernova yet seen. It is known as SN2016aps, and was seen in a galaxy, which does not yet have a name or designation, four billion light years away. At first the supernova seemed to be on its own, an isolated star that exploded without anything around it. Then, after two years of studying it, the scientists realized that it was so bright that it outshone the entire galaxy it was in. Their calculations show that it was five times more powerful than usual supernovas and the star that caused it was fifty to a hundred times larger than our Sun. One of the theories that they have about the supernova was that it may have actually been caused by two stars, both in their last stage of evolution, that crashed into each other. The event was detected and studied using the Pan-STARRS telescope array at the Haleakala Observatory in Hawaii. Story from CNN



lion

of

Astronomy Short

In the early 1970s, Judith Miles, a high school student from Lexington, Massachusetts, wanted to know if spiders could spin webs in microgravity. NASA approved her project, and in July 1973, the Skylab 3 crew was launched with two Cross Spiders named Anita and Arabella as passengers. Once aboard the space station, the two were carefully monitored for behavior. At first, their webs were chaotic and disorganized. But after a few days, when they apparently got used to microgravity, their webs became more organized and symmetrical, just like their webs on Earth would be. Unfortunately, both spiders died during the mission. When Skylab 3 returned to Earth, the main thing scientists noticed was that their silk varied in thickness, compared to a uniform thickness in regular gravity. Shuttle mission STS-93 repeated the spider web weaving experiment, and more recently spiders have been experimental subjects aboard ISS on several occasions.



(Right-I said earlier that I’ve had a lot of time on my hands lately. What did you expect from a 60s kid? A free eyepiece to the first person who can name the artist, the full title of this album, and the year it came out-send to lanpar362@gmail.com-the editor)



Astronomy (Bad) Joke

“A Higgs boson goes into a church and the priest says, ‘We don’t allow Higgs bosons here.’ And the Higgs boson says, ‘But without me there is no mass.’”

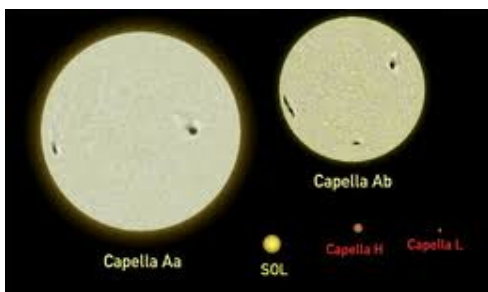
Capella

Capella, also known as Alpha Aurigae, is the sixth brightest star in the nighttime sky and the brightest star in Auriga, the Chariot Driver. Capella is actually not just one star, but four, consisting of two binary pairs, which orbit around each other

The main pair consists of Capella Aa and Capella Ab. Capella Aa is a class K star about 2.5 times the size of the Sun. Capella Ab is a class G star which has exhausted its hydrogen and is starting to move off the main sequence and into a red giant phase. It is also about 2.5 times the size of the Sun. Capella Aa and Ab are about .75 AUs from each other and orbit around each other every 104 days. Together, they have an apparent magnitude of .08, and an absolute magnitude of .11. Capella Aa has one of the most energetic x-ray emissions in the sky, which is believed to come from its corona.

The other two stars in Capella are known as Capella H and Capella L. they, too, are a binary pair, and orbit the main stars from a distance of almost 11,000 AUs. Capella H is a red dwarf, about half the size of our Sun, with an apparent magnitude of 10.1 and an absolute magnitude of 9.5. Capella L is also a red dwarf, about half the size of Capella H, with an apparent magnitude of 13.5 and an absolute magnitude of 13.1. Capella H and L take almost 300 years to make one orbit of Capella Aa and Ab. The entire Capella system is about 43 light years from Earth.

Like many other bright stars, Capella was well known to the ancients. In Greek mythology, it was seen as the goat that provided milk for the gods. As such, it was sometimes called the "Goat Star." The Romans gave it its name; in Latin, the name Capella means "little goat." To the ancient Hindus, Capella was seen as the heart of Brahma. The Chinese saw it as Wu Che er, "the second of the five chariots," along with Beta Aurigae, Theta Aurigae, Iota Aurigae, and Beta Tauri. The ancient Hawaiians called it Ke Kao Mkali'I, "the canoe bailer of Makalii," and used it as one of their main navigation stars at sea.



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

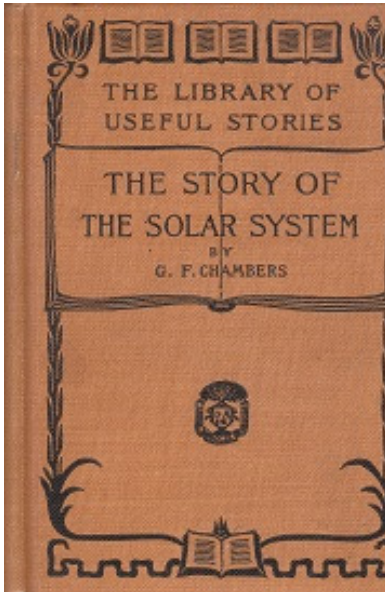
Modra Observatory

Modra Observatory is located in Modra, the Slovak Republic, and is managed and operated by the astronomy department of Comenius University in nearby Bratislava. The physics, geophysics, and meteorology departments also play a role in its operation and research programs.

The observatory was established in 1988 by the University for its scientists and graduate students, and today has four telescopes for scientific research: a .6m reflector, a .7 m reflector, .2 m solar refractor, and a .28m Schmidt-Cassegrain transit telescope. Two other telescopes are used for public outreach: another .28 Schmidt-Cassegrain telescope, and a .24m Newtonian reflector. The observatory also has facilities for continuing measurements of the Earth's magnetic field and for seismographic studies. Astronomical studies focus on planetary research; asteroids, especially near-Earth objects; and meteorites; as well as solar investigations. Several near-Earth objects have been discovered at the observatory; the best known is asteroid 11118 Modra, named after the city. Above right-the domes housing the .7m and .6m reflectors



A Look at Planetary Astronomy Over One Hundred Years Ago



While sheltering-in-place, I spent some time going through my book collection, and came across a little volume entitled *The Story of the Solar System* by G.F. Chambers, copyright date 1895. I have no idea how I got it; it may have come from a friend who gave me some old books years ago, or it might have been inherited from my father who in turn inherited it from his aunt along with a number of other 1800s books. Anyway, I started reading it, and found it fascinating for the fact that it gives a view of astronomy before Lowell, before Hubble, before Einstein and many others, a Victorian interpretation of our solar system.

I looked up G.F. Chambers(1841-1915) and found him to be an interesting person in his own right. He was actually a barrister(in England, an attorney who is qualified to argue cases in court) who did legal work for the British Parliament. Astronomy was a hobby that he pursued from a young age; he eventually built his own observatory and studied double and variable stars. He also wrote a number of books intended to give people an introduction to astronomy, one of which was *The Story of the Solar System*.

In Chambers' vision of the solar system only eight planets exist, and he divides them into Inferior Planets, those inside Earth's orbit, and Superior Planets, those beyond it. He also discriminates between Primary Planets and Secondary Planets, by which he means the planetary moons, in 1895, a total of twenty. He talks about Hall's discovery of Deimos and Phobos as if it had just happened, which it more or less had. He also speculates about the correlation of sunspots with storms on Jupiter, and how scientists were still not sure of the makeup of Saturn's rings. He goes into detail on how Neptune was found, it being the first planet to be discovered by mathematical calculations and only later by visual observation.

What is most intriguing is Chambers' portraits of the people and the times in which he wrote. William Herschel, for example, thought that the Sun was inhabited, and his son John, of whom Chambers writes about as if he knew him personally, seemed to play a much bigger role in discovery than his father. He mentions that a number of astronomers in the 1800s were convinced that Venus had at least one moon and possibly more. Chambers discusses people such as Schwabe, De La Rue, Di Vico, Taylor, and Fontana, who were apparently well known scientists at the time, but have been bypassed in today's astronomy tomes. Even more so, Chambers writes in the pedantic and superior tone of a late Victorian Englishman, England then being at the apex of its imperial power. He does not hesitate to express opinions about how other country's efforts in astronomy fall short of what he considers British superiority. In naming the minor planets, he comments, "At the outset the names were given from the mythologies of ancient Greece and Rome, but, latterly, the most fantastic and ridiculous names have in many cases been selected which in too many cases served no other purpose than that of displaying the national or personal vanity of the astronomer who applied them in several planets. The French are great offenders in this matter."(pp.114-5), a clear nationalistic swipe at England's traditional rival(the French could probably say the same thing about the English).

If one can get past the ponderous syntax that is the hallmark of Victorian writing, *The Story of the Solar System* is an entertaining and illuminating book, giving a good deal of insight into nineteenth century planetary astronomy. We can think about how far we've come since then, but maybe two hundred years from now, our stories about the planets will seem as quaint and incomprehensible as those of the nineteenth century seem to us in the twentyfirst. If nothing else, being sequestered has allowed me to find out a few more things about our world, and other worlds as well.

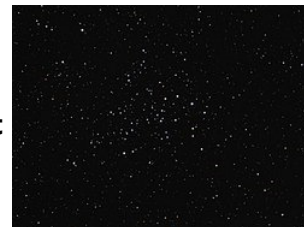
Shelter-in-Place Astronomy

Since the advent of the COVID-19 virus in March and subsequent orders by the mayor and governor to shelter-in-place, I've only occasionally strayed away from my immediate neighborhood, of course taking care to use a mask and maintaining social distance(which may become Webster's term of the year for 2020). Nevertheless, I've also done a fair amount of starwatching from my backyard, and, despite the light pollution of northwest Fresno, have come across several good objects which I hadn't seen before. So, here are a couple of my favorite shelter-in-place astronomy sightings:

NGC 1528-This is a nice open cluster in Perseus that was first seen by William Herschel in 1790. It has about 165 stars and has an apparent magnitude of 6.5. It is approximately 2,500 light years from Earth.



NGC 1545-This open cluster is not far from 1528, only about 1.5 degrees away, and was also first seen by William Herschel in 1790. It is about 2,300 light years from Earth and has an apparent magnitude of 6.4.



NGC 1502-this is a small cluster of 45 stars in Camelopardalis that was also first seen by Herschel in 1787. It has an apparent magnitude of 6.9 and is about 2,700 light years from Earth



M53-this may be familiar to many astronomers, but a few weeks ago was the first time I saw it. It is a globular cluster in Coma Berenices and was first seen by Johann Bode in 1775. It is approximately 58,000 light years from Earth and has an apparent magnitude of 8.3.



M3-Believe it or not, I also saw M3 for the first time about two weeks ago. This is another globular cluster which Messier himself discovered in 1764. It has an apparent magnitude of 6.2 and is 34,000 light years from Earth



From the Observer Archives

"When scientists first started systematic studies of Venus in the early 20th century, they assumed that, because it was covered with clouds, it must have a very wet swampy surface. This led to the speculation that the planet was covered with great lakes of petroleum. It was all nonsense, of course, and when Mariner 2 flew by Venus in 1962, they realized that it was a hot dry place, fueled by a runaway greenhouse effect."

From *The Observer*, December 2000-January 2001

Since Venus has been prominent in the evening skies lately, this seemed like a good time to reminisce on what scientists used to think about it.