



# THE OBSERVER

The Newsletter of Central Valley Astronomers of Fresno

November-December 2017



## 2018-The Year of the James Webb Space Telescope

I know I put a similar image on the front of the November-December 2016 issue, but, hey, the JWST is going up in October 2018, and it's the biggest thing since, well, the Hubble Space Telescope. More about it in a future *Observer* issue.

Image-NASA/JPL

### Astronomy Quote of the month-

“Our universe might have started in somebody’s basement...”

-Alan Guth,  
discoverer of  
cosmic inflation



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**To all CVA members-**

This has been an eventful year, the one we anticipated for a long time. The solar eclipse of 2017 finally arrived, and it was worth the years we spent planning and hoping. Now, we look forward to October 2023 and April 2024, a partial and another total solar eclipse, both of which will take place over the U.S. Can't wait for them.

2018 will be the year of the James Webb Space Telescope. Now undergoing final tests, it will be launched from the French Guiana Space Center in October. It will be as revolutionary as the Hubble Space Telescope was when it was first operational. Once settled in to one of the "L" points in Jupiter's orbit, it will be able to see the universe as nothing else ever has. It will be able to image planets orbiting distant stars, galaxies at the very edge of time and space, and perhaps even the accretion discs around black holes. It will be the next giant step in space research.

2018 will also be the year that America finally has its own manned spacecraft again-and it's about time. If all goes well, Space-X's Dragon V2 will have its first manned launch in April, and Boeing's CST-100 Starliner will make its first manned flight in June. Both companies plan for their craft to be operational and making regular trips to ISS by the end of the year. In addition, a modified version of the Dragon V2 may take two paying passengers on a circumlunar mission in December. Can't wait for that, either.

So, 2018 is shaping up to be a great year. All kinds of neat stuff going on. How soon is it until January?

Have a great Holiday season.

**Larry Parmeter**  
**Observer Editor**

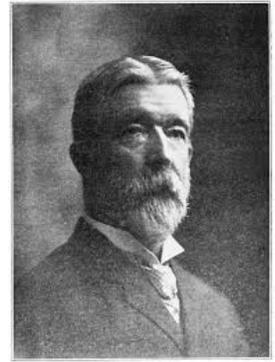
**Number of extra-solar planets found as of October 2017-3,691**

**How many more are out there-tens of thousands?**

**Hundreds of thousands?**

## Profiles in Astronomy-Louis Boss 1846-1912

Louis Boss was born and raised in Providence, Rhode Island, and received his college education at Dartmouth, after which he worked as a clerk for the U.S. Government. His main interest, however, was astronomy, and as part of his government job, he participated in several surveying and navigation projects, the best known being the International Boundary Survey from 1872 to 1876, which accurately defined the border between the U.S. and Canada. He served as the assistant astronomer. Afterwards, he accepted an offer to be the director of the Dudley Observatory in Schenectady, New York, a position he held for the rest of his life.



Boss was a pioneer in the study of proper motion of the stars, and eventually compiled and published a catalogue on his findings. Known as *Preliminary General Catalogue of 6188 Stars for the Epoch 1900*, it was first published in 1910. He also catalogued and published highly accurate information concerning cometary orbits, and extensively studied the Hyades star cluster. In 1909, he became editor of the *Astronomical Journal* and held that position until his death, when his son, Benjamin Boss took it over. Boss, Jr. also published an updated catalogue of his father's star findings and proper motions in 1936.

Boss won many honors for his work; among them were the gold medal of the Royal Astronomical Society and the Lalande Astronomical Prize. A crater on the moon is named in his honor.

Source-Wikipedia

## Star Stories

*This begins a new series about the stars that shine over our heads. Each issue will focus on a different one. For this first, I choose one of my favorites: Alberio.*

Alberio is formally called Beta Cygni; it is commonly known as "The Eye of the Swan," and has in the past been called the "Beak of the Swan." The Arabs called it *minquar al-dajaja*, "The Hen's Beak." The modern name Alberio comes from the original Greek word *Ornis* referring to the constellation Cygnus; in Latin, it was mistranslated to *Ireo*; the Arabs originally translated it as *Urnis*, but, again through mistranslations from Arabic back to Latin, it became *Ab-ireo*, thus *Alberio*.

Alberio is believed to be a double star system (but see below). The brighter star, known as B Cygni A, consists of a yellowish K type star with an apparent magnitude of 3.1. In the late 1970s, B Cygni A was found to have two tiny and very faint companion stars, whose characteristics are still not fully known. They are known as B Cygni Ab and B Cygni Ac. Some astronomers believe there is actually only one companion, B Cygni Ac. The blue star near B Cygni A is a much dimmer B type star with a magnitude of 5.8. It is known as B Cygni B, and is not known to have any companions. Some scientists say that the two main stars in Alberio constitute a true binary. It has been calculated that if Alberio is a binary, its orbital period is at least 10,000 years.

Image-NASA/HST

Source-Wikipedia



## Scott Kelly Speaks in Fresno

Former NASA astronaut Scott Kelly, who spent a year aboard the international Space Station, from March 2015 to March 2016, spoke to a rapt audience at the Saroyan Theater on September 27, as the first in the annual Fresno Town Hall lectures. Kelly led off by mentioning that the year-long mission was actually his second tour aboard ISS; he had earlier spent almost five months aboard it in 2010. He spent much of the 90 minute presentation talking about how he came to be an astronaut, starting with his youth in New Jersey, and crediting his mother, who was one of the first female police officers in the state, for setting high goals. He noted that he was an inattentive, mostly average student in high school, and drifted into college, but changed his attitude when he read Tom Wolfe's *The Right Stuff* as a college freshman. He also credits his identical twin brother Mark Kelly, whom he said was much more focused and goal oriented than him (and he related that he only applied to NASA because Mark encouraged him to do so, and when he went to the astronaut committee interview in Houston, he wore the same suit that his brother did, and wondered if the committee would notice it). He emphasized that throughout his careers, as a college student, a Navy pilot, and then as an astronaut, he learned and advanced, not through huge leaps and bounds, but through tiny steps and practicing over and over, which he claims are the keys to success.



Of his year aboard ISS, Kelly says he enjoyed it, but was also happy to come back to Earth as well. He talked about many of the dangers of long-term space flight, especially its impact on the human body, such as bone density loss, and also the problem of radiation exposure. He wants humanity to go to Mars and other planets, but says that many such problems will have to be resolved before such missions are feasible. He told a number of stories about life aboard ISS (One of the more revealing ones concerned an incident when the space station received a warning that an old Russian satellite might impact it. Kelly was given directives from NASA to, on the American side, close all the hatches, shut down various systems, prepare to disembark in the Soyuz ferry craft, and so on. He continued, "Afterwards, I went over to the Russian side to see if I could help my colleagues get their systems taken care of, and they were...having lunch." As it turned out, the satellite passed by safely out of ISS's



range), more than once referred to his ISS mission partner Mikhail Kornienko as "my friend and brother," and emphasized the need for a planet-wide effort to combat climate change. Kelly, who left NASA a few months after he returned to Earth, gave no hint of his future plans during the talk, but reports are that he may go to work for a commercial space company such as Space-X or Sierra-Nevada Systems, and might go back into space someday aboard a private commercial spacecraft.

### U.S., Russia Plan Moon Base

Despite the current political tensions between the United States and Russia, the space agencies of both countries are going ahead with plans for an eventual joint manned base on the Moon. Both NASA and Roscosmos announced in early October that such a base will probably be established in the early 2030s, and its engineering and administration will be along the lines of the current International Space Station. The base will be dependent on both Russia's advanced Proton rocket and also NASA's SLS rocket, which will probably not be operational until 2021 or 2022. Like ISS, the proposed Moon base will probably accommodate up to six crewmembers at a time, who will spend anywhere between three and six months at it. So far, no hardware has yet been built; everything is still on paper. But representative of both countries say that they are committed to a base, both as a scientific station and also a jumping-off point for expeditions to deep space targets such as Mars. Both the U.S. and Russia are now planning manned trips to the Moon by 2030. China is also considering putting men on the Moon by 2030, and India may as well.

(In reference to the political problems between the two countries, both the American astronauts and Russian cosmonauts on ISS say that they never worry about that issue; they have much more important things to do. In an interview aboard ISS in late 2015, Mikhail Kornienko, Scott Kelly's colleague for a year in space, said, "We have no political troubles here." Then he added, "Put Putin and [then President] Obama up here by themselves, and they'll come to an agreement in a week," a comment which almost certainly guarantees he'll never go into space again.)

### Trump Administration Announces New Head of NASA

In September, after several months of speculation, the Trump administration announced the nomination of Representative James Bridenstien of Oklahoma to be the new chief administrator of NASA. Bridenstien is a former Navy pilot who served in Iraq and has had a life-long interest in the space program. During his three terms in Congress, he served on the House Space Committee and is a strong advocate for America returning to the Moon and also going to Mars. However, he must be confirmed by the Senate, and some senators question his credentials, claiming that a political candidate should not be heading the space agency, and also that he has doubts about climate change, which is one of NASA's primary science research projects. In particular, Senator Bill Nelson of Florida, a former astronaut, opposes Bridenstien's nomination, saying that he is unqualified and too politically slanted to be an effective administrator. Others, though, say that he would be a good and fair head of NASA. Hearings on his nomination will be held in November with a possible vote at the end of the month.



## Hawking's Thesis Draws Huge Numbers

On October 22, 2017, Stephen Hawking's 1966 doctorate thesis at Cambridge University was put online, as part of the university's Apollo Repository program, to make research papers more accessible to students and scientists. While most Apollo repository thesis papers rarely get more than 100 hits a month, Hawking's, in the first day of public access, received over 60,000 hits, resulting in the Cambridge computer server crashing. The paper in theoretical astrophysics, about 100 pages long and entitled "Properties of Expanding Universes," outlined his research and views on a number of cosmological phenomena, especially what he called Singularities, which would eventually lead to his life-long interest in and major discoveries concerning black holes. Hawking, now 75, wrote the paper as a 24 year old graduate student. After he received his doctorate, he stayed at Cambridge as a research associate, and in 1980, based on his findings dealing with black holes and gravity, was elevated to Lucasian Professor of Mathematics, a post formerly held by Newton and Dirac, and one of the most prestigious academic positions in the world.



Right-Hawking today, in his wheelchair with a computerized voice synthesizer. He was diagnosed with ALS (Lou Gerhig's Disease) in 1963, and has been wheelchair bound since the early 1970s (some medical experts believe that he does not have ALS at all, but a different neuromuscular wasting disease which has allowed him to live so long; they say that almost all ALS patients die within five years of diagnosis). Because of his malady, he has not been able to talk since 1985. Nevertheless, he has made groundbreaking discoveries in understanding the universe, so much so that many say he is the worthy successor to Einstein.

## Astronomy Short

Astronomy is full of people who made major discoveries while making their living in other areas of knowledge. William Herschel was a music teacher and built musical instruments for a living until he discovered Uranus in 1783. Afterwards, the British government gave him a pension to study astronomy for the rest of his life. Alexander Friedman, who corrected the errors in Einstein's Theory of Relativity, so much so that some call it the Einstein-Friedman theory, was a meteorologist who took on Einstein's equations as a diversion from his weather experiments. Heinrich Olbers discovered the asteroids Pallas and Vesta along with several comets, and also formulated Olber's Paradox, but was a renowned medical doctor by profession. Angelo Secchi, a Jesuit priest, studied Mars and drew the first accurate maps of the planet, and his ecclesiastical colleague, Giuseppe Piazzi, a monk, was the first to discover an asteroid, Ceres. And, of course, Percival Lowell was a businessman when he decided to build his own observatory and study both Mars and "Planet X," which would become Pluto.

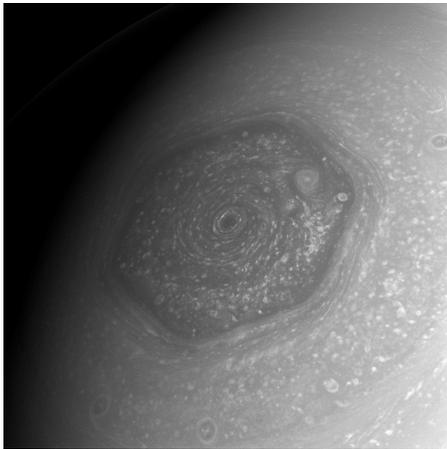


Images-above top-Secchi; middle-Lowell; bottom-Friedman

# Cassini Says Goodbye By Teagan Wall

*Editor's note-I originally received this article in late August, and decided to save it until now, due to the September Eclipse issue. On September 15, after a series of increasingly close orbits, Cassini plunged into Saturn's atmosphere and burned up, ending a 20 year mission.*

On September 15th, the Cassini spacecraft will have its final mission. It will dive into the planet Saturn, gathering information and sending it back to Earth for as long as possible. As it dives, it will burn up in the atmosphere, much like a meteor. Cassini's original mission was supposed to last four years, but it has now been orbiting Saturn for more than 13 years! The spacecraft has seen and discovered so many things in that time. In 2010, Cassini saw a massive storm in Saturn's northern hemisphere. During this storm, scientists learned that Saturn's atmosphere has water vapor, which rose to the surface. Cassini also looked at the giant storm at Saturn's north pole. (below, left) This storm is shaped like a hexagon. NASA used pictures and other data from Cassini to learn how the storm got its six-sided shape.

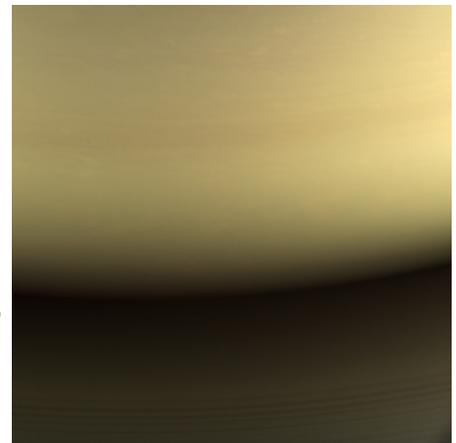


Cassini looked at some of Saturn's moons, such as Titan and Enceladus. Titan is Saturn's largest moon. Cassini carried a lander to Titan. The lander, called Huygens, parachuted from Cassini down to the surface of the moon. It turns out, Titan is quite an exciting place! It has seas, rivers, lakes and rain. This means that in some ways, Titan's landscape looks a bit like Earth. However, its seas and rivers aren't made of water—they're made of a chemical called methane. Cassini also helped us learn that Saturn's moon Enceladus is covered in ice. Underneath the ice is a giant liquid ocean that covers the whole moon. Tall geysers from this ocean spray out of cracks in the ice

and into space, like a giant sneeze. Cassini flew through one of these geysers. We learned that the ocean is made of very salty water, along with some of the chemicals that living things need. If there is life on Enceladus, NASA scientists don't want life from Earth getting mixed in. Tiny living things may have hitched a ride on Cassini when it left Earth. If these germs are still alive, and they land on Enceladus, they could grow and spread. We want to protect Enceladus, so that if we find life, we can be sure it didn't come from Earth. This idea is called planetary protection.

Scientists worry that when Cassini runs out of fuel, it could crash into Titan or Enceladus. So years ago, they came up with a plan to prevent that from happening. Cassini will complete its exploration by diving into Saturn—on purpose. The spacecraft will burn up and become part of the planet it explored. During its final plunge, Cassini will tell us more about Saturn's atmosphere, and protect the moons at the same time. What an exciting way to say goodbye!

Above right-Cassini's last image, taken on September 14, 2017. Cassini took 453,000 images during its 20 year mission, discovered six new moons of Saturn, and was responsible for 3,900 scientific papers being published



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

## The Belgrade Observatory

The Belgrade Observatory, also known as the Zvezdara Observatory, was established in 1887 by Milan Nedeljkovic, who would become one of Serbia's most distinguished scientists. Serbia(now Yugoslavia) was at that time part of the Austro-Hungarian Empire, and Nedeljkovic, as professor of astronomy and meteorology at the University of Belgrade, pushed it through several layers of bureaucracy. Originally, the observatory had a dual purpose: to study astronomy and also meteorology. Its first facility was a house in downtown Belgrade, near the university, then in 1891, it moved to a permanent facility about three miles away. In the early 1900s, a department of seismic studies was added. At the end of World War I, the retreating Austro-Hungarian army destroyed all the instruments and equipment in the observatory building. They were replaced with war reparations money in 1922.

In 1929, a new observatory was built, still further away from the city center, in a semi-wooded area known as Zvezdara. It had a modern library, research facilities, and two telescopes, one a .65m Zeiss refractor, and the other a .16m Zeiss refractor. During World War II, the area was occupied by the Nazis, who closed down the observatory and tried to dismantle the telescopes and take them back to Germany; however, the director at the time, Vojoslav Miskovic, prevented them from doing so. After the war, a transit telescope was built on the facility grounds.

Today, the observatory is run by the University of Belgrade, and the .65m refractor is still operational. However, since 2010, the observatory has built and operates two remote telescopes on Mount Vidojevica in southern Yugoslavia. One is a .6m Schmidt-Cassegrain, and the second is a 1.4m reflector. The observatory currently has a staff of about 50 people, including 39 scientists. Also graduate students from the university use the observatory for their research projects. Besides astronomical studies, the observatory still continues its research in meteorology and seismology.

Left-the dome housing the .65 refractor at Zvezdara. It is rarely used due to light pollution.

Source-Wikipedia

