

November-December  
2016  
Volume 64  
Issue 7

# The Observer

The Newsletter of Central Valley Astronomers of Fresno

## In this Issue:

Profiles in Astronomy-Abd  
al-Rahman al-Sufi

The Guillermo Haro Obser-  
vatory

More on the James Webb  
Telescope

The Successor to Soyuz

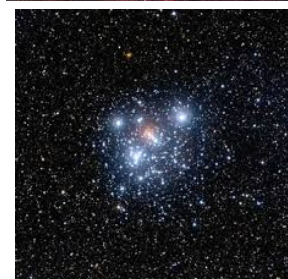
Elon Musk's Plan to Send a  
Million People to Mars

NASA is Worried about its  
Commercial Partners

New Types of Gravitational  
Lenses found

The Caldwell Catalogue

Five Good Winter Objects  
to View



Two of the Caldwell ob-  
jects: C 20 and C 94



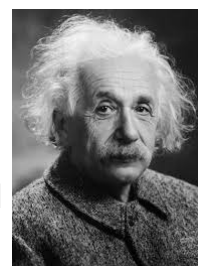
## The Next Great Telescope

Starting in 2017, the world's astronomical minds will be thinking about the James Webb Space Telescope, now in the final construction and testing stages. Scheduled for launch in 2018, it will be the most powerful and far-reaching instrument ever developed (at least until its successor, which is already being planned, comes along). More on the JWST inside (above-the JWST in the "clean room" at NASA's Goddard Space Flight Center).

Image from NASA/JWST

## Astronomy Quote of the Month

In 1948, Albert Einstein was offered the presidency of the newly-established country of Israel (in Israel, unlike the U.S., the office of the president is appointive and mostly ceremonial). It was a reawakening of his Jewish roots, and he was honored by the offer, but declined it. He explained that he was too old and knew little about politics. A few years later, in reference to the offer, he said,



"Equations are more important to me, because politics are for the present, but an equation is for eternity."

From Stephen Hawking, *A Brief History of Time*

Central Valley Astronomers  
Web Address:  
www.cvaafresno.org

Webmaster  
Scott Davis 559-392-1365  
scodavis@hotmail.com

The Observer      NoveDecember 2016

*The Observer* is the newsletter of the Central Valley Astronomers  
of Fresno

#### Officers and Directors for 2016

President  
Lynn Kliewer 559-251-3656  
lelliottk@att.net

Vice-president  
Fred Lusk 559-436-1833  
fel3@pacbell.net

Secretary-Treasurer  
Steve Harness 559-292-2753  
sharness@sbcglobe.net

Star Party Coordinator  
Brian Bellis  
pandb91@comcast.net

Historian and Newsletter editor  
Larry Parmeter 559-276-8753  
lwparmeter@aol.com

Director  
Dave Artis 559-658-8016  
Dave.artis@direcpc.com

Director  
Warren Maguire 559-294-7444  
slicker1948@yahoo.com

Director  
Joe Griffin  
559-270-4214



**2017 Will Finally Be Here  
The Total Solar Eclipse-  
Be Ready for It!  
Where Will You Be on  
August 21?**

**Number of extra-solar planets found as of October 2016-3,533  
How many more are out there-tens of thousands?  
Hundreds of thousands?**

## Profiles in Astronomy

### Abd al-Rahman al Sufi 903AD-986AD

Abd al-Rahman al Sufi, better known in the West as Azophi, was born in Rey in what is now Iran(or Persia). The al Sufi at the end of his name implies that he was a Sufi, a small Islamic sect known for its mysticism and interest in science. Little is known about his early life. He is now believed to be one of the nine famous Muslim astronomers(the other eight are: Al-Battari, Abul Waffaa Al-Bozgani, Abul Ishak Al-Nakkash Al-Zirkli, Abul Bahaa Al-Din Al-Kharki, Al-Badie Al-Astralbi, Ibn Al-Shater, Oleg Bek, and Al-Rudari Shams El-Din Al-Fasi); his main work was carried out at the court of Adud ad Daula in Ispahan in Persia. He also later performed astronomical and other scientific work at Shiraz, also in Persia.

Al-Rahman not only preserved classical astronomical knowledge for future generations but also contributed his own original research and ideas. He translated classical Greek astronomical texts into Arabic, including Ptolemy's star atlas. His own star catalogue, known as *The Book of Fixed Stars*, continued where Ptolemy's *Almagest* left off. It included corrections of mistakes he found in Ptolemy's manuscripts, detailed drawing of the constellations, more precise locations of many stars, and translations of stellar names from Greek into Arabic.

Al-Rahman also was one of the first scientists to observe and study galaxies. He was probably the first person in the northern hemisphere to observe and record the Large Magellanic Cloud during an expedition to what is now Yemen(at certain times of the year and under certain conditions, the LMC can in fact be seen from Yemen). He was also the first, in 964 AD, to observe and record the Great Galaxy in Andromeda. As well, he studied and calculated to a great degree of accuracy the plane of the ecliptic in relationship to the celestial equator. He also did research into navigation, surveying, and timekeeping. One of his better known texts describes over a thousand different uses for the astrolabe. He wrote several books on his findings; some are still in use today.

A crater on the moon is named in honor of al-Rahman, as is an asteroid. Every other year the Astronomical Society of Iran holds an international observing contest in his name, the Sufi Observing Competition.

Source and image-Wikipedia



---

## James Webb Space Telescope Being Prepared for Launch



The James Webb Space Telescope, originally scheduled to be in space in 2011, is now in the final stages of construction, will soon undergo testing, and is now scheduled for a n October 2018 launch. Originally budgeted at \$1.6 billion, by the time it is launched it will have cost almost \$8 billion. A joint project between NASA, ESA, and the Canadian Space Agency, the telescope will be launch aboard an Ariane 5 rocket from the French Guiana Space Center in South America. JWST will be placed into an orbit that matches one of the stable "L" points between the Earth and the Sun, approximately 900,000 miles from Earth. This means that it will see objects with precision and clarity unmatched bay another other telescope in existence. It also means that, unlike Hubble, if something goes wrong, it cannot be repaired, so the \$8 billion better have been spent wisely.

## What New In Space

### Elon Musk's Vision to Send Humans to Mars

At the annual International Astronomical Conference in Guadalajara, Mexico on October 4, Space-X founder Elon Musk outlined plans to send people to colonize Mars as early as 2022. Using Falcon 9 heavy lift rockets and two 747 size manned spacecraft, Musk proposed a Martian trip that will see 100 people travel on the initial mission, and thousands more in the years and decades to come. He envisions close to a million humans living on Mars by 2060. With a reusable spacecraft, Musk proposes sending an initial crew into Earth orbit, having the craft refueled by a second craft, then pushing it off into interplanetary travel. Once it reaches the Red Planet, the entire spacecraft will descend through the atmosphere to make a soft landing. Once on Mars, the crew will make its own oxygen, food, and rocket propellant for a return trip. Musk said that the manned craft will be named "Heart of Gold," after a vehicle in Douglas Adams' *A Hitchhiker's Guide to the Galaxy*.



The main concern of skeptics is where Musk will receive the funding to pay for such a trip, estimating that it would cost probably hundreds of billions of dollars. Musk replied that current unmanned cargo spacecraft and manned missions to ISS would provide some of the money. He also claimed that reusable spacecraft and in-orbit refueling will bring the costs down by "magnitudes." Even the most hardened skeptics were won over by Musk's vision, seeing it as a major breakthrough in human space exploration. Musk believes that if humanity stays on Earth, it is doomed to eventual extinction, but traveling and colonizing other planets will reinvigorate it, leading to new and exciting historical paths.

### The Successor to Soyuz

For almost 50 years, the Russian manned space vehicle has been the venerable Soyuz spacecraft, which was originally designed by the great spacecraft engineer Sergei Korolev in the early 1960s. Ironically, it was based on a design that General Electric proposed to NASA in 1960 as a prototype for the Apollo spacecraft. Although NASA rejected GE's design, Korolev liked it and the now familiar three part bell-shaped crew module, barrel-shaped orbital habitat, and cylindrical service module has served the Soviet/Russian space program well. Since the first manned mission in 1967, the Soyuz has undergone six major iterations: the original Soyuz, the Soyuz T series, the TM series, the TMA series, the TMA-M series, and the most recent, the MS spacecraft, all of them derived from the original Soyuz.



RKA, the Russian Space Agency is, however, envisioning an end to Soyuz, and replacing it with a modern, more advanced spacecraft that will be capable of trans-lunar and perhaps even lunar landing missions by the late 2020s. Ironically, the new craft looks very much like the Apollo spacecraft of the 1960s and 70s. The new craft has no official name as of yet, but is known by its project designation of PTK-NP.

The project began in 2006, when RKA and ESA, the European Space Agency, paired up to plan possible future manned missions, including Moon landing flights, using an entirely new spacecraft. A number of design concepts were proposed, and by 2009, a cone-shaped craft similar

to the Apollo capsule was chosen. Originally, the name of the new craft was to be Kliper. However, by 2010, ESA had dropped out of the agreement due to budget cuts, and RKA decided to go it alone. (According to the Russians, NASA was asked to participate, but declined). In 2013, the decision was made to commit to building hardware, both the craft and the new rocket booster that would

carry it. A major influence on this was NASA's test flight of an unmanned Orion-MPCV vehicle in November 2014. However, by 2015, severe cuts in the Russian space program budget pushed back the entire project, and its status is currently struggling, although it is hoped that eventually the project will go through. Russian space experts now say that it will have its first manned mission in 2023 or 2024, with a possible circumlunar manned flight by 2027.

The new craft will have two parts: a cone-shaped crew module that can carry up to six crew members, and a service module with solar panels. The crew module will include a docking and transfer tunnel(just like the Apollo) that will be used for a future lunar lander. Specifics about the craft: weight, length, width, etc, have not been released, but they are believed to be in the range of the Orion-MPCV spacecraft. RKA is also designing a new rocket, based on the Zenit booster, which is currently being built in the Ukraine, to put the spacecraft into orbit. So far, the Russians have not released any details about a lunar lander, although it is believed to look similar to the U.S. lunar lander of the 1960s and 70s. Western experts say that if the Russians are planning for eventual Moon landings, based on current operations, they will probably not take place until at least 2030.

(Within the last few months it has been revealed that the Chinese are also working on an entirely new manned spacecraft, intended to replace the current Shenzhou spacecraft. Indications are that it will be used for lunar exploration and landings in the 2020s, as well as a ferry craft to and from the space station that the Chinese are expected to launch around 2020. Its design details are classified, but experts say that it probably looks very similar to-guess what?-the Apollo-Orion-MPCV, holding up to five crew members. It is not known when the new craft will make its first manned flight, but indications are around 2021 or 2022.)

## NASA Worried About Commercial Spacecraft

NASA has decided not to buy seats aboard Soyuz missions after 2018, feeling that one of the two commercial spacecraft companies chosen by the space agency; Space-X and Boeing; will have its manned spacecraft operational by that time. There has been some concern on the part of space experts that both companies are behind in the development of their craft. Space-X's Dragon V2(below left) is being held up by problems with the Falcon booster rocket. With a Falcon rocket exploding and burning on the launch pad in September, Space-X now says that the earliest it can have a manned test launching is the fall of 2017. Boeing, in the meantime, has had development problems with its CEV-100 spacecraft(above right), and has announced that its first test flight will be in January or February 2018 at the earliest. Some experts say that all of this is causing NASA to take a second look at Sierra-Nevada's DreamChaser(right) mini-space shuttle, which is now expected to have its first test launch within the next few months. In 2014, NASA rejected it in



favor of Space-X and Boeing, mostly because of past experiences with its own space shuttles, but earlier this year it was awarded a contract for unmanned cargo supply flights to ISS. If Boeing's and Space-X's troubles continue, it may well be that NASA will be back in the space shuttle business, at least temporarily, in order to keep Americans aboard ISS.



---

## A Cosmic Short-Time Warp Time

Not exactly about astronomy or space science(well, kind of), but I just finished reading Stephen King's book *11/22/63*, about a man from 2011 who goes back in time to the early 1960s to try to prevent the assassination of President John F. Kennedy. While in the past, he meets and falls in love with a young woman. Eventually he reveals to her who he really is, and where and when he's from. At one point, she asks him, "What's life like in 2011?" He thinks for a minute, then replies, "Well, gas prices are higher, and we push a lot more buttons. Other than that, things are pretty much the same."



# From NASA's Space Place

## One Incredible Galaxy Cluster Yields Two Types of Gravitational Lenses

By Ethan Siegel

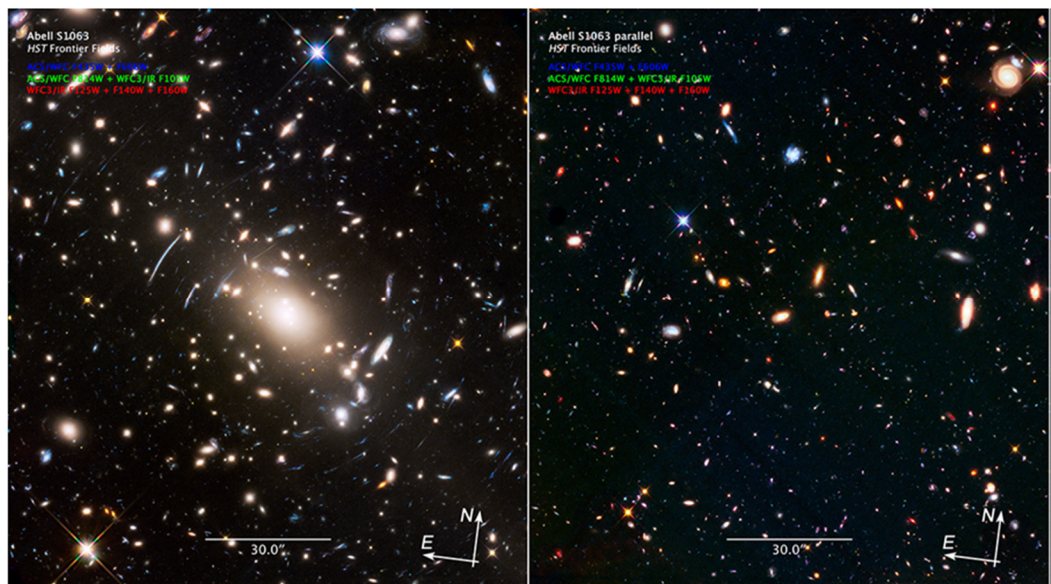
There is this great idea that if you look hard enough and long enough at any region of space, your line of sight will eventually run into a luminous object: a star, a galaxy or a cluster of galaxies. In reality, the universe is finite in age, so this isn't quite the case. There are objects that emit light from the past 13.7 billion years—99 percent of the age of the universe—but none before that. Even in theory, there are no stars or galaxies to see beyond that time, as light is limited by the amount of time it has to travel. But with the advent of large, powerful space telescopes that can collect data for the equivalent of millions of seconds of observing time, in both visible light and infrared wavelengths, we can see nearly to the edge of all that's accessible to us.

The most massive compact, bound structures in the universe are galaxy clusters that are hundreds or even thousands of times the mass of the Milky Way. One of them, Abell S1063, was the target of a recent set of Hubble Space Telescope observations as part of the Frontier Fields program. While the Advanced Camera for Surveys instrument imaged the cluster, another instrument, the Wide Field Camera 3, used an optical trick to image a parallel field, offset by just a few arc minutes. Then the technique was reversed, giving us an unprecedentedly deep view of two closely aligned fields simultaneously, with wavelengths ranging from 435 to 1600 nanometers.

With a huge, towering galaxy cluster in one field and no comparably massive objects in the other, the effects of both weak and strong gravitational lensing are readily apparent. The galaxy cluster—over 100 trillion times the mass of our sun—warps the fabric of space. This causes background light to bend around it, converging on our eyes another four billion light years away. From behind the cluster, the light from distant galaxies is stretched, magnified, distorted, and bent into arcs and multiple images: a classic example of strong gravitational lensing. But in a subtler fashion, the less optimally aligned galaxies are distorted as well; they are stretched into elliptical shapes along concentric circles surrounding the cluster.

A visual inspection yields more of these tangential alignments than radial ones in the cluster field, while the parallel field exhibits no such shape distortion. This effect, known as weak gravitational lensing, is a very powerful technique for obtaining galaxy cluster masses independent of any other conditions. In this serendipitous image, both types of lensing can be discerned by the naked eye. When the James Webb Space Telescope launches in 2018, gravitational lensing may well empower us to see all the way back to the very first stars and galaxies.

*Galaxy cluster Abell S1063 (left) as imaged with the Hubble Space Telescope as part of the Frontier Fields program. The distorted images of the background galaxies are a consequence of the warped space due to Einstein's general relativity; the parallel field (right) shows no such effects. Image credit: NASA, ESA and Jennifer Lotz (STScI)*



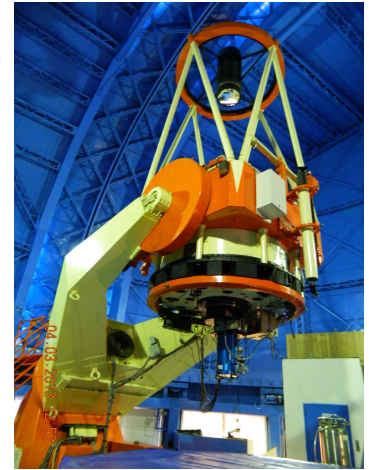
Article and images courtesy of Nasa's Space Place

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

## The Guillermo Haro Observatory

The Guillermo Haro Observatory, officially known as the Observatorio AstroFísico Guillermo Haro, or OAGH, is located in the Sonoran Desert in northern Mexico, just north of the city of Cananea. It is named after the distinguished astronomer Guillermo Haro, who is best known as the co-discoverer of the Harbig-Haro objects. It is administered by the National Institute of Astrophysics, Optics, and Electronics.

OAGH was established in 1972, but was not dedicated until 1987, and the main telescope did not become operational until 1992. Currently, it has two telescopes. The larger telescope is a 2.12m(83") Ritchey-Chretien reflector capable of multiple uses, including spectroscopy and photometry. A second telescope is a .41m(16") Schmidt-Cassegrain, built by Meade, which is used for atmospheric studies. Right-the 2.12m R-C telescope at the Guillermo Haro Observatory



## The Caldwell Catalogue

When I bought my new telescope a few months ago, it came with, among other things, a list of objects known as the Caldwell Catalogue. Over the years, I've come across and used many different listings of astronomical objects, the best known, of course being the Messier Catalogue, and also the New General Catalogue, commonly known as the NGC.. But I had never heard of the Caldwell Catalogue, and neither had some other astronomers that I knew. So I decided to learn about it. Turns out that the Caldwell Catalogue was developed by an Englishman named Sir Patrick Caldwell-Moore and first published in 1995. He compiled a listing of 109 objects: galaxies, nebulae, and clusters, meant not to replace, but to complement the traditional Messier catalogue used by almost every amateur astronomer. Moore-Caldwell noted that Messier's original listings included only objects in the northern hemisphere, as well as only objects that, to him and his assistants, looked like comets (Messier started his list as a comet-hunting endeavor). So Caldwell established his list to include objects not on Messier's list that he felt should be seen by dedicated amateur astronomers. Every one of them is also an NGC or IC object, and many are well known already. For example, Caldwell (or simply C) 6, also known as NGC 6543 is the Cat's Eye Nebula; C 20, NGC 7000, is the North American Nebula; and C 14 is the famous double cluster in Perseus. Caldwell also includes an number of objects in the southern skies, among them C92, the Eta Carina Nebula; C 94, the Jewel Box in Crux; C 103, the Tarantula Nebula in Dorado; and C 65, NGC 253, the well known Sculptor Galaxy.

Having been given a new list of objects, my telescope and I will keep busy checking them off and enjoying them, as I have done with the Messier and NGC listings for many years.



C39, the Eskimo Nebula



C80, the great globular cluster  
Known as Omega Centauri



C46, Hubble's Variable Nebula

## Five Good Winter Objects-Some Well Known, Some Not



No winter viewing is complete without a look at the famous Double Cluster in Perseus, NGC 869 and NGC 884. They have an apparent magnitude of 3.8, are about 12 million years old, and are roughly 7,500 light years from Earth. An interesting thing about them is that both are blueshifted, so our descendants may see them dominate Earth's night sky someday.

Not many states have their own astronomical object, but California does. The California Nebula, NGC 1499, is an emission nebula in Perseus, and has a very low surface brightness, making it difficult to see without a hydrogen beta filter. Its apparent magnitude is 6 and it is about 1,000 light years from Earth. It was discovered by Edward Bernard in 1884.



In the (justifiable) rush to see M31, the Great Galaxy in Andromeda, M32 is often overlooked. M32 is a dwarf elliptical galaxy, one of the satellite galaxies of its larger sibling. It has an apparent magnitude of 8, contains about three billion stars, and is strongly redshifted. Astronomers have calculated it to be about 2.6 million light years from the Earth.

Right-the well known Rosette Nebula, NGC 2237, an H II area in Monoceros. The open cluster within it is NGC 2244. Both are about 5,000 light years from Earth.



Finally, another double cluster, but not as famous as the one in Perseus. This is NGC 1807 and NGC 1817 in Taurus. The better known cluster NGC 1817 was discovered by William Herschel in 1784, has an apparent magnitude of 7, and is about 1,600 light years from Earth. Many scientists believe that 1807 is an extension of 1817, since both have the same apparent magnitude and are the same distance from Earth. Also, both have a large number of variable stars.