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The Observer

The Newsletter of Central Valley Astronomers of Fresno

In this Issue:

Astronomical Image of the Month
Hubble Gives a 26th Anniversary Gift to the World

On April 22, 2016, the Space Telescope Science Institute released this dazzling image of the Bubble Nebula taken by the Hubble Space Telescope a few days earlier, to celebrate its 26th year of orbital operations. Released from the Space Shuttle Discovery on April 24, 1990, Hubble has taken over 1.2 million images, many of which have forever changed the way that humanity views the Cosmos. Known as NGC 7635, the Bubble Nebula is an HII emission nebula at magnitude 10, and is about 7,100 light years from Earth. It is also catalogued as Sharpness 162 and Caldwell 11.
Image-NASA/STSI/HST

CVA Members-

Lots of summer activities coming up!

See the 2016 CVA Summer Schedule

On Page 2!

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

CVA Events This Summer-2016

May 7-Eastman Lake Star Party

May 14-Riverpark Public Star Party

May 21-CVA Monthly Meeting-Fresno State 7pm

June 11-Riverpark Public Star Party

June 18-CVA Monthly Meeting Fresno State 7pm

June 25-Millerton Lake Star Party

July 1,2,3,4-Courtright Reservoir Star Party

July 2-Eastman Lake Star Party

July 9-Riverpark Public Star Party

July 29,30,31-Courtright Reservoir Star Party

July 30-Millerton Lake Star Party

August 6-Eastman Lake Star Party

August 13-Riverpark Public Starparty

August 27-Millerton Lake Star Party

September 2,3,4-Glacier Point Star Party

Number of extra-solar planets found as of April 2016-2,107
How many more are out there-tens of thousands?
Hundreds of thousands?

Profiles in Astronomy

Neghnad Saha 1893-1956

Saha was born into a poor family in a village near Dakha, in what was then British India (today Bangladesh). Despite his family's financial situation, he was able to attend school, eventually graduated from Dakha College, and later did graduate work at the Presidency College, then the premier higher education institution in India. There, his classmate and close friend was Satranda Bose, who would become internationally known in quantum physics, and one of his teachers was Jagadish Chandra Bose, one of the world's foremost mathematicians. After his studies at the Presidency College, he studied astrophysics in England and Germany, and taught at the Imperial College in London before returning to India to take up teaching positions, first, at Allahabad University, and later at Calcutta University, where he was the head of the physics department, and the founder and director of the Institute for Nuclear Physics, until his death.

Saha is best known for what is today called the Saha Equation. In the 1920s, he studied spectrographs of various stars, and, using those to determine their temperatures, he developed a formula which could tell the levels of ionization of the elements that made up those stars. It was a major breakthrough in stellar studies-determining what elements made up a particular star, and it brought Saha international fame. He also invented an instrument which could determine the weight and pressure of solar particles.

Saha won numerous honors for his work; among other things, he was made a member of the Royal Society in England at the young age of 34. Many in the scientific community believe that he should have been awarded the Nobel Prize for his work on stellar elements. At his death in 1956, he was lauded as India's leading scientist, and a several academic facilities and research institutions are named after him.

Source and Image-Wikipedia

Glacier Point 2016
September 2,3,4(Labor Day Weekend)

Always the high point(literally and otherwise) of CVA's observing year!

For information and reservations, contact Dave Dutton at twodocs@sti.net

Five Lesser Known but still Great Summer Viewing Objects-All Discovered by the Herschels

NGC 6638 in Sagittarius(left)

Overshadowed by its larger and brighter siblings in Sagittarius, NGC 6638 is a beautiful little globular cluster just south of Lambda Sagittari and only about one degree from both M22 and M28. First seen by William Herschel in 1784, it has a visual magnitude of 9.2, and can be easily seen with a small telescope on a summer night. It is approximately 26,000 light years from Earth, one of the closer globular clusters.

NGC 205 in Andromeda(lright)

This often overlooked companion to M31 was noticed by Charles Messier in 1773, but then forgotten, and rediscovered by Caroline Herschel in 1783. An elliptical galaxy with a magnitude of 8.3, it can be easily seen in a small telescope. It is a wonderful object in its own right, and well worth a detailed examination on any clear night. In 1967, it was given the designation of M110.

NGC 5053 in Coma Bernices(left)

Again, less than one degree from the much better known M53, this is a pretty little globular cluster about 53, 000 light years from Earth. Its magnitude is 9.8. It was found by William Herschel in 1784.

NGC 6337 in Scorpius(right)

First seen by John Herschel in 1834, this small but beautiful planetary nebula is actually a binary, with a small star orbiting the white dwarf in the center- unusual for a nebula of this kind. Its magnitude is 12.3. It is also catalogued as PK349-1.1

NGC 6207 in Hercules(left)

Less than one degree from M13, 6207 is a magnitude 12.2 spiral galaxy. First seen by William Herschel in 1787, it is 30 million light years from Earth.

A Film, a Memory, and a Vision

By Larry Parmeter, *Observer* editor

On April 23, 2016, CVA members received a special treat, thanks to Dr. Steve White, director of the Downing Planetarium. He was able to show the just-released version of The Last Man on the moon, a biography of Gene Cernan, the commander of the last Moon mission, Apollo 17, in December 1972. It profiled Cernan's life, from his early days as a Navy pilot, to a newly minted astronaut going through training, his Gemini and two Apollo missions, his personal and family life, and his activities today at the age of 82.

The story resonated with me because about three weeks before, while working with elementary school students at the San Joaquin River Center, I struck up a conversation with one of the teachers, a man in his forties. For some unknown reason, we started talking about the important events of the twentieth century, most of which were negative: the two world wars, the atomic bomb, racial conflict, and so on. But I had to say that the single most important event of the century was a positive one, and it occurred on July 20, 1969, the night that astronauts walked on the Moon.

I was 15 then, an impressionable teen with a growing interest in space and space travel. My father told us all, "We're going to watch this, this is history in the making," and we gathered around our black-and-white TV. I don't remember which of the three major channels we had it on, but I do remember NASA reminding Neil Armstrong to turn on the TV camera as he came down the ladder. Then a somewhat grainy shadowed image came on, with the captain "Live from the Moon." We watched the rest and within an hour the world was never again the same. Vietnam, race riots, civil unrest, all was forgotten by an event that transcended boundaries and groups. The whole world *was* watching, and faith in humanity was restored, at least for a little while.

Sure, later there were the charges that the money could have been better spent on poverty and other social programs, that it was dominated by white males, and various other criticisms, but those are bogus arguments. As Cernan related in the film, "When we were launched, it wasn't the three of us going to the Moon, it was all of America, it was all of the world going to the Moon. The Apollo Moon landing became something greater than themselves: they were the triumph of the better angel of humanity, taking its first steps to become citizens of the Cosmos. Everything afterwards was a letdown(and Google, Apple, and Facebook don't even come close).

Today, 44 years after Apollo 17, Cernan and the other Moonwalkers(of the twelve, only seven are still alive today; they are all in their eighties, and all will probably be gone in ten to fifteen years) are working hard to make sure that the achievement of Apollo is not forgotten. Cernan again explains in the film:" A whole generation that was yet to be born in 1972 has grown up and come of age." What will my great-grandchildren think of the Moon landings; will they see them as epical events, or merely as a facts and dates from a history book that recede with each edition?

Even now, the landings seem almost like a dream, a memory a bit more substantial than others, and when the generation that witnessed them is gone, will they keep their viability? I cannot answer that; I can only help to push their importance forward as long as I can, and do it the way all are educated: one person at a time.

Towards the end of the film, Cernan confides that he did something very personal just before he left the Moon's surface: he scratched his daughter's initials into the lunar soil. "Maybe a thousand years from now, someone will find them and realize what they are." Their meaningfulness remains, etched on a faraway land. He also walks past the rusting and now plant strewn landscape of Launch Complex 39, ground zero for the Apollo launches. The past and the future. Memories and visions. In a very real sense they are the same, and that is not a paradox. They both say Here people left the Earth and for the first time in history traveled to another planetary body.

Nothing quite this uplifting had ever been done before; probably nothing this farseeing will ever be done again. The memory and vision of Apollo will survive forever.

What's New in Space

Space-X to Send Unmanned Dragon Spacecraft to Mars in 2018

Space-X founder Elon Musk announced on April 27 that his commercial spaceflight company Space-X will launch and then soft-land an unmanned Dragon space capsule on Mars in 2018, with help from NASA. The capsule, a version of Space-X's unmanned Dragon cargo capsule, will be known as Red Dragon, and will be the first of several Mars flights to test unmanned supply mission capabilities to the Red Planet. The spacecraft will be launched with Space-X's Falcon heavy lift rocket, and NASA will provide the communications and navigation logistics. The Red Dragon craft will be about 20 feet high and 12 feet wide at the base, and will weigh about 4,000 Earth pounds. It will be roughly the size of a large SUV.

The Red Dragon will have the capability to soft land using powerful rockets on its sides that will allow it to touch down gently on the surface. Space-X is currently testing the same soft landing system for its Dragon V2, the manned version which may take astronauts to and from the International Space Station as early as 2017. Musk, in announcing the Red Dragon, said that the technology will allow the Dragon spacecraft system to go to and land on any solid planetary body in the solar system, which he hinted is its ultimate goal. If the first Red Dragon mission is successful, it will be the first private commercial mission ever outside of Earth orbit, and to another planet.

First Launch from Russia's New Spaceport a Success

With Russian President Vladimir Putin looking on, a Russian booster rocket successfully blasted off from the country's new space launch center, known as the Vostochny Cosmodrome, near the Amur River in Eastern Siberia on April 28. The booster, a Soyuz 2.1A rocket, put three communications satellites into orbit, the Russian Space Agency announced . The launch was a major test for the country's engineering and scientific program, which wants to wean itself from the already established facility at Baikaneur, which has been the nation's primary launch center for almost 60 years, but has been in the independent country of Kazakhstan since the downfall of the Soviet Union in 1991. Roscosmos, the Russian Space Agency, has a contract with Kazakhstan to use Baikonur through 2050, but the space agency decided several years ago to build its own in-country launch center to avoid any possible political trouble. The new launch center has been under construction for almost ten years, has had huge cost overruns, and serious engineering and construction problems. Still, Roscosmos plans for it to be its main space launch center for the future, with manned Soyuz launchings from it to ISS taking place as early as 2017. At the same time, Russian launch activity at Baikonur will be slowly scaled down, and possibly ended altogether by 2025

Inflatable Spacecraft Now a Reality

The successful Falcon 9 launch on April 8 carried a new type of spacecraft to the International Space Station. Sponsored and built by Bigelow Aerospace, it is called BEAM, or Bigelow Expanded Activity Module, it is essentially an inflatable room, and will spend the next two years attached to ISS. Made of low-weight high strength fabrics and composite materials, the module will be slowly "blown up" like a balloon, and then be subjected to various tests by the ISS astronauts. They will not actually live in it, but enter it every now and then to perform their tests and experiments. Bigelow Aerospace first proposed the BEAM almost ten years ago, and envisioned having a "space hotel" made up of several modules linked together operational by 2015. But seemingly like everything else

space involved, the first experimental module was delayed to problems until 2016. The main advantage to the inflatable module is that it is much lighter and cheaper to build than regular solid materials modules, which leads to lower construction and launch costs. Bigelow Aerospace says that this will allow smaller and less profitable companies to send experiments and manufacturing processes into space at reasonable cost. It also still sees the "space hotel" concept as viable, and now plans to have a manned facility made of the inflatable modules orbiting the Earth by 2020 or 2021. Bigelow erospace has a contract with Space-X to deliver inflatable modules into orbit, and will no doubt also use the manned Dragon V2 as the way to get people to them.

Right-an illustration showing the BEAM attached to ISS

Scott Kelly returns to Earth, then Leaves NASA

American astronaut Scott Kelly, who returned to Earth safely on March 1 after spending almost a year in space, announced on March 15 that he is leaving the astronaut corps and NASA to pursue other ventures. He did not say exactly what he will do, but indications are that he will be involved with one of the commercial space companies, and might go into space again sometime in the future aboard a private commercial spacecraft. Kelly, 52, was chosen as an astronaut, along with his identical twin brother Mark, in 1996, and subsequently flew five times in space, two of them long term missions aboard the International Space Station. When the option came open for him to spend a year in space, NASA seized it as a unique opportunity to do physiological studies on him in space and identical studies of Mark on the ground, to see the similarities and differences. Mark, who was the commander of the next-to-last Space Shuttle flight, left the space program several years ago to take care of his wife, former Arizona Congresswoman Gabrielle Giffords, who was shot at a campaign rally in 2011. However, he agreed to participate, and regularly traveled to the Manned Spacecraft Center in Houston while Scott was in orbit. Even though the brothers are now officially no longer with NASA, they will continue, like many other former astronauts, to be involved with the space agency in long-term biomedical research on the effects to the body due to extended stays in space.

First U.S. Commercial Manned Spacecraft Launches Scheduled for One Year from Now

After what seems like an eternity, the first manned American spacecraft in several years will be launched into orbit in 2017. The first manned space flight of Boeing's CST-100(left), now named Starliner, will take place in July 2017, with a crew of two-one NASA astronaut and one Boeing pilot-astronaut. The mission will be known as Boe-CFT-1, will be launched by an Atlas V rocket, and spend 14 days in space, most of them attached to the International Space Station. If all goes well, a second manned flight in December 2017 will deliver U.S. astronauts to ISS. In the meantime, Space-X's Dragon V2(for Version 2-the manned version-right) will be launched by a Falcon heavy lift booster from the Kennedy Space Center, for a 21 day unmanned test flight to ISS in May 2017. If that flight goes well, Dragon V2 will have its first manned flight, delivering astronauts to ISS on a 14 day mission in July or August of 2017. Whichever craft is launched first, it will be the first U.S. manned spaceflight in six years, since the end of the Space Shuttle program in 2011.

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From NASA's *Space Place*

Gravitational Wave Astronomy Will Be The Next Great Scientific Frontier

By Ethan Siegel

Imagine a world very different from our own: permanently shrouded in clouds, where the sky was never seen. Never had anyone see the Sun, the Moon, the stars or planets, until one night, a single bright object shone through. Imagine that you saw not only a bright point of light against a dark backdrop of sky, but that you could see a banded structure, a ringed system around it and perhaps even a bright satellite: a moon. That's the magnitude of what LIGO (the Laser Interferometer Gravitational-wave Observatory) saw, when it directly detected gravitational waves for the first time.

An unavoidable prediction of Einstein's General Relativity, gravitational waves emerge whenever a mass gets accelerated. For most systems -- like Earth orbiting the Sun -- the waves are so weak that it would take many times the age of the Universe to notice. But when very massive objects orbit at very short distances, the orbits decay noticeably and rapidly, producing potentially observable gravitational waves. Systems such as the binary pulsar PSR B1913+16 [the subtlety here is that binary pulsars may contain a single neutron star, so it's best to be specific], where two neutron stars orbit one another at very short distances, had previously shown this phenomenon of orbital decay, but gravitational waves had never been directly detected until now.

When a gravitational wave passes through an objects, it simultaneously stretches and compresses space along mutually perpendicular directions: first horizontally, then vertically, in an oscillating fashion. The LIGO detectors work by splitting a laser beam into perpendicular "arms," letting the beams reflect back and forth in each arm hundreds of times (for an effective path lengths of hundreds of km), and then recombining them at a photodetector. The interference pattern seen there will shift, predictably, if gravitational waves pass through and change the effective path lengths of the arms. Over a span of 20 milliseconds on September 14, 2015, both LIGO detectors (in Louisiana and Washington) saw identical stretching-and-compressing patterns. From that tiny amount of data, scientists were able to conclude that two black holes, of 36 and 29 solar masses apiece, merged together, emitting 5% of their total mass into gravitational wave energy, via Einstein's $E = mc^2$.

During that event, more energy was emitted in gravitational waves than by all the stars in the observable Universe combined. The entire Earth was compressed by less than the width of a proton during this event, yet thanks to LIGO's incredible precision, we were able to detect it. At least a handful of these events are expected every year. In the future, different observatories, such as NANOGrav (which uses radiotelescopes to the delay caused by gravitational waves on pulsar radiation) and the space mission LISA will detect gravitational waves from supermassive black holes and many other sources. We've just seen our first event using a new type of astronomy, and can now test black holes and gravity like never before.

Both text and chart from NASA Space Place March 2016

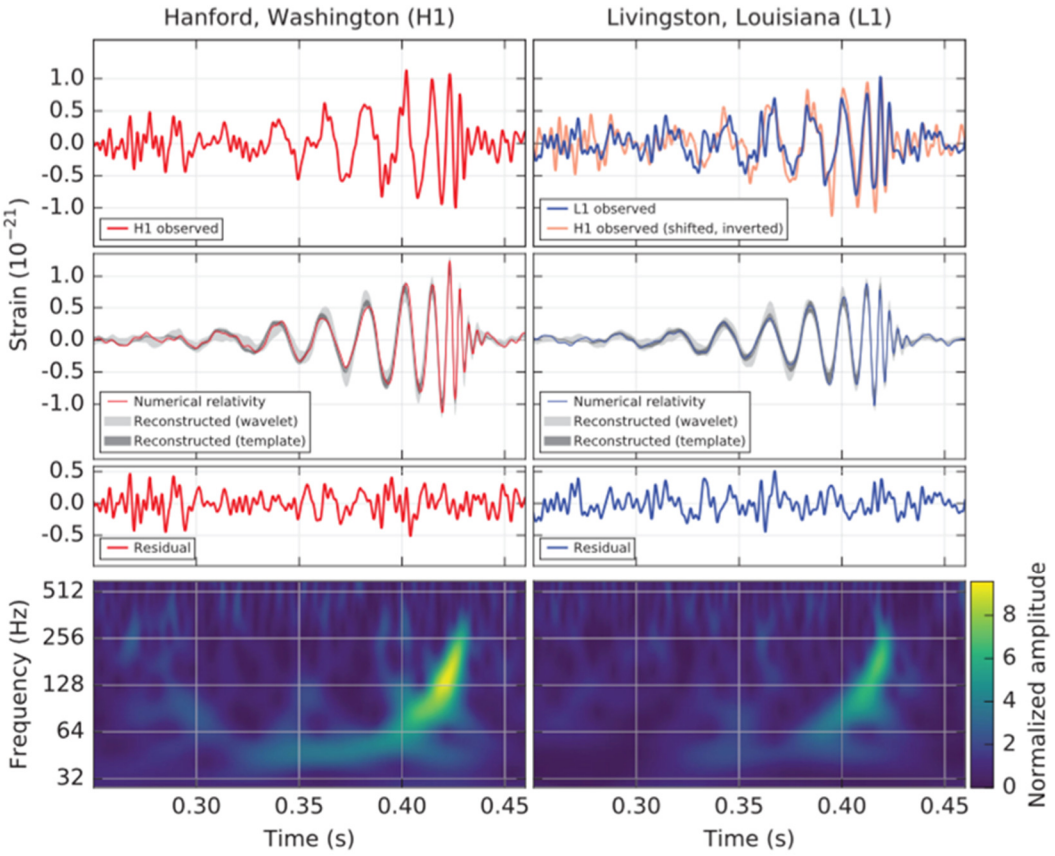

Image credit: Observation of Gravitational Waves from a Binary Black Hole Merger B. P. Abbott et al., (LIGO Scientific Collaboration and Virgo Collaboration), Physical Review Letters 116, 061102 (2016). This figure shows the data (top panels) at the Washington and Louisiana LIGO stations, the predicted signal from Einstein's theory (middle panels), and the inferred signals (bottom panels). The signals matched perfectly in both detectors.

The Hamburg Observatory

Part of a Continuing Series on Lesser Known-but Still Important-Observatories throughout the World

The Hamburg Observatory, in Northern Germany, has had a long and illustrious history. Its beginnings can be traced to a prominent Hamburg citizen, Johann Repsold, who established his own private observatory in 1802. In 1821, after a fire destroyed most of Repsold's observatory, the city became co-owners of what was left of the facilities, and in 1833, after Repsold's death, took over the site completely. Charles Rumker became the first director in 1834, and in 1856, his son George Rumker became director. In 1876, the "Equator," a 10.5" refractor, was built, and was the main and largest telescope for many years afterwards.

In 1906, due to increasing light pollution in Hamburg, it was decided to move the observatory to Bergedorf, a small town about thirty miles south of the city. The move was completed in 1912, and has been the observatory's home ever since. In 1911, the 1m Hamburg reflector saw first light at Bergedorf, and, with technological updates, has been a mainstay at the observatory since then. During World War II, the observatory was closed, but reopened afterwards and has engaged in scientific research ever since then. In 1962, the European Southern Observatory was founded at Bergedorf, and in 1968, administration of the observatory was taken over by Hamburg University. In 2012, the Bergedorf site celebrated its centennial. The original facility in Hamburg is now a science museum operated by the observatory.

Today, the Observatory has nine operational telescopes. The 10.5" refractor is still used, as is the 1m Hamburg reflector. A 40cm Cassegrain telescope, known as the Salvador Mirror, is also active, as are two astrographs, one a triplet. Another 23cm refractor is used largely for photography. The Oskar-Luhning Telescope, a 1.2 m Richey-Cassegrain, is the currently the largest telescope at Bergedorf. Two other telescopes, one in Greece and another in Mexico, are also operated by the Bergedorf facility. Most of the Bergedorf telescopes were designed and built by Zeiss.

Berhnard Schmidt, the inventor of the Schmidt Camera, is probably Bergedorf's most illustrious alumnus. He lived and worked at Bergedorf from 1920 until his death in 1935. In 1962, the observatory opened a museum in his honor, and his original Schmidt camera is one of the objects on display. Walter Baade, who later revolutionized stellar research at Mount Wilson, also worked at Bergedorf from 1919 to 1931.

Top right-the 1m Hamburg Telescope at the Bergedorf facility

Another of Many Reminders During this Year and Next- The First Total Solar Eclipse in the U.S. in 50 years will take place on August 21, 2017 Start Planning Now!