

July-August
2011
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Issue 4

The Observer

The Newsletter of Central Valley Astronomers of Fresno

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July 2-Star Party at Eastman Lake

July 9-RiverPark public starparty

July 29, 30, 31-Star Party at Courtright Reservoir

July 29, 30, 31-Glacier Point star party

Aug 6-RiverPark public star party

Aug 13-CVA meeting 7pm

Aug 26,27, 28-Star Party-Courtright Reservoir

Aug 27-Star Party at Eastman Lake



Special Expanded Issue-The Space Shuttle Era 1981-2011

The above image shows Endeavour docked to the International Space Station, May 2011. Together, they make up the largest and heaviest structure ever in space-almost 500, 000 Earth pounds. How was this picture taken? By an unmanned Russian Progress cargo spacecraft that was approaching ISS. One more shuttle mission remains, STS-135, Atlantis, now scheduled to be launched on July 8.

Astronomical Quote of the Month-

There will be no lack of human pioneers once we have mastered the art of flight...Let us create vessels and sails adjusted to the heavenly ether, and there will be plenty of people unafraid of the empty wastes...

Kepler, in a letter to Galileo, April 1610



New Moon July 1



Full Moon July 14



New Moon July 30



Full Moon August 14



New Moon August 28

Glacier Point 2011-July 29, 30, 31!

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The Observer July-August 2011

The Observer is the newsletter of the Central Valley Astronomers of Fresno- Established 1952

The President's Message-

The meeting held June 18 was one for the ages. We had a great spirited conversation and excellent PowerPoint presentation by Dr. Ray Hall, the High Energy Physics professor at CSUF. Dr. Hall comes from Fermi Lab, the collider replaced by CERN's LHC or Large Hadron Collider-more on this in a minute. Bryan gave us an update on the use of Eastman Lake in July. It is a go. He also told us about an upcoming Millerton Lake Star Party, and we will have three additional dates. We got an update on Glacier Point. Too bad some of you missed it.

All the members of the club are welcome anytime for events, star parties and meetings. It is great to get together and visit with one another to share thoughts, ideas, and suggestions. There are so many recent and new members who have never met the older members that have been with us for decades.

Please come out to the meetings and any other activities. Join the fun and wonderful camaraderie of these members like Clarence Noell, and all the others that find the time to do as required in our mission statement, to educate the public, and provide telescopes at schools and other parks museums, and institutions at no cost. Please don't let the cost of fuel or other distractions hinder you from a few hours of sharing your passion with others.

Now about the meeting some of you missed. Dr. Hall gave us an inspiring, thought-provoking presentation on Demarcation- the myths about Science and Pseudoscience. He told us why the Scientific Method is flawed for explaining all science, and how peer review should not be the final decider into whether a theory should be accepted. Dr. Hall presented us with a new method by Okyalos (sic) that says:

$T = M + A$, or Theory equals Methods + Assumptions being tested.

He told us about Popper, and his belief that science can not be true without proving falsification. This, he believes, is where Pseudoscience like Astrology and Creation Science is flawed. Creation Science demands you accept unproven dogma on faith, such as Genesis is the only Word to understanding the Universe, and that Noah's flood was real based on faith alone, which can't be proven, and is more of a philosophy stemming from personal beliefs and experiences.

As for Astrology, there is no way that planets can influence people's lives. Gravity is so weak between the planets and Sun that by merely snapping your fingers is much more work than the Earth affects the Sun. Planets in ancient horoscopes do not predetermine our lives and what type of person we will be. That is up to the individual and the choices they make. (Many studies have been done and research undertaken to test these ideas, which are false, or at best, within the scope of chance.). Dr. Hall made a wonderful fibre optic box of the Big Dipper asterism and how viewing it from different angles through smoked glass will show strange patterns as viewed from outside Earth.

Along these lines, there is no proof whatsoever that eating a shark's fin in soup will increase virility as many Asians and others believe. In fact, studies and testing has shown that eating large fish, such as shark and Blue Fin Tuna will lead to an increase of Mercury in the system. So just eating the fin will not lower the level. The shark is there to clean up the ocean to maintain its health and vitality. Killing 100 million of them a year as a supplemental food based on wants and not needs are detrimental. How healthy do you think the ocean is now?

So, as you can see by just a few examples, pseudoscience is everywhere. It has also been shown that unfettered belief in many pseudoscience concepts has a direct correlation to the average person's intelligence and level of education.

You shoulda been there- it was mind-boggling and eye-opening. I hope you attend the August meeting on the 13th. Bryan Bellis is going to tell us about Caldwell Objects, such as the Cat's Eye Nebula in Draco, and what and where to see them. See you there!

-Randy

Profiles in Astronomy

James Keeler 1857-1900

Keeler is all but forgotten today, but he played a major role in bring the astronomical community into the modern world, and his accomplishments garner far less recognition than they deserve.

Keeler was born in 1857 in Illinois, but grew up in Florida, where his parents moved to after the Civil War. He attended Johns Hopkins University, and was one of its first graduates, receiving a degree in physics in 1881. Even as a student, his knowledge of physics and astronomy was so great that before he graduated he was offered a job at the Allegheny Observatory in Pittsburg by Samuel Langley, then the director(Langley would later go on to be the head of the Smithsonian Institution, and compete with the Wright brothers in building and flying a powered aircraft). Keeler worked at the Allegheny Observatory until 1886, when he was hired to be the first staff astronomer at the newly established Lick Observatory near San Jose, California. From 1887 to 1891, Keeler lived on Mt. Hamilton, where he worked with both the Lick refractor and the 36" Crossley reflector, the first large reflector telescope. In 1891, he went back to Pittsburg, to be director of the Allegheny Observatory(no one is really sure why he took the position; Lick was then on the cutting edge of astronomy, while the Allegheny Observatory was a third rate facility with woefully outdated equipment. Some say he simply missed the East). Anyway, Keeler stayed in Pittsburg until 1898, when, tired of the air pollution and limitations at Allegheny, he went back to Lick to be its director. Unfortunately, he was at Lick less than two years when he died at age 42; he was a heavy smoker, and it is believed that he had lung cancer.

Keeler is best known for his studies of the planets, especially Saturn. In 1888, he discovered a gap in Saturn's rings, which had first been hypothesized by Johann Enke; it is now known as Enke's Gap. Using spectrographic analysis, he also confirmed Maxwell's theory that Saturn's rings are made up of millions of tiny particles, each a moon in its own right. Using the Crossley reflector at Lick, he photographed hundreds of galaxies(then called nebulae), and was one of the first to speculate that they might be outside our own galaxy, the Milky Way. His greatest contribution, though was in popularizing the reflector telescope. His pioneering research using the 36" Crossley reflector encouraged other astronomers to start using reflectors as well; before his time, almost all major astronomical discoveries had involved refractors. Keeler's Crossley usage marked the beginning of the era of giant reflectors, a movement which was taken up by his friend George Hale, and eventually culminated in the 200" Hale Palomar telescope.

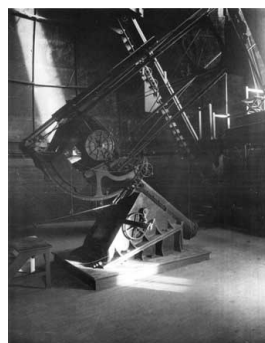
Keeler, along with Hale, co-founded the *Astrophysics Journal*, and was its first editor. He was awarded the Henry Draper Medal by the National Academy of Sciences, and was also the President of the Astronomical Society of the Pacific. When Voyager I flew by Saturn in 1981, it discovered a second gap in the rings; NASA named it the Keeler Gap in his honor. A mountain peak in the Sierra Nevadas is named after him, as is a crater on the Moon, and an asteroid.



J. E. Keeler

The Crossley Reflector

The 36" Crossley Reflector that Keeler used on Mt. Hamilton has had a long and storied history. It was originally built in England in 1879 by Andrew Common, a wealthy amateur astronomer. He had the mirror(glass coated with silver) made by George Calver, a French optician in Paris. In 1883, he took the first clear photographic images of the Orion Nebula(M41) with it. Common moved on to other projects, though, and sold it to Charles Crossley, a member of the British Parliament, in 1885. Crossley intended to use it in his native northern English, but quickly realized that the weather there was very unfavorable for astronomy, so he decided to sell it after a year or so. At the same time, Edward Holden, the director of the newly established Lick Observatory in California, was looking for a large reflector, so he arranged to buy it and have it shipped to the U.S. It arrived at Mt. Hamilton in 1886(after the mirror was refurbished by Calver), was given its own housing and dome, and has been there ever since. The frame has been rebuilt several times, and the dome has been rebuilt twice as well. Even after 130 years, the Crossley is still operational, and the observatory plans to keep it going for the foreseeable future. It was the first great reflector, and still does useful work in the shadow of its big brother, the 120" Shane telescope. Right-The Crossley in 1925; Far Right, with a modern frame and mount in 1990



CVA Calendar July-August 2011

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					July 1 Cassini orbits Saturn 2004 Courtright Star Party New moon	2 Eastman Lake star party Courtright Lake star party con't
3	4 Independence Day	5	6	7	8 STS-135, Atlantis, last scheduled space shuttle launch	9 Riverpark public star party
10	11	12	13	14 Full moon	15	16
17	18	19	20 Apollo 11-first manned landing on the moon-1969 Viking 1 lands on Mars- 1976	21	22	23
24	25	26	27	28 Delta Aquarid me- teor's peak	29 Courtright Lake star party begins Glacier Point Star party	30 Glacier Point star party New moon
31	August 1 Ramadam begins	2	3	4	5	6 Riverpark star party
7	8	9	10	11	12 Perseid meteor shower peaks	13 CVA meeting 7pm CSUF Full moon
14	15	16	17 Mars' moons Deimos and Phobos discovered - 1877	18	19	20
21	22	23	24 Pluto demoted and reclassified as "dwarf planet" 2006	25	26 Courtright star party begins	27 Eastman Lake star party
28 New moon	29	30	31	September 1	2	3

The Space Shuttle Era 1981-2011

Thoughts on a Time

By Larry Parmeter, CVA editor



I wish to start this with a personal story. In December 1983, I was a graduate student in education at San Jose State, and living and working in nearby Santa Clara. I decided to take a night off from work and drive to the high desert to Edwards Air Force Base to watch the return of the Space Shuttle, STS-9, SpaceLab-1. The shuttle was scheduled to land at 8am, and I drove all night to get there. Once there, however, I learned that, because of high winds, the landing had been delayed, and might not even take place at all that day. Along with about 100,000 other people, I wandered around the public viewing area, visited the souvenir stands, slept in the backseat of my car, and listened over someone's short wave radio to NASA flight controllers sending computer codes to the

astronauts. Finally, word spread throughout the viewing area that the shuttle would land at 4pm. And it did. Coming out of an overcast sky that was already turning grey in pre-twilight, the orbiter Columbia was a great bird swooping effortlessly down to land on the dry lakebed, as aircraft had been doing for over 50 years. They were home, and none of us had left. A man standing next to me at the fence said that this was the sixth landing he had seen, and he wasn't the least bit tired of it. He'd be back for more, he said, and so would many others. And so would I.

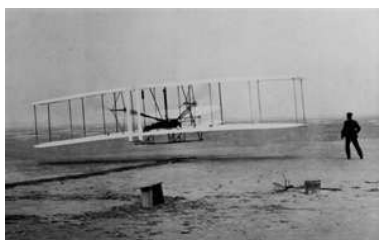
Looking back from my vantage point today, I now realize that I, like so many of my contemporaries, have come of age and marked the events of our lives through the shuttle. I was a second year student in college when the program was approved in 1972, just starting a career in teaching when the first launch occurred in April 1981; a rejected teacher-in-space applicant when Challenger exploded in 1986; making a shift from the Bay Area to Fresno in 1988, when flights resumed; married and raising my son when Columbia fell apart in 2003; and today, contemplating retirement as Atlantis makes the last flight in July. We grew up together, matured together, celebrated together, suffered loss together, and are now more or less going out together. It's been a nice partnership.

But the shuttle is much more than just me obviously. I remember when it was first proposed and all the controversy surrounding it, and its critics saying it was a white elephant and not worth it, and the protesters saying that it took away from the poor and the hungry, and the politicians decrying it because it wasn't helping them to get reelected, and a thousand other complaints. And all along, American astronauts, and eventually those from other countries as well, got into it and rode it like a bronco into space and came back to Earth, landing before huge crowds waving flags. The shuttle became something greater than a spacecraft; it metamorphosed into something as American as the Declaration of Independence, the Gettysburg Address, the cowboy, baseball, and home computers. It became a symbol of what this country was all about.

In early 1984 I watched the CBS Evening News with Dan Rather one night. He led off the broadcast with a juxtaposition: "Tonight, we begin with humanity at its worst," and a backdrop of images of fighting in the Middle East; and then "and humanity at its best;" another image, that of astronaut Bruce McCandless floating out of the payload bay of Challenger and becoming an untethered human satellite 200 miles above Earth, his life raft a thruster powered backpack that he helped design and build. The MMU (Manned Maneuvering Unit), as it was called, was something new and daring, another frontier that allowed the body and the imagination to soar above the pettiness and tragedy of everyday life. It was a seminal image of what Americans do best, and what they have always offered to the rest of the world: an essential goodness and purity that pushes aside hatred and suffering.



McCandless and his colleagues were the spiritual counterparts to Joliet, La Salle, Lewis and Clark, the Wrights, Perry, Earhart, Yeager, and, years later, Rutan and Musk "We are explorers," said Daniel Goldin, NASA's chief administrator from 1992 to 2001. "It is written in our



genes." Nowhere else is this seen more vividly than in the United States.



This is perhaps why the shuttle program has had so much support by the American people over the years. It goes to the heart of the American ethic and resonates in everyone who understands this country. No wonder close to 500,000 traveled to Florida last month to watch Endeavour's last launch, and even more are expected at Atlantis's in July. No wonder that when STS-4 landed at Edwards on Independence Day 1982, over 800,000 braved the high desert heat to see it live. No wonder that every time NASA put out a call for a new astronaut group of maybe fifteen to twenty people, it received thousands of applications. No wonder that from nations throughout the world, men

and women came to this land to seek a seat to the heavens. America is not only adventurous and technologically proficient, but good as well, and that goodness shows in a white and black ship traversing the dark vastness of space. It represents not only knowledge and ability, but fairness, equality, opportunity, and plain decency. America has its problems, and others accuse this nation of not always living up to its ideas. But every time a shuttle lifted off from L C 39 in Florida, the Earth stopped and held its breath and watched what John F. Kennedy called "the glow from the fire that can truly light the world." The Shuttle has become a part of our cultural consciousness.

Watching a shuttle launch or landing in person is like being at a transcendent spiritual event: people are leaving the Earth. They are transforming into the heroes of a distinct mythology. Almost three millennia ago, the Greeks dared to sail on voyages of great adventure, and the Greek poets turned them into demi-gods who stormed the unknown so that others could see the light. In my writing classes, I tell my students, we are all storytellers, and a thousand or more years from now, future bards will tell the stories of men and women who left this planet to go on voyages of adventure, and returned with the fire of Prometheus and gave it to all for the betterment of humanity. The great mythologist Joseph Campbell once wrote, "The hero ventures forth from the world of common day into a region of supernatural wonder; fabulous forces are encountered there and a decisive victory is won: the hero comes back from this mysterious adventure with the power to bestow boons on his fellow man." The stories of the shuttles will be our future mythic journeys, and the shuttle astronauts, men and women, will be our mythic heroes.



The Space Shuttle Era 1981-2011

A Space Shuttle Chronology: when it all started

1965-The Air Force, as an outgrowth of the now cancelled "Dynasoar" program, begins classified studies of a large scale reusable manned space vehicle that can be launched vertically and land on a runway. By 1967, NASA is involved in these studies, and quietly begins research on possible designs and engines

Spring 1968-NASA engineers and managers, troubled by the huge cost of the Apollo program, start discussing the idea of a follow-up spacecraft that will be reusable and cost efficient-the "Next Step."

1968-1969-Overshadowed by the Apollo Moon flights, NASA cements the concept of a reusable space plane that can put large numbers of astronauts into orbit, deliver and repair satellites, and serve as a construction and supply vehicle for a proposed space station. Leading aerospace companies start working on design concepts.

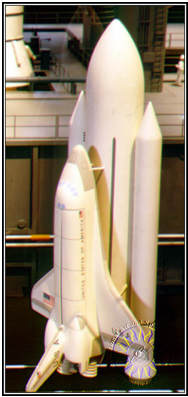
February 1969-The new Nixon Administration gives NASA the go-ahead to work on a reusable space plane to eventually replace the Apollo-Saturn system

Late 1969-Grumman proposes a four person space plane with a modified Saturn 5 as its booster. It is rejected for not being reusable enough



1970-Rockwell proposes the “mother ship” idea-a space plane carried piggyback atop a larger vehicle, which would release it at about 200,000 feet and then go into low earth orbit. It is also rejected as being too expensive.

Late 1971-Rockwell takes the “baby” space plane off the mother ship and mates it with solid booster rockets and an external fuel tank. This becomes the leading contender for NASA’s vision.



April 1972-The Nixon Administration approves the NASA-Rockwell design and gives it \$5 billion for initial development. NASA had asked for almost \$10 billion, and has to eliminate many features of the program. Many NASA officials and some of the astronauts resign, claiming that the space agency, for the first time in its history, has put cost efficiency ahead of safety and quality. Shortly afterwards, Rockwell is given the prime contract to build five shuttles: one test vehicle and four operational craft. Morton-Thiokol(now ATK Systems) of Utah gets the contract for the solid rocket boosters, and Boeing receives the contract for the external fuel tank. NASA had hoped for five operational orbiters, and has to make do with four. With leftover parts, Rockwell partially builds the fifth one anyway, and puts it in storage. It eventually becomes Endeavour, which replaces the ill-fated Challenger.

August 1972-Construction of the first shuttle, Enterprise, begins at Rockwell’s aerospace facility in Palmdale, California. NASA’s schedule calls for the first manned launch in March 1978.

July 1976-The first shuttle, Enterprise, is delivered to NASA by Rockwell. Enterprise is made out of wood, and is not expected to go into space. Its function is to test the shuttle’s aerodynamics and gliding and landing capabilities.

August 1976-Enterprise makes its first free flight and landing at Edwards Air Force Base.



October 1976-the flight and landing tests with Enterprise end. Enterprise will eventually end up at the Smithsonian’s Air and Space Museum.

1977-1980-NASA and Rockwell have repeated problems with the thermal protection system, the “heat tiles.” Thousands need to be either modified or replaced. This alone sets back the Shuttle program almost two years.

March 1979-The first operational shuttle orbiter, Columbia, arrives at the Kennedy Space Center, and the first manned launch is now scheduled for February 1980. Columbia has taken almost four years to build.

1980-Repeated problems during pre-flight testing push the first launch back to early 1981. The Shuttle program is now three years behind schedule.

April 12, 1981-On the 20th anniversary of manned space flight, Columbia, STS-1, is finally launched with veteran astronaut John Young and rookie pilot Bob Crippin. It is the first time Americans have been in space in six years. Despite some concerns about the heat tiles, Columbia successfully completes a two day mission, and lands at Edwards Air Force Base in front of almost 400,000 people.



The Space Shuttle Era has begun.

The Space Shuttle Era 1981-2011

I have written what I can about the Space Shuttle and what it means to the U.S. and the people of Earth. But perhaps the Shuttle's most enduring legacy is the photographs it brought back, images of both the ordinary and the extraordinary, of familiar patterns in a brave new world. I will say no more and let them speak for themselves.





The Space Shuttle Era 1981-2011

What Next?

After the flight of STS-135 in July, the Shuttle program will end, and NASA will have no manned space vehicles for the foreseeable future. However, things are going on, both inside the space agency and elsewhere as well. The U.S. will not be entirely out of manned space flight, and may, in fact, be stronger than ever in a few years.

At the moment, NASA has a contract with RKA, the Russian Space Agency, to fly six American astronauts a year, via the Soyuz spacecraft, to ISS through 2014. Many in Congress and the American aerospace community, though, are nervous about that, particularly if U.S. -Russian political relations take a turn for the worse, which they have threatened to do in the last few years.



NASA is anticipating backups, and they will come into force in the next three to four years. The most talked about is Elon Musk's Space-X program. Space-X has a contract with NASA to fly unmanned cargo to ISS, using its Dragon spacecraft (at left) and Falcon launcher, starting at the end of 2011. In April 2011, Space-X announced that Dragon will be man rated and ready to carry up to seven astronauts at a time to ISS by early 2014. The Sierra-Nevada Corporation also announced at the same time that its DreamChaser mini-shuttle will be ready for manned operational flights by 2015. Boeing's CV-100 spacecraft, which can also carry up to seven people, will commence manned operational flights in

2015 as well.

The biggest story, though, is NASA's announcement in May 2011, that Lockheed had been chosen (no surprise) to build its deep space manned spacecraft. Why no surprise? Because it's already being built. Lockheed building the MPCV (Multipurpose Crew Vehicle - image on the right) and having it ready for manned flight by 2016 is ironic because it's simply Orion with a new name. After President Obama cancelled the Constellation program in 2010, he announced that the Orion would be built as a "lifeboat" for ISS crews, and nothing more. In reality, the "lifeboat" proposal was meant to stave off pressure from legislators, and to save face, as well as jobs and votes during a recession; and Lockheed, with NASA's support and encouragement, simply continued working on the Orion craft with the unspoken notion that it would be used for deep space missions all along. NASA's announcement in May didn't change a thing, except for a new name. The MPCV-Orion will now be a four person spacecraft which will take crews to asteroids and Mars in the 2020s. (It would not surprise me in the least if NASA is also providing under-the-table funding and support for the Constellation lunar lander as well. The President's decision to skip the Moon, in the face of Russian and Chinese announcements that they'll send men there by 2025, has been met with major opposition from Congress, the military, and the aerospace community. If Obama is defeated for re-election in 2012, many believe strongly that the new Republican president will reestablish the Orion Moon landing program-but under a different name. All of this reminds me of a novel I read many years ago. In it, the protagonist is faced with a major problem inherited from his predecessor. He simply leaves things as they are, and changes the name and goals. Problem solved.).



What is more contentious is the booster that NASA will use for the MPCV-Orion. Some want it to use an already established rocket like the Atlas 5 or the Delta 4, or perhaps ATK Systems' new Liberty booster (which is essentially the Ares I), which is supposed to be ready for manned launches by 2015. Others want NASA to design and build an entirely new booster, and heavy lift vehicle as well. My opinion-NASA needs to stop reinventing the wheel, and use something that's already proven and reliable-like the Atlas or Delta. For that matter, NASA should also make its heavy lift vehicle out of the shuttle's solid rocket boosters, shuttle fuel tank, and a piggyback cargo holder using shuttle liquid fueled engines-In other words, a slight larger and much more powerful variation of the Shuttle-C unmanned heavy lift rocket that was first proposed, but never built, in the early 1990s. But, nah, that would be too easy, too quickly built, and not expensive enough.



For NASA's astronauts, these are bittersweet days. The astronaut corps, which had a high of almost 150 in 2004, is now down to about 60 people. Over the last 2-3 years, many astronauts, realizing that they would never fly in space again with NASA, have left, and have not been replaced. Several of them are now working for commercial spaceflight companies like Space-X, Sierra-Nevada, and Virgin Galactic, in the hopes that they will get another chance to go back into space, albeit under a different logo. (On left, former Shuttle-ISS astronaut Garrett Reisman, who now

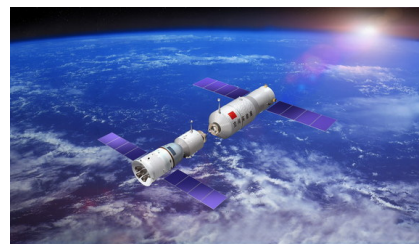
Works for Space-X, and hopes to go back to ISS aboard Dragon by 2015). It is known that Richard Branson's Virgin Galactic is interested in hiring ex-shuttle astronauts as pilots for the White Knight and SpaceShip 2 program, which is now planning operational flights in 2012. Most of those who are still in Houston have already been assigned to Soyuz/ISS missions, or are planning to stick it out until the next big spaceflight era begins, perhaps in four or five years. The last astronaut "class" was chosen in 2004, and NASA had planned to choose a new group of 15 to 20 this year. But that has been put off until at least 2013 when the space agency's long term manned space goals(hopefully) are clearer. To a person, though, none of the astronauts are bitter or angry. They are happy and grateful that they have been allowed to be a part of America's great adventure, and they have seen the world as few ever have.

What Else is New in Space

In the Meantime, China Revs up for its Next Step

While the American space program is winding down, at least in this phase, the Chinese space program is starting to get into high gear. The Chinese Space Agency announced in April 2011 that the long awaited Chinese space station, called Tiangong(which means "Heavenly Palace" in Chinese) will be launched by the end of this year, possibly as early as September, and will welcome astronaut crews shortly after that. According to drawings and information released by the Chinese, Tiangong will be constructed in modular form, and will look much like the Russian Mir space station of the 1980s and 90s.

The initial module, not much larger than a Shenzhou craft, will be launched first, and it will be used not only for manned space habitation, but also for testing and practicing rendezvous and docking techniques. After these have been perfected, the core module, with a multiple docking adaptor, will be launched and attached to the initial module. Later, the station will be further enlarged with at least two other modules. According to the Chinese, it will be used for up to three years, and will be continuously inhabited by crews on a rotating basis. Whether or not it will play a role in Chinese plans to send manned missions to the moon by 2020 is not known. The Tiangong and the Shenzhou missions will be the first manned Chinese space flights in almost six years. On left-a drawing, released by the Chinese Space agency, of what Tiangong will look like in space(not all the modules are pictured). The number of astronauts who will work aboard it has not been released, but the fact that the drawing shows two docked Shenzhou spacecraft leads space experts to believe that there may be up to four or five at a time.



The Next Generation Soyuz Makes its Debut

In early 2011, RKA, the Russian Space Agency, unveiled its latest model Soyuz, the TMA-DM, which it will use for ISS missions for at least the next eight to ten years. Externally, it looks pretty much like previous Soyuz craft, but internally, it has been updated with the latest electronics and instrumentation, new computers and communications systems, and an orbital module that can hold a bit more cargo. This is the fifth generation Soyuz since the ill-fated Soyuz 1 mission in April 1967. The original Soyuzes were used in missions 1 to 40, from 1967 to 1981. The Soyuz T(for transport) series, from 1980 to 1986, 14 flights; Soyuz TM(Transport-Mir) series, from 1987 to 2002, for 32 flights; Soyuz TMA(Transport Mir Alpha-The original name for the International Space Station) series, from 2002 to present, for 19 flights; and now TMA-M. There is no indication that the Russians will use the TMA-M or a more advanced Soyuz for their proposed Moon landings in the 2020s, or whether they will build a whole new spacecraft.



The Space Shuttle Era 1981-2011

The Shuttle's Other Legacy: Hubble

More than anything else, the Space Shuttle Era is intrinsically intertwined with that of the Hubble Space Telescope. It was designed to be carried into space by the shuttle, it was designed to be serviced in space by the shuttle, and both have sent back images that have elevated the understanding of space by both the general public and the scientific community.

HST had its origins in post World War II scientific America. Although space based telescopes had been discussed since the 1920s, it was astronomer Lyman Spitzer who, in 1946, first seriously proposed a telescope that could orbit above the Earth's atmosphere and take images of the planets and stars in unsurpassed clarity. However, not until the 1970s, and the beginning of the Shuttle Era was serious planning begun. The first proposal for a space telescope was vetoed in 1974 by then President Ford due to federal budget cutbacks during the recession of that year. But concentrated lobbying by the scientific community persuaded the President and Congress to approve funding two years later. It also helped that NASA persuaded ESA, the European Space Agency, to fund part of the project.

Work on the telescope was begun almost immediately, aiming for completion and a launch in 1983. The Marshall Space Flight Center in Huntsville, Alabama had overall responsibility for the scope; Lockheed designed and built the housing and assembly; Goddard Space Flight Center designed and built the various scientific instruments, and Elmer-Perkin was in charge of the optics; the actual mirror blanks were made at Corning Glassworks in New York. As a backup, NASA had Eastman Kodak make and polish a second identical mirror, which is now in the Smithsonian Institution. Itek, which had a small part of the telescope contract, also made a third identical mirror, which is now part of the largest telescope at the Magdalena Ridge Observatory in New Mexico.

The optics design is of a Cassegrain reflector of Richey-Chretien design. This uses two mirrors, a primary and secondary, with hyperbolic curved surfaces. The primary mirror is 96" (2.4 meters) in diameter, and the secondary is 18" in diameter. The focal length is 57.8 meters, or 189 feet. The complete telescope assembly is 60' long, 13.5' in diameter (which allowed it to barely fit into the Shuttle's cargo bay), and has a weight of 24,000 Earth pounds. Originally funded at \$500 million, by the time it was launched, the telescope cost \$1.2 billion. It was officially named the Hubble Space Telescope in 1983 to honor astronomer Edwin Hubble, who discovered the expanding universe in the 1920s.

Originally scheduled to be launched in 1983, problems delayed the telescope's launch date until 1986. NASA officials confidently planned to put it into space then, but the Challenger disaster delayed it, along with many other space projects, for several years.

While waiting for launch, the telescope was put into storage at Lockheed Missile and Space's "clean room" in Sunnyvale, California (in 1988, when I was living in Santa Clara and was a member of the San Jose Astronomical Association, I skipped school one day and was allowed, along with other SJAA members, to tour Lockheed and view HST through the enclosed visitors' gallery overlooking the clean room. It was a sight I'll never forget).

Hubble was finally launched on April 24, 1990, aboard Discovery, STS-31. Within a few weeks, scientists and engineers doing checkout tests at the Space Telescope Science Facility at Johns Hopkins University realized that something was radically wrong with the optics. The HST images were blurry and unfocused; further tests showed that the main mirror was warped; in optics parlance, it had myopia. The problem was eventually traced to a custom designed machine that Elmer-Perkin had built to test the mirror's curvature; it was flawed (during the mirror testing, NASA had doubts about the machine, but E-P insisted that it was far superior to traditional

mirror curvature testing methods. After the warped mirror was discovered, NASA examined and retested the Kodak and Itek



backup mirrors, which had used traditional curvature testing technology. Both were flawless.). Although some research, such as spectrographic and light magnitude studies, could be done, the main work would have to wait until the first shuttle servicing visit.

In December 1993, Endeavour, STS-61, undertook the first HST servicing mission. The telescope's main instruments were designed in modular form, so they could be removed and replaced with newer ones when needed. Engineers designed and built a module with "corrective lenses" to offset the mirror's myopia, and it was installed, along with other improvements, by the STS-61 astronauts. With its new glasses, Hubble's full potential was unleashed, and its resulting images of the universe stunned both astronomers and the public with their clarity and beauty. The world was viewing the cosmos as it had never been seen before.

Subsequent shuttle service missions; HST-2 in February 1997; HST-3A in December 1999; HST-3B in March 2002; and HST-4 in May 2009, further extended Hubble's lifetime and abilities. With its up-to-date electronics, cameras, and guidance equipment, it has gone far beyond its original goals. It has pretty much settled the dispute over the Hubble constant and the age of the universe, it has provided unequivocal evidence for the existence of black holes, it has watched stars being

born and stars dying, it has followed supernovas and the birth of planetary systems. More than anything else, it has imaged a universe of mystery, ethereal beauty, and imagination that has caught the public consciousness as few things have ever done. The myopic mirror has long been forgotten; Hubble's images have redeemed it many times over.



As of 2011, HST is 21 years old in space; since there will be no more servicing missions; scientists hope to keep it operational until the advent of the James Webb Space Telescope, which was originally scheduled to be in 2010, then delayed until 2014; now the best estimate is 2021.

Few think that Hubble's instruments and electronics will last through 2015, after which it will simply drift useless in orbit until reenters the atmosphere. Also, several ground-based telescopes, like the Keck, now equal or exceed Hubble's range and clarity. Hubble, though, is unique; it has expanded man's vision of the cosmos and set standards that may never be exceeded. As I wrote in an *Observer* article several years ago, there was nothing like it before; there will never be anything like it again.



Hubble's most famous image, the one that captured the imagination of the world: the "Pillars of Creation;" gas clouds containing new-born stars in the Eagle Nebula.

Vital Statistics of the Space Shuttle Era

Total number of space shuttle flights-135(including STS-135)

Total number of people who went into space aboard shuttles during the program-346

Total number of nationalities represented aboard the shuttle during its history—19
(U.S. Russia/Soviet Union, Germany, France, Canada, Japan, Italy, Holland, Belgium, Saudi Arabia, Mexico, India, England, Austria, Ukraine, Spain, Israel, Sweden, Switzerland)

Shortest shuttle flight(complete flight)-STS-2, Columbia, 2 days 6 hours 13 minutes

Longest shuttle flight-STs-80, Columbia, 17 days 15 hours, 53 min

Shuttle flight with the largest crew-STs-61A in 1985-8 person crew(5 Americans, 2 Germans, 1 Dutch)

Largest/heaviest payload on a single shuttle mission-STs-31, with the Hubble Space Telescope, 24,500 Earth pounds

Year with the highest number of shuttle flights-1985, with 13

Average cost of a shuttle mission-\$1.18 billion(includes payload)

Estimated total cost of the shuttle program from inception in 1972-\$160 billion

Average cost per year of the shuttle program-\$4.1 billion

The shuttle program as a percentage of the national budget 2011-.0902%

Was this a bargain or what?



Space Shuttle Era Trivia

Who was the first non-American to fly aboard an American spacecraft?

Who made the most flights aboard the Space Shuttle?

What are the Shuttle's three landing sites?

Who was the first Russian aboard a Shuttle flight?

How many Shuttle launch pads are there?

Who was the first non-NASA "civilian" astronaut to fly aboard the Shuttle?

What was the average "turn around" time for a shuttle orbiter?

What animal caused a Shuttle flight to be delayed three months?

How many times did the Shuttle visit the Mir space station?

Who was the oldest person on a Shuttle flight?

Name one of the Shuttle's overseas emergency landing sites.

Name the three major telescopes that the Shuttle put into orbit.

What was the name of the satellite that the shuttle "captured" and fixed in 1984?

What European born astronaut flew on more Shuttle flights than any other foreigner?

The term "bad hair day" originated with what happening aboard the early shuttle flights?

A married couple flew on one of the Shuttle missions. Who were they and which one was it?

What shuttle mission had to be duplicated because the original one was forced to end early due to problems?

If you know the answers to at least some of these, send them to me. I will publish the answers to all of them in the September-October 2011 issue



Number of extra-solar planets found as of June 2011-562

How many more are out there?

Astronomical Trivia

This month's question-

The American Gemini program put ten manned spacecraft into Earth orbit in 1965 and 1966. Gemini, though, was not its original name. What was it?

Gemini's original name was Mercury Mark II. The Gemini—Mercury Mark II program was never intended to be. NASA's original plan was to move directly from Mercury to Apollo, but it realized in late 1961 that it needed an intermediate program to gain experience in rendezvous and docking, and also in long duration space flight. Thus, Mercury Mark II was dreamed up and planned out literally overnight as an extension of the Mercury program. Originally it was to use a modified version of the Mercury capsule, but the more sophisticated orbital techniques and the resulting necessity for two man crews required a whole new spacecraft. Max Faget, a Canadian-born engineer who was the chief designer of the Mercury capsule, also designed the Mark II spacecraft in about a week in January 1962. Shortly after the final design was approved, its name was changed to Gemini to honor the twin brothers of Greek mythology.

This issue's trivia question-

Up to the 20th century, most (but not all) reflecting telescope mirrors were not made out of polished glass. What was the most common material used for them?

Larry Parmeter is the editor of

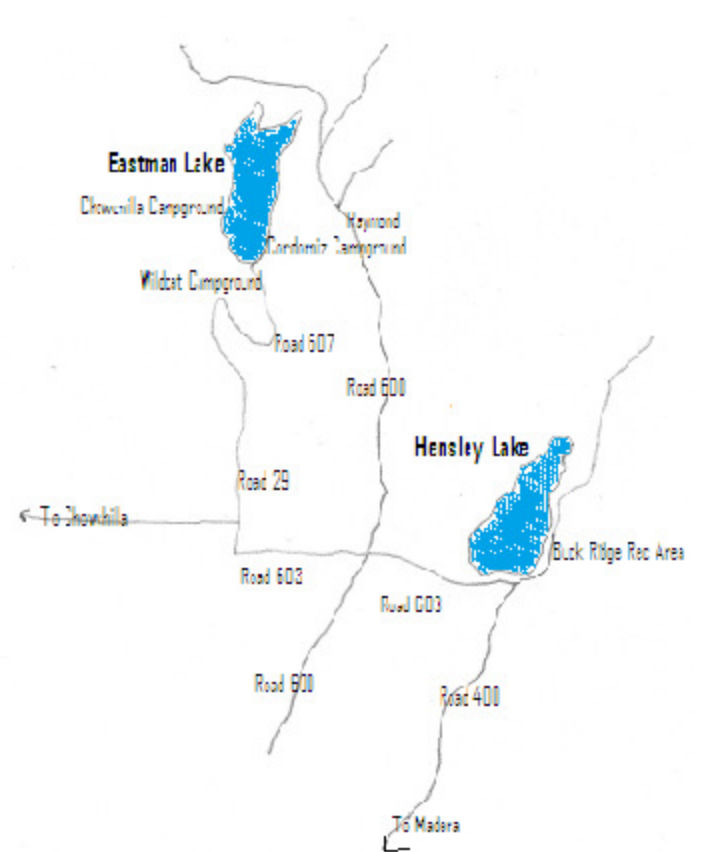
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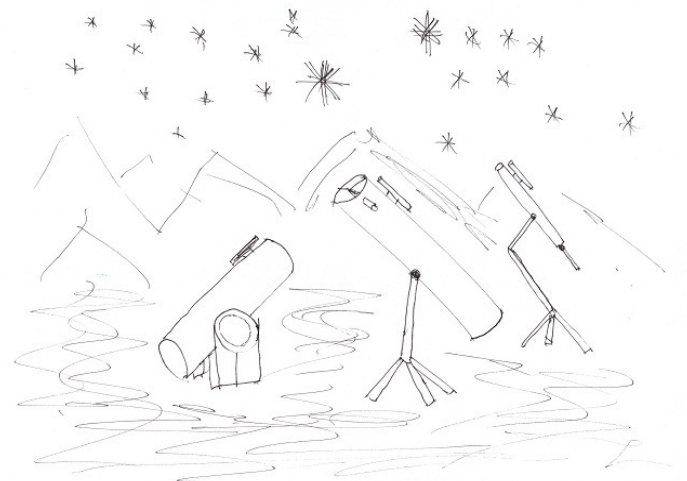
Please submit articles in Microsoft Word format



To Hensley and Eastman Lakes-Star party sites

Telescope Talk

By Parmeter



"There's two stars in the sky that I hadn't noticed before"
"Yes, their names are Challenger and Columbia"