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The Observer

The Newsletter of Central Valley Astronomers of Fresno

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Two beautiful summer-fall
nebulae-M17, the Omega;
and M57, the Ring



Observer Image of the Month (Let's Just Get it Over with and Make it The Image of the Year)

New Horizons' Vision of Pluto Close Up

For that matter, what more can be said? New Horizons' images of Pluto during its closest approach on July electrified the world. Now NH is speeding towards more potential mini-planets far out in the Kuiper Belt.
Image-NSAS/JPL/NH

Astronomy Quote of the Month

He that strives to touch a star
Oft stumbles at a straw

-Edmund Spenser



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The Observer September-October 2015

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A Preface

This month's Profiles in Astronomy is not about a scientist or an engineer or a technical person. It is on a writer, Ray Bradbury, who never earned a college degree, but became one of the most influential voices in planetary exploration and space sciences. As an English teacher, I had my students read his classic book *The Martian Chronicles*, on many occasions. Here, from the story "Ylla," is one of the most beautiful and eloquent passages in modern literature:

"They had a house of crystal pillars on the planet Mars by the edge of an empty sea, and every morning you could see Mrs. K eating the golden fruits that grew from the crystal walls, or cleaning the house with handfuls of magnetic dust, which, taking all the dirt with it, blew away on the hot wind. Afternoons, when the fossil sea was warm and motionless, and the wine trees stood still in the yard, and the little distant Martian bone town was all enclosed, and no one drifted out their doors, you could see Mr. K himself in his room, reading from a metal book with raised hieroglyphs over which he brushed his hand, as one might play a harp. And from the book, as his fingers stroked, a voice sang, a soft ancient voice, which told tales of when the sea was red steam on the shore and ancient men carried clouds of metal insects and electric spiders into battle..."

Why Ray Bradbury never won the Nobel Literature Prize for his writings, I do not know. Actually I do know-the Nobel committee does not consider science fiction-science fantasy to be serious thoughtful literature. It is wrong.



Illustration from Google Images

The Legacy of New Horizons

By Larry Parmeter, *Observer* Editor

A short while ago, just before I starting writing this, I was working on a presentation that I'm giving later in the month dealing with the teen-high school years. Part of it involves the latest neuroscience findings relating to teen brains; not only are they not fully developed, but also, by their very nature, they allow, and even encourage totally irrational behavior and high level risk-taking, sometimes(tragically) with fatal results. Although this has been observed in adolescents for many years, now there's an organic component to support it.



The flip side of this also causes young people, and especially Americans, to be incredibly creative and daring in their idealism. I remember a story told about Steve Jobs, in his early 20s at the time, attending the national computer manufacturers' conference around 1979, demonstrating the newly developed Apple II at it, and telling the audience, "This machine is going to change the world." They laughed at him. He went back to the same conference two years later. They weren't laughing any more. They were desperately trying to keep up with Apple, one of the most successful and innovative companies of the last 50 years. The same could be said of the founders of Google, Facebook, Dell, Cisco, and a dozen others. Young people willing to break the rules and trample over the boundaries. Only in America could that be done. In Europe, in Asia, and elsewhere, no one in his or her right mind would give startup money to a 20 year old, no matter how good the idea is.



I think about this because almost 25 years ago, a group of young people at JPL and Cal Tech had an idea to send a spacecraft to Pluto. Over three and a half billion miles away. Communications signals would take four and a half hours to reach the craft and another four and a half hours to return to Earth. The journey would take anywhere between 10 and 20 years. Too many old pros said, ain't going to happen. Too much can go wrong. Don't waste the money. But the young people, led by a junior scientist named Alan Stern, ignored their elders, as young people generally do, and forged ahead. First they developed the Pluto Kuiper Express(also called the Pluto Fast Flyby) and when it fell through, they came up with New Horizons, the economy model, and pushed it through Congress and NASA. It was built and launched in 2005, and the rest is history. In fact, it's more than history. It's taken away peoples' breaths.

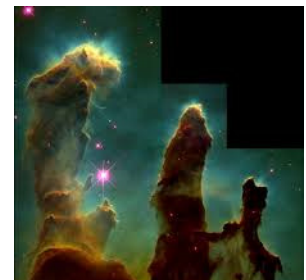


I, like many of my colleagues, was fortunate to grow up and live in the space age, from its beginnings in the 1950s, to the era of ISS today. I wonder how many times we've all felt that thrill. I can name some of them: Shepard's flight, Glenn's flight, Armstrong and Aldrin live from the Moon, Viking landing on Mars, Voyager I passing by Jupiter and Saturn, Columbia's first launch and landing, Voyager again at Uranus and Neptune, Sojourner leaving Sagan Station and trundling across the Martian landscape, Curiosity at Bradbury Landing, and now New Horizons sweeping past Pluto and heading into eternity. These were distinctly American moments, almost all of them created in the imaginations of youngsters.

I realize more and more that America is a nation of teens, who in many ways, refuse to grow up. Adulthood requires caution, rational judgement, resistance, hesitation. Yes, Americans can be petulant, whinny, resentful, and unfortunately, judgmental and violent. But America also grabs the rest of the world and gives it a vision and a future like no nation ever has: personal rights and liberties for all, unlimited opportunity, technology beyond compare, and explorations that stagger the imagination: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and now Pluto. And with Hubble, America has pointed the way to the stars and the universe itself. As The Who sang years ago, the kids have turned out to be alright.

Critics say that the money spent on projects such as New Horizons could be used to solve admittedly serious problems like discrimination and poverty. They miss the point. The voyages of New Horizons and its older siblings have brought the world closer, have made people realize the beauty and uniqueness of Earth, and have given them hope and inspiration. The ethereal image of "Spaceship Earth" floating in the blackness of space, has done more for consciousness building than any political or social movement. The youth and idealism of the space program exemplifies what the United States does best: challenging the unknown, and each of its adventures into the cosmos propels humanity into a higher trajectory, from which it will never retreat.

Only in America.



Notable Events and Dates in September and October

September 1-Pioneer 11 flies past Saturn, the first spacecraft to do so-1979

September 3-Viking 2 lands on Mars-1976

September 7-Labor Day

September 12-Charles Messier begins his famous list of astronomical objects-1758

September 13-Rosh Hashanah begins

September 13-Partial solar eclipse in S. Africa, Indian Ocean, and Antarctica

September 23-Discovery of Neptune by John J. Adams, Urbain LeVerrier, and Johann Galle-1846

September 23-Yom Kippur Begins

September 23(again!)-Fall Equinox

September 28-Lunar eclipse in E. Pacific Ocean, Americas, Europe, Africa, W. Asia

October 1-NASA officially established-1958

October 3-First successful flight of the German V-2 rocket-1942

October 4-Sputnik 1, first artificial satellite, launched-1957

October 7-Luna 3 takes first images of the Moon's far side-1959

October 11-First manned Apollo mission, Apollo 7, launched-1968

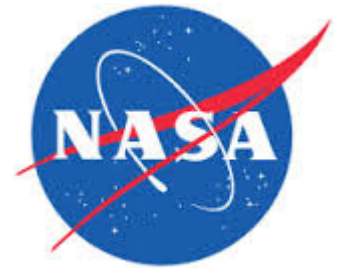
October 12-Columbus Day

October 14-Sound "barrier" broken by Chuck Yeager in the Bell X-1-1947

October 22-Venera 3 takes first images from the surface of Venus-1975

October 24-United Nations Day

October 31-Halloween Night



Profiles in Astronomy

Ray Bradbury 1920-2012

Ray Bradbury was a writer by profession, not an astronomer or even a scientist of any kind. Yet, his impact on astronomy and space sciences was enormous, and countless scientists today cite him as a major influence on their lives and careers.

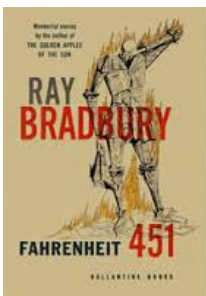
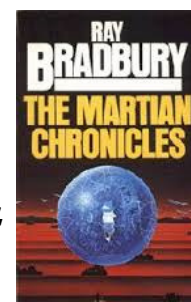
Bradbury was born in 1920 in Waukegan, Illinois, a small Midwestern town that he would later use as a model in several of his stories. When he was 14, his family moved to Los Angeles, his father looking for work during the Great Depression. He would live in LA for the rest of his life (ironically, he never had a car or a driver's license in all the years he lived in LA. He always rode his bicycle or took the bus). There, young Bradbury felt the pull of Hollywood and especially the theater and writing. Determined to become a writer, he published his first story in a pulp science fiction magazine at age 17. Afterwards, his stories began to be published regularly. He never served during World War II due to disabilities, and continued his writing in the 1940s, as well as doing theater and scriptwriting work. By the late 1940s, he was a full-time science fiction-science fantasy writer.

In 1950, Bradbury traveled to New York to try to sell some of his short stories. A publisher there recommended that he take them and expand them into a full length novel. That night, Bradbury wrote short passages connecting a series of stories that he had written about humans going to Mars and colonizing it. When he showed the completed writing to the publisher the next day, it was immediately purchased, and published later that year as *The Martian Chronicles*, which has since become one of the most famous science fiction-fantasy books ever written. In 1953, he wrote and published *Fahrenheit 451*, which was based on a novella, *The Fireman*, that he had written several years earlier. It cemented his reputation, and for the rest of his life, he was a major fixture on the American literary scene. His many other collections of short stories such as *Dandelion Wine*, *Something Wicked This Way Comes*, *R is for Rocket*, and others brought him lasting fame. Many of his stories, such as "The Fog Horn," "The Wonderful Ice Cream Suit," and "A Sound of Thunder" have been made into movies or plays. In all, during a career that spanned almost 75 years, he wrote over 600 short stories, 11 novels, 6 plays, and countless movie and TV scripts..

Bradbury never attended college; instead, he said, he spent much of his time in libraries reading endlessly. At one point, he cited a whole range of literary influences, from Edgar Rice Burroughs and Edgar Allen Poe to John Steinbeck, Robert Heinlein, Edith Wharton, William Shakespeare, John Donne, Thomas Wolfe, Eudora Welty, Robert Frost, Catherine Anne Porter, and Aldous Huxley. Many of his stories take place in "Green Town," a fictionalization of his Illinois hometown, which he saw as the epitome of innocence in Middle America.

Bradbury received numerous awards for his writings, including the National Medal of the Arts, which cited him as "an American Treasure," and a special Pulitzer Prize for *The Martian Chronicles*, only the second time the Pulitzer committee had given such an honor (the first was to Theodore Giesel, aka Dr. Suess). Many astronomers, space scientists, and astronauts have said that Bradbury influenced them to pursue their careers, naming *The Martian Chronicles* and other Bradbury stories as their favorite literary readings. In August 2012, two months after Bradbury's death, when the rover Curiosity landed on Mars, its landing site was designated "Bradbury Landing," and shortly afterwards, the rover Tweeted back to Earth a special tribute to Bradbury.

Source-Wikipedia

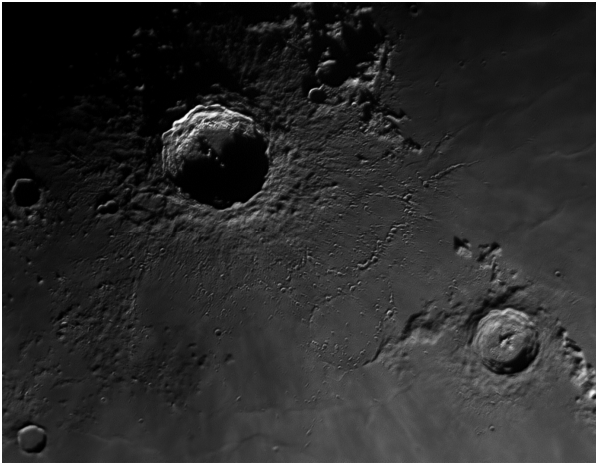


Many people, including my students, have wondered why Bradbury named his well known novel *Fahrenheit 451*, which depicts a society that burns books, and individuals who fight against it. The answer is very simple-451° Fahrenheit is the temperature at which paper burns.

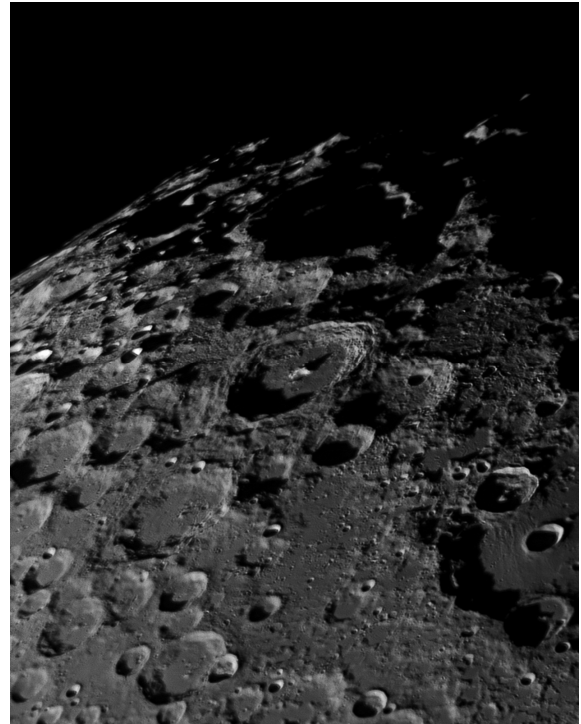


Great Summer Astro Images

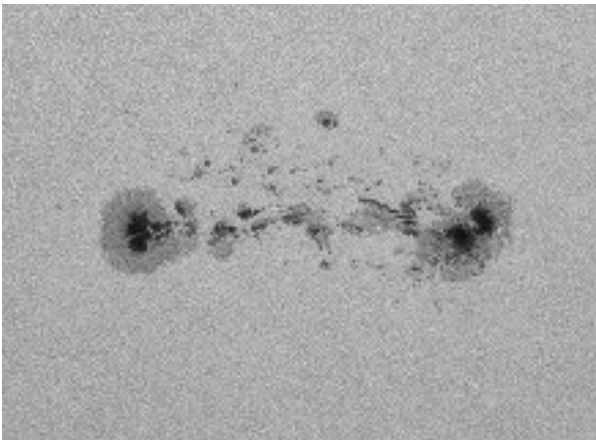
By Chad Quandt



Above-The craters Copernicus and Eratosthenes on the Moon



Right-The Moretus region on the Moon



Above-Sunspot AR2403



Right-M31-the Great Galaxy in Andromeda

**Reminder-CVA's Annual Star-B-Que At Eastman Lake
Saturday, September 12, 2015
Followed by the monthly September Star Party
Visit the CVA website at www.cvaafresno.org for more details**

Gas in Space: Imaging from a Red Zone

by Scott J. Davis

One of my goals this year was completing my project of imaging all 110 Messier objects. Unfortunately, many of the star party weekends this spring and summer have been covered with clouds. Further complicating the matter is the recent fires that are affecting the skies throughout the entire San Joaquin Valley. The arrival of my newborn son has also kept me at home more during the month of August.

Summer, however, is the time for nebulae. The areas of Cygnus and Sagittarius are particularly rich in regions of ionized gas. While the aforementioned challenges prevented me from getting the data I really wanted, it didn't stop me from gathering many hours of narrowband (Hydrogen-Alpha) data from my backyard.

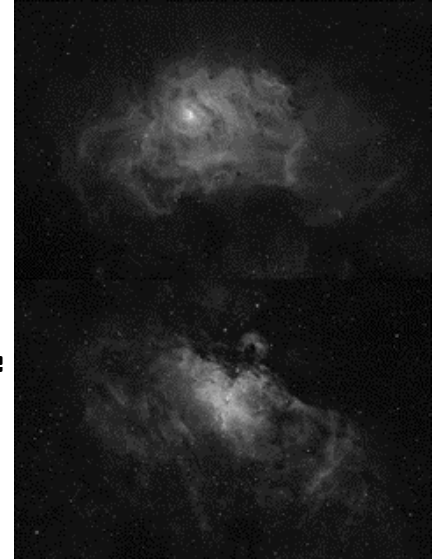
My backyard has some of the worst possible skies – on a normal night, I can only see six out of the seven stars of the Big Dipper, and only three out of the seven of the Little Dipper. The brightest deep sky objects are completely invisible to the naked eye, and the Milky Way is nonexistent. Narrowband filters, however, while not completely unaffected by light pollution, filter out a great percentage of stray light, allowing imaging of gaseous objects. My filters of choice clip in to my Canon DSLR and consist of a 6nm Hydrogen-Alpha filter and 12nm Oxygen-III filter.

The result? Crystal-clear images of some of the most beautiful areas of the sky. The two images at right were shot from my backyard, and each represents approximately 4 hours of data. Eventually, I will be capturing full-color data to combine with the Hydrogen data to create the final images.

Many people believe it is completely impossible to practice amateur astronomy from a red zone. While there are a great many objects that cannot be observed from such a zone, there are some that can. And with the help of narrowband filters, even imaging is possible from some of the worst skies in the country.

It truly is amazing what we amateur astronomers have available to us in today's world. What is even more amazing is what we are able to achieve with the right tools, some time, and a *lot* of patience.

Clear skies, everyone!



CVA Riverpark 2015

Riverpark on July 22-One of the largest crowds ever seen at a Riverpark public starwatch-estimated at well over 1,000 people. 12 telescopes that night, and even they didn't seem to be enough-long lines at every one of them! Pictures by Steve Harness



What's New in Space

NASA announces First Dragon and CST-100 Missions and Crews

On July 10, NASA announced the names of four astronauts who will pilot the first test flights of both the Space-X Dragon V2 and the Boeing CST-100 in 2017. Robert Behnken, Sunita Williams, Eric Boe, and Douglas Hurley will begin training with Space-X and Boeing almost immediately, learning to fly the two different spacecraft. All of them space shuttle veterans, they will be assigned to the first manned flight of one spacecraft or another in late 2016. Space-X has announced that two of them will fly aboard the first Dragon V2 mission in April 2017, and one, along with a Boeing pilot, will be aboard the first flight of the CST-100 in July 2017. Indications are that the Boeing pilot on the first CST flight will probably be Christopher Ferguson, a former NASA astronaut and space shuttle veteran who is now Boeing's director of crew and mission operations for the CST program. NASA may announce more astronaut assignments to Dragon V2 and CST-100 missions by the end of the year.

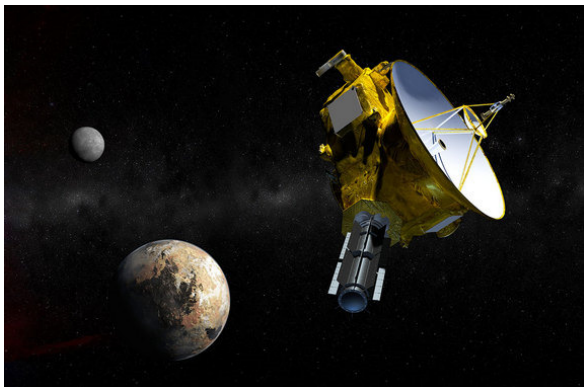
"Space Elevator" Tower Patent Awarded to Canadian Company

Thoth Technology of Ontario, Canada has been awarded a U.S. patent to build a 20 kilometer (12 mile) high "space elevator," where space vehicles can be both launched and land, saving, money and fuel. The structure would rely on inflatable cells which would reach almost 70,000 into the atmosphere, with a flat, aircraft carrier-like launch and landing platform at the top. The advantage to the structure is that it would be able to allow single-stage-to-orbit spacecraft, since the bulk of a rocket's fuel and engines are used only for the first 10-15 mile ascent, to gain altitude and speed. The patent rights center around the guidance and stabilization system that will be used to keep the structure stable and level under adverse atmospheric conditions. The company will first build a 1.5 kilometer (9. mile) high tower as a demonstrator, and then start work on the full 20 km tower. According to the company, the demonstrator tower will take three to five years to complete, and, if all goes well, another three years beyond that for the full 20km tower, so roughly a timeline of about 2023-2025 for the full tower to become operational. The cost estimate is between \$5-7 billion U.S. dollars for both towers. The company did not indicate where the final full tower will be located.



What Now for New Horizons after Pluto?

The overwhelmingly successful flyby on July 14 ended one phase of New Horizon's mission, and may have begun another. Now that Pluto has been investigated, mission scientists and managers are aiming the craft for an even more distant target; in fact, maybe two of them. The primary focus for the spacecraft is now two "dwarf" planet bodies known as 2014MU69 and 2014PN70, both Kuiper Belt objects over a billion miles beyond Pluto. Although a final decision on which one to explore may not be made until early 2016, engineers have said that the best and most efficient time to fire New Horizon's rockets to put it into a new trajectory will be this October, so a decision may be made much quicker. If the go-ahead is given for one of the two, New Horizons will fly by it in mid 2019, and then, depending on the health of the craft and its fuel supply, may go even further and fly by a second BK object in the early 2020s. Mission scientists stress that the two proposed objects are much different from Pluto, not only in size, but also in possible mineral composition, which makes them ideal targets for exploration.



Solar Wind Creates—and Whips—a Magnetic Tail Around Earth

By Ethan Siegel

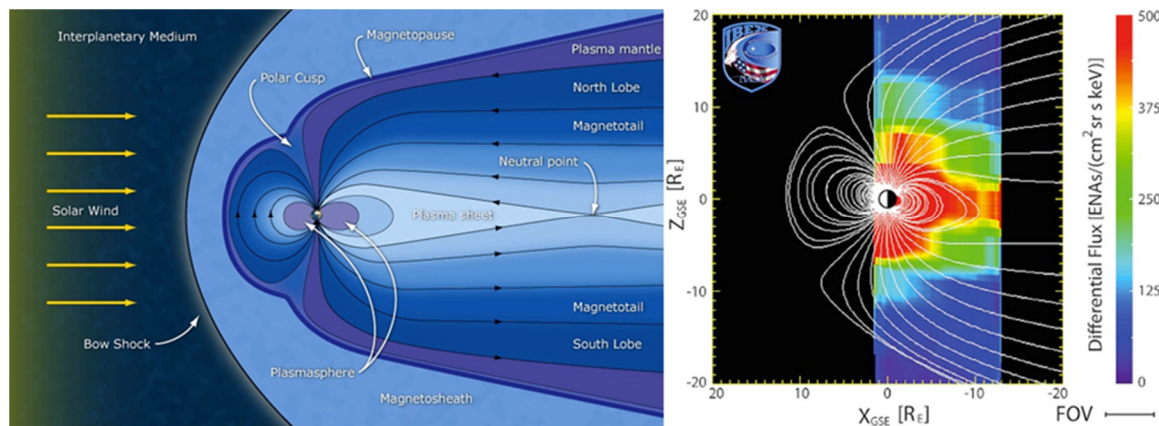
From NASA's *Space Place*

As Earth spins on its axis, our planet's interior spins as well. Deep inside our world, Earth's metal-rich core produces a magnetic field that spans the entire globe, with the magnetic poles offset only slightly from our rotational axis. If you fly up to great distances, well above Earth's surface, you'll find that this magnetic web, called the magnetosphere, is no longer spherical. It not only bends away from the direction of the sun at high altitudes, but it exhibits some very strange features, all thanks to the effects of our parent star.

The sun isn't just the primary source of light and heat for our world; it also emits an intense stream of charged particles, the solar wind, and has its own intense magnetic field that extends much farther into space than our own planet's does. The solar wind travels fast, making the 150 million km (93 million mile) journey to our world in around three days, and is greatly affected by Earth. Under normal circumstances, our world's magnetic field acts like a shield for these particles, bending them out of the way of our planet and protecting plant and animal life from this harmful radiation.

But for every action, there's an equal and opposite reaction: as our magnetosphere bends the solar wind's ions, these particles also distort our magnetosphere, creating a long magnetotail that not only flattens and narrows, but whips back-and-forth in the on-rushing solar wind. The particles are so diffuse that collisions between them practically never occur, but the electromagnetic interactions create waves in Earth's magnetosphere, which grow in magnitude and then transfer energy to other particles. The charged particles travel within the magnetic field toward both poles, and when they hit the ionosphere region of Earth's upper atmosphere, they collide with ions of oxygen and nitrogen causing aurora. Missions such as the European Space Agency and NASA Cluster mission have just led to the first accurate model and understanding of equatorial magnetosonic waves, one such example of the interactions that cause Earth's magnetotail to whip around in the wind like so.

The shape of Earth's magnetic field not only affects aurorae, but can also impact satellite electronics. Understanding its shape and how the magnetosphere interacts with the solar wind can also lead to more accurate predictions of energetic electrons in near-Earth space that can disrupt our technological infrastructure. As our knowledge increases, we may someday be able to reach one of the holy grails of connecting heliophysics to Earth: forecasting and accurately predicting space weather and its effects. Thanks to the Cluster Inner Magnetosphere Campaign, Van Allen Probes, Mars Odyssey Thermal Emission Imaging System, Magnetospheric Multiscale, and Heliophysics System Observatory missions, we're closer to this than ever before.



Article and images courtesy of NASA's *Space Place*, 2015

Number of extra-solar planets found as of August 2015-1,946
How many more are out there-tens of thousands,
hundreds of thousands?

Mt. Lemmon Observatory

Part of an ongoing series about lesser known-but still important-observatories throughout the world

When astronomers hear the name of Tucson, Arizona, they almost automatically think of either Kitt Peak, which is about 60 miles west of the city, or the Angel Mirror Making Lab at the University of Arizona in the downtown area. What escapes the notice of most is a third facility, the Mount Lemmon Observatory, located at the top of its namesake about 30 miles northeast of Tucson.

The Mount Lemmon Observatory actually began as an Air Force radar installation, the Mt. Lemmon Force Station, in 1954. In 1970, The Air Force turned it over to the University of Arizona's Stewart Observatory, although the radar facility continued to be used to track missile launches from White Sands, New Mexico and Vandenberg Air Force Base in California until it was closed in 2003. Over the years, the Stewart Observatory established several telescopes on the mountain, as did other universities and organizations. The location, at 9,100 feet in the dry Arizona climate, has made it ideal for infrared and near infrared studies, and also for finding asteroids and near-Earth objects.

Today, eight telescopes make up the observatory complex. The largest is the 1.52 meter Stewart Observatory Telescope, which is a Cassegrain reflector and is used primarily for the ongoing Catalina Sky Survey. Another 1.52 meter reflector is managed by the University of Minnesota and is used for infrared studies. A 1.02 meter reflector is used by the Catalina Sky Survey to study near-Earth objects. A 1 meter reflector is owned and managed by the Korea Astronomy and Space Science Institute. Four smaller telescopes, three of them owned and managed by the Mt. Lemmon Sky Center, are for various areas of research. A .81 meter Ritchey-Chretien reflector is for public and amateur astronomy use. A .7 meter reflector, run by the Stewart Observatory, is for student research and general observing. A .6 meter Ritchey-Chretien reflector is also used for general observing, and the smallest telescope, .5 meter reflector, is used for near-infrared research.

Source: "Mt. Lemmon Observatory," Wikipedia,



Left-the Mt. Lemmon Observatory layout from the air

Right-the domes of the larger telescopes



Left-The Stewart Observatory sign at the entrance to the observatory

Right-The .81 meter public viewing telescope

