Volume 26 Issue 10

October 2012

The Observer

East Valley Astronomy Club

From the Desk of the President

by David Douglass

As most of you know now, last Thursday evening (the night before the EVAC meeting), I found myself being admitted to Banner Desert Hospital for a serious infection and problem with my foot. As I write this, I am now home, heavily medicated, and recovering from minor surgery. All seems to be healing well. I would like to thank all of the EVAC members for their kind emails, and phone calls.

As you might imagine, that evening, I was scrambling to get coverage for the EVAC meeting. Our VP, Ed Thomas was in California for the PATS show. It was not a hard problem to solve. One phone call to Claude Haynes, and all was set. What a comfort it was to be able to call him, and know that all would be taken care of. Thank you, Claude.

October is the beginning of our good viewing weather. The Antenna Site, west of Phoenix, is one of the remaining quality dark sites left in Arizona. On Oct 12th and 13th, EVAC hosts the All Arizona Star Party. Please plan on attending. Hopefully, the weather will cooperate, and we can all enjoy some quality observing from a premier site, all in good company.

At the October EVAC meeting, we will be opening nominations for officers and board members for 2013. The election will be at the November meeting. All but one of the current officer positions are term limited, and we need new board members. All positions, including the four officers, are open to nomination. Please consider volunteering for one of these posts. EVAC has a long history of volunteers who have served us well. Can you volunteer to run for an office and help EVAC continue to grow and provide a good astronomical program and continued outreach?

It is a busy time. Hopefully, we will all have many opportunities to enjoy our chosen hobby. And the best way to do that, is "keep looking up".

The Backyard Astronomer

History is Over Your Head Tonight

by Bill Dellinges

There are two stars overhead this month that played an important role in determining the distance to the stars.

By the late 1700's, the rough distances to the sun and planets had been determined using Kepler's Third Law of Motion and clever use of triangulation involving parallax measurements of the moon and planets. Now it was time to take on the distance to the stars.

For some time it was known that in theory a star's distance could be determined by measuring its observed shift relative to more distant stars when viewed at opposite points in Earth's orbit. Knowing the angle subtended by a star's parallax and the size of the Earth's orbital diameter (which was known and acted as the base in the equation) one could calculate the distance to that star. The problem was the angle is minute and could not be measured with the crude telescopes of that period.

Continued on page 2

Upcoming Events:

Local Star Party - October 6

Public Star Party - October 12

All-Arizona Star Party - October 12-13

General Meeting - October 19

Check out all of the upcoming club events in the Calendars on page 8

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The Backyard Astronomer

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By the early 1800's, the situation had changed. High quality achromatic refractors and filar micrometers were now being produced. The necessary tools for astrometry required to measure stellar parallax were now available. For some time it was known a few stars had high proper motion, an apparent transverse motion across the sky (as opposed to radial motion, movement to or away from the observer). This suggested they might be closer to us than other stars. If their parallax could be measured, their distance could be determined.

In the 1830's, three astronomers independently took on the challenge. Two of the stars are overhead in October skies – one bright, the other not so much. German – Russian astronomer Friedrich von Struve zeroed in on Vega mainly because it was bright and presumably close (the closer the star, the larger its parallax will be, making it easier to measure).German astronomer Friedrich Bessel chose 61 Cygni, a 5th magnitude star in Cygnus because of its high proper motion. The third target was in the southern hemisphere. Scottish astronomer Thomas Henderson targeted Alpha Centauri from South Africa, because like Struve, its brightness suggested closeness.

In 1838, Bessel announced he had found the parallax of 61 Cygni indicating a distance very close to today's estimated 11.4 light years. Henderson published his distance to Alpha Centauri as 4.3 light years making it the closest star to our solar system (turned out the star is a triple star and its faint 11th magnitude "C" companion is 0.2 light years closer to us than Alpha Centauri). In 1840, Struve found Vega to be 26 light years away. So the verdict was in, even the nearest stars are very, very far away.

Astronomical epilogue: In 1844, the meticulous Bessel was studying the star Sirius to determine its parallax when he observed a noticeable waviness in its motion across the sky. Being a prominent double star discoverer, he inferred there must be an unseen companion orbiting Sirius and affecting its motion. What puzzled him was that if it was massive enough to influence Sirius' motion, why wasn't it visible?

At any rate, he predicted the unseen companion would eventually be discovered.

Fast forward to 1862. The premiere American telescope maker Alvan Clark was testing his new 18" refractor and noticed a dim star very close to Sirius. At first he thought it might be a flaw in the lens, but repeated observations proved otherwise. Bessel's "unseen companion" had been discovered. But how could this small dim star make Sirius, a star twice as massive of the Sun, wobble.

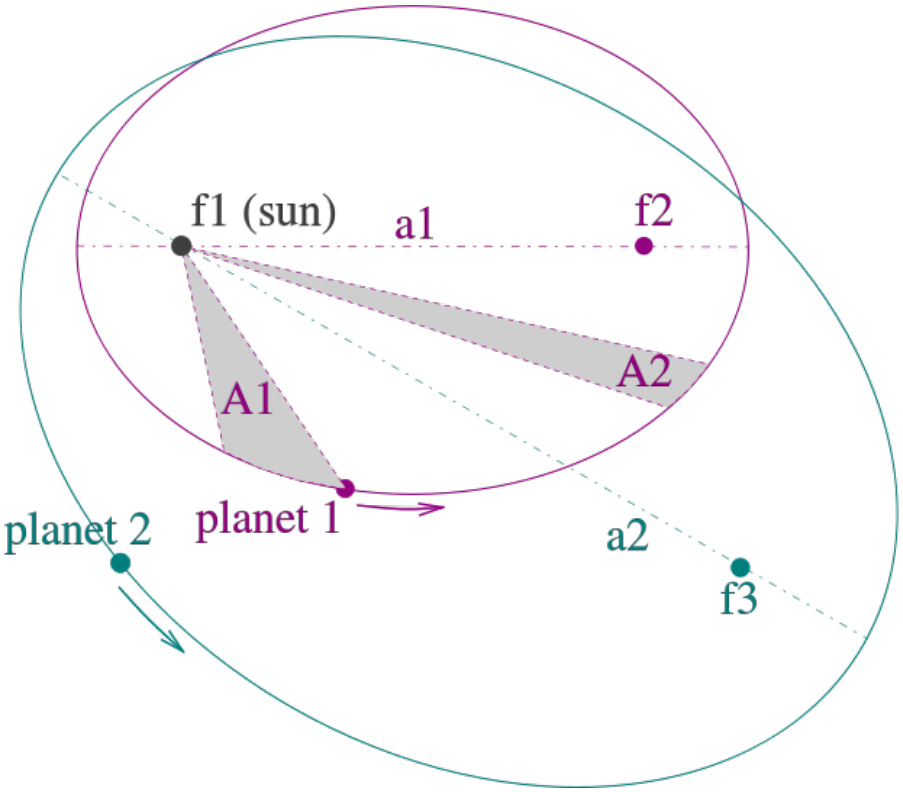


Illustration of Kepler's three laws with two planetary orbits. (1) The orbits are ellipses, with focal points f1 and f2 for the first planet and f1 and f3 for the second planet. The Sun is placed in focal point f1. (2) The two shaded sectors A1 and A2 have the same surface area and the time for planet 1 to cover segment A1 is equal to the time to cover segment A2. (3) The total orbit times for planet 1 and planet 2 have a ratio a13/2 : a23/2.

Fast forward to 1915. Astronomer Walter Sydney Adams took a spectrum of dim Sirius B with the relatively new spectrograph through the Mount Wilson 60" reflector and found Sirius B had a temperature of 10,000 K (vs. 5780K for the Sun)., as hot as Sirius itself. If both stars had the same surface temperature, they should be the same brightness. But the magnitudes of Sirius and its companion are -1.4 and 8.4 respectively. Calculations showed the companion, the so-called "Pup" of the Dog Star Sirius, would have to have the mass of the sun in order to make Sirius wobble to the extent it did. But its dimness indicated it had to be small, about the size of Earth. A cubic inch of such a star would weigh one ton. The first white dwarf (a star that was white hot yet very small) had been discovered. Advances in stellar evolution in the coming decades verified that strange stars like white dwarfs were a common consequence of the death of solar mass stars.

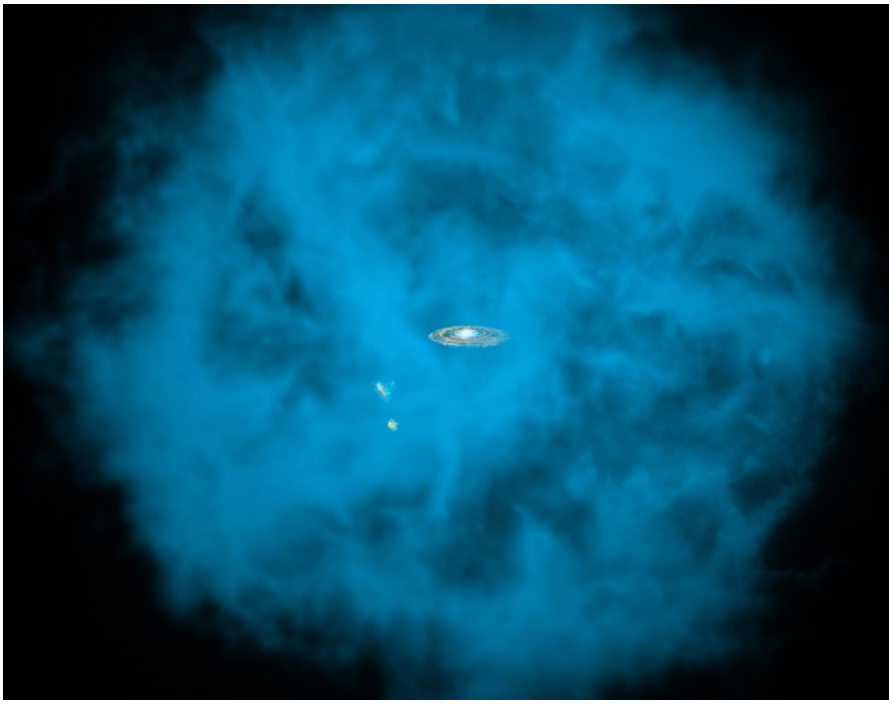
Sirius B's period of revolution around Sirius is 50 years. It's currently about 9" arc seconds from the Dog Star, as seen from Earth, and difficult to detect in amateur equipment due to the glare of the Hound. Maximum separation will be 11.3" in 2020 when 8" and larger telescopes should be able to split the pair – but it won't be easy. Tip: Some observers resort to placing a narrow strip of material across their eyepiece field lens just wide enough to occult the intense glare of Sirius.

NASA'S Chandra Shows Milky Way is Surrounded by Halo of Hot Gas

Astronomers have used NASA's Chandra X-ray Observatory to find evidence our Milky Way Galaxy is embedded in an enormous halo of hot gas that extends for hundreds of thousands of light years. The estimated mass of the halo is comparable to the mass of all the stars in the galaxy.

If the size and mass of this gas halo is confirmed, it also could be an explanation for what is known as the "missing baryon" problem for the galaxy.

Baryons are particles, such as protons and neutrons, that make up more than 99.9 percent of the mass of atoms found in the cosmos. Measurements of extremely distant gas halos and galaxies indicate the baryonic matter present when the universe was only a few billion years old represented about one-sixth the mass and density of the existing unobservable, or dark, matter. In the current epoch, about 10 billion years later, a census of the baryons present in stars and gas in our galaxy and nearby galaxies shows at least half the baryons are unaccounted for.



This artist's illustration shows an enormous halo of hot gas (in blue) around the Milky Way galaxy. Also shown, to the lower left of the Milky Way, are the Small and Large Magellanic Clouds, two small neighboring galaxies. The halo of gas is shown with a radius of about 300,000 light years, although it may extend significantly further.

In a recent study, a team of five astronomers used data from Chandra, the European Space Agency's XMM-Newton space observatory and Japan's Suzaku satellite to set limits on the temperature, extent and mass of the hot gas halo. Chandra observed eight bright X-ray sources located far beyond the galaxy at distances of hundreds of millions of light-years. The data revealed X-rays from these distant sources are absorbed selectively by oxygen ions in the vicinity of the galaxy. The scientists determined the temperature of the absorbing halo is between 1 million and 2.5 million kelvins, or a few hundred times hotter than the surface of the sun.

Other studies have shown that the Milky Way and other galaxies are embedded in warm gas with temperatures between 100,000 and 1 million kelvins. Studies have indicated the presence of a hotter gas with a temperature greater than 1 million kelvins. This new research provides evidence the hot gas halo enveloping the Milky Way is much more massive than the warm gas halo.

"We know the gas is around the galaxy, and we know how hot it is," said Anjali Gupta, lead author of The Astrophysical Journal paper describing the research. "The big question is, how large is the halo, and how massive is it?"

To begin to answer this question, the authors supplemented Chandra data on the amount of absorption produced by the oxygen ions with XMM-Newton and Suzaku data on the X-rays emitted by the gas halo. They concluded that the mass of the gas is equivalent to the mass in more than 10 billion suns, perhaps as large as 60 billion suns.

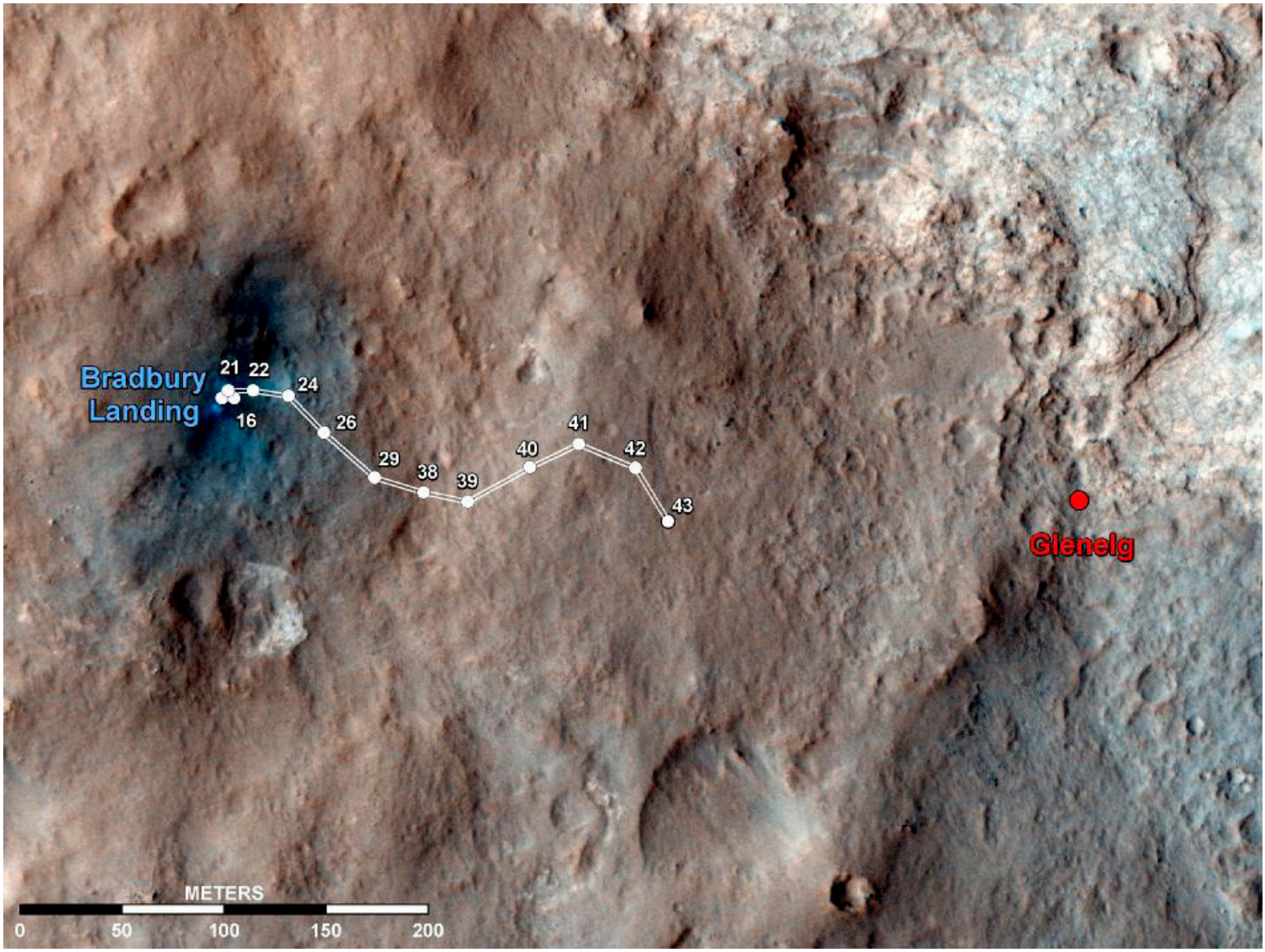
"Our work shows that, for reasonable values of parameters and with reasonable assumptions, the Chandra observations imply a huge reservoir of hot gas around the Milky Way," said co-author Smita Mathur of Ohio State University in Columbus. "It may extend for a few hundred thousand light-years around the Milky Way or it may extend farther into the surrounding local group of galaxies. Either way, its mass appears to be very large."

The estimated mass depends on factors such as the amount of oxygen relative to hydrogen, which is the dominant element in the gas. Nevertheless, the estimation represents an important step in solving the case of the missing baryons, a mystery that has puzzled astronomers for more than a decade.

Although there are uncertainties, the work by Gupta and colleagues provides the best evidence yet that the galaxy's missing baryons have been hiding in a halo of million-kelvin gas that envelopes the galaxy. The estimated density of this halo is so low that similar halos around other galaxies would have escaped detection.

The paper describing these results was published in the Sept. 1 issue of The Astrophysical Journal. Other co-authors were Yair Krongold of Universidad Nacional Autonoma de Mexico in Mexico City; Fabrizio Nicastro of Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass.; and Massimiliano Galeazzi of University of Miami in Coral Gables, Fla.

NASA's Marshall Space Flight Center in Huntsville, Ala., manages the Chandra program for NASA's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory controls Chandra's science and flight operations from Cambridge.



This map shows the route driven by NASA's Mars rover Curiosity through the 43rd Martian day, or sol, of the rover's mission on Mars (Sept. 19, 2012).

The route starts where the rover touched down, a site subsequently named Bradbury Landing. The line extending toward the right (eastward) from Bradbury Landing is the rover's path. Numbering of the dots along the line indicate the sol number of each drive. North is up. The scale bar is 200 meters (656 feet).

By Sol 43, Curiosity had driven at total of about 950 feet (290 meters). The Glenelg area farther east is the mission's first major science destination, selected as likely to offer a good target for Curiosity's first analysis of powder collected by drilling into a rock.

The image used for the map is from an observation of the landing site by the High Resolution Imaging Science Experiment (HiRISE) instrument on NASA's Mars Reconnaissance Orbiter.

Image credit: NASA/JPL-Caltech/Univ. of Arizona

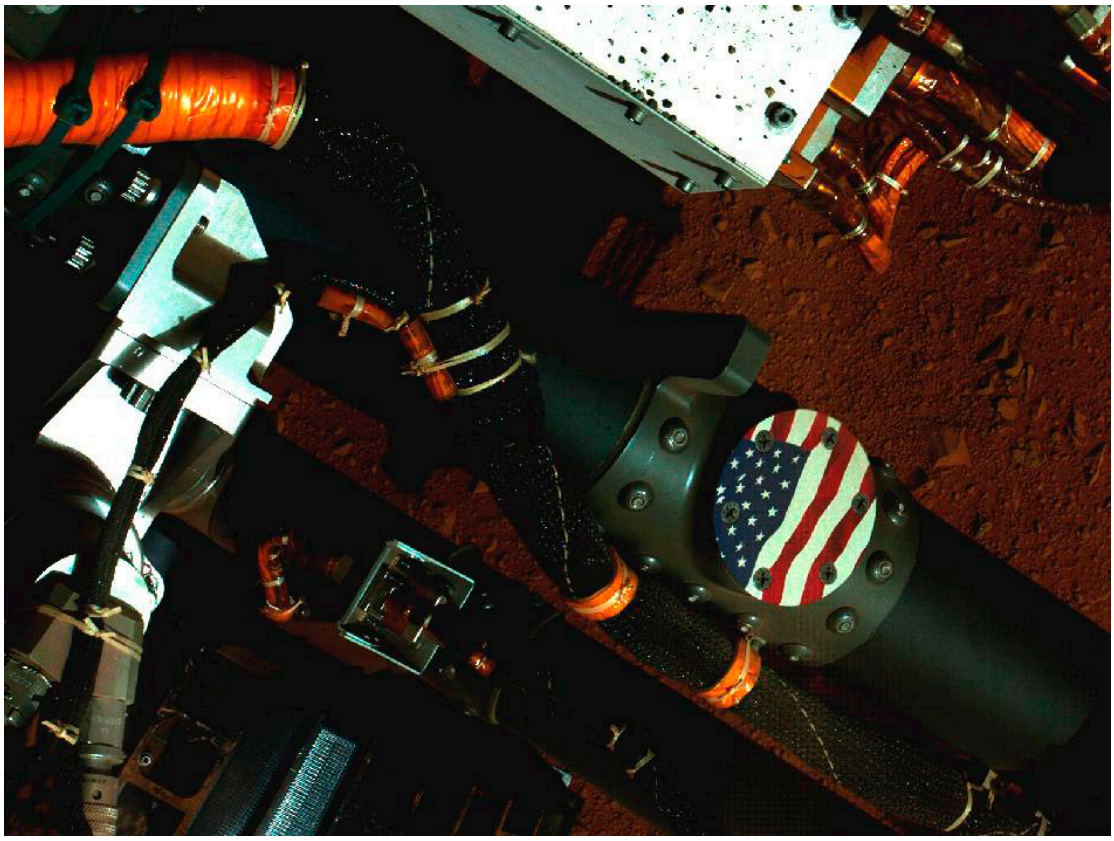
October Guest Speaker: Dr. Sara Walker

Dr. Sara Walker is a NASA Astrobiology Institute Postdoctoral Fellow and Adjunct Faculty in the Beyond Center for Fundamental Concepts in Science at Arizona State University.

She received her Ph.D. in Physics and Astronomy from Dartmouth College. She then worked at Georgia Tech as postdoctoral fellow in the NSF/NASA Center for Chemical Evolution.

Her research focuses on astrobiology, with particular focus on the origins of life both here on Earth and potentially elsewhere.

Sara is also member of the leadership council for the space science research and education nonprofit Blue Marble Space, where she helps to run the SAGAN astrobiology-focused social networking site aimed at connecting scientists with the public.



This view of the American flag medallion on NASA's Mars rover Curiosity was taken by the rover's Mars Hand Lens Imager (MAHLI) during the 44th Martian day, or sol, of Curiosity's work on Mars (Sept. 19, 2012). The flag is one of four "mobility logos" placed on the rover's mobility rocker arms.

Image credit: NASA/JPL-Caltech/ MSSS

◑Last Quarter Moon on October 8 at 00:34

○New Moon on October 15 at 05:03

◑First Quarter Moon on October 21 at 20:32

●Full Moon on October 29 at 12:50

Upcoming Meetings

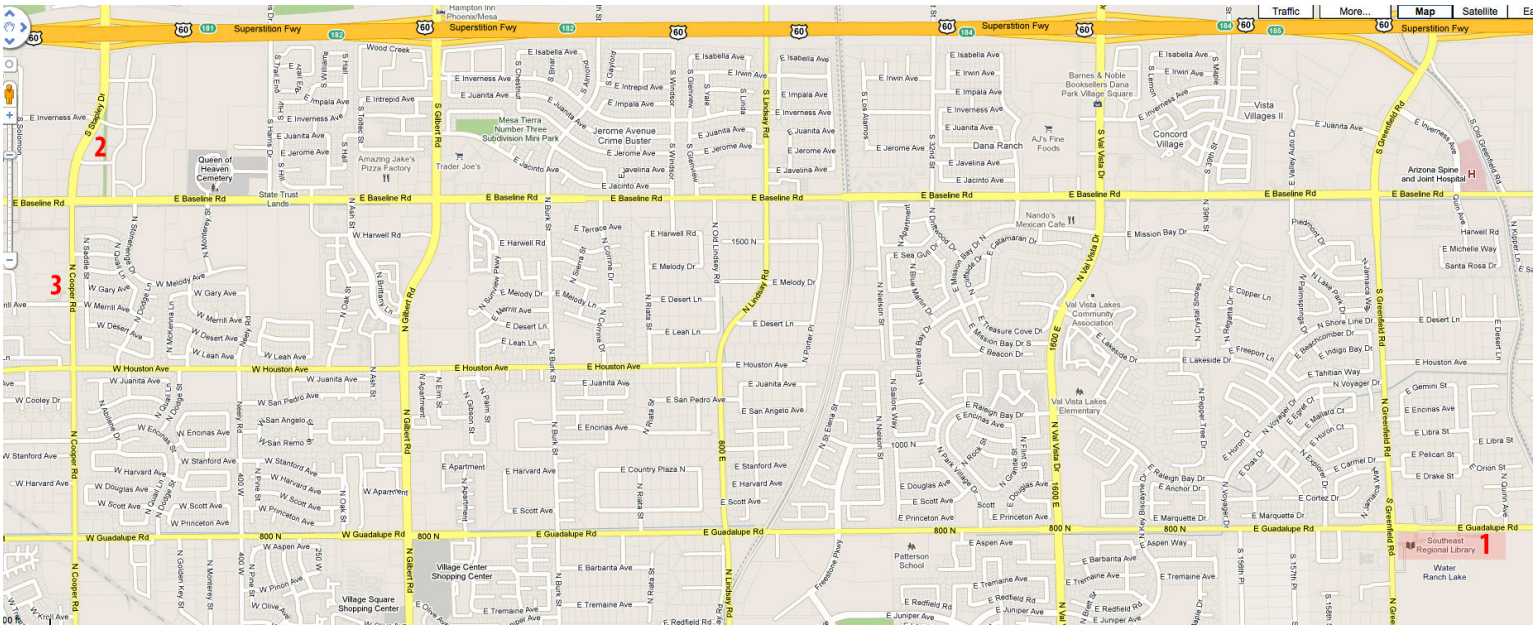
October 19
November 16
December **Holiday Party**
January 18
February 15
March 15

The monthly general meeting is your chance to find out what other club members are up to, learn about upcoming club events and listen to presentations by professional and well-known amateur astronomers.

Our meetings are held on the third Friday of each month at the Southeast Regional Library in Gilbert. The library is located at 775 N. Greenfield Road; on the southeast corner of Greenfield and Guadalupe Roads. Meetings begin at 7:30 pm.

All are welcome to attend the pre-meeting dinner at 5:30 pm. We meet at Old Country Buffet, located at 1855 S. Stapley Drive in Mesa. The restaurant is in the plaza on the northeast corner of Stapley and Baseline Roads, just south of US60.

Visitors are always welcome!



2 **Old Country Buffet**
1855 S. Stapley Drive
Mesa, Az. 85204

Southeast Regional Library
1 **775 N. Greenfield Road**
Gilbert, Az. 85234

October 2012

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3	4	5	**6**
7	8	9	10	11	**12**	**13**
14	15	16	17	18	**19**	20
21	22	23	24	25	**26**	**27**
28	29	30	31			

October 6 - Local Star Party at Boyce Thompson

October 12 - Public Star Party & SkyWatch

October 12-14 - All-Arizona Star Party

October 13 - Deep Sky Observing Night

October 19 - General Meeting at SE Library

October 26 - Franklin Junior High Star Party

October 27 - Sheraton Wild Horse Pass Star Party

November 2012

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1	2	3
4	5	6	7	8	**9**	**10**
11	12	13	14	**15**	**16**	**17**
18	19	20	21	22	23	24
25	26	27	28	**29**	**30**	

November 9 - Public Star Party & SkyWatch at Riparian Preserve

November 10 - Local Star Party at Boyce Thompson

November 15 - Poston Junior High Star Party

November 16 - General Meeting at SE Library

November 17 - Deep Sky Observing Night

November 29 - Kino Junior High Star Party

November 30 - Porter Elementary Star Party

East Valley Astronomy Club -- 2012 Membership Form

Please complete this form and return it to the club Treasurer at the next meeting or mail it to EVAC, PO Box 2202, Mesa, Az, 85214-2202. Please include a check or money order made payable to EVAC for the appropriate amount.

IMPORTANT: All memberships expire on December 31 of each year.

Select one of the following:

☐ New Member ☐ Renewal ☐ Change of Address

New Member Dues (dues are prorated, select according to the month you are joining the club):

☐ **$30.00 Individual** January through March

☐ **$35.00 Family** January through March

☐ **$15.00 Individual** July through September

☐ **$17.50 Family** July through September

☐ **$22.50 Individual** April through June

☐ **$26.25 Family** April through June

☐ **$37.50 Individual** October through December

☐ **$43.75 Family** October through December

Includes dues for the following year

Renewal (current members only):

☐ **$30.00 Individual** ☐ **$35.00 Family**

Name Badges:

☐ **$10.00** Each (including postage) Quantity: _____

Name to imprint: _____

Total amount enclosed: _____

Please make check or money order payable to EVAC

☐ Payment was remitted separately using PayPal ☐ Payment was remitted separately using my financial institution's online bill payment feature

Name: _____ Phone: _____

Address: _____ Email: _____

☐ Publish email address on website

City, State, Zip: _____ URL: _____

How would you like to receive your monthly newsletter? (choose one option):

☐ Electronic delivery (PDF) *Included with membership* ☐ US Mail **Please add $10 to the total payment**

Areas of Interest (check all that apply):

☐ General Observing ☐ Cosmology

☐ Lunar Observing ☐ Telescope Making

☐ Planetary Observing ☐ Astrophotography

☐ Deep Sky Observing ☐ Other

Please describe your astronomy equipment:

Would you be interested in attending a beginner's workshop? ☐ Yes ☐ No

How did you discover East Valley Astronomy Club? _____

PO Box 2202
Mesa, AZ 85214-2202
www.evaconline.org

All members are required to have a liability release form (waiver) on file. Please complete one and forward to the Treasurer with your membership application or renewal.

Liability Release Form

In consideration of attending any publicized Star Party hosted by the East Valley Astronomy Club (hereinafter referred to as "EVAC") I hereby affirm that I and my family agree to hold EVAC harmless from any claims, liabilities, losses, demands, causes of action, suits and expenses (including attorney fees), which may directly or indirectly be connected to EVAC and/or my presence on the premises of any EVAC Star Party and related areas.

I further agree to indemnify any party indicated above should such party suffer any claims, liabilities, losses, demands, causes of action, suits and expenses (including attorney fees), caused directly or indirectly by my negligent or intentional acts, or failure to act, or if such acts or failures to act are directly or indirectly caused by any person in my family or associates while participating in an EVAC Star Party.

My signature upon this form also indicates agreement and acceptance on behalf of all minor children (under 18 years of age) under my care in attendance.

EVAC only recognizes those who are members or invitees and who also have a signed Liability Release Form on file as participants at an EVAC Star Party.

Please print name here ***Date***

Please sign name here

PO Box 2202
Mesa, AZ 85214-2202
www.eastvalleyastronomy.org

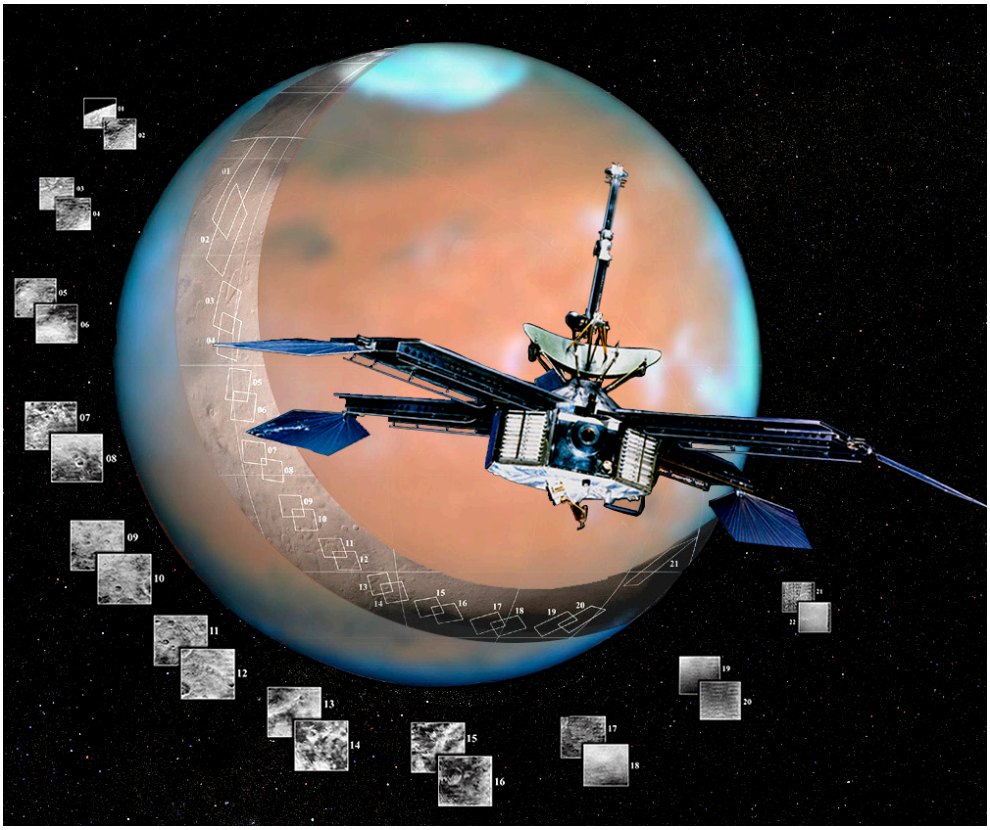
Doing Science With a Spacecraft's Signal

by David Doody

Mariner 2 to Venus, the first interplanetary flight, was launched August 27 fifty years ago. This was a time when scientists were first learning that Venus might not harbor jungles under its thick atmosphere after all. A Russian scientist had discovered that atmosphere during the rare Venus transit of 1761, because of the effects of sunlight from behind.

Mariner 2 proved interplanetary flight was possible, and our ability to take close-up images of other planets would be richly rewarding in scientific return. But it also meant we could use the spacecraft itself as a "light" source, planting it behind an object of our choosing and making direct measurements.

Mariner 4 did the first occultation experiment of this sort when it passed behind Mars as seen from Earth in July 1965. But, instead of visible light from the Sun, this occultation experiment used the spacecraft's approximately 2-GHz radio signal.



In this poster art of Mariner 4, you can see the parabolic reflector atop the spacecraft bus. Like the reflector inside a flashlight, it sends a beam of electromagnetic energy in a particular direction. Credit: NASA/JPL/ Corby Waste.

The Mariner 4 experiment revealed Mars' thin atmosphere. Since then, successful radio science occultation experiments have been conducted at every planet and many large moons. And another one is on schedule to investigate Pluto and its companion Charon, when the New Horizons spacecraft flies by in July 2015. Also, during that flyby, a different kind of radio science experiment will investigate the gravitational field.

The most recent radio science occultation experiment took place September 2, 2012, when the Cassini spacecraft carried its three transmitters behind Saturn. These three different frequencies are all kept precisely "in tune" with one another, based on a reference frequency sent from Earth. Compared to observations of the free space for calibration just before ingress to occultation, the experiment makes it possible to tease out a wide variety of components in Saturn's ionosphere and atmosphere.

Occultation experiments comprise only one of many categories of radio science experiments. Others include tests of General Relativity, studying the solar corona, mapping gravity fields, determining mass, and more. They all rely on NASA's Deep Space Network to capture the signals, which are then archived and studied.

Find out more about spacecraft science experiments in "Basics of Space Flight," a website and book by this author, http://www2.jpl.nasa.gov/basics. Kids can learn all about NASA's Deep Space Network by playing the "Uplink-Downlink" game at http://spaceplace.nasa.gov/dsn-game.

If It's Clear...

by Fulton Wright, Jr.
Prescott Astronomy Club

October 2012

Celestial events (from Sky & Telescope magazine, Astronomy magazine, and anywhere else I can find information) customized for Prescott, Arizona. Remember, the Moon is ½ degree or 30 arcminutes in diameter. All times are Mountain Standard Time.

On Wednesday, October 3, in the early morning, you can see Venus and Regulus within 1/4 degree of each other. They are closest when they rise at 3:14 AM. Twilight interferes about 5:30 AM.

On Sunday, October 7, the Moon is at last quarter phase and rises at 11:31 PM.

On the night of Friday, October 12, you can watch 2 of Jupiter's satellites play hide and seek in the planets shadow. From 1:21 AM (Saturday) to 3:40 AM, Ganymede is hiding in Jupiter's shadow. At 4:21 AM Io disappears in Jupiter's shadow. Io goes behind Jupiter before it emerges from the planet's shadow. Ganymede goes behind Jupiter at 6:05 AM, just as morning twilight interferes.

On Sunday, October 14, it is new Moon and you have all night to hunt for faint fuzzies.

On Thursday, October 18, about 6:45 PM, you might want to checkout the Moon, a planet and a star near each other. Lowest in the southwest you will find the red star, Antares; above and to the right, the red planet, Mars; up and to the left, the crescent Moon. The red star and planet will be near each other for a few nights, while the Moon moves higher in the sky each night.

On Sunday, October 21, at 11:49 PM, the first quarter Moon sets.

On Monday, October 22, you have a chance to see the Moon occult the globular cluster, M72. The northern part of the dark limb begins to cover the cluster about 8:40 PM. By 9:00 PM the cluster is pretty much covered. Around 9:25 PM the cluster starts to emerge from the bright limb of the Moon. By 9:40 PM the motion of the Moon has revealed the cluster. This will not be an easy observation. The cluster is magnitude 9 and the Moon is magnitude -10. That 19 magnitude difference means that the Moon is 36 million times brighter (however, spread over a much bigger area.) A big telescope and high power will help.

On Tuesday, October 23, at 8:09 PM, Jupiter rises with Ganymede's shadow on the planet. At 9:41 PM the shadow leaves. At 10:21 PM Io emerges from behind the planet. At 11:31 PM Ganymede moves in front of the planet. At 1:17 AM (Wednesday) Ganymede moves from in front of the planet.

On Monday, October 29, at 5:35 PM (4 minutes before sunset), the full Moon rises, spoiling any chance of seeing faint fuzzies for the whole night.

On the night of Tuesday, October 30, you have a fairly rare chance to see an entire transit of Ganymede. Here is the schedule:
11:41 PM Ganymede's shadow falls on Jupiter.
(12:07 AM Io appears from behind Jupiter.)
1:40 AM Ganymede's shadow leaves Jupiter.
2:57 AM Ganymede moves in front of Jupiter.
4:43 AM Ganymede moves from in front of Jupiter.

Looking for that perfect weekend activity?

Why not resolve to getting involved?

Contact Dave Coshow to join the staff at GRCO

Email: grco@evaconline.org

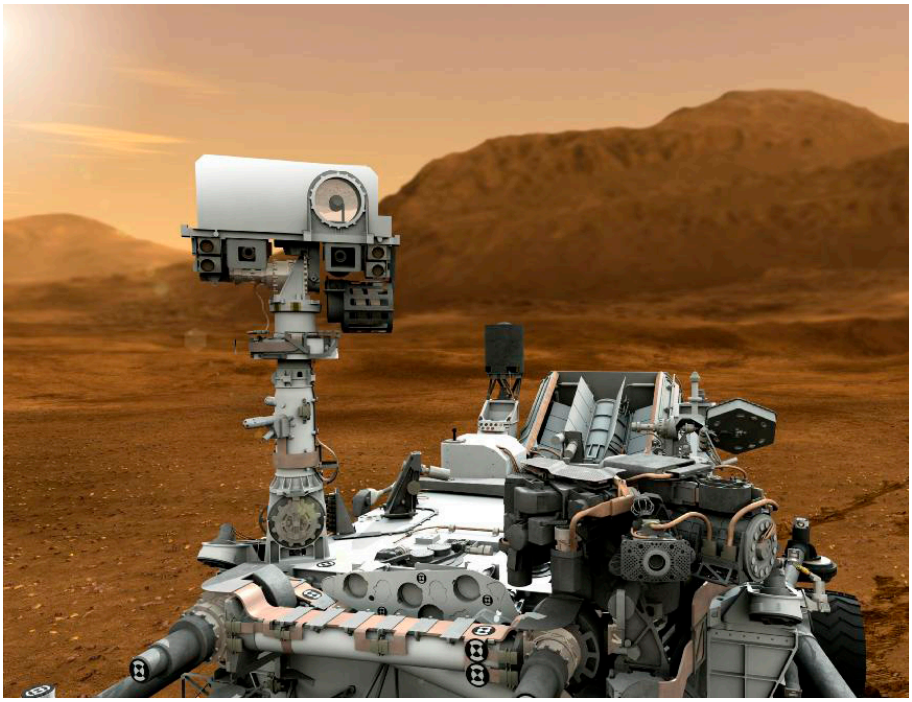
Curiosity Mission Overview

The Mars Science Laboratory spacecraft launched from Cape Canaveral Air Force Station, Florida, on Nov. 26, 2011.

Mars rover Curiosity landed successfully on the floor of Gale Crater on Aug. 6, 2012, Universal Time (evening of Aug. 5, Pacific Time).

Engineers designed the spacecraft to steer itself during descent through Mars' atmosphere with a series of S-curve maneuvers similar to those used by astronauts piloting NASA space shuttles.

During the three minutes before touchdown, the spacecraft slowed its descent with a parachute, then used retrorockets mounted around the rim of an upper stage. In the final seconds, the upper stage acted as a sky crane, lowering the upright rover on a tether to the surface.



This artist concept features NASA's Mars Science Laboratory Curiosity rover, a mobile robot for investigating Mars' past or present ability to sustain microbial life. In this picture, the mast, or rover's "head," rises to about 2.1 meters (6.9 feet) above ground level. This mast supports two remote-sensing instruments: the Mast Camera, or "eyes," for stereo color viewing of surrounding terrain and material collected by the arm; and, the ChemCam instrument, which is a laser that vaporizes material from rocks up to about 9 meters (30 feet) away and determines what elements the rocks are made of. Image credit: NASA/JPL-Caltech

Curiosity is about twice as long (about 3 meters or 10 feet) and five times as heavy as NASA's twin Mars Exploration Rovers, Spirit and Opportunity, launched in 2003. It inherited many design elements from them, including six-wheel drive, a rocker-bogie suspension system and cameras mounted on a mast to help the mission's team on Earth select exploration targets and driving routes. Unlike earlier rovers, Curiosity carries equipment to gather samples of rocks and soil, process them and distribute them to onboard test chambers inside analytical instruments.

NASA's Jet Propulsion Laboratory (JPL), Pasadena, Calif., builder of the Mars Science Laboratory, engineered Curiosity to roll over obstacles up to 65 centimeters (25 inches) high and to travel up to about 200 meters (660 feet) per day on Martian terrain.

The rover's electrical power is supplied by a U.S. Department of Energy radioisotope power generator. The multimission radioisotope thermoelectric generator produces electricity from the heat of plutonium-238's radioactive decay. This long-lived power supply gives the mission an operating lifespan on Mars' surface of a full Mars year (687 Earth days) or more. At launch, the generator provided about 110 watts of electrical power to operate the rover's instruments, robotic arm, wheels, computers and radio.

Warm fluids heated by the generator's excess heat are plumbed throughout the rover to keep electronics and other systems at acceptable operating temperatures.

The mission uses radio relays via Mars orbiters as the principal means of communication between Curiosity and the Deep Space Network of antennas on Earth.

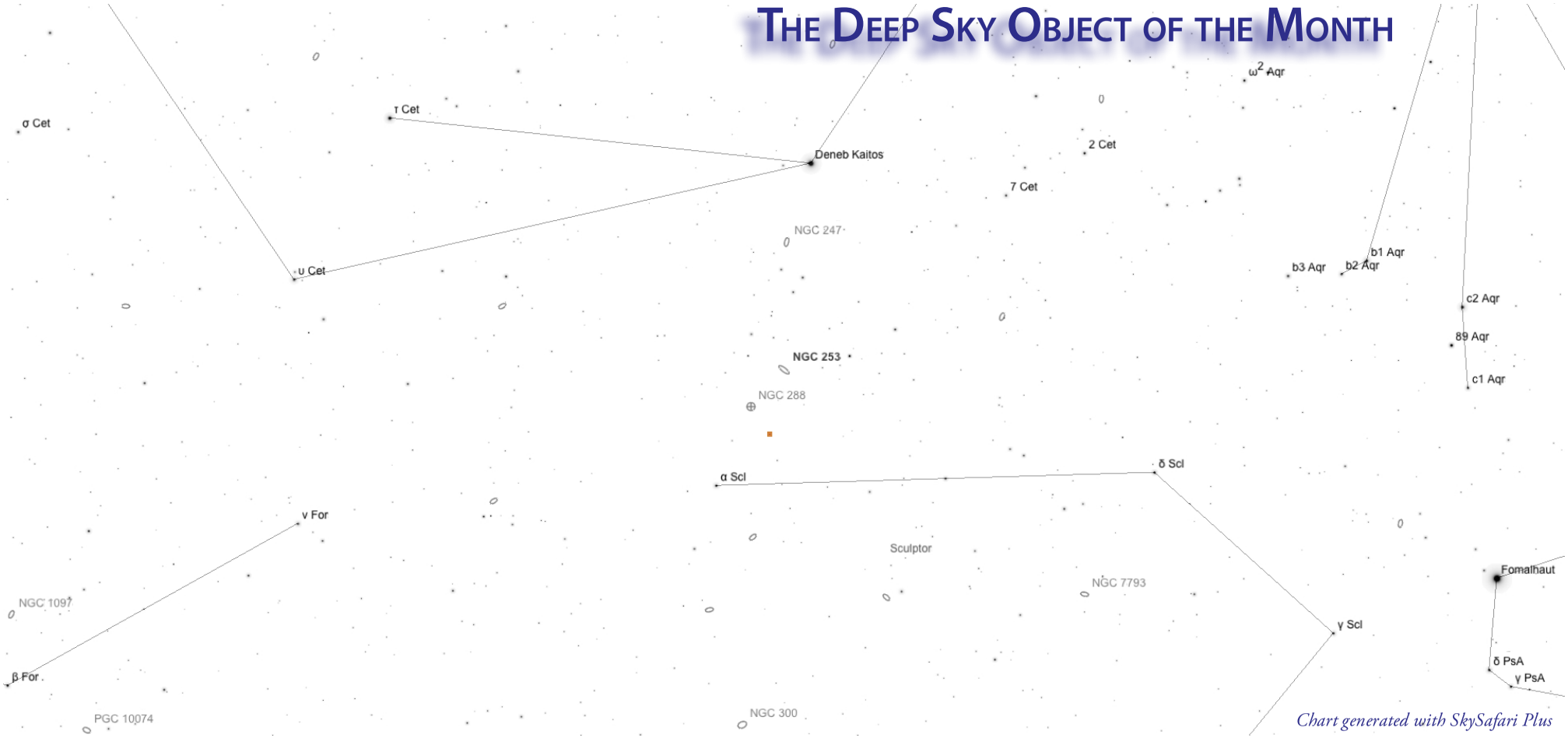
The overarching science goal of the mission is to assess whether the landing area has ever had or still has environmental conditions favorable to microbial life, both its habitability and its preservation.

Curiosity landed near the foot of a layered mountain inside Gale Crater. Layers of this mountain contain minerals that form in water and may also preserve organics, the chemical building blocks of life. The portion of the crater floor where Curiosity landed has an alluvial fan likely formed by water-carried sediments. Selection of Gale Crater followed consideration of more than 30 Martian locations by more than 100 scientists participating in a series of open workshops.

Selection of a landing site of prime scientific interest benefited from examining candidate sites with NASA's Mars Reconnaissance Orbiter since 2006, from earlier orbiters' observations, and from a capability of landing within a target area only about 20 kilometers (12 miles) long. That precision, about a five-fold improvement on earlier Mars landings, makes feasible sites that would otherwise be excluded for encompassing nearby unsuitable terrain. The Gale Crater landing site is so close to the crater wall that it would not have been considered safe if the mission were not using this improved precision.

Advancing the technologies for precision landing of a heavy payload yields research benefits beyond the returns from Mars Science Laboratory itself. Those same capabilities would be important for later missions, both to pick up rocks on Mars and bring them back to Earth and to conduct extensive surface exploration for Martian life.

The Deep Sky Object of the Month



NGC 253 is the brightest member of the Sculptor Group of galaxies and is often referred to as the Sculptor Galaxy, but the RASC Observer's Handbook gives the common name Silver Coin Galaxy.

NGC 253 was one of the major discoveries of Caroline Herschel, the sister of William Herschel. She discovered this object on September 23, 1783 with "an excellent small Newtonian Sweeper of 27 inches focal length and a power of 30" (William Herschel's description), and added it to her list as No. 10. William Herschel later included it in his catalog as No. V.1.

As one of the brightest galaxies in the sky (visual magnitude 8.0), the Sculptor Galaxy is viewable through binoculars. It is a good target for observation with a telescope with a 300 mm diameter or larger. As seen through such telescopes, it appears as a galaxy with a long, oval bulge and a mottled disk.

Visually, NGC 253 is an impressive sight in larger instruments. Its huge envelope is an elongated 25′ x 7′, and its disk shows complex dust lanes north of the core.

In 1961, Allan Sandage wrote in the Hubble Atlas of Galaxies that the Sculptor Galaxy is "the prototype example of a special subgroup of Sc systems... galaxies of the group are dominated by the dust pattern. Dust lanes and patches of great complexity..."

NGC 253 itself lies some 10 million light years distant. NGC 253's true size is estimated to be 70,000 light years, comparable to the diameter of the Milky Way. But NGC 253 has a luminosity considerably less than the Milky Way's. One supernova has been discovered in NGC 253 to date: SN 1940E (Fritz Zwicky).

NGC 253 (Sculptor Galaxy) Spiral Galaxy in Sculptor

RA: 00h 48m 13.95s Dec: -25° 12′ 43.0″ Size: 29.0′ x 6.8′ Magnitude: 7.19

NGC 253 Sculptor Galaxy

Photograph courtesy of Jon Christensen

NGC 253
Sculptor
October 27, 2005
12.5 inch RCOS RC at F/9
SBIG STL 11000 Camera
120 Minutes Luminance; R30, G25, B30

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