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1. Editor Greetings!

Welcome to the Cowichan Valley StarFinders Astronomy Club's "Clear Skies" monthly newsletter.

Hey, did any one go out in the wee hours to see the lunar eclipse? And most importantly, did you take pictures? If so, let us know.

Our "winter social" is coming up soon on Dec 15th, its always a great time, having a good meal with friends just before all h#!** breaks loose and the rush begins. Bryon and I just never seem to learn....each year we vow to get things done earlier and each year we are still stuck running around in circles....and we're not talking crop circles either. OOPs I've digressed.....back to our socials. At our November Social we watched Part 1 of a 2 Part series called "longitude". Pretty good vid, although we need to make a date for part 2 before I forget Part 1. Let's discuss at the "winter gathering".

December's Sky this Month is jammed packed with events. First of all there are 2 meteor showers: First are the Geminids on the 13th -14th. Unfortunately, the Moon will still appear about 85 percent lit so you will only see the very bright meteors. Secondly, the Ursid's on the 22nd -23rd. The last showers of the year. This year they should prove the better of the two as the New Moon won't hinder the view. Then we have the Solstice arriving on the 22nd, the longest night of the year. And finally the big kawoonah Christmas. Have a wonderful holiday everyone and remember, Astronomy is looking up!

Many thanks to this month's contributors Moe R and Bryon T.

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2. Socials

Socials are held on the 4th Wednesday of each month (except for July and August) at the home of Bryon and Freda.

Click on the [Map](#) or follow these directions:

Island Hwy, Mill Bay

Turn on Frayne Rd towards ocean (Serious Coffee is on the corner)

Turn right on Huckleberry Rd

4th house on the left across from Springbank road and Mail boxes.

Look for the STAR sign

Please park on Huckleberry or Springbank Rd's.

Call Brian 743-6633 if you need directions

Our next Social will be held at **6:30** on **THURSDAY December 15th**
Feature: ""Winter Social Gathering" at Good Company Steakhouse, 270 Trans Canada Hwy, Duncan, 250 748 1212.

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Social Highlights Nov 23rd/11

By Bryon Thompson

Our president thought this may be a great time to watch a movie called "Longitude". The movie tended to be quiet long and therefore we only got through "Part 1" of the movie. We will need to set up a date to watch "part 2" soon before we forget the story. For those of us who already forgot; here's the movie overview:

It is based on an 18th century clock maker named Jon Harrison (Gambon) begins what is to become a forty-year task to invent a system for determining longitude at sea with a nautical timepiece. Meanwhile, 200 years in the future, naval officer Rupert Gould (Irons) discovers Harrison's neglected chronometers and sets out to restore them. A high seas saga of passion, determination, and discovery presented by A&E and based on the novel by Dava Sobel.

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3. Upcoming Events



Every Saturdays & Wednesdays* 1:00-1:30 PM, CHLY 101.7 FM

Not Rocket Science (NRS) is a thirty minute weekly radio show about the science of everything and everything science. Dial them up or listen to past podcasts at <http://chly.dailysplice.com/notrocketscience/>

Dec 3 – 6:00pm – 8:30pm Out in Outer Space at Juan de Fuca Pool, Juan de Fuca Recreation Centre, 1767 Old Island Highway, Victoria
Put on your space helmet and join in the fun. Each planet has its own station with games and activities. Slide down the space ship slide, jump over the moon, find little green men, win prizes, and have fun. Regular admission rates.

Dec 8 - 10:00am - 6:00pm, Discover Tectoria 2011 at the Crystal Garden in Victoria. Admission: \$20.00 or Keep your eyes out for free ticket cut-outs in the Times Colonist and through your local technology companies. the biggest tech event in the city! A Showcase of Greater Victoria's #1 Sector. Website info: <http://www.mistic.bc.ca/index.php?page=36>

Dec 8 - 7:00pm - 9:00pm, Christmas Social & Fundraiser Includes food, socializing and musical entertainment by Randy Krall. Cost is \$20 per person. The food will be pizza, salads, desserts and soft drinks. Vegetarian choices will also be available. You MUST RSVP and pay for your ticket no later than the Nov 24 meeting. Nanaimo Astronomy Club Location: Beban Social Complex Street: 2300 Bowen Road City/Town: Nanaimo For more info: <http://www.nanaimoastronomy.com/>

Dec 27-30 - 9:00pm -4:00pm, Mad About Science at St. Michael's University, Victoria.
Are you MAD about science? Are you CRAZY for bugs and insects? Are you WILD about animals and sea creatures? Are you a FAN of space and robots? Are you FASCINATED by experiments and explosions?. Age Range 5 – 7 Cost: 4 / \$ 150. Website info: <http://www.childsplay101.com/listing.php>

Dec 8 – 6:30pm, Winter Social Gathering Come join club members for supper and great conversation at the Good Company Steakhouse, 270 Trans Canada Hwy, Duncan, 250 748 1212

Sept – Dec 31st – 4:00pm – 5:00pm Girls in Science Led by CAGIS. the group is geared for girls ages 7-16, and will include one meeting per month with professionals in Science, Engineering and Mathematics. Registration: Canadian Association of Girls in Science 250-686-6917 Registration Link cagisvictoria@gmail.com

South Pacific Eclipse Cruise Nov 2-22, 2012 - Honolulu, Hawaii to Sydney, Australia - observe the 2012 eclipse from the deck of the Celebrity Millennium. Please Contact Sandy Campbell of Expedia CruiseShipCenters by [email](#) or by telephone 250-477-4877 or 250-588-1276 for more details.

NASA Launches credit NASA.Com:

Date: December (U/R)

Mission: SpaceX

Launch Vehicle: Falcon 9/Dragon

Launch Site: Cape Canaveral Air Force Station, Fla.

Launch Pad: Space Launch Complex 40

Description: NASA is working with SpaceX to combine its last two demonstration flights. If approved, the Falcon 9 rocket would launch the Dragon capsule to the International Space Station for a docking.

Date: Dec. 21 +

Assembly Flight: 29S

Mission: Expedition 30/31

Launch Vehicle: Soyuz TMA-03M

Launch Site: Baikonur Cosmodrome, Kazakhstan

Description: Soyuz TMA-03M will carry three Expedition 30/31 crew members to the International Space Station.

Date: December +

Mission: Orbital Sciences Corporation

Launch Vehicle: Taurus II

Launch Site: Wallops Flight Facility

Launch Pad: OA

Description: The Taurus II is scheduled for a test flight under NASA's Commercial Orbital Transportation Services agreement with the company.

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4. This Month In Exploration

Courtesy of: NASA History Program Office

110 Years Ago – 1906

December 30: Sergey Korolev born, Zhitomir, Ukraine USSR.

65 Years Ago -- 1946

December 17: First night firing in the U.S. of a V-2. Missile No. 17 launched from the White Sands Missile Range, NM.

45 Years Ago – 1966

December 7: ATS 1 launched by Atlas Agena, 9:12 p.m., EST, Cape Canaveral, Fla.

December 14: Biosatellite 1 launched by Delta, 2:20 p.m., EST, Cape Canaveral, Fla.

December 22: First HL-10 glide flight, Bruce Peterson pilot, DFRF, CA.

40 Years Ago – 1971

December 2: USSR Mars 3 lands on Mars, launched May 28, 1971. First unmanned landing on Mars.

December 19: Intelsat 4 F-3 launched by Atlas Centaur, 8:10 p.m., EST, Cape Canaveral, Fla..

30 Years Ago – 1981

December 15: Intelsat 5D F-3 launched by Atlas Centaur, 6:35 p.m., EST, Cape Canaveral, Fla.

25 Years Ago -- 1986

December 4: Fleetsatcom 7 launched by Atlas G Centaur, 9:30 p.m., EST, Cape Canaveral, Fla.

15 Years Ago – 1996

December 4: Mars Pathfinder launched aboard a Delta II 7925 launch vehicle from Cape Canaveral Air Station. Landed on Mars on July 4, 1997.

December 24: Bion 11 launched from Plesetsk cosmodrome by a Soyuz-U rocket at 13:50 UTC. It carried a capsule housing two monkeys and several newts, snails, beetles, fruit flies, and small plants to study their responses and behaviors under microgravity.

10 Years Ago – 2001

December 5: STS-108 (Space Shuttle Endeavour) launched 5:19 p.m. EST, KSC. Crew: Dominic L. Gorie, Mark E. Kelly, Linda M. Godwin, and Daniel M. Tani. 12th Space Shuttle flight to the International Space Station (ISS). Carried an Italian cargo module, the Raffaello Multi-Purpose Logistics Module (MPLM), that was attached to the Unity module of the ISS. Also Expedition 3 & 4 crews exchange. Landed December 17 at 12:55 p.m., EST, KSC. Mission Duration: 11 days, 19 hours, 36 minutes.

December 7: TIMED (Thermosphere, Ionosphere, Mesosphere Energetics and Dynamics) ionospheric research satellite launched by a Delta 2 rocket from Vandenberg AFB at 15:07 UTC.

December 7: Jason 1, an American-French (NASA-CNES) oceanographic satellite was launched by a Delta 2 rocket from Vandenberg AFB 15:07 UTC to supplement and extend the TOPEX/Poseidon mission results by monitoring the sea surface level and wave heights.

December 16: STARSHINE 2, a US high school educational microsatellite was deployed from STS-108. It was built with the participation of 25,000 students in 26 countries and very similar to the STARSHINE 3 that was launched in September 2001.

December 21: Sean O'Keefe takes office as tenth NASA Administrator.

5 Years Ago – 2006

December 10: STS-116 (Space Shuttle Discovery) launched 8:47 p.m. EST, KSC. Crew: William A. Oefelein, Joan E. Higginbotham, Mark L. Polansky, Robert L. Curbeam, Nicholas J.M. Patrick, Sunita L. Williams, and the European Space Agency's Christer Fuglesang (Sweden). International Space Station Flight 12A.1. Rewired the International Space Station's power system, paving the way for further construction. Landed December 22 at 5:32 p.m. EST, KSC. Mission Duration: 12 days, 20 hours, 45 minutes.

December 10: Dr. John C. Mather, an astronomer at NASA's Goddard Space Flight Center received the 2006 Nobel Prize for Physics, awarded by the Royal Swedish Academy of Sciences. Mather shares the prize with George F. Smoot of the University of California for their collaborative work on understanding the Big Bang. The two scientists lead the Cosmic Background Explorer satellite mission.

December 16: GeneSat 1, a NASA-Ames nanosatellite, was launched by a Minotaur rocket from Wallops Island in Virginia at 7:00 am EST. The 10 kg craft carries E. Coli bacteria to monitor the effect of space radiation by protein-sensing optical instruments.

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5. Cool Pics/Videos

Want to show off your latest pics? Well here's your chance; email the editor at [My Cool Pics](#) and we will try to post them in the next edition of "Clear Skies".

Neutrinos Faster Than Light - Well it is confirmed folks. Watch the video for an explanation on why and how the particles that are truly FASTER than light. Click on the link. The [Youtube](#) video is sponsored by the University of Nottingham and Sixtysymbols.com. For more videos on Physics and Astronomy go to SixtySymbols.com,

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6. Featured Articles

Articles

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7. [NASA Has Lost Hundreds of Its Moon Rocks](#)

Strange Hollows Discovered on Mercury – Oct 24/11 Credit: NASA Science

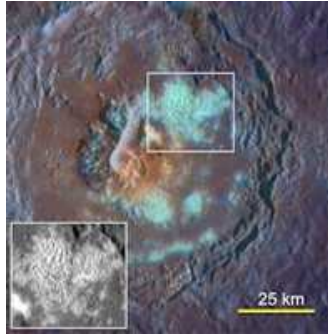
NASA's MESSENGER spacecraft has discovered strange hollows on the surface of Mercury. Images taken from orbit reveal thousands of peculiar depressions at a variety of longitudes and latitudes, ranging in size from 60 feet to over a mile across and 60 to 120 feet deep. No one knows how they got there.



"These hollows were a major surprise," says David Blewett, science team member from the Johns Hopkins University Applied Physics Laboratory. "We've been thinking of Mercury as a relic – a place that's really not changing much anymore, except by impact cratering. But the hollows appear to be younger than the craters in which they are found, and that means Mercury's surface is still evolving in a surprising way."

Mars Reconnaissance Orbiter spotted similar depressions in the carbon dioxide ice

at Mars' south pole, giving that surface a "swiss cheese" appearance. But on Mercury they're found in rock and often have bright interiors and halos. "We've never seen anything quite like this on a rocky surface." If you could stand in one of these "sleepy" hollows on Mercury's surface, you'd find yourself, like Ichabod Crane, in a quiet, still, haunting place, with a black sky above your head.

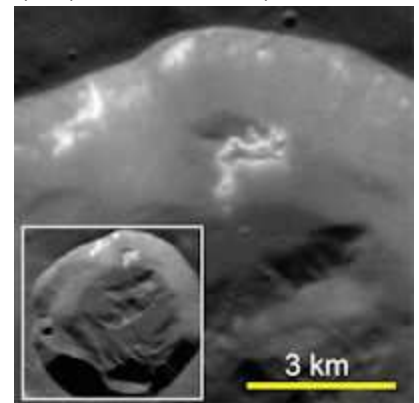


Another example of hollows in crater Tyagaraja. Courtesy Science/AAAS

"There's essentially no atmosphere on Mercury," explains Blewett. "And with no atmosphere, wind doesn't blow and rain doesn't fall. So the hollows weren't carved by wind or water. Other forces must be at work."

As the planet closest to the Sun, Mercury is exposed to fierce heat and extreme space weather. Blewett believes these factors play a role. A key clue, he says, is that many of the hollows are associated with central mounds or mountains inside Mercury's impact craters. These so-called "peak rings" are thought to be made of material forced up from the depths by the impact that formed the crater. Excavated material could be unstable when it finds itself suddenly exposed at Mercury's surface. "Certain minerals, for example those that contain sulfur and other volatiles, would be easily vaporized by the onslaught of heat, solar wind, and micrometeoroids that Mercury experiences on a daily basis," he says. "Perhaps sulfur is vaporizing, leaving just the other minerals, and therefore weakening the rock and making it spongier. Then the rock would crumble and erode more readily, forming these depressions."

A fresh impact crater. Hollows are present on a section of the crater wall that has slid partway down toward the floor. Courtesy Science/AAAS



MESSENGER has indeed proven Mercury unexpectedly rich in sulfur. That in itself is a surprise that's forcing scientists to rethink how Mercury was formed. The prevailing models suggest that either (1) very early in Solar System history, during the final sweep-up of the large planetesimals that formed the planets, a colossal impact tore off much of Mercury's rocky outer layering; or (2) a hot phase of the early Sun heated up the surface enough to scorch off the outer layers. In either case, the elements with a low boiling point – volatiles like sulfur and potassium – would have been driven off. But they're still there.

"The old models just don't fit with the new data, so we'll have to look at other hypotheses." To figure out how the planets and Solar System came to be, scientists must understand Mercury. "It's the anchor at one end of the Solar System. Learning how Mercury formed will have major implications for the rest of the planets. And MESSENGER is showing that, up to now, we've been completely wrong about this little world in so many ways!" What other surprises does Mercury hold? The sleepy hollows of the innermost planet may be just the beginning.

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LISA Pathfinder Takes Major Step in Hunt for Gravity Waves— Nov 15/11 Credit: *Astronomy.com, ESA, Noordwijk, Netherlands*

Sensors destined for the European Space Agency's (ESA) LISA Pathfinder mission in 2014 have far exceeded expectations, paving the way for a mission to detect one of the most elusive forces permeating through space — gravity waves.

Right: LISA Pathfinder about to enter the space environment vacuum test. Credit: Astrium, United Kingdom

The Optical Metrology Subsystem underwent its first full tests under space-like temperature and vacuum conditions using an almost complete version of the spacecraft. The results exceeded the precision required to detect the enigmatic ripples in the fabric of space and time predicted by Albert Einstein — and did it by two to three times.

In space, the LISA Pathfinder will measure the distance between two free-floating gold-platinum cubes using lasers. In the ground tests currently being performed by the team in Ottobrunn, Germany, separate mirrors replace these cubes.

In addition to measuring the distance between the cubes, it also measures their angles with respect to the laser beams — and the tests show an accuracy of 10 trillionths of a degree. “This is equivalent to the angle subtended by an astronaut’s footprint on the Moon!” said Paul McNamara from ESA.



Under perfect conditions in space, the free-floating cubes would be expected to exactly copy each other’s motions. However, according to Einstein’s general theory of relativity, if a gravitational wave were to pass through space, possibly caused by an event as catastrophic as the collision of two black holes, then a minuscule distortion in the fabric of space itself would be detectable. The accuracy required to detect such a subtle change is phenomenal — around a hundredth the size of an atom — a picometer. The requirement set for the instrument was around 6 picometers, measured over 1,000 seconds, which the team initially bettered in 2010. During the latest testing, a

staggering 2-picometer accuracy was obtained, far exceeding the best performance for an instrument of this type.

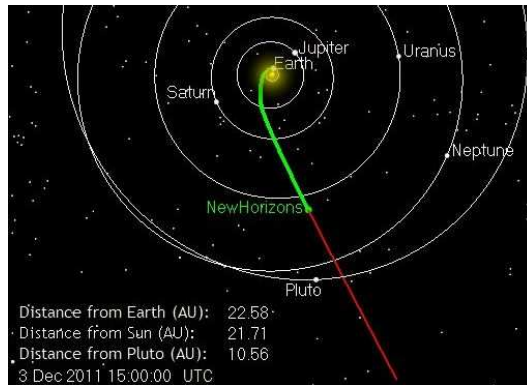
“The whole team has worked extremely hard to make this measurement possible,” said McNamara. “When LISA Pathfinder is launched, and we’re in the quiet environment of space some 1.5 billion kilometers [930 million miles] from Earth, we expect that performance will be even better.” The instrument team from Astrium GmbH, the Albert Einstein Institute, and ESA are testing the Optical Metrology Subsystem during LISA Pathfinder’s thermal vacuum tests in Ottobrunn by spacecraft prime contractor Astrium in the United Kingdom.

LISA Pathfinder is expected to be launched in mid-2014 to demonstrate the technologies and endurance in space for a New Gravitational wave Observatory mission, one of the candidates for ESA’s next flagship mission planned for a launch early in the next decade, aiming to find this final piece in Einstein’s cosmic puzzle.

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New Horizons Becomes Closest Spacecraft to Approach Pluto – Dec 3/11 *Credit: NASA Science*

NASA’s New Horizons mission reached a special milestone yesterday, Dec. 2, 2011, on its way to reconnoiter the Pluto system, coming closer to Pluto than any other spacecraft.



It’s taken New Horizons 2,143 days of high-speed flight – covering more than a million kilometers per day for nearly six years—to break the closest-approach mark of 1.58 billion kilometers set by NASA’s Voyager 1 in January 1986.

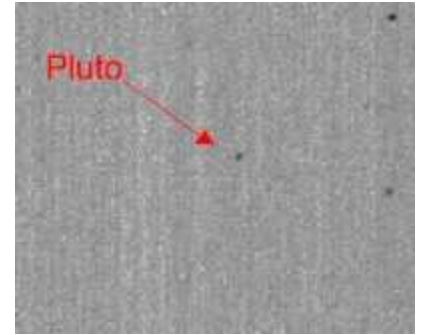
“What a cool milestone!” says New Horizons Principal Investigator Alan Stern, of the Southwest Research Institute. “Although we’re still a long way — 1.5 billion kilometers

from Pluto — we’re now in new territory as the closest any spacecraft has ever gotten to Pluto, and getting closer every day by over a million kilometers.

Now New Horizons, which is healthy, on course and closer to Pluto than Voyager ever came, will continue to set proximity-to-Pluto records every day until its closest approach – about 7,767 miles (12,500 kilometers) from the planet – on July 14, 2015.

New Horizons’ current view of Pluto still resembles this image snapped by the spacecraft’s long-range telescopic camera in 2007; that will change exponentially beginning in late 2014, as New Horizons speeds closer to its target planet and its cameras begin to resolve details.

"We've come a long way across the solar system," says Glen Fountain, New Horizons project manager at the Johns Hopkins University Applied Physics Laboratory. "When we launched [on Jan. 19, 2006] it seemed like our 10-year journey would take forever, but those years have been passing us quickly. We're almost six years in flight, and it's just about three years until our encounter begins." From New Horizons' current distance to Pluto – about as far as Earth is from Saturn – Pluto remains just a faint point of light. But by the time New Horizons sails through the Pluto system in mid-2015, the planet and its moons will be so close that the spacecraft's cameras will spot features as small as a football field. "I wonder how long it will be until the next Pluto spacecraft — perhaps a future orbiter or lander — crosses this distance marker?" Stern continues. "It could be decades."



New Horizons is currently in hibernation, with all but its most essential systems turned off, speeding away from the Sun at more than 55,500 kilometers per hour. Operators at the Applied Physics Lab will "wake" the spacecraft in January for a month of testing and maintenance activities.

Check the New Horizons homepage for more information and updates en route to Pluto:

<http://pluto.jhuapl.edu>.

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Spitzer Discovers Strange New "Species" of Ultra-red Galaxies—Dec 2/11 Credit: *Astronomy.com, Harvard-Smithsonian Center for Astrophysics, Cambridge, Massachusetts*

In the distant reaches of the universe, almost 13 billion light-years from Earth, a strange species of galaxy lay hidden. Cloaked in dust and dimmed by the intervening distance, even the Hubble Space Telescope couldn't spy it. It took the revealing power of NASA's Spitzer Space Telescope to uncover not one, but four remarkably red galaxies. And while astronomers can describe the members of this new "species," they can't explain what makes them so ruddy.

"We've had to go to extremes to get the models to match our observations," said Jiasheng Huang from the Harvard-Smithsonian Center for Astrophysics (CfA) in Cambridge, Massachusetts. Spitzer succeeded where Hubble failed because Spitzer is sensitive to infrared light — light so red that it lies beyond the visible part of the spectrum. The newfound galaxies are more than 60 times brighter in the infrared than they are at the reddest colors Hubble can detect.

Galaxies can be very red for several reasons. They might be very dusty. They might contain many old red stars. Or they might be very distant, in which case the expansion of the universe stretches their light to longer wavelengths and hence redder colors — a process known as redshifting. All three reasons seem to apply to the newfound galaxies.

All four galaxies are grouped near each other and appear to be physically associated, rather than being a chance line-up. Due to their great distance, we see them as they were only a billion years after the Big Bang — an era when the first galaxies formed. "Hubble has shown us some of the first protogalaxies that formed, but nothing that looks like this," said Giovanni Fazio from the CfA. "In a sense, these galaxies might be a 'missing link' in galactic evolution."

Next, researchers hope to measure an accurate redshift for the galaxies, which will require more powerful instruments like the Large Millimeter Telescope or Atacama Large Millimeter Array. They also plan to search for more examples of this new "species" of extremely red galaxies. "There's evidence for others in other regions of the sky. We'll analyze more Spitzer and Hubble observations to track them down," said Fazio.

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SETI Search Resumes at Allen Telescope Array, Targeting New Planets—Dec 7 /11 credit *Astronomy.com, Jet Propulsion Laboratory, Pasadena, California*

The Allen Telescope Array (ATA) is once again searching planetary systems for signals that would be evidence of extraterrestrial intelligence. Among its first targets are some of the exoplanet candidates recently discovered by NASA's Kepler space telescope.



"This is a superb opportunity for SETI observations," said Jill Tarter, the Director of the Center for SETI Research at the SETI Institute. "For the first time, we can point our telescopes at stars, and know that those stars actually host planetary systems -- including at least one that begins to approximate an Earth analog in the habitable zone around its host star. That's the type of world that might be home to a civilization capable of building radio transmitters."

The ATA had been placed in hibernation mode last April as the result of the withdrawal of the SETI Institute's former partner, U.C. Berkeley, due to budgetary shortfalls. Berkeley was the operator of the Hat Creek Observatory in northern California where the ATA is located. With new funding recently acquired for observatory operations, the ATA can resume SETI observations where it left off: examining the thousands of new candidate planets found by Kepler. Highest priority will be given to the handful of worlds discovered so far that are located in their star's habitable zone: the range of orbital radii where temperatures are neither too hot nor too cold for liquid water to exist. Most astrobiologists consider that liquid water is the sine qua non for life.

"In SETI, as with all research, preconceived notions such as habitable zones could be barriers to discovery," adds Tarter. "So, with sufficient future funding from our donors, it's our intention to examine all of the planetary systems found by Kepler."

Observations over the next two years will allow a systematic exploration of these Kepler discoveries across the entire, naturally-quiet 1 to 10 GHz terrestrial microwave window. The ATA is unique in providing ready access to tens of millions of channels at any one time, anywhere in this 9 billion channel range (each channel is 1 Hz wide). Until recently many SETI searches focused on limited frequency ranges, including a small number of observations at the 8.67 GHz spin-flip transition of the 3He^+ ion, proposed by the team of Bob Rood (University of Virginia) and Tom Bania (Boston University). In memory of Rood, who died November 2, the initial ATA search of Kepler targets this week will focus around the 8.67 GHz band, before moving on to examine the billions of channels available for observation at the ATA.

The restart of SETI work at the ATA has been made possible thanks to the interest and generosity of the public who supported SETI research via the www.SETIStars.org web site. Additional funds necessary for observatory re-activation and operations are being provided by the United States Air Force as part of a formal assessment of the instrument's utility for Space Situational Awareness (see www.seti.org/afspc for more information).

"Kepler's success has created an amazing opportunity to focus SETI research. While discovery of new exoplanets via Kepler is backed with government monies, the search for evidence that some of these worlds might be home to intelligence falls to SETI alone. And our SETI exploration depends entirely on private donations, for which we are deeply grateful to our donors," notes Tarter.

"The year-in and year-out fundraising challenge we tackle in order to conduct SETI research is an absolute human and organizational struggle, yet it is well worth the hard work to help Jill's team address what is one of humanity's most profound research questions," says Tom Pierson, CEO of the SETI Institute.

The public can follow the new ATA observations via the [SETIStars.org](http://www.SETIStars.org) web site and can read more about the overall work of the SETI Institute at www.seti.org. The SETI Institute is proud to be a supporting partner in NASA's Kepler mission -- see <http://goo.gl/ykFTf>.

Headquartered in Mountain View, California, the SETI Institute is a non-profit research organization that addresses the question of the origin, nature, and prevalence of life beyond Earth.

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The Birth of a Telescope 30 Times Larger Than Earth --Dec 8/11 *credit Portal to the Universe*

On 15 November 2011, the Effelsberg 100-meter radio telescope, together with three Russian and

one Ukrainian telescope, took part in the first interferometric observations with the orbiting 10-meter antenna Spektr-R of the Russian RadioAstron project. The observations were made at a wavelength of 18 centimeters, targeting the distant, bright, and very compact quasar 0212+735. Interferometric signals have been successfully detected by the RadioAstron team between Spektr-R and the ground antennas, setting a new world record for the size of a radio interferometer and opening a new era in interferometric studies of cosmic radio emission.

The technique of very long baseline interferometry, which has already set a number of world records in astronomy, now enters an entirely new era signaled by a successful detection of interferometric signals ("fringes") made in observations performed with the 10-meter space-borne antenna Spektr-R of the RadioAstron project, three 32-meter antennas of the Russian QUASAR Network, the Ukrainian 70-meter antenna in Evpatoria, and the German 100-meter radio telescope in Effelsberg. The detection was made on 15 November 2011, with observations performed at a wavelength of 18 centimeters and targeting bright and extremely compact radio emission from the distant quasar 0212+735.

"These fascinating results confirm our expectations that we will be able to probe with RadioAstron the conditions in the innermost regions of quasars with unprecedented detail", says Anton Zensus, director at the Max-Planck-Institut für Radioastronomie in Bonn and head of the institute's "Very Long Baseline Interferometry" (VLBI) research group. "The weak signals from such systems require the coordinated use of the most sensitive radio telescopes available such as the 100-m dish in Effelsberg."

In order to perform these observations, data from the space antenna of RadioAstron were recorded on-board and sent to the satellite tracking antenna in Puschino, Russia. These data have been subsequently combined with recordings made at ground-based radio telescopes participating in RadioAstron observations. This is done at a special RadioAstron correlator facility in Moscow. The RadioAstron correlator performs searches for correlations (or interferometric fringes) between the signals recorded at two or more antennas. Using these correlations, images of distant cosmic objects can be reconstructed at a resolution that would have been achieved with a telescope as large as the largest distance between the antennas participating in observations.

The satellite was about 100,000 km away from Earth during the observations of the quasar 0212+735. Planned observations with SpectR will extend out to 360,000 kilometers from the Earth, thus creating a telescope which is effectively 30 times larger than the size of our planet. This kind of telescope will achieve a resolution as fine as 1/100,000 of a second of arc. This resolution is sufficient for measuring the size of a one cent coin on the surface of Moon and reaches within a factor of two of the scale of the event horizon in the supermassive black hole in the center of our Galaxy.

"The RadioAstron team is very excited to get the first interferometric signals", says RadioAstron scientist Yuri Kovalev from Astro Space Center in Moscow. "This achievement confirms a successful operation of the extremely complex system and is a milestone that allows us to move forward to an extensive science program involving radio telescopes located throughout the world."

This exciting new capability promises to help tackling some of the most puzzling problems in astrophysics, including the origin of the most energetic particles in the Universe and the nature of supermassive black holes.

The RadioAstron project is led by the Astro Space Center of the P.N. Lebedev Physical Institute in Moscow, Russia.

The QUASAR Network is operated by the Institute of Applied Astronomy in St. Petersburg, Russia. The satellite tracking antenna in Puschino (Russia) is part of the Puschino Radio Astronomy Observatory. The 100-meter radio telescope in Effelsberg is operated by the Max-Planck-Institut für Radioastronomie in Bonn, Germany. The 70-meter antenna in Evpatoria (Ukraine) is operated by the Ukrainian National Space Agency. The orbiting Spektr-R antenna was constructed at the Lavochkin Association in Russia and launched on 18 July 2011 from the Russian space launch center in Baikonur (Kazakhstan) by the Zenit Russian-Ukrainian rocket with the Fregat-SB booster. At present, the initial in-orbit checkout period of Spektr-R is nearing its completion and science observations are expected to begin in early 2012.

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NASA Has Lost Hundreds of Its Moon Rocks—Dec 9/11 Credit: [Space.com](#)

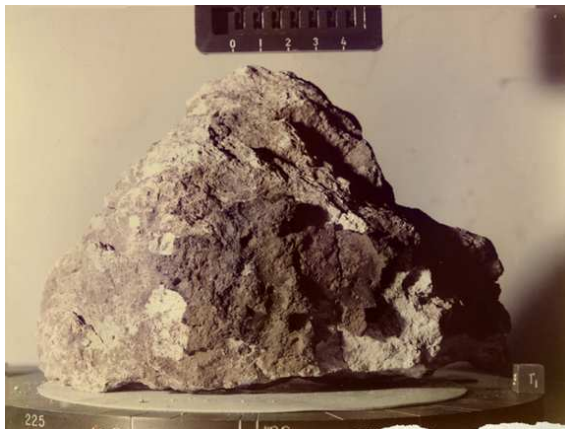
NASA has lost or misplaced more than 500 of the moon rocks its Apollo astronauts collected and brought back to Earth, according to a new agency report. Right: This NASA moon rock was collected by astronauts on the Apollo 14 mission to the lunar surface in 1971.

In an audit released Thursday (Dec. 8), NASA's Office of Inspector General states that the agency "lacks sufficient controls over its loans of moon rocks and other astromaterials, which increases the risk that these unique resources may be lost."

The report stresses the importance of maintaining stricter guidelines for the release of lunar materials to researchers, and more meticulous inventory procedures for their storage and return.



"NASA has been experiencing loss of astromaterials since lunar samples were first returned by Apollo missions," inspector general Paul K. Martin detailed in the report. "In addition to the Mount Cuba disk, NASA confirmed that 516 other loaned astromaterials have been lost or stolen between 1970 and June 2010, including 18 lunar samples reported lost by a researcher in 2010 and 218 lunar and meteorite samples stolen from a researcher at [NASA's Johnson Space Center] in 2002, but since recovered." And while the agency reported the 517 missing moon rock samples, even more of these precious materials may have gone astray, according to the report. Martin's office audited 59 researchers who had received samples from NASA, and found that 11 of them, or 19 percent, could not locate all of the borrowed materials.



The report also found that the Astromaterials Acquisition and Curation Office at the Johnson Space Center in Houston had records of hundreds of samples that no longer exist, and loans to 12 researchers who had died, retired or relocated, sometimes without the office's knowledge and without returning the samples.

Left: Lunar sample 60025. Apollo 16 astronauts collected this sample in 1972 while on the fifth moon mission — the first mission to sample the lunar highlands.

"The Curation Office did not ensure that these loaned research samples were efficiently used

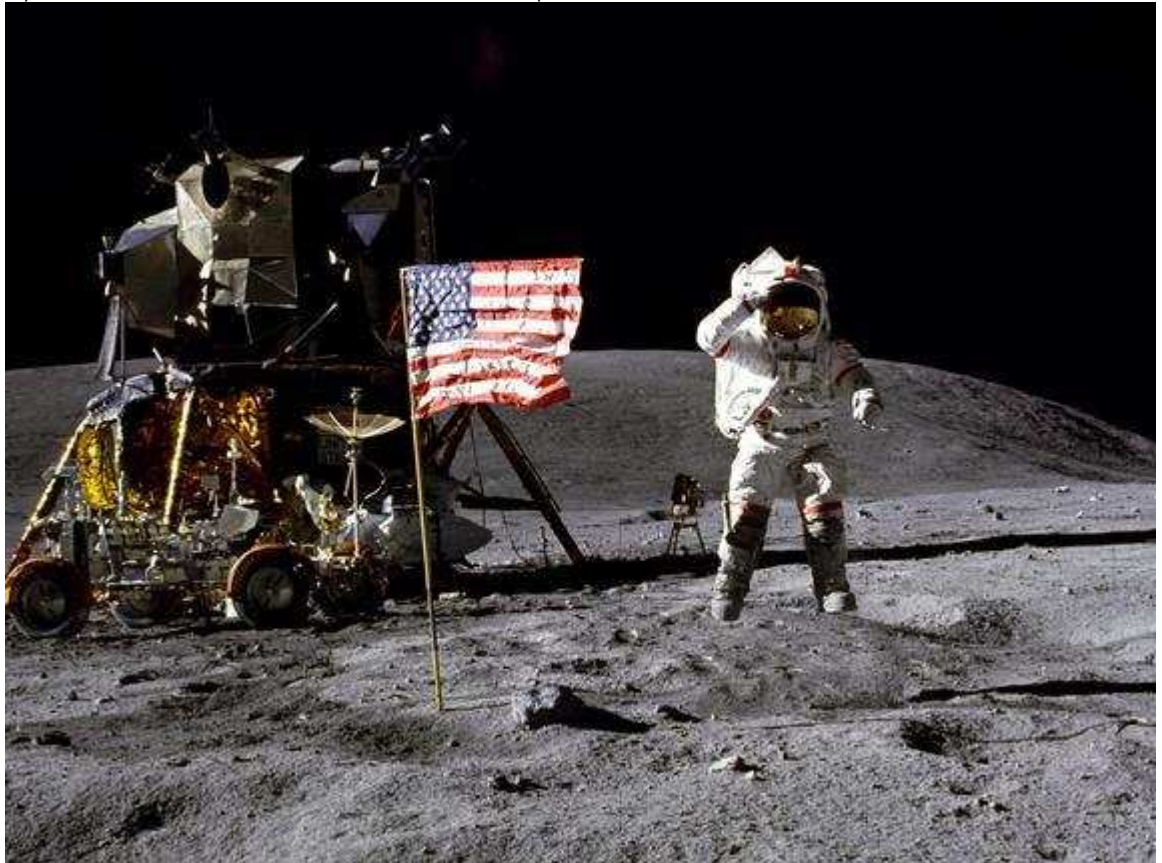
and promptly returned to NASA," Martin wrote. "For example, we learned of one researcher who still had lunar samples he had borrowed 35 years ago on which he had never conducted research."

In response to the inspector general report, the agency is looking into modifying their loan agreements and procedures. "NASA is committed to the protection of our nation's space-related artifacts, and sharing these treasures with outside researchers and the general public," NASA spokesman Dwayne Brown said in a statement. "We agree with the recommendations contained in the recently released Inspector General report examining NASA's controls over loans of moon rocks and other astromaterials to researchers and educators. Actions will mostly result in changes to loan agreements and inventory control procedures."

The agency does not consider lunar rocks and other moon samples to be at high risk, Brown added. But perhaps the losses need to be put into context, said Robert Pearlman, editor of collectSPACE.com, an online publication and community for space history and artifact enthusiasts. "According to the Office of Inspector General, out of the 26,000 samples NASA has on loan, it has lost just 517," Pearlman told SPACE.com. "That's not to excuse the space agency and its curators, but with so many samples spread across the globe, some losses are probably to be expected."

Still, the misplaced moon samples are truly regrettable, he added, and could be an indication of a broader issue within the public psyche.

"Maybe it is a sign of the times that some scientific researchers and educational organizations that were loaned samples and then lost them would no longer recognize the rarity and historical significance of the lunar material," Pearlman said. "It seems that the moon, or at least its exploration by humans, has lost some of its shine over the past four decades."



John Young, astronaut and Navy veteran, salutes the U.S. flag at the Descartes landing site during the first Apollo 16 extravehicular activity (EVA-1). Young, commander of the Apollo 16 lunar landing mission, jumps up from the lunar surface as astronaut and Air Force veteran, Charles M. Duke Jr., lunar module pilot, took this picture.

Back from the moon

From 1969 to 1972, 12 astronauts landed on the moon during the agency's Apollo program. A total of 842 pounds (382 kilograms) of lunar rock and soil came back with these astronauts over the course of six moon landings.

NASA regularly loans moon rocks, meteorites and samples of comet dust to museums, researchers, educators and institutions around the world. The Astromaterials Acquisition and Curation Office maintains 140,000 lunar samples, 18,000 meteorite samples, and about 5,000 solar wind, comet and cosmic dust samples, the report said. "As of March 2011, over 26,000 of these samples were on loan for scientific study, educational pursuits and public outreach purposes," Martin wrote. Maintaining better control of these samples returned from space will likely require a much larger overhaul of the system currently in place. "Perhaps the bigger question is why these samples were not actively being used — either in current research or educational lessons — such that their loss, other than to theft, would be far more conspicuous," Pearlman said. "Why were there researchers who received samples and didn't use them? Why were educational samples entrusted to just one staff member in such a way that upon that person's passing, no one else was aware of them?"

The space agency is committed to making changes to address the issues cited in the new report, Brown said. "Over the history of the program, NASA has continually reviewed, assessed, and updated its procedures to mitigate incidents that result in loss of samples," he said. "NASA will incorporate the [Inspector General's] recommendations within new procedures and processes already in work. NASA plans to complete the entire updating process within 9 months."

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7. Ask an Expert

Have you been thumbing through the Astronomy or Sky and Telescope magazine and have some questions on the latest and greatest in astronomy gear? Or maybe you're narrowing down your search for just the right telescope and want to know the difference between Dobsonians, Schmidt-Cassegrains, Reflector and Refractors. Well wonder no more, email [Brian Robilliard](mailto:Brian.Robilliard@skyandtelescope.org) our resident expert to get the "inside scoop" on what's hot or not in astronomy gear.

Are you new to astronomy? Want to know the how to find objects in the sky? Or just wondering what that bright object in the evening sky is? Well wonder no more; email [Bryon Thompson](mailto:Bryon.Thompson@skyandtelescope.org) our Editor and master of Astronomy 101 basics.

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8. Kids Korner

If you have any ideas that might spark the interest of a young upcoming astronomer, please send your submissions to the editor.

This month we have a short video about:

How The Sith Stole Christmas by OneMinuteGalactica

http://www.youtube.com/watch?feature=player_embedded&v=yb-RaywZEFw

Merry Christmas ☺

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9. The Sky This Month

By oneminuteastronomer.com

Observing Site: Duncan, **48.783°N, 123.700°W**

December 1, 2011

It's a fine month for stargazing. Jupiter dominates the sky this month, shining brightly overhead and just east of the V-shaped constellation Taurus. Venus shines even brighter during December in the southwestern sky about 45 minutes after sunset. And Mercury gears up to put on a good apparition in the morning sky this month.

Observers in Australia, New Zealand, and western North America get a chance to see a total lunar eclipse on December 10. The fine Geminid meteor shower peaks on December 13-14, although the Moon will wash out the faintest meteors.

And the dim stars of October and November finally give way to the mighty constellation Orion as it wheels into view this month in the mid-evening hours. Orion is trailed by brilliant Sirius, the brightest star in the sky, and by the rich star fields of Canis Major and the southern constellation Carina. December 2. First Quarter Moon (9:52 Universal Time)

2 Dec. Mars reaches quadrature (90 degrees west of the Sun); the Red Planet reaches the meridian near dawn. It's growing larger and may reveal a few surface details in a telescope at high magnification.

6 Dec. Bright Jupiter is just to the west of the waxing gibbous Moon.

10 Dec. Full Moon (14:36 UT)

Total Lunar Eclipse, visible in part from western North America (before moonset) and western Europe (at Moon rise). The eclipse is fully visible in Australia and eastern Asia, and almost fully visible in New Zealand. South Africa just glimpses a portion of the eclipse at moonrise. Eastern North America sees a partial eclipse as the Moon sets.

14 Dec. The Geminid meteor shower peaks at 18:00 Universal Time. Look for meteors on December 13 and 14 anywhere in the sky. They will appear to trace their paths back to a point in Gemini. A gibbous Moon will get in the way of the faintest meteors.

14-28 Dec. Mercury shines brightly about 8-10 degrees above the southeastern horizon about 45 minutes before sunrise.

18 Dec. Last Quarter Moon (00:48 UT)

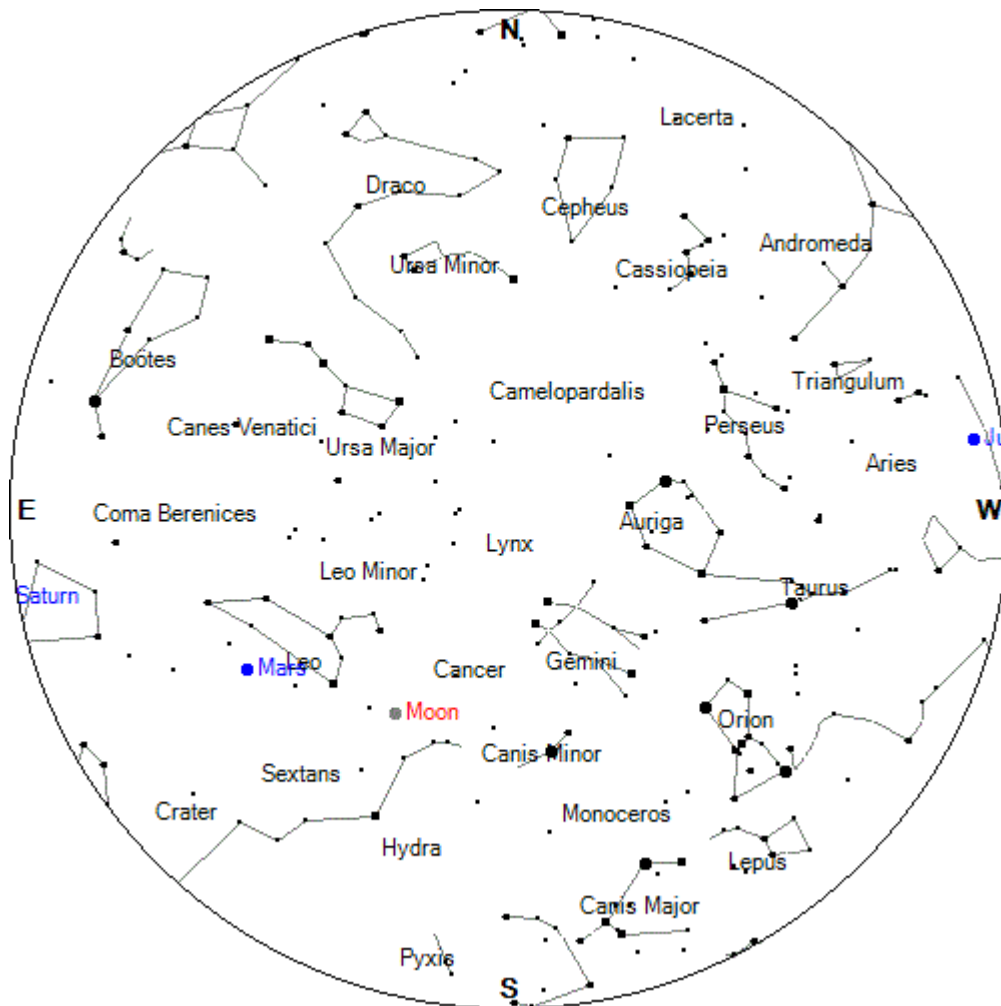
20 Dec. The waning crescent Moon is near the planet Saturn and the star Spica a few hours before sunrise.

22 Dec. Winter/Summer begins in the Northern/Southern hemisphere (5:30 UT).
A waning crescent Moon is visible near Mercury low in the southeast before sunrise.

24 Dec. New Moon (18:06 UT)

26 Dec. A thin crescent Moon hovers near brilliant Venus in the southwestern sky just after sunset.

Sky Chart —Here's your mid-December midnight sky chart. In order to use the sky chart properly remember the centre of the chart is the sky directly above your head (or the Zenith). Turn the chart so that the direction you are facing is at the bottom of the chart (or pointed toward your toes). The star field directly in front of you will be between the bottom of the chart and the centre.



SkyChart Courtesy of Heavens-Above