



# Clear Skies

Volume 17 Issue 4

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## 1. Editor Greetings!

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

Ok, so if you like me you probably missed the Oct 8, International Observe the Moon Night. The RASC Victoria Centre had a get together at Clover Point and I would interested to hear how it went. Also, if you took a good lunar shot then send it along to [newsletter@starfinders.ca](mailto:newsletter@starfinders.ca) to be included in the next issue. Bryon included a shot of the September Harvest moon, check it out in the "Cool PICS/Videos" section. While you're there you might as well do some "armchair exploring" and check out our Galactic Neighbourhood in 3D. Also, Moon Zoo needs your help to explore the lunar surface. Something that can be a family activity on those rainy days. Check out more info in the "Kids Korner" section.

Hey what's going on lately? It's not even 2012 yet and things are already starting to fall out of the skies! Read the official NASA report on re-entry of UARS and the debunked hoaxes that were on YouTube. The videos have since been removed from YouTube except one (and NO northern Alberta was not hit). But just when you thought the "junk from Space" was over we now have a 2<sup>nd</sup> German space telescope called ROSAT entering the atmosphere any time soon. Feeling a tiny bit like "Chicken Little"....hum?

If you missed Andrew Woodsworth's presentation on the ALMA project at the ISP, don't feel too bad. ALMA just released its first image, read all about it in the "Featured Articles" section.

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

Freda Eckstein  
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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  
3rd 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 **7:30** on **WEDNESDAY October 26th**  
**Feature: "TBA"** at the time of this writing we do not have our confirmation on a speaker. So keep watching your email.

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## Social Highlights Sept 28<sup>th</sup>/11

By Nancy Kirshfelt

Everyone came together at the first meeting of the year to reminisce about the wonderful Island Star Party held this summer under the starry skies of Bright Angel Park.

The evening included a showing of photos taken at this year's Star Party as well as some taken at the 2010 Star Party. Lots of information and ideas were shared for next year's event. There were, of course, the cookies and beverages that have made the CVSF meetings "the place to be" on the fourth Wednesday of every month.

The meeting concluded with a showing of the film, "We are the Aliens" a film made in 2006 by the BBC. In this film, "We meet the scientists on a mission to get to the bottom of the beginnings of life on Earth - from the team in Texas who are lovingly building a robotic submarine called DEPTHX to explore a moon of Jupiter, to Southern India where they are investigating a mysterious red rain which fell for two months in 2001. According to local scientist Godfrey Louis, the rain contains biological cells unlike any he had seen before - with no DNA and the ability to replicate at 300°C." (BBC)

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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/>

#### **Harry Potter & The Deathly Hallows - Part 2 The IMAX Experience, Victoria B.C.**

Harry Potter and the Deathly Hallows – Part 2, is the final adventure in the Harry Potter film series. The much-anticipated motion picture event is the second of two full-length parts. For show times and tickets click [here](#)

**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:** Oct. 25

**Mission:** NPP

**Launch Vehicle:** Delta II

**Launch Site:** Vandenberg Air Force Base, Calif.

**Launch Pad:** Space Launch Complex 2W

**Launch Window:** 2:48:01 a.m. - 2:57:11 a.m. PDT / 5:48:01 a.m. - 5:57:11 a.m. EDT

**Description:** The National Polar-orbiting Operational Environmental Satellite System Preparatory Project (NPP) mission for NASA and NOAA is to measure Earth's atmospheric and sea surface temperatures, humidity sounding, land and ocean biological activity and cloud and aerosol properties.

**Date:** Oct. 30

**Assembly Flight:** 45P

**Mission:** ISS Progress 45

**Launch Vehicle:** Russian Soyuz Rocket

**Launch Site:** Baikonur Cosmodrome, Kazakhstan

**Description:** International Space Station resupply.

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### 4. This Month In History

Courtesy of: [Windows2universe.org](http://Windows2universe.org)

**October 4**

**1947 - Death of Max Planck**

Max Planck was a German physicist who lived between 1858-1947. His theories changed our understanding of atomic processes and started the field of quantum physics, which studies energy inside atoms. Many of Planck's ideas were later used by Einstein when he developed his theory of relativity.

**1957 - Sputnik launch**

Sputnik 1, launched by the Soviet Union, became the first artificial satellite to successfully orbit the Earth.

**October 5**

**1882 - Birthday of Robert Goddard**

Robert Goddard was an American physicist who lived between 1882-1945. He was a pioneer of modern rocketry who discovered that liquid fuel is more efficient than solid fuel.

**October 7**

**1885 - Birthday of Niels Bohr**

Niels Bohr was a Danish physicist who lived between 1885-1962. He investigated atomic structure, modifying Rutherford's old model of an atom. Bohr also claimed that an atom's chemical properties are determined only by the electrons with the largest orbits.

**October 19**

**1937 - Death of Ernest Rutherford**

Ernest Rutherford was a New Zealand-born physicist who lived between 1871-1937. He is considered the father of nuclear physics because of his discoveries on atomic structure.

**October 24**

**1601 - Death of Tycho Brahe**

Tycho Brahe was a Danish astronomer who lived between 1546-1601. For over twenty years, he made very accurate observations of the night sky. Tycho also built the world's first observatory.

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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".



September Harvest Moon, handheld with a cannon 60d 500 mm lens by Bryon Thompson. Hey this is so clear I can even see Wilma!

**Explore our Galactic Neighborhood in 3D** - "Eyes on the Solar System" is a 3-D environment full of real NASA mission data. Explore the cosmos from your computer. Hop on an asteroid. Fly with NASA's Voyager 2 spacecraft. See the entire solar system moving in real time. It's up to you. You control space and time <http://solarsystem.nasa.gov/eyes/index.html>

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## 6. Featured Articles

### Articles

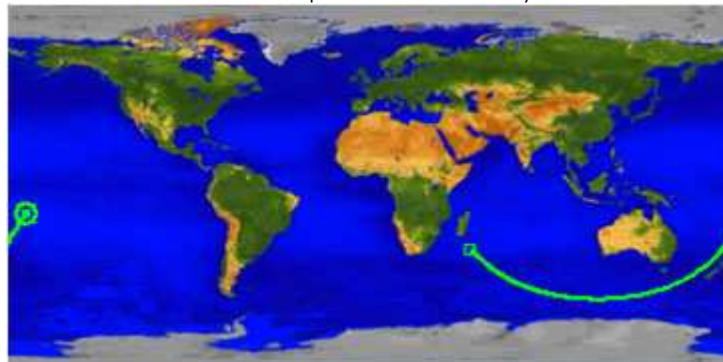
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**Final Update: NASA's UARS Re-enters Earth's Atmosphere** – Sept 27, 2011 Credit NASA Headquarters, Washington, D.C.

NASA's decommissioned Upper Atmosphere Research Satellite fell back to Earth at 12 a.m. EDT (0400 GMT), as Friday, Sept. 23, turned to Saturday, Sept. 24 on the United States east coast. The Joint Space Operations Center at Vandenberg Air Force Base in California has determined the satellite entered the atmosphere over the Pacific Ocean at 14.1 degrees south latitude and 189.8 degrees east longitude (170.2 west longitude). This location is over a broad, remote ocean area in the Southern Hemisphere, far from any major land mass. The debris field is located between 300 miles and 800 miles downrange, or generally northeast of the re-entry point. NASA is not aware of any possible debris sightings from this geographic area.

This is your source for official information on the re-entry of UARS. All information posted here has been verified with a government or law enforcement agency. This is NASA's final status report on the re-entry of UARS.



*UARS re-entry map. Credit: NASA*

This map shows the ground track for UARS beginning in the Indian Ocean off the coast of Africa at 0330 GMT and ending at atmospheric interface over the Pacific Ocean at 0400 GMT.

Six years after the end of its productive scientific life, UARS broke into pieces during re-entry, and most of it up burned in the atmosphere. Twenty-six satellite components, weighing a total of about 1,200 pounds, could have survived the fiery re-entry and reach the surface of Earth.

The Operations Center for JFCC-Space, the Joint Functional Component Command at Vandenberg Air Force Base, Calif., which works around the clock detecting, identifying and tracking all man-made objects in Earth orbit, tracked the movements of UARS through the satellite's final orbits and provided confirmation of re-entry.

"We extend our appreciation to the Joint Space Operations Center for monitoring UARS not only this past week but also throughout its entire 20 years on orbit," said Nick Johnson, NASA's chief scientist for orbital debris, at NASA's Johnson Space Center in Houston. "This was not an easy re-entry to predict because of the natural forces acting on the satellite as its orbit decayed. Space-faring nations around the world also were monitoring the satellite's descent in the last two hours and all the

predictions were well within the range estimated by JSpOC."

UARS was launched Sept. 12, 1991, aboard space shuttle mission STS-48 and deployed on Sept. 15, 1991. It was the first multi-instrumented satellite to observe numerous chemical components of the atmosphere for better understanding of photochemistry. UARS data marked the beginning of many long-term records for key chemicals in the atmosphere. The satellite also provided key data on the amount of light that comes from the sun at ultraviolet and visible wavelengths. UARS ceased its scientific life in 2005.

So now you know that there was no debris field in western Canada (credit EarthSky) So, don't be fooled by the fake videos circulating on the Internet. But if you're going to watch just one fake – and remember this is a hoax, it's just too good to be true – check out this amazing [Portuguese video](#). It can't be real, but it has some realistic elements, like the little pops and flares along the path of the (giant!) body flaming along through the night.

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## 2<sup>nd</sup> Big Satellite Set to Resist Re-entry Burn-up –Sep 24/11 credit NewScientist

A defunct German space telescope called ROSAT is set to hit the planet at the end of October – and it even is more likely than UARS to cause injury or damage in populated areas.

No one yet knows where UARS (Upper Atmosphere Research Satellite) will fall to earth. Although most of the craft's mass will be reduced to an incandescent plasma, some 532 kilograms of it in 26 pieces are forecast to survive – including a 150-kilogram instrument mounting.

NASA calculates a 1-in-3200 chance of UARS causing injury or damage. But at the end of October or beginning of November, ROSAT – a 2.4-tonne X-ray telescope built by the German aerospace lab DLR and launched by NASA in 1990 – will re-enter the atmosphere, presenting a 1 in 2000 chance of injury. The higher risk stems from the requirements of imaging X-rays in space, says DLR spokesperson Andreas Schütz. The spacecraft's mirrors had to be heavily shielded from heat that could have wrecked its X-ray sensing operations during its eight-year working life. But this means those mirrors will be far more likely to survive a fiery re-entry.

Broken mirror, bad luck

On its ROSAT website, DLR estimates that "up to 30 individual debris items with a total mass of up to 1.6 tonnes might reach the surface of the Earth. The X-ray optical system, with its mirrors and a mechanical support structure made of carbon-fibre reinforced composite – or at least a part of it – could be the heaviest single component to reach the ground."

At the European Space Agency in Darmstadt, Germany, the head of the space debris office, Heiner Klinkrad, agrees that ROSAT's design means more of it will hit the surface. "This is indeed because ROSAT has a large mirror structure that survives high re-entry temperatures," he says.

ROSAT was deactivated in 1999 and its orbit has been decaying since then. "ROSAT does not have a propulsion system on board which can be used to manoeuvre the satellite to allow a controlled re-entry," says space industry lawyer Joanne Wheeler of London-based legal practice CMS Cameron McKenna. "And the time and position of ROSAT's re-entry cannot be predicted with any precision due to fluctuations in solar activity, which affect atmospheric drag."

Solar swelling

US Strategic Command tracks all space objects and the US-government-run Aerospace Corporation lists both upcoming and recent re-entries on its website. But ROSAT is not yet on the upcoming list because its re-entry time is far from certain.

The moment a craft will re-enter is difficult to predict because it is determined by two main factors. First, the geometry of the tumbling satellite as it enters the upper atmosphere, which acts as a brake. Second, the behaviour of the upper atmosphere itself, which grows and shrinks with the amount of solar activity, says Hugh Lewis, a space debris specialist at the University of Southampton, UK.

"Solar activity causes the atmosphere to expand upwards, causing more braking on space objects. The reason UARS is coming back sooner than expected is a sudden increase in solar activity. Indeed, we expect to see a higher rate of re-entries as we approach the solar maximum in 2013," he

says.

But don't expect it to be raining spaceships – what's coming down is partly a legacy of 1990s space-flight activity. "Some of the re-entries we see today [with UARS and ROSAT] are a heritage of years with high launch rates, which were a factor of two higher than they are today," says Klinkrad.

"The trend is towards smaller satellites, with more dedicated payloads," he says, rather than "all-in-one" satellite missions on giant craft like UARS. That means debris from future missions should be smaller.

*Editor Notes:* here's the latest update from "the A Register" **The 2,400 kg German ROSAT is due to re-enter sometime between October 21 and October 24, according to DLR, the German space agency.**

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## OPERA Reports Anomaly in Neutrino Flight Time from CERN to Gran Sasso – Sept 26/11 credit CERN, Geneva, Switzerland

The OPERA experiment, which observes a neutrino beam from CERN in Geneva, Switzerland, to Italy's INFN Gran Sasso Laboratory 450 miles (730 kilometers) away, presented new results indicating an anomaly in the speed of subatomic neutrinos.

The OPERA result is based on the observation of over 15,000 neutrino events measured at Gran Sasso, and appears to indicate that the neutrinos travel at a velocity 20 parts per million above the speed of light, nature's cosmic speed limit. Given the potential far-reaching consequences of such a result, independent measurements are needed before the effect can either be refuted or firmly established. This is why the OPERA collaboration has decided to open the result to broader scrutiny.



The Oscillation Project with Emulsion-TRacking Apparatus (OPERA) is an experiment to test the phenomenon of neutrino oscillations. It exploits CERN Neutrinos to Gran Sasso (CNCS), a high-intensity and high-energy beam of muon neutrinos produced at the CERN Super Proton Synchrotron in Geneva, Switzerland, and pointing to the Laboratori Nazionali del Gran Sasso (LNGS) underground laboratory, 455 miles (730 kilometers) away at Gran Sasso in central Italy.

The OPERA measurement is at odds with well-established laws of nature, though science frequently progresses by overthrowing the established paradigms. For this reason, many searches have been made for deviations from Einstein's theory of relativity, so far not finding any such evidence. The strong constraints arising from these observations make an interpretation of the OPERA measurement in terms of modification of Einstein's theory unlikely, and give further strong reason to seek new independent measurements.

"This result comes as a complete surprise," said OPERA spokesperson Antonio Ereditato from the University of Bern. "After many months of studies and cross-checks, we have not found any instrumental effect that could explain the result of the

measurement. While OPERA researchers will continue their studies, we are also looking forward to independent measurements to fully assess the nature of this observation."

"When an experiment finds an apparently unbelievable result and can find no artifact of the measurement to account for it, it's normal procedure is to invite broader scrutiny, and this is exactly what the OPERA collaboration is doing — it's good scientific practice," said Sergio Bertolucci from CERN. "If this measurement is confirmed, it might change our view of physics, but we need to be sure that there are no other, more mundane explanations. That will require independent measurements."

In order to perform this study, the OPERA Collaboration teamed up with experts in metrology from CERN and other institutions to perform a series of high-precision measurements of the distance between the source and the detector, and of the neutrinos' time of flight. The distance between the origin of the neutrino beam and OPERA was measured with an uncertainty of 8 inches (20 centimeters) over the 450-mile (730 km) travel path. The neutrinos' time of flight was determined with an accuracy of less than 10 nanoseconds by using sophisticated instruments, including advanced GPS systems and atomic clocks. The time response of all elements of the CNCS beam line and of the OPERA detector has also been measured with great precision.

"We have established synchronization between CERN and Gran Sasso that gives us nanosecond accuracy, and we've measured the distance between the two sites to 8 inches (20 cm)," said Dario Autiero from CNRS. "Although our measurements have low systematic uncertainty and high statistical accuracy, and we place great confidence in our results, we're looking forward to comparing them with those from other experiments."



"The potential impact on science is too large to draw immediate conclusions or attempt physics interpretations. My first reaction is that the neutrino is still surprising us with its mysteries," said Ereditato.

The OPERA experiment was inaugurated in 2006, with the main goal of studying the rare transformation (oscillation) of muon neutrinos into tau neutrinos. One first such event was observed in 2010, proving the unique ability of the experiment in the detection of the elusive signal of tau neutrinos.

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### **Very Large Telescope Captures Rare Hypergiant**—Sept 28 /11 credit ESO, Garching, Germany

Astronomers have used the European Southern Observatory's (ESO) Very Large Telescope (VLT) to image a colossal star that belongs to one of the rarest classes of stars in the universe, the yellow hypergiants. The new picture is the best ever taken of a star in this class and shows for the first time a huge dusty double shell surrounding the central hypergiant. The star and its shells resemble an egg white around a yolky center, leading the astronomers to nickname the object the Fried Egg Nebula.



This picture of the nebula around a rare yellow hypergiant star called IRAS 17163-3907 is the best ever taken of a star in this class and shows for the first time a huge dusty double shell surrounding the central hypergiant. The star and its shells resemble an egg white around a yolky center.

The monster star, known to astronomers as IRAS 17163-3907, has a diameter about a thousand times bigger than our Sun. At a distance of about 13,000 light-years from Earth, it is the closest yellow hypergiant found to date, and new observations show it shines some 500,000 times more brightly than the Sun.

"This object was known to glow brightly in the infrared, but, surprisingly, nobody had identified it as a yellow hypergiant before," said ESO's Eric Lagarde, who led the team that produced the new images. The observations of the star and the discovery of its surrounding shells were made using the VISIR infrared camera on the VLT. The pictures are the first of this object to clearly show the material around it and reveal two almost perfectly spherical shells.

If the Fried Egg Nebula were placed in the center of the solar system, the Earth would lie deep within the star itself and the planet Jupiter would be orbiting just above its surface. The much larger surrounding nebula would engulf all the planets and dwarf planets and even some of the comets that orbit far beyond the orbit of Neptune. The outer shell has a radius 10,000 times the distance from the Earth to the Sun.

Yellow hypergiants are in an extremely active phase of their evolution, undergoing a series of explosive events — this star has ejected 4 times the mass of the Sun in just a few hundred years. The material flung out during these bursts has formed the extensive double shell of the nebula, which is made of dust rich in silicates and mixed with gas.

This activity also shows that the star is likely to soon die an explosive death — it will be one of the next supernova explosions in our galaxy. Supernovae provide much-needed chemicals to the surrounding interstellar environment, and the resulting shock waves can kick start the formation of new stars.

The VLT mid-IR instrument, VISIR, captured this image of the Fried Egg Nebula through three mid-infrared filters that are here colored blue, green, and red.

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### **ALMA's First Released Image**—Oct 4/11 credit ESO, Garching, Germany

Humanity's most complex ground-based astronomy observatory, the Atacama Large Millimeter/submillimeter Array (ALMA), has officially opened for astronomers. The first released image, from a telescope still under construction, reveals a view of the universe that cannot be seen by visible-light and infrared telescopes. Thousands of scientists from around the world competed to be among the first few researchers to explore some of the darkest, coldest, furthest, and most hidden secrets of the cosmos with this new astronomical tool.

At present, around a third of ALMA's eventual 66 radio antennas, with separations up to only 410 feet



Antennae Galaxies composite of ALMA and Hubble observations. Credit: ALMA (ESO/NAOJ/NRAO). Visible light image: NASA/ESA Hubble Space Telescope

(125 meters) rather than the maximum 10 miles (16 kilometers), make up the growing array on the Chajnantor plateau in northern Chile at an elevation of 16,400 feet (5,000 meters). And yet, even under construction, ALMA has become the best telescope of its kind — as reflected by the extraordinary number of astronomers who requested time to observe with it. "Even in this very early phase, ALMA already outperforms all other submillimeter arrays. Reaching this milestone is a tribute to the impressive efforts of the many scientists and engineers in the ALMA partner regions around the world who made it possible," said Tim de Zeeuw from the European Southern Observatory (ESO).

ALMA observes the universe in light with millimeter and submillimeter wavelengths, roughly 1,000 times longer than visible-light wavelengths. Using these longer wavelengths allows astronomers to study extremely cold objects in space — such as the dense clouds of cosmic dust and gas from which stars and

planets form — as well as distant objects in the early universe. ALMA is radically different from visible-light and infrared telescopes. It is an array of linked antennas acting as a single giant telescope, and it detects much longer wavelengths than those of visible light. Its images, therefore, look quite unlike more familiar pictures of the cosmos.

The ALMA team has been busy testing the observatory's systems over the past few months in preparation for the first round of scientific observations known as Early Science. One outcome of their tests is the first image published from ALMA, albeit from what is still very much a growing telescope. Most of the observations used to create this image of the Antennae Galaxies were made using only 12 antennas working together — far fewer than will be used for the first science observations — and with the antennas much closer together, as well. Both of these factors make the new image just a taste of what is to come. As the observatory grows, the sharpness, efficiency, and quality of its observations will increase dramatically as more antennas become available and the array grows in size.

The Antennae Galaxies are a pair of colliding galaxies with dramatically distorted shapes. While visible light shows us the stars in the galaxies, ALMA's view reveals something that cannot be seen in visible light — the clouds of dense cold gas from which new stars form. This is the best submillimeter-wavelength image ever made of the Antennae Galaxies.

Massive concentrations of gas are found not only in the hearts of the two galaxies, but also in the chaotic region where they are colliding. Here, the total amount of gas is billions of times the mass of our Sun — a rich reservoir of material for future generations of stars. Observations like these open a new window on the submillimeter universe and will be vital in helping us understand how galaxy collisions can trigger the birth of new stars. This is just one example of how ALMA reveals parts of the universe that cannot be seen with visible-light and infrared telescopes.

ALMA could accept only about 100 or so projects for this first nine-month phase of Early Science. Nevertheless, over the last few months, keen astronomers from around the world have submitted over 900 proposals for observations. The successful projects were chosen based on their scientific merit, their regional diversity, and also their relevance to ALMA's major science goals.

"We are living in a historic moment for science and particularly for astronomy, and perhaps also for the evolution of humanity because we start to use the greatest observatory under construction at the moment," said Thijs de Graauw from ALMA.

One of the projects chosen for ALMA Early Science observations was that of David Wilner from the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts. "My team hunts for the building blocks of solar systems, and ALMA is uniquely equipped to spot them," Wilner said.

His team's target is AU Microscopii, a star 33 light-years away that is only 1% of the age of our Sun. "We will use ALMA to image the 'birth ring' of planetesimals that we believe orbits this young star. Only with ALMA, however, can we hope to discover clumps in these dusty asteroid belts, which can be the markers of unseen planets." Wilner and his team will share their data with a European team who also requested ALMA observations of this nearby, dust-ringed star.



Any hunt for habitable planets around other stars often begins with a hunt for water in those distant solar systems. Debris disks, the swarms of dust, gas, and rocks around stars, are suspected also to contain craggy ice chunks filled with frozen water, gas, and possibly even organic molecules — the astrochemistry of life.

Simon Casassus from the University of Chile and his team will use ALMA to observe the gas and dust disk around HD142527, a young star that is 400 light-years away. "The dusty disk around this star has a very large gap, which may have been carved by the formation of giant planets," said Casassus. "Outside the gap, this disk contains enough gas to make about a dozen Jupiter-sized planets. Inside the gap, a young gaseous giant planet could still be forming, if there is gaseous material available." Their ALMA observations will measure the mass and physical conditions of gas interior to the gap. "Thus, ALMA gives us a chance to observe planet formation, or its most recent wake," said Casassus.

Further away, 26,000 light-years from us in the center of our galaxy, sits Sagittarius A\*, a supermassive black hole four million times the mass of our Sun. Gas and dust between it and us hide it from our optical telescopes. However, ALMA is tuned to see through the galactic murk and give us tantalizing views of Sagittarius A\*.

"ALMA will let us watch flares of light coming from around this supermassive black hole, and make images of the gas clouds caught by its immense pull," said Heino Falcke from Radboud University Nijmegen in the Netherlands. "This will let us study this monster's messy feeding habits. We think that some of the gas may be escaping its grip, at close to the speed of light."

Like the black outlines in a child's coloring book, cosmic dust and cold gas trace out structures inside galaxies, even if we can't see those galaxies clearly. At the outer fringes of our visible universe lie the mysterious starburst galaxies, bright islands in an otherwise calm, dark cosmos. ALMA will hunt for cold gas and dust traces here, as far back as a few hundred million years after the Big Bang, at a time astronomers call "cosmic dawn."

Masami Ouchi of the University of Tokyo in Japan will use ALMA to observe Himiko, a distant galaxy churning out at least 100 Suns' worth of stars every year and surrounded by a giant, bright nebula. "Other telescopes cannot show us why Himiko is so bright and how it has developed such a huge, hot nebula when the ancient universe all around it is so calm and dark," said Ouchi. "ALMA can show us the cold gas deep in Himiko's star-forming nebula, tracing the movements and activities inside, and we will finally see how galaxies started forming at the cosmic dawn."

During its Early Science observations, ALMA will continue its construction phase in the Chilean Andes, high on the remote Chajnantor Plain in the harsh Atacama Desert. Each new, climate-armoured antenna will join the array and be linked via fiber optic cabling. The views from each distant antenna are assembled into one large view by one of the world's fastest special-purpose supercomputers, the ALMA correlator, which can perform 17 quadrillion operations per second.

By 2013, ALMA will be an up to 10 mile-wide (16-km) array of 66 ultra-precision millimeter/submillimeter wave radio antennas working together as one telescope and built by ALMA's multinational partners in Europe, North America, and East Asia.

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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.

### Moon Zoo - Your Chance to Explore the Moon!

The aim of Moon Zoo is to provide detailed crater counts for as much of the Moon's surface as possible. Unlike here on Earth where weather quickly erodes any signs of all but the most recent impacts, craters on the lunar surface stay almost until eternity. That means that the number of craters on a particular piece of the surface tells us how old it is. We need your help to explore the lunar surface, by answering a series of questions about what you see. The most important thing to remember is that we've chosen tasks that are best done by humans rather than computer, so please don't spend much more than a minute on any single image. As a community we have already visually classified 2,491,695 images from NASA's Lunar Reconnaissance Orbiter (LRO). Click [here](#) to begin taking part in the project.

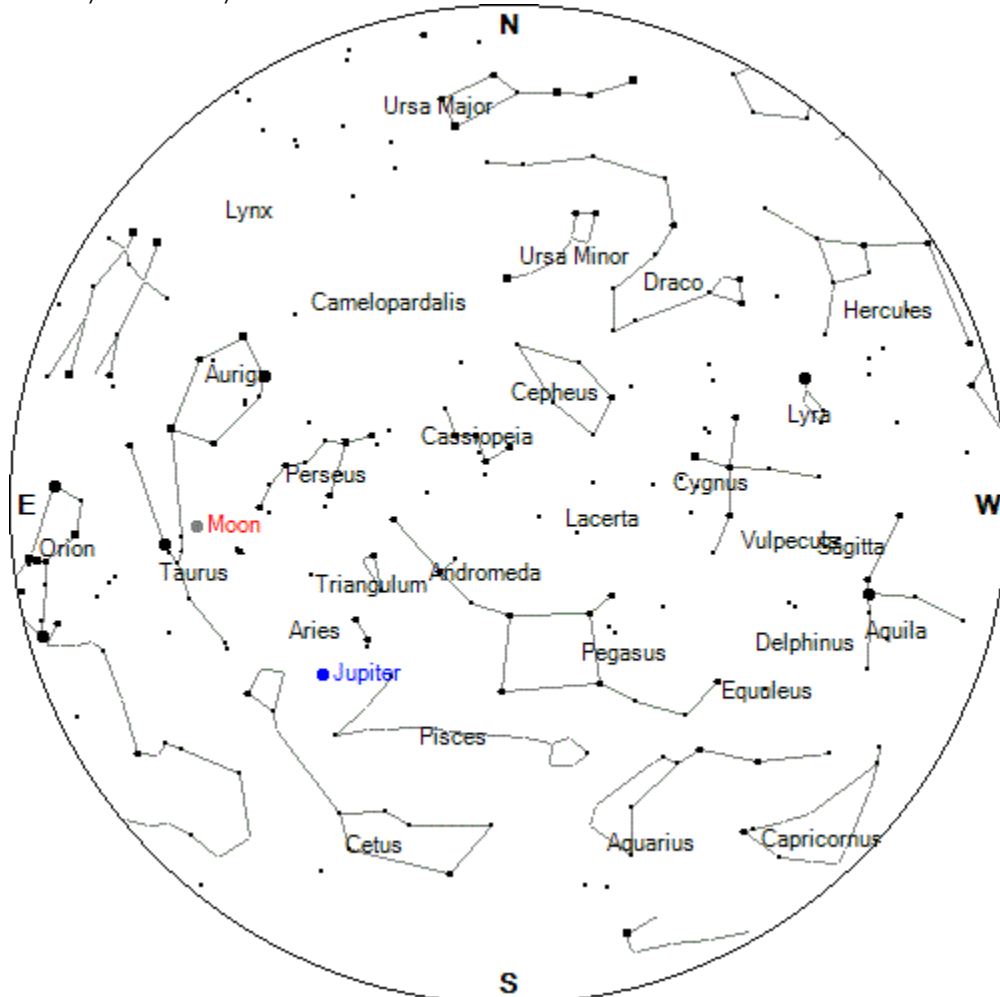
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## 9. The Sky This Month

By Bryon Thompson

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

Sky Chart —Here's your mid-October 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

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