COWICHAN VALLEY STARFINDERS ASTRONOMY CLUB

Clear Skies

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Quick Links

1. Greetings!

Welcome to the Cowichan Valley StarFinders Astronomy Club's "Clear Skies" monthly newsletter.
This newsletter is a special edition encompassing May and June and is just ahead of the "summer solstice"

Did you know that back in May of 1988, Frank and other interested parties founded our club? Today I am proud to report that our club is 23 years old. It is a wonderful accomplishment and a testament to Frank and the other original Members of which many are still active in the club today.

Reminder that our next Social will be held at 6:00pm on WEDNESDAY June 22nd. See "Socials" section for directions and more info. This is our last Social before the summer holidays. Socials will resume again in September at Bryon and Freda's house. Have a great summer and hope to see some of you under the stars!
Many thanks to this month's contributors Moe R and Bryon T.

By Freda Eckstein

" Astronomers, like burglars and jazz musicians, operate best at night"- Miles Kington

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2. Socials

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

Our next Social will be held at **6:00pm** on **WEDNESDAY June 22nd**
Feature: "Summer Social & AGM" hosted by CVSF
NEW LOCATION: Moe Raven and Shawna Meade will host the event at their home 1475 Beatrice Way, Cobble Hill. Look for the CLUB sign, please park on the road side. For Map directions click here.

The summer social & AGM are hosted by CVSF, which means that the club pays for the goodies and drinks to celebrate the clubs birthday (23 years) and to elect our next "board of directors" for the club during our AGM portion of the evening.

As a registered Society, we must hold one meeting a year that is considered an AGM. There are three parts to the AGM, the Report of the Directors, the Financial Statement and election of Director positions (which take effect in September). As a member in good standing you are allowed to vote and hold director postions.

More information on the AGM positionss will be distributed in a separate email.

I would also like to acknowledge all the speakers who participated in our 2010/2011 series: Dr. Robert Kowalewski, Dr. Falk Herwig, Dr. Florin Diacu, John McDonald and Dr. Gregory Arkos. You're willingness to come out and give a talk to the club is much appreciated. Also a big thanks to Mandy, the Victoria Speakers Bureau, for

helping organize the series.

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Social Highlights

April 27th: "Travel Astrophotography (or how to pack a lot of stuff in your suitcase)" by John McDonald. John of course, was his wonderful self, filled with information. The small but enthusiastic crowd was treated to an intimate evening workshop. Since John has retired from work, he and his wife travel to some great dark skies. Over the years, John has learned to pare down on his Astrophotography tech gear. He now travels with: a camera (Rebel Ti) Lenses (10mm focal length. 300ml for eta corina or LMC shots), tripod, interval tuner, sky charts, red light and batteries. Sometimes he can get away with some extras such as : a 80mm telescope, astrotrac travel mount (30 lbs), Compass, Binos, tools, binos, laptop, most of the above is squished to fit into a photographer backpack. Some other useful tools are: red dot finders, right angle finder, external Power and backup storage disk.

When getting a camera ensure that the camera has a CMOS sensor. CMOS uses less power, heat and noise. Advantages of a camera over a CCD? Mostly cost, do not need a computer, advantage is a deeper well depth (more detail), more work and you need a power source.

John does some of his editing using photoshop CS2 for noise reduction, feathering/sharpening, Inversion (to create fuzzy bits). His stacking preferences are: Deep Sky Stacker (Free on the internet) also Image plus (huge learning curve). He also uses Registax video stacker for Videos.

John took the time to show us some marvelous pictures and videos he did. Two that really stood out were:
The Large Magellanic Cloud (LMC) which is a nearby irregular galaxy, and is a satellite of the Milky Way. At a distance of 160,000 light-years).
Eta Carinae, a interesting red star and nebula about 7,500 light-years from Earth in the southern constellation Carina and now known to be a binary star system.

We probably would have kept John busy with questions all night. But all good things must come to an end and John had a long drive home.

By Bryon Thompson

May 25th "Apocalyptic Prophecy: Fact or Fiction?" by Dr. Gregory Arkos
Dr. Arkos is a member of the faculty at VIU, in the department of Physics, Engineering and Astronomy. For those of us who were waiting on the edge of our seats for the end of the world on Dec. 21, 2012, we were shocked to find out that there is very little evidence to prove that the world will end on that date. To start off with, End of Days predictions have been around for a long time. There have been 44 significant claims of an imminent apocalypse in the last few hundred years. Many predictions are linked to religion and many to astronomical events.

Why is Dec. 21, 2012 singled out as the day of the Apocalypse? The Mayans were very aware of astronomical cycles and used this knowledge to create their calendar. The Mayan calendar ends with the 13th cycle of the Longcount Calendar on Dec. 21, 2012 and so this has been taken to indicate that the Mayans knew that all civilization would end on this date. Or perhaps they ran out of rock on which to carve the calendar...or they just got tired of carving...you be the judge. As Dr. Arkos said, the Mayans could not predict the end of their own civilization, let alone the end of all civilization. Theories of what will happen in 2012 include: the Earth will be hit by a tenth planet (Planet X) that no one has ever detected in the sky; geomagnetic reversal will cause Earth to be vulnerable to solar radiation; enormous solar eruptions will hit the Earth and destroy it; and galactic alignment of the Sun, Earth and the centre of the galaxy will cause a gravitational pull that will rip the Earth apart. Luckily for us, Dr. Arkos informed us that there is no evidence for the theory of Planet X, geomagnetic reversal will not end the world as it has happened several times already, the sun is not behaving abnormally and galactic alignment is common and uneventful.

In the end, we found out that the end of the world theories make for good stories and those predicting them get a lot of attention. So we can all sit back and relax, right? Oh...but what about Near Earth Objects???

By Nancy Kirshfelt

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3. Upcoming Events

June 22nd, 9:00 pm – 10:00 pm Astronomy Open House Every Wednesday at University of Victoria, 5th floor Bob Wright Centre
You say you do not know a red dwarf from a black Hole? A giant star from a globular cluster? Well here's your chance to discover everything you've wanted to know about the sky.
Rain or Shine, Admission Free, Parking $2.00

June 24th , 6:00pm CVSF Social, Cowichan Valley (Mill Bay)
"Summer Social & AGM" hosted by CVSF
NEW LOCATION: Moe Raven and Shawna Meade will host the event at their home.

NASA Launches credit NASA.Com:

Date: July 8 +
Mission: STS-135
Launch Vehicle: Space Shuttle Atlantis
Launch Site: Kennedy Space Center - Launch Pad 39A
Launch Time: 11:26 a.m. EDT
Description: Space shuttle Atlantis will carry the Raffaello multipurpose logistics module to deliver supplies, logistics and spare parts to the International Space Station. Atlantis also will fly a system to investigate the potential for robotically refueling existing spacecraft and return a failed ammonia pump module.

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4. This Month In History

Courtesy of: Windows2universe.org

May 2
1519 - Death of Leonardo da Vinci
Leonardo da Vinci was an Italian artist and scientist who lived between 1452-1519. Leonardo was the original Renaissance man, whose roles included inventor, engineer, architect, mathematician, geologist, and astronomer.

May 5
1961 - Shepard becomes the first American in space
Shepard became the first American astronaut in space when he flew aboard Mercury 3. The spacecraft reached an altitude of 116 miles on a 15-minute flight.

May 11
1918 - Richard Feynman's birthday
Richard Feynman was an American physicist who lived between 1918-1988. He contributed to many areas of physics, including atomic theory and quantum electrodynamics, which studies electron behavior. He also participated in the Manhattan Project, the building of the first atomic bomb.

May 21
1911 - Death of Williamina Fleming
Williamina Paton Stevens Fleming was a Scottish-American astronomer who lived from 1857-1911. She discovered 10 of the 24 novae then known. She also discovered over 200 variable stars. Fleming worked at the Harvard Observatory for many years.

May 24
1543 - Death of Nicholas Copernicus
Nicholas Copernicus was a Polish astronomer who lived between 1473-1543. Before his time, people believed in the Ptolemaic model of the solar system, which maintained that the Earth was the center of the universe. Copernicus changed this belief when he introduced the heliocentric model, centered around the sun.

June 8
1625 - Birthday of Giovanni Cassini
Giovanni Cassini was Italian-French astronomer who lived between 1625-1712. He discovered that

Saturn's Rings are split into two parts, and today the gap between them is called the "Cassini Division". He also discovered four of Saturn's moons.

June 13
1831 - James Maxwell's birthday
James Clerk Maxwell was a Scottish physicist who lived between 1831-1879. Maxwell is most famous for his equations linking electricity and magnetism. His revolutionary work lead to the development of quantum physics in the early 1900's and to Einstein's theory of relativity.

June 16
1977 - Death of Wernher von Braun
Wernher von Braun was a German engineer who lived between 1912-1977. He is considered the father of the space age for his work in rocketry.

June 30
1905 - Einstein introduces special Theory of Relativity
Albert Einstein introduced special Theory of Relativity in paper Electrodynamics of Moving Bodies.

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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".

June 15 marks Full Moon and the first lunar eclipse of 2011. This eclipse will be long and deep and dark, the longest lunar eclipse in nearly 11 years. But unfortunately we in North America were unable to see it. If you want to see the eclipse online here's your chance to view some photo's from around the world and then an online video….coool. http://techie-buzz.com/science/photos-lunar-eclipse.html

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6. Featured Articles

Articles

RETURN TO CATEGORIES

1. Gravity Probe B Confirms Two Einstein Space-Time Theories
2. Unique Portrait of Shuttle and ISS
3. NASA Probes Suggest Magnetic Bubbles Reside at Edge of Solar System
4. Physicsts Hit on Mathematical Description of Superfluid Dynamics
5. Major Drop in Solar Activity Predicted
6. NASA Spacecraft Confirms Theories, See Surprises at Mercury

Gravity Probe B Confirms Two Einstein Space-time Theories–

May 5 /11 credit *NASA*

NASA's Gravity Probe B (GP-B) mission has confirmed two key predictions derived from Albert Einstein's general theory of relativity, which the spacecraft was designed to test.

The experiment, launched in 2004, used four ultra-precise gyroscopes to measure the hypothesized geodetic effect — the warping of space and time around a gravitational body — and frame-dragging — the amount a spinning object pulls space and time with it as it rotates.

GP-B determined both effects with unprecedented precision by pointing at a single star, IM Pegasi, while in a polar orbit around Earth. If gravity did not affect space and time, GP-B's gyroscopes would point in the same direction forever while in orbit. But in confirmation of Einstein's theories, the gyroscopes experienced measurable, minute changes in the direction of their spin while Earth's gravity pulled at them.

"Imagine the Earth as if it were immersed in honey. As the planet rotates, the honey around it would swirl, and it's the same with space and time," said Francis Everitt from Stanford University in Menlo Park, California. "GP-B confirmed two of the most profound predictions of Einstein's universe, having far-reaching implications across astrophysics research. Likewise, the decades of technological innovation behind the mission will have a lasting legacy on Earth and in space." GP-B is one of the longest-running projects in NASA history, with agency involvement starting in the fall of 1963 with initial funding to develop a relativity gyroscope experiment. Subsequent decades of development led to groundbreaking technologies to control environmental disturbances on spacecraft, such as aerodynamic drag, magnetic

fields, and thermal variations. The mission's star tracker and gyroscopes were the most precise ever designed and produced. GP-B completed its data collection operations and was decommissioned in December 2010. "The mission results will have a long-term impact on the work of theoretical physicists," said Bill Danchi from NASA Headquarters in Washington, D.C. "Every future challenge to Einstein's theories of general relativity will have to seek more precise measurements than the remarkable work GP-B accomplished."

Innovations enabled by GP-B have been used in GPS technologies that allow airplanes to land unaided. Additional GP-B technologies were applied to NASA's Cosmic Background Explorer mission, which accurately determined the universe's background radiation. That measurement is the underpinning of the Big Bang theory and led to the Nobel Prize for NASA physicist John Mather.

The drag-free satellite concept pioneered by GP-B made a number of Earth-observing satellites possible, including NASA's Gravity Recovery and Climate Experiment and the European Space Agency's Gravity field and steady-state Ocean Circulation Explorer. These satellites provide the most precise measurements of the shape of Earth, critical for precise navigation on land and sea, and understanding the relationship between ocean circulation and climate patterns.

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Unique "portrait" of Shuttle and International Space Station – June 7/11 Credit *NASA*

Newly-released portraits show the International Space Station together with the space shuttle, the vehicle that helped build the complex during the last decade. The pictures are the first taken of a shuttle docked to the station from the perspective of a Russian Soyuz spacecraft.

On May 23, the Soyuz was carrying Russian cosmonaut Dmitry Kondratyev, NASA astronaut Cady Coleman and European Space Agency astronaut Paolo Nespoli back to Earth. Once their vehicle was about 600 feet from the station, Mission Control Moscow, outside the Russian capital, commanded the orbiting laboratory to rotate 130 degrees. This move allowed Nespoli to capture digital photographs and high-definition video of shuttle Endeavour docked to the station.

The Soyuz landed in Kazakhstan and was taken to Moscow for routine post-landing analysis. NASA and the Russian space agency, Roscosmos, then processed the imagery as part of the standard disposition of spacecraft cargo.

Additional images and high definition video are being processed and will be posted on NASA's website. To view the still images, click here
http://www.nasa.gov/mission_pages/station/multimedia/e27depart.html

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NASA Probes Suggest Magnetic Bubbles Reside at Edge of Solar System–June 9/11 *credit NASA*

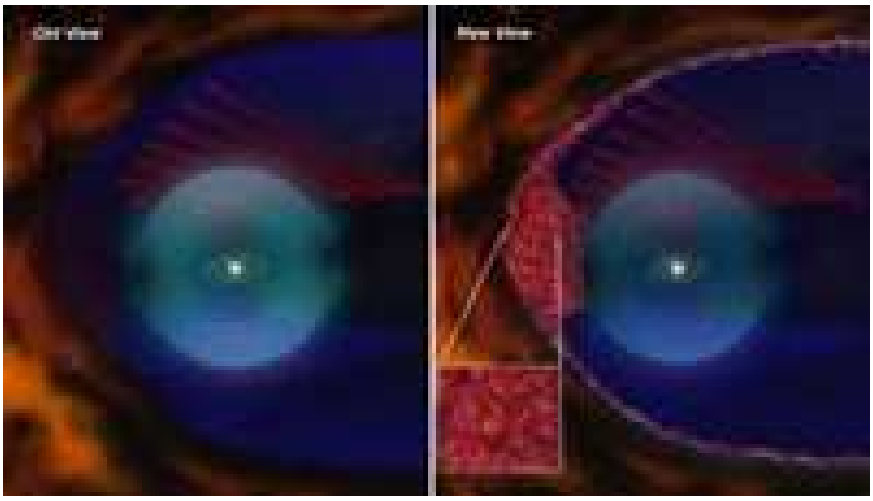
While using a new computer model to analyze Voyager data, scientists found the Sun's distant magnetic field is made up of bubbles approximately 100 million miles wide. The bubbles are created when magnetic field lines reorganize. The new model suggests the field lines are broken up into self-contained structures disconnected from the solar magnetic field. The findings are described in the June 9 edition of the Astrophysical Journal.

Like Earth, the Sun has a magnetic field with a north pole and a south pole. The field lines are stretched outward by the solar wind or a stream of charged particles emanating from the star that interacts with material expelled from others in our corner of the Milky Way galaxy.

The Voyager spacecraft, more than nine billion miles away from Earth, are traveling in a boundary region. In that area, the solar wind and magnetic field are affected by material expelled from other stars in our corner of the Milky Way galaxy.

"The Sun's magnetic field extends all the way to the edge of the solar system," said astronomer Merav Opher of Boston University. "Because the Sun spins, its magnetic field becomes twisted and

wrinkled, a bit like a ballerina's skirt. Far, far away from the Sun, where the Voyagers are, the folds of the skirt bunch up."



Left: Old and new views of the heliosheath. Red and blue spirals are the gracefully curving magnetic field lines of orthodox models. New data from Voyager add a magnetic froth (inset) to the mix.

Understanding the structure of the Sun's magnetic field will allow scientists to explain how galactic cosmic rays enter our solar system and help define how our star interacts with the rest of the galaxy. So far, much of the evidence for the existence of the bubbles originates from an instrument aboard the spacecraft that measures energetic particles. Investigators are studying more information and hoping to find signatures of the bubbles in the Voyager magnetic field data. "We are still trying to wrap our minds around the implications of the findings," said University of Maryland physicist Jim Drake, one of Opher's colleagues.

Launched in 1977, the Voyager twin spacecraft have been on a 33-year journey. They are en route to reach the edge of interstellar space. NASA's Jet Propulsion Laboratory in Pasadena, California, built the spacecraft and continues to operate them. The Voyager missions are part of the Heliophysics System Observatory, sponsored by the Heliophysics Division of NASA's Science Mission Directorate in Washington

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Physicists Hit on Mathematical Description of Superfluid Dynamics–June 9/11

credit University of Washington, Seattle

It has been 100 years since the discovery of superconductivity, a state achieved when mercury was cooled, with the help of liquid helium, to nearly the coldest temperature achievable to form a superfluid that provides no resistance to electrons as they flow through it.

During that century, scientists have struggled to find a precise mathematical explanation of why and how this strange fluid behaves as it does. Liquid helium-4 itself becomes a superfluid when cooled to within a few degrees of absolute zero on the Kelvin scale (minus 273 Celsius or minus 460 Fahrenheit), and the resulting lack of viscosity allows it to seem to defy gravity, flowing up and over the sides of a container.

A 2001 photo from the space shuttle shows a phenomenon called von Karman vortices in clouds downwind from Rashiri Island in the northern Sea of Japan. The vortices are similar to those that form in superfluids

Now a team led by a University of Washington physicist, using the most powerful supercomputer available for open science, has devised a theoretical framework that explains the real-time behavior of superfluids that are made of fermions -- subatomic particles such as electrons, protons and neutrons that are basic building blocks of nature. Such superfluids are found in neutron stars, which rotate between one and 1,000 times a second. These stars, also called pulsars, have 50 percent greater mass than the Sun but are packed so densely that one can occupy an area only about the size of a city such as Seattle, said Aurel Bulgac, a UW physics professor and lead author of a paper in the June 10 edition of Science that details the work. As a neutron star rotates, the superfluid on the surface behaves quite differently than a liquid would on the surface of the Earth. As the rotational speed increases the fluid opens a

series of small vortices. As the vortices assemble into triangular patterns, the triangles build a lattice structure within the superfluid. "When you reach the correct speed, you'll create one vortex in the middle," Bulgac said. "And as you increase the speed, you will increase the number of vortices. But it always occurs in steps."

Similar behavior can be recreated in a laboratory using a vacuum chamber and a laser beam to create a high-intensity electrical field that will cool a small sample, perhaps 1 million atoms, to temperatures near absolute zero. A "laser spoon" then can stir the superfluid fast enough to create vortices.

In trying to understand the odd behavior, scientists have attempted to devise descriptive equations, as they might to describe the swirling action in a cup of coffee as it is stirred, Bulgac said. But to describe the action in a superfluid made of fermions, a nearly limitless number of equations is needed. Each describes what happens if just one variable -- such as velocity, temperature or density -- is changed. Because the variables are linked, if one changes others will change as well. The challenge, Bulgac said, was to formulate the proper mathematical problem and then find a computer that could work through the problem as the number of variable changes reached 1 trillion or more. To reach its solution, the team in the last year used the JaguarPF computer at Oak Ridge National Laboratory in Tennessee, one of the largest supercomputers in the world, for the equivalent of 70 million hours, which would require almost 8,000 years on a single-core personal computer (JaguarPF has nearly a quarter-million cores). "This tells you the complexity of these calculations and how difficult this is," he said. The researchers also found through their calculations that by increasing the speed at which the fluid was stirred, eventually it would lose its superfluid properties -- though not as soon as had been previously hypothesized.

The work means that researchers can "to some extent" study the properties of a neutron star using computer simulations, Bulgac said. It also opens new directions of research in cold-atom physics. "This is a pretty major step forward in studying these dynamic processes," he said.

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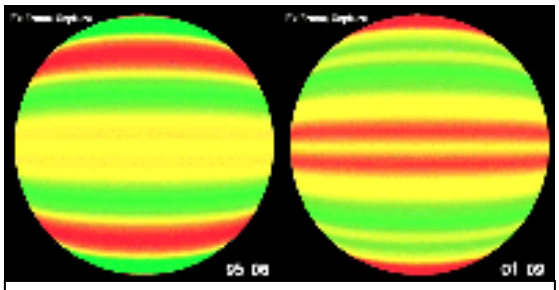
Major Drop in Solar Activity Predicted–June 14/11 *credit National Solar Observatory, Sunspot, New Mexico*



Mobile "jet streams" in the Sun migrate from the poles toward the equator as the solar cycle progresses. At left (solar minimum) the red jet streams are located near the poles. At right (solar maximum) they have migrated close to the equator. The jet streams are associated with the locations where sunspots emerge during the solar cycle, and are thought to play an important role in generating the Sun's magnetic field.
Photo by F. Hill, et al. (GONG/NSO/AURA/NSF)

A missing jet stream, fading spots, and slower activity near the poles say that our Sun is heading for a rest period even as it is acting up for the first time in years, according to scientists at the National Solar Observatory (NSO) and the Air Force Research Laboratory (AFRL).

As the current sunspot cycle, Cycle 24, begins to ramp up toward maximum, independent studies of the solar interior, visible surface, and the corona indicate that the next 11-year solar sunspot cycle, Cycle 25, will be greatly reduced or may not happen at all. "This is highly unusual and unexpected," Frank Hill, associate director of the NSO's Solar Synoptic Network, said of the results. "But the fact that three completely different views of the Sun point in the same direction is a powerful indicator that the sunspot cycle may be going into hibernation." Spot numbers and other solar activity rise and fall about every 11 years, which is half of the Sun's 22-year magnetic interval, because the Sun's magnetic poles reverse with each cycle. An immediate question is whether this slowdown presages a second Maunder Minimum, a 70-year period with virtually no sunspots between 1645 and 1715.

Hill is the lead author on one of three papers on these results being presented this week. Using data from the Global Oscillation Network Group (GONG) of six observing stations around the world, the team translates surface pulsations caused by sound reverberating through the Sun into models of the internal structure. One of its discoveries is an east-west zonal wind flow inside the Sun, called the torsional oscillation, which starts at mid-latitudes and migrates toward the equator. The latitude of this wind stream matches the new spot formation in each cycle, and successfully predicted the late onset of the current Cycle 24. "We expected to see the start of the zonal flow for Cycle 25 by now,"

Hill explained, "but we see no sign of it. This indicates that the start of Cycle 25 may be delayed to 2021 or 2022, or may not happen at all."

In the second paper, Matt Penn and William Livingston see a long-term weakening trend in the strength of sunspots, and predict that by Cycle 25 magnetic fields erupting on the Sun will be so weak that few if any sunspots will be formed. Spots are formed when intense magnetic flux tubes erupt from the interior and keep cooled gas from circulating back to the interior. For typical sunspots, this magnetism has a strength of 2,500 to 3,500 gauss (Earth's magnetic field is less than 1 gauss at the surface); the field must reach at least 1,500 gauss to form a dark spot.

Using more than 13 years of sunspot data collected at the McMath-Pierce Telescope at Kitt Peak in Arizona, Penn and Livingston observed that the average field strength declined about 50 gauss per year during Cycle 23 and now in Cycle 24. They also observed that spot temperatures have risen exactly as expected for such changes in the magnetic field. If the trend continues, the field strength will drop below the 1,500 gauss threshold and spots will largely disappear as the magnetic field is no longer strong enough to overcome convective forces on the solar surface.

Moving outward, Richard Altrock, manager of the Air Force's coronal research program at NSO's Sunspot, New Mexico, facilities, has observed a slowing of the "rush to the poles," the rapid poleward march of magnetic activity observed in the Sun's faint corona. Altrock used 4 decades of observations with NSO's 16-inch (40cm) coronagraphic telescope at Sunspot. "A key thing to understand is that those wonderful, delicate coronal features are actually powerful, robust magnetic structures rooted in the interior of the Sun," Altrock explained. "Changes we see in the corona reflect changes deep inside the Sun." Altrock used a photometer to map iron heated to 3.6 million degrees Fahrenheit (2 million degrees Celsius). Stripped of half of its electrons, it is easily concentrated by magnetism rising from the Sun. In a well-known pattern, new solar activity emerges first at about 70° latitude at the start of a cycle, then toward the equator as the cycle ages. At the same time, the new magnetic fields push remnants of the older cycle as far as 85° poleward. "In cycles 21 through 23, solar maximum occurred when this rush appeared at an average latitude of 76°," Altrock said. "Cycle 24 started out late and slow and may not be strong enough to create a rush to the poles, indicating we'll see a very weak solar maximum in 2013, if at all. If the rush to the poles fails to complete, this creates a tremendous dilemma for the theorists, as it would mean that Cycle 23's magnetic field will not completely disappear from the polar regions (the rush to the poles accomplishes this feat). No one knows what the Sun will do in that case."

All three of these lines of research to point to the familiar sunspot cycle shutting down for a while. "If we are right," Hill concluded, "this could be the last solar maximum we'll see for a few decades. That would affect everything from space exploration to Earth's climate."

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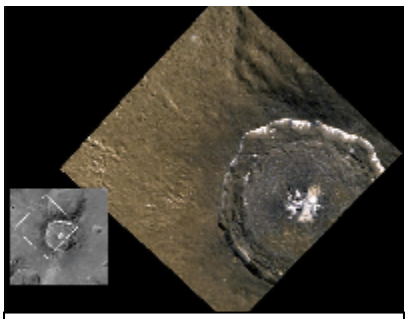
NASA Spacecraft Confirms Theories, Sees Surprises at Mercury–June 16/11 *credit NASA Headquarters, Washington, D.C*

NASA scientists are making new discoveries about the planet Mercury. Data from MESSENGER, the first spacecraft to orbit Mercury, is giving scientists important clues to the origin of the planet and its geological history and helping them better understand its dynamic interior and exterior processes.

NASA's MErcury Surface, Space ENvironment, GEochemistry, and Ranging spacecraft, or MESSENGER, has been orbiting Mercury since March 18. To date, the spacecraft has provided tens of thousands of images showing detailed planetary features. The planet's surface previously had been seen only at comparatively low resolution, but it's now in sharper focus.

The spacecraft also has collected extensive measurements of the chemical composition of Mercury's surface and topography and gathered global observations of the planet's magnetic field. Data now confirm that bursts of energetic particles in Mercury's magnetosphere are a continuing product of the interaction of Mercury's magnetic field with the solar wind.



This spectacular view of the crater Degas was obtained as a high-resolution targeted observation (296 feet [90 meters] per pixel). Impact melt coats its floor, and as the melt cooled and shrank, it formed the cracks observed across the crater. For context, Mariner 10's view of Degas is shown at left. Degas is 32 miles (52 kilometers) in diameter and is centered at 37.1° N, 232.8° E.

"We are assembling a global overview of the nature and workings of Mercury for the first time," said MESSENGER principal investigator Sean Solomon of the Carnegie Institution of Washington. "Many of our earlier ideas are being cast aside as new observations lead to new insights. Our primary mission has another 3 Mercury years to run, and we can expect more surprises as our solar system's innermost planet reveals its long-held secrets."

Flyby images of Mercury had detected bright, patchy deposits on some crater floors. Without high-resolution images to obtain a closer look, these features remained only a curiosity. Now new detailed images have revealed these patchy deposits to be clusters of rimless, irregular pits varying in size from several hundred feet to a few miles wide. These pits are often surrounded by diffuse halos of more reflective material and are found on central peaks, peak rings, and rims of craters.

"The etched appearance of these landforms is unlike anything we've seen before on Mercury or the Moon," said Brett Denevi, a staff scientist at the Johns Hopkins University Applied Physics Laboratory in Laurel, Maryland, and a member of the MESSENGER imaging team. "We are still debating their origin, but they appear to be relatively young and may suggest a more abundant than expected volatile component in Mercury's crust."

One of two instruments on the spacecraft designed to measure the quantity of key chemical elements on Mercury has made several important discoveries since the orbital mission began. Elemental ratios averaged over large areas of the planet's surface show that Mercury's surface differs markedly in composition from that of the Moon.

Observations have revealed substantial amounts of sulfur at Mercury's surface, lending support to prior suggestions from ground-based telescopic observations that sulfide minerals are present. This discovery suggests that the original building blocks from which Mercury formed may have been less oxidized than those that formed the other terrestrial planets. The result also hints that sulfur-containing gases may have contributed to past explosive volcanic activity on Mercury.

Topography data of Mercury's northern hemisphere reveal the planet's large-scale shape and profiles of geological features in high detail. The north polar region is a broad area of low elevations, whereas the overall range in topographic heights seen to date exceeds 5 miles (9 kilometers).

Two decades ago, Earth-based radar images showed deposits thought to consist of water ice and perhaps other ices near Mercury's north and south poles. These deposits are preserved on the cold, permanently shadowed floors of high-latitude impact craters. MESSENGER is testing this idea by measuring the floor depths of craters near Mercury's north pole. The craters hosting polar deposits appear to be deep enough to be consistent with the idea that those deposits are in permanently shadowed areas.

During the first of three Mercury flybys in 1974, Mariner 10 discovered bursts of energetic particles in the planet's Earth-like magnetosphere. Four bursts of particles were observed on that flyby. Scientists were puzzled that no such strong events were detected by MESSENGER during any of its three flybys of the planet in 2008 and 2009. But now that the spacecraft is in near-polar orbit around Mercury, energetic events are being seen regularly.

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7. Buy and Sell

Here's your chance to clean out the closet and find a home for your slightly used treasures. Post your buy and sell items by emailing the Editor with your details.

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8. 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 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 our Editor and master of Astronomy 101 basics.

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9. Kids Korner

For the younger astronomers. We want your input on what you would like to see happening at the club. Tell us a bit about yourself and why you love astronomy. Email the Editor with your submissions. For the older folks, if you have any ideas that might spark the interest of a young upcoming astronomer, please send your submissions to the editor.

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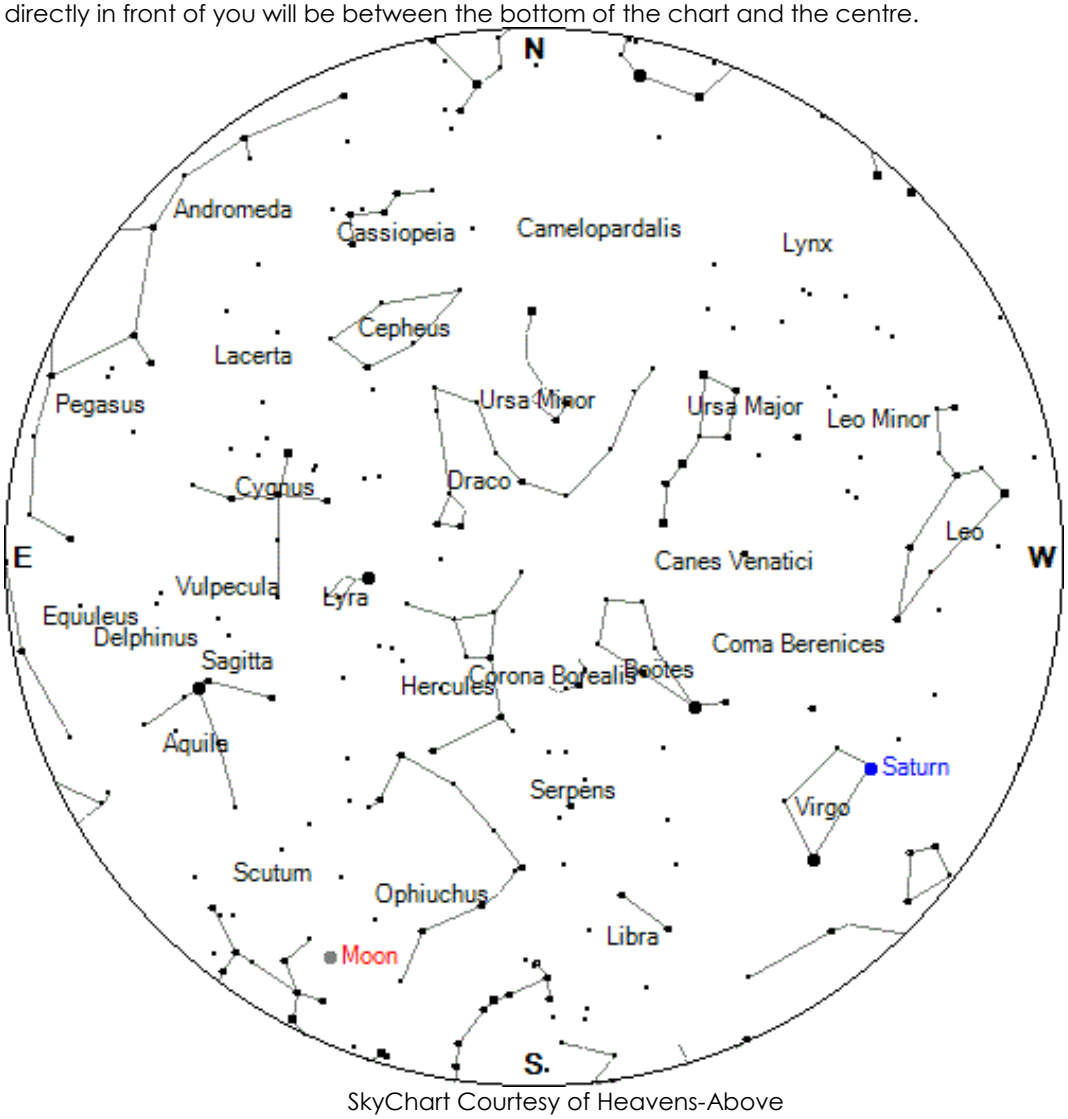
10. The Sky This Month

By Bryon Thompson

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

Sky Chart —Here's your mid-June 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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