



Clear Skies

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1. Greetings!

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

As we ever so creep into better weather here on the west coast you may find yourself star gazing remembering last years "star parties" and all the fun that was had or you may just want to "get outta town" and head for the "heat". If you are one of the latter folk then you will be most interested in this month's social feature on April 27. John McDonald is back to impart some wisdom and wit with his presentation "**Travel Astrophotography(or how to pack a lot of stuff in your suitcase)**". We will also be drawing for a CVSF 2010 tee-shirt as a door prize, so you have to be at the social to win.

It was a clear night on the south island for our view of the "super moon". Check out the Cool Pics/Videos to see Dave Polster's shot of the full moon in all its glory. Joe Carr helped to sort out the debate on whether the moon was actually "bigger" by finding a gif on the internet showing the difference. Take it with a grain of salt...it is the internet afterall. However, I did hear rumours that John McDonald has a shot which actually measured the size difference. Hopefully John will show us this shot after his presentation.

If you are sticking around waiting for the clouds to part then you may see some wonderful phenomenon spectacles in the sky as "Spring is Fireball Season". Their nightly rate mysteriously climbs 10% to 30%. For more information on this see the "Featured Article".

And finally, if your just waterlogged and got those "rainy day feelings" then there is always time for a test of your wits, try the Astronomy – Universe Galaxy: Matching game in the Kids Korner. Just a little something to get us thinking about Astronomy Day coming up on May 7 at Bright Angel Park. There will be more information on this coming up this month. Stay Tuned.

Many thanks to this month's contributors Dave P, Joe C, 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 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 April 27th**
Feature: "Travel Astrophotography(or how to pack a lot of stuff in your suitcase)" by John McDonald.
 This man should know; he is enjoying retirement to its fullest and is travelling the globe creating astrophotography delights which us "armchair travellers" can enjoy. ☺

Bio: John McDonald holds a PhD from the University of Ottawa (1964). He was a faculty member at the University of Alberta from 1965 to 2001. Currently he is a Fellow of the Institute of Physics (UK), Professor Emeritus at the University of Alberta and Adjunct Professor at the University of Victoria.

John's research was in nuclear and particle physics and he is the author or co-author of 250 published scientific papers. He contributed to the development of the Tile Endcap for OPAL detector at the CERN Laboratory in Geneva and played a major role in the ALTA project to study of ultra high-energy cosmic rays.

Currently, John is enjoying retirement in Victoria. He continues to study and enjoy physics, especially its connection with cosmology, and he serves on the Research Council of the Canadian Institute for Advanced Research. Recreational activities including flying, model building and cross country skiing have been an important part of his life and he is now having a great time observing and photographing the sky as a member and past president of the Victoria Centre of the Royal Astronomical Society.

We are always delighted to have John present at the club and we try and get him to come out at least once a year. He is very down-to-earth. A great presenter and is full of practical information which any budding astrophotographer can should not missed out on.

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Social Highlights – March 23rd, 2011

By Bryon Thompson

Dr. Florin Diacu's talk on "Chaos Theory" was interesting, but what was a treat to everyone who joined us was his talk on Astronomical events relating to chronological history. Archeologists typically carbon date artifacts using historical timelines or chronological dates. But what if the chronological dates are incorrect? That was the prime discussion based on Dr. Diacu's book "The Lost Millennium".

Dr. Diacu presented the history of chronology from Egyptian horoscopes to the work of Isaac Newton, with cameos by Voltaire and Edmund Halley. He demonstrated that our calendar is far from perfect. It all depends on the dating of ancient events which we found out could be off by a thousand years!

Cool so we are all younger than we thought ;)

To read more on Florin's Part detective story, part conspiracy theory, part scientific history buy it on amazon.ca

"Diacu gives both sides of the argument fairly but the mere idea that the calendar may be out by as much as 1,000 years is staggering."

—The London Free Press

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3. Upcoming Events



Every Wednesday from 8-10 UVIC Open House: In The Sky Above, at UVic (until April 2011)

The University of Victoria's newest stellar acquisition is the largest telescope on a university campus in Canada; members of the public are invited to take in the view every Wed. night at UVic. The telescope is on the roof of UVic's new science building and is the country's fifth largest overall. Visitors can expect to observe visible planets, double stars, open clusters, nebulae and even the Andromeda Galaxy.

Weekly viewings continue through April 2011, except last two Wed. in Dec.

Bob Wright Centre, fifth floor (use main lobby elevator on east side of building)

Admission is free. All ages and levels of cosmological knowledge are welcome.

Evening parking is \$2.

Campus maps are available at www.uvic.ca/visitors/explore/maps.

For event info, contact the astronomy department at the numbers below.

Contacts: Russell Robb (Senior Lab Instructor, Department of Physics & Astronomy) at 250-721-7750 or robb@uvic.ca

April 3rd, 10 pm ET/PT Force of Nature- the David Suzuki Movie, on CBC TV

Stay indoors this Sunday night. This may be the only time we ask you to watch TV instead of getting out in nature. Get to know the real David behind his nature programs, and hear about his vision for the environment. He takes you through his upbringing, his time in a Japanese internment camp, his studies during the American space race, his activism in the '60s, all the way to the present. Force of Nature: The David Suzuki Movie is a personal portrait that also inspires us to make a difference with our lives.

April 9th, 8pm-Midnight Yuri's Night at H.R. MacMillan Space Centre, Vancouver

Join us for a night of music, theatre, and rockets, to toast the 50th anniversary of the first person in space, Yuri Gagarin. It's an adult evening at the Space Centre! Activities include: Ride the human gyroscope, Cosmic Courtyard Disco, Launch glow-in-the-dark rockets, Planetarium Shows featuring Johnny Tomorrow, Borscht, and more. Advance ticket sales only: \$30 per person (Sorry, no ticket sales at the door). For more info visit: <http://www.spacecentre.ca>

April 16th, 12:30pm Earth Walk – Earth Day with walk from the Legislature to Centennial Square and/or join RASC Victoria Centre at their table all afternoon.

April 27th, 7:30pm CVSF Social, Cowichan Valley (Mill Bay)

Feature is "Travel Astrophotography (or how to pack a lot of stuff in your suitcase)" by John McDonald. No matter what level of astrophotographer you are you will gain insights to the craft from "the master himself". John travels the world and produces the most amazing astrophotos with sometimes the most basic tools. Find out what John packs in his suitcase while globtrotting in this NOT TO BE MISSED talk. For more info visit: <http://www.starfinders.ca/socials.htm>

April 28th 7:00 – 9:00 pm Nanaimo Astronomy Event

"The Creation Of The Elements" By Dr. Falk Herwig Beban Social Complex, 2300 Bowen Road, Nanaimo. The elements are made in stars and stellar explosions. He will describe the processes that are responsible for the creation of the elements, including - in general terms - the simulations and physics that are used for predictions. The simulations are compared with observations of elements in stars from spectroscopy as well as measurements of isotopic ratios in stellar dust grains that can be extracted from meteoritic materials collected on earth. For more info visit: <http://www.nanaimoastronomy.com/events/regular-meeting-presentation-2>

P.S. CVSF had Dr. Herwig as a guest speaker back in Nov 2010 doing a very similar talk. If you missed his talk be sure to catch this one in Nanaimo. Dr. Herwig is a very engaging speaker who explains the process in laymen terms. Very very interesting.

May 7th 6:30 – 10:00pm CVSF STAR PARTY (International Astronomy Day), Bright Angel Park, Cowichan Station.

NASA Launches credit NASA.Com:

Date: April 19 +

Mission: STS-134

Launch Vehicle: Space Shuttle Endeavour

Launch Site: Kennedy Space Center - Launch Pad 39A

Launch Time: 7:48 p.m. EDT

STS-134 Description: Space shuttle Endeavour will deliver the Express Logistics Carrier-3 (ELC-3) and the Alpha Magnetic Spectrometer (AMS) to the International Space Station.

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4. This Month In History

Courtesy of: Windows2universe.org

April 12

1961 - Yuri Gagarin becomes the first man in space

Gagarin became the first person in space when he flew aboard the Vostok spacecraft in 1961. He orbited the Earth once on this historic flight. The flight lasted 1 hour and 48 minutes.

April 14**1629 - Christian Huygens's birthday**

Christian Huygens was a Dutch physicist and astronomer who lived between 1629-1695. Using a telescope he had made, Huygens first identified Saturn's rings and one of Saturn's moons. Huygens also invented the pendulum clock and proposed the wave theory of light.

April 15**1452 - Birthday 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.

April 17**1790 - Death of Ben Franklin**

Ben Franklin was an American scientist and statesman who lived between 1706-1790. Franklin's famous kite experiment led to his invention of the lightning rod. His other inventions included bifocals and a stove which heats houses more safely than a fireplace.

April 18**1955 - Death of Albert Einstein**

Albert Einstein was a German physicist who lived between 1879-1955. Probably the most well-known scientist of the twentieth century, Einstein came up with many original theories and invented modern physics. He is most famous for his theory of relativity.

April 19**1882 - Death of Charles Darwin**

Charles Darwin was an English Naturalist who lived between 1809-1882. He laid the foundations for the modern science of biology, and changed how other scientists understood the appearance of life on Earth. In 1859 Darwin published a book called *The Origin of Species by Means of Natural Selection*, which started a scientific revolution.

April 23**1858 - Birthday 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.

April 24**1990 - Hubble Space telescope put into orbit**

The Hubble was first launched in 1990 from Space Shuttle Discovery, but the design and construction started in the 1970's. The project is a joint one between the National Aeronautics and Space Administration (NASA) and the European Space Agency (ESA)..

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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".

The largest full moon in more than 18 years – a so-called "supermoon" – did not disappoint eager skywatchers around the world Saturday when it rose, big and bright, into Earth's night sky.

Is it a bird a plane; No it's a Super moon! On March 19 the full moon was 221,565 miles (356,575 kilometers), making it the biggest and brightest full moon since 1993. The "supermoon" phenomenon occurred because the moon was in its full phase and just 50 minutes past perigee – the point of its orbit that brings it closer to Earth. This year's biggest full moon gained notoriety after erroneous claims that it would spark waves of natural disasters around the world. Well thank goodness that didn't happen. As seen here; club member Dave Polster took a superb picture of the "bright" big moon from Duncan. Dave "Wilma" looks great!



Here's a "gif" submitted by Joe Carr. Joe found this on the internet and it shows how much more "larger" the supermoon was.

<http://www.pictorobservatory.ca/Supermoon.gif>

For something completely different. Take a look at these strange craft in the Mojave Desert

<http://www.space.com/11242-strange-craft-mojave-sky-theyre.html>

Is that Weird or What?

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6. Featured Articles

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Earth's Sixth Mass Extinction: Is It Almost Here?— Mar 2/11 credit NSF

Steep decline of many animal species warns that Earth is on the brink



Earth's warming climate is contributing to an infection responsible for tropical frog extinctions. With the steep decline in populations of many animal species, scientists have warned that Earth is on the brink of a mass extinction like those that have occurred just five times during the past 540 million years.

Each of these "Big Five" saw three-quarters or more of all animal species go extinct.

In results of a study published in this week's issue of journal Nature, researchers report on an assessment of where mammals and other species stand today in terms of possible extinction compared with the past 540 million years. They find cause for hope--and alarm. "If you look only at the critically endangered mammals--those where the risk of extinction is at least 50 percent within three of their generations--and assume that their time will run out and they will be extinct in 1,000 years, that puts us clearly outside any range of normal and tells us that we are moving into the mass extinction realm," said Anthony Barnosky, an integrative biologist at the University of California at Berkeley, and first author of the paper. Barnosky is also a curator in the university's Museum of Paleontology and a

research paleontologist in its Museum of Vertebrate Zoology.

"A modern global mass extinction is a largely unaddressed hazard of climate change and human activities," said H. Richard Lane, program director in the National Science Foundation's (NSF) Division of Earth Sciences, which funded the research. "Its continued progression, as this paper shows, could result in unforeseen--and irreversible--consequences to the environment and to humanity," said Lane.

If currently threatened species--those officially classed as critically endangered, endangered, and vulnerable--actually went extinct, and that rate of extinction continued, the sixth mass extinction could arrive in as little as 3 to 22 centuries, according to Barnosky. It's not too late, he and colleagues believe, to save endangered mammals and other such species--and stop short of the tipping point.

That would require dealing with a perfect storm of threats, including habitat fragmentation, invasive species, disease and global warming. "So far, only 1 to 2 percent of all species have gone extinct in the groups we can look at clearly, so by those numbers it looks like we are not far down the road to extinction," said Barnosky.

"We still have a lot of Earth's biota to save."

Co-author Charles Marshall, also an integrative biologist at UC-Berkeley and director of the university's Museum of Paleontology, emphasized that the small number of recorded extinctions to date does not mean we are not in a crisis. "Just because the magnitude is low compared to the biggest mass extinctions we've seen in half a billion years doesn't mean they aren't significant," he said.

"Present rates are higher than during most past mass extinctions." The study originated in a seminar Barnosky organized to bring biologists and paleontologists together in an attempt to compare the extinction rate seen in the fossil record with today's extinction record. They're like comparing apples and oranges, Barnosky said. The fossil record goes back 3.5 billion years, while the historical record goes back only a few thousand years. In addition, the fossil record has many holes, making it impossible to count every species that evolved and subsequently disappeared, perhaps, scientists believe, some 99 percent of all species that have ever existed. Likewise, a different set of data problems complicates counting modern extinctions. Dating of the fossil record also is not very precise, Marshall said. "If we find a mass extinction, we have great difficulty determining whether it was a 'bad weekend' or it occurred over a decade or 10,000 years," he said. "But without the fossil record, we have no scale to measure the significance of the impact we're having."

"Instead of calculating a single death rate, we estimated the range of plausible rates for mass extinctions from the fossil record, and compared it to where we are now," Marshall said, explaining how researchers got around this limitation.

Barnosky's team chose mammals as a starting point because they are well-studied today and are well-represented in the fossil record going back some 65 million years.

Biologists estimate that within the past 500 years, at least 80 mammal species have gone extinct--from a starting total of 5,570 species.

The team's estimate for the average extinction rate for mammals is less than two extinctions every million years, far lower than the current extinction rate for mammals. "It looks like modern extinction rates resemble mass extinction rates, even after setting a high bar for defining 'mass extinction,'" Barnosky said.

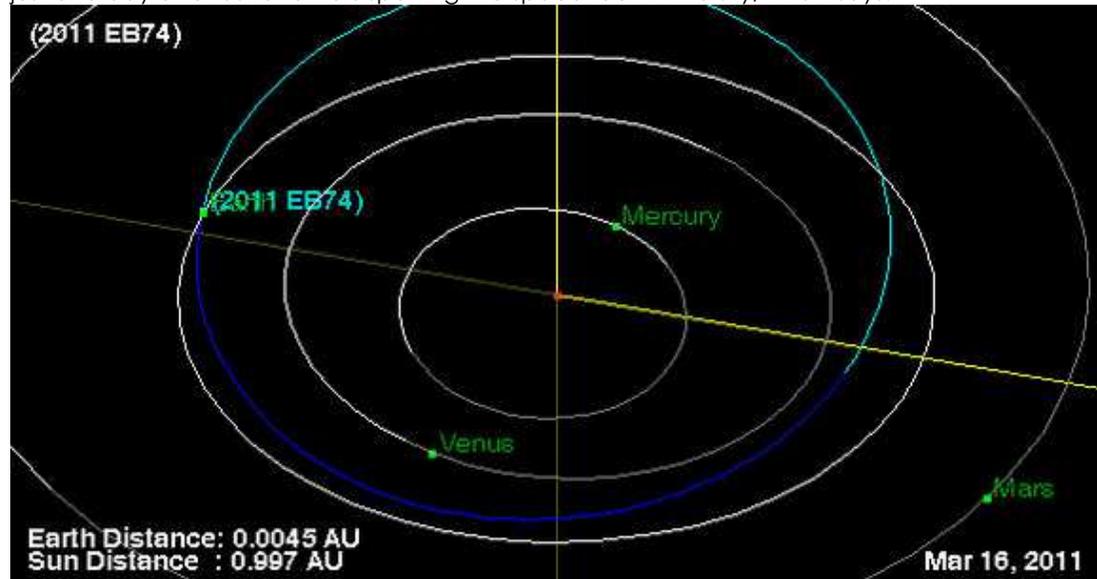
After studying the list of threatened species maintained by the International Union for Conservation of Nature (IUCN), the team concluded that if all mammals now listed as critically endangered, endangered and threatened go extinct--and whether that takes several hundred years or a thousand years--the Earth will be in a true mass extinction. "Obviously there are caveats," Barnosky said.

"What we know is based on observations from just a very few twigs plucked from an enormous number of branches that make up the tree of life." He urges similar studies of groups other than mammals to confirm the findings, as well as action to combat the loss of animal and plant species. "Our findings highlight how essential it is to save critically endangered, endangered and vulnerable species," Barnosky said.

"With them, Earth's biodiversity remains in pretty good shape compared to the long-term biodiversity baseline." If most of them die, even if their disappearance is stretched out over the next 1,000 years, the sixth mass extinction will have arrived."

House-Size Asteroid Zooms Close by Earth —Mar 16/11 credit NASA and About.com

An asteroid the size of a house zoomed by Earth today (March 16), flying within the orbit of the moon just one day after astronomers spotting the space rock in the sky, NASA says.



The small asteroid 2011 EB74 was about 47 feet (14 meters) across and posed no threat of hitting Earth, since it was too small to survive the trip through the planet's atmosphere. Instead, the asteroid passed our planet at a comfortable distance of about 203,000 miles (326,696 kilometers) when it made its closest approach at 5:49 p.m. EDT (21:49 GMT), NASA officials said.

For comparison, the average distance between the Earth and the moon is about 238,000 miles (382,900 km). The flyby of 2011 EB74 is about 0.85 Earth-moon distances, officials said.

Astronomers discovered asteroid 2011 EB74 yesterday (March 15) as part of the ongoing Catalina Sky Survey, a project based at the University of Arizona to seek out previously unknown near-Earth objects like asteroids and comets. NASA announced the asteroid's close flyby today on Twitter and via an online widget used by astronomers with the agency's Asteroid Watch program. The program aims to share news and updates about asteroids and other near-Earth objects with the public.

"At 14 meters in size, 2011 EB74 is NOT considered a potentially hazardous asteroid. Rocks this size would burn up in our atmosphere," Asteroid Watch officials wrote in a Twitter update. The asteroid will likely be extremely hard to spot for skywatchers, unless they are seasoned amateur astronomers and have the right observing equipment, officials said. "These objects are dark and fast, and usually require a sizeable telescope to track," Asteroid Watch officials told one Twitter user.

Today's asteroid flyby is the latest space rock to fly near Earth this year. A car-size asteroid buzzed Earth on Feb. 14. A tiny space rock set a new record for the closest approach to Earth without entering the atmosphere when it zipped within 3,400 miles (5,471 km) of the planet on Feb. 4. Like 2011 EB74, neither of those asteroid encounters posed a threat to Earth.

NASA astronomers and other scientists regularly monitor the skies to hunt for asteroids or comets that may be an impact threat to Earth. One such effort, which uses a telescope called Pan-STARRS PS1 in Hawaii, set a new record this year when it discovered 19 previously unknown asteroids in a single night on Jan. 29. The Near-Earth Object program at NASA's Jet Propulsion Laboratory in Pasadena, Calif., tracks potentially dangerous asteroids and studies their orbits to determine if they pose a risk of hitting the Earth. The Asteroid Watch program is an outreach arm of that effort.

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NASA's Stardust: Good to The Last Drop—March 27/11 credit NASA Headquarters

On Thursday, March 24, at about 7 p.m. EDT, NASA's Stardust spacecraft will perform a final burn with its main engines.

At first glance, the burn is something of an insignificant event. After all, the venerable spacecraft has executed 40 major flight path maneuvers since its 1999 launch, and between these main engines

and the reaction control system, its rocket motors have collectively fired more than 2 million times. But the March 24 burn will be different from all others. This burn will effectively end the life of NASA's most traveled comet hunter.

"We call it a 'burn to depletion,' and that is pretty much what we're doing — firing our rockets until there is nothing left in the tank," said Tim Larson from NASA's Jet Propulsion Laboratory in Pasadena, California. "It's a unique way for an interplanetary spacecraft to go out. Essentially, Stardust will be providing us useful information to the very end." Burn to depletion will answer the question about how much fuel Stardust had left in its tank. "We'll take those data and compare them to what our estimates told us was left," said Allan Chevront from Lockheed Martin Space Systems, Sunnyvale, California. "That will give us a better idea how valid our fuel consumption models are and make our predictions even more accurate for future missions." Fuel



consumption models are necessary because no one has invented an entirely reliable fuel gauge for spacecraft. Until that day arrives, mission planners can approximate fuel usage by looking at the history of the vehicle's flight and how many times and for how long its rocket motors have fired.

Stardust's burn to depletion is expected to impart valuable information because the spacecraft has essentially been running on borrowed time. Launched February 7, 1999, Stardust had already flown past the asteroid Annefrank, flown past and collected particle samples from Comet Wild 2, and returned those particles to Earth in a sample return capsule January 2006 — and in so doing racked up 2.88 billion miles (4.63 billion kilometers) on its odometer. NASA then had the still-healthy spacecraft to perform a flyby of Comet Tempel 1, a new low-cost mission that required another 5 years and 646 million miles (1.04 billion km). After all those milestones and all that time logged on the spacecraft, the Stardust team knew the end was near. They just didn't know exactly how close.

Prior to this final burn, Stardust will point its medium-gain antenna at Earth, approximately 194 million miles (312 million km) away. As there is no tomorrow for Stardust, the spacecraft is expected to downlink information on the burn as it happens. The command from the spacecraft computer ordering the rockets to fire will be sent for 45 minutes, but the burn is expected to last only between a couple of minutes to about 10 minutes.

"What we think will happen is that when the fuel reaches a critically low level, gaseous helium will enter the thruster chambers," said Larson. "The resulting thrust will be less than 10 percent of what was expected. While Stardust will continue to command its rocket engines to fire until the pre-planned firing time of 45 minutes has elapsed, the burn is essentially over." Twenty minutes after the engines run dry, the spacecraft's computer will command its transmitters off. They actively shut off their radios to preclude the remote chance that at some point down the road Stardust's transmitter could turn on and broadcast on a frequency being used by other operational spacecraft. Turning off the transmitter ensures there will be no unintended radio interference in the future.

Without fuel to power the spacecraft's attitude control system, Stardust's solar panels will not remain pointed at the Sun. When this occurs, the spacecraft's batteries are expected to drain of power and deplete within hours. "When we take into account all the possibilities for how long the burn could be and then the possible post-burn trajectories, we project that over the next 100 years, Stardust will not get any closer than 1.7 million miles (2.7 million km) of Earth's orbit or within 13 million miles (21 million km) of Mars orbit," said Larson. "That is far enough from protected targets to meet all of NASA's Planetary Protection directives." Some planetary spacecraft, like the Galileo mission to Jupiter, are intentionally sent into the planet's atmosphere to make sure it is destroyed in a controlled way. Others have their transmitters shut off or just fade away, said Larson. "I think this is a fitting end for Stardust. It's going down swinging."

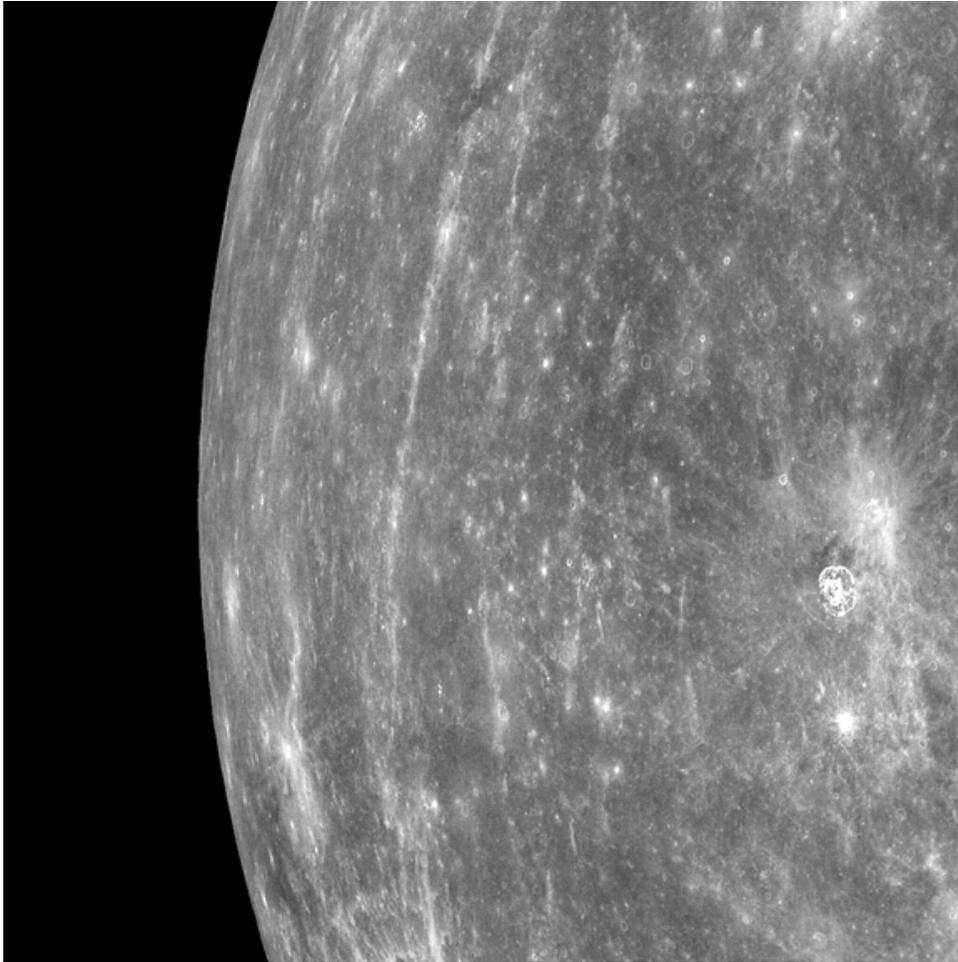
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Ice on Mercury? NASA Probe May Solve That Mystery and Others—Mar 30/11 *credit Space.com*

A NASA spacecraft now circling Mercury is set to tackle some big mysteries of the scorched, tiny world — including whether or not water ice lurks in its shadowy craters.

NASA's Messenger probe became the first spacecraft ever to orbit Mercury when it arrived at the planet on March 17. While the spacecraft won't officially start its yearlong science mission until April 4, the observations it's already made hint at many discoveries to come, researchers said.

"We're really seeing Mercury now with new eyes," Messenger principal investigator Sean Solomon, of



the Carnegie Institution of Washington, told reporters today (March 30). "As a result, an entire global perspective is unfolding, and will continue to unfold over the next few months." Above: Bright rays, consisting of impact ejecta and secondary craters, radiate from Mercury's Debussy crater, located at the top. The image, acquired by NASA's Messenger spacecraft on March 29, 2011, shows a small portion of Debussy's large system of rays in greater detail than ever before. CREDIT: NASA/Johns Hopkins University

The search for water ice on the blisteringly hot planet is one of

the mission's driving motivations. Though Mercury's surface temperatures can top 842 degrees Fahrenheit (450 degrees Celsius), ice may survive on the floors of permanently shadowed polar craters. And about 20 years ago, radar data first picked up intriguing evidence of reflective materials at Mercury's poles that might just be water ice, researchers said. "Could ice be trapped there? The thermal models say yes, it's possible," Solomon said. "But is it water ice? There are alternative ideas."

Messenger will also investigate other questions about Mercury — why it's so much denser than the other rocky planets, for example. Also, the mission team wants to learn more about how the planet's core is structured, the nature of its global magnetic field and other aspects of Mercury's composition and history. That work will start in earnest next week. In the meantime, scientists are sifting through the spacecraft's increasing pile of new Mercury photos. By the end of tomorrow, it will have snapped 1,500 photos of the planet from orbit, researchers said — more than it captured during its three previous flybys of the planet in 2008 and 2009.

The first photos

Messenger — whose name is short for MERcury Surface, Space ENvironment, GEochemistry, and Ranging — is still officially in a commissioning phase, during which time mission scientists are checking out its cameras and other instruments.

But the probe has not been idly waiting for its main mission to start. Messenger snapped the first photos of Mercury from orbit yesterday (March 29), imaging previously unseen areas of the planet — terrain near the poles that Messenger missed on its three flybys.

Bright rays, consisting of impact ejecta and secondary craters, radiate from Mercury's Debussy crater, located at the top. The image, acquired by NASA's Messenger spacecraft on March 29, 2011, shows a small portion of Debussy's large system of rays in greater detail than ever before.

CREDIT: NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington
The pictures show the battered, crater-strewn surface of Mercury in great detail.

"We are delighted to be able to see the surface at the very high latitudes," Solomon said. So far, everything is going well with Messenger's mission and its instruments.

"All subsystems and instruments are on and operating nominally, within specifications," said Messenger mission systems engineer Eric Finnegan, of Johns Hopkins University's Applied Physics Laboratory. "This is a tremendous achievement for the entire Messenger team."

Much more to come

Over the next 12 months, Messenger will continue taking pictures and peering at Mercury with its seven instruments, mapping the planet's surface and helping scientists better understand its composition, tenuous atmosphere and geologic history. [Most Enduring Mysteries of Mercury] This information could shed light on how our solar system formed and evolved — and perhaps, by extension, how alien planetary systems have come about as well,

researchers said. The observations Messenger has made from orbit thus far suggest the probe will beam home all sorts of eye-opening information, researchers said. It may, for instance, help researchers learn why Mercury — like Earth — has a global magnetic field, while its rocky planet cousins Mars and Venus do not. In its first five days in orbit, Messenger tripled the number of spacecraft observations of Mercury's magnetic field available to astronomers, researchers said. "We are rapidly ramping up a much larger dataset with which to characterize the geometry of Mercury's magnetic field," Solomon said. "That will tell us a lot about Mercury's internal structure and dynamics."

A busy year ahead

The \$446 million Messenger probe launched in August 2004. The spacecraft is now in an extremely elliptical orbit that brings it within 124 miles (200 kilometers) of Mercury at the closest point and retreats to more than 9,300 miles (15,000 km) away at the farthest point. While Messenger is the first mission ever to orbit Mercury, it is not the first spacecraft to visit the planet. NASA's Mariner 10 spacecraft flew by the planet three times in the mid-1970s. On April 4, Messenger will start mapping and studying the entire surface of Mercury, a process that is expected to require about 75,000 images. But the early science returns have whetted the appetites of mission scientists, who can't wait for the data to really start pouring in.

"It's just a wonderful adventure for those of us on the science team that have front-row seats for these new data that are coming down," Solomon said. "It's a wonderful time in the history of exploration of planet Earth's neighborhood, and we are delighted to be a part of that."

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Spring is Fireball Season —Mar 31/11 *credit Science News*

What are the signs of spring? They are as familiar as a blooming Daffodil, a songbird at dawn, a surprising shaft of warmth from the afternoon sun.

And, oh yes, don't forget the meteors. "Spring is fireball season," says Bill Cooke of NASA's Meteoroid Environment Center. "For reasons we don't fully understand, the rate of bright meteors climbs during



the weeks around the vernal equinox." In other seasons, a person willing to watch the sky from dusk to dawn could expect to see around 10 random or "sporadic" fireballs. A fireball is a meteor brighter than the planet Venus. Earth is bombarded by them as our planet plows through the jetsam and flotsam of space--i.e., fragments of broken asteroids and decaying comets that litter the inner solar system.

In spring, fireballs are more abundant. Their nightly rate mysteriously climbs 10% to 30%. "We've known about this phenomenon for more than 30 years," says Cooke. "It's not only fireballs that are affected. Meteorite falls--space rocks that actually hit the ground--are more common in spring as well!"

Researchers who study Earth's meteoroid environment have never come up with a satisfactory explanation for the extra fireballs. In fact, the more they think about it, the stranger it gets.

Consider the following:



A NASA fireball camera at the Marshall Space Flight Center. There is a point in the heavens called the "apex of Earth's way." It is, simply, the direction our planet is traveling. As Earth circles the sun, the apex circles the heavens, completing one trip through the Zodiac every year.

The apex is significant because it is where sporadic meteors are supposed to come from. If Earth were a car, the apex would be the front windshield. When a car drives down a country road, insects accumulate on the glass up front. Ditto for meteoroids swept up by Earth.

Every autumn, the apex climbs to its highest point in the night sky. At that time, sporadic meteors of ordinary brightness are seen in abundance, sometimes dozens per night.

Read that again: Every autumn.

"Autumn is the season for sporadic meteors," says Cooke. "So why are the sporadic fireballs peaking in spring? That is the mystery."

Meteoroid expert Peter Brown of the University of Western Ontario notes that "some researchers think there might be an intrinsic variation in the meteoroid population along Earth's orbit, with a peak in big fireball-producing debris around spring and early summer. We probably won't know the answer until we learn more about their orbits."

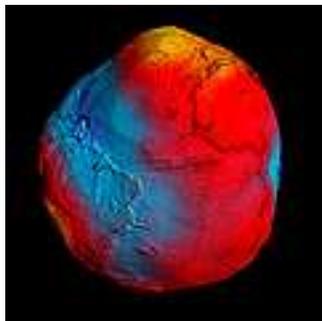
To solve this and other puzzles, Cooke is setting up a network of smart meteor cameras around the country to photograph fireballs and triangulate their orbits. As explained in the Science@NASA story *What's Hitting Earth?*, he's looking for places to put his cameras; educators are encouraged to get involved. Networked observations of spring fireballs could ultimately reveal their origin.

"It might take a few years to collect enough data," he cautions. Until then, it's a beautiful mystery. Go out and enjoy the night sky. It is spring, after all.

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Earth's Gravity Revealed in Unprecedented Detail—Mar 31/11 *credit ESA News*

After just two years in orbit, ESA's GOCE satellite has gathered enough data to map Earth's gravity with unrivalled precision. Scientists now have access to the most accurate model of the 'geoid' ever produced to further our understanding of how Earth works.



The new geoid was unveiled today at the Fourth International GOCE User Workshop hosted at the Technische Universität München in Munich, Germany. Media representatives and scientists from around the world have been treated to the best view yet of global gravity. The geoid is the surface of an ideal global ocean in the absence of tides and currents, shaped only by gravity. It is a crucial reference for measuring ocean circulation, sea-level change and ice dynamics – all affected by climate change.

Prof. Reiner Rummel, former Head of the Institute for Astronomical and Physical Geodesy at the Technische Universität München, said, "We see a continuous stream of excellent GOCE gradiometry data coming in. With each new two-month

cycle, our GOCE gravity field model is getting better and better.

"Now the time has come to use GOCE data for science and applications. I am particularly excited about the first oceanographic results. They show that GOCE will give us dynamic topography and circulation patterns of the oceans with unprecedented quality and resolution. I am confident that these results will help improve our understanding of the dynamics of world oceans." The two-day workshop provides the science community with the latest information on the performance of the satellite and details about data products and user services.

Participants are also discussing how the GOCE geoid will make advances in ocean and climate studies, and improve our understanding of Earth's internal structure. For example, the gravity data from GOCE are helping to develop a deeper knowledge of the processes that cause earthquakes, such as the event that recently devastated Japan. Since this earthquake was caused by tectonic plate movement under the ocean, the motion cannot be observed directly from space. However, earthquakes create signatures in gravity data, which could be used to understand the processes leading to these natural disasters and ultimately help to predict them.

The GOCE satellite was launched in March 2009 and has now collected more than 12-months of gravity data.

Volker Liebig, Director of ESA's Earth Observation Programmes said, "Benefiting from a period of exceptional low solar activity, GOCE has been able to stay in low orbit and achieve coverage six weeks ahead of schedule. This also means that we still have fuel to continue measuring gravity until the end of 2012, thereby doubling the life of the mission and adding even more precision to the GOCE geoid."



GOCE has achieved many firsts in Earth observation. Its gradiometer – six highly sensitive accelerometers measuring gravity in 3D – is the first in space. It orbits at the lowest altitude of any observation satellite to gather the best data on Earth's gravity. The design of this sleek one-tonne satellite is unique. In addition, GOCE uses an innovative ion engine that generates tiny forces to compensate for any drag the satellite experiences as it orbits through the remnants of Earth's atmosphere.

Prof. Liebig added, "You could say that, at its early conception, GOCE was more like science fiction. GOCE has now clearly demonstrated that it is a state-of-the-art mission."

Rune Floberghagen, ESA's GOCE Mission Manager, noted "This is a highly significant step for the mission. We now look forward to the coming months, when additional data will add to the accuracy of the GOCE geoid, further benefiting our data users." Check out the 3D GOCE geoid here:

<http://www.esa.int/esa-mm/mmg.pl?b=b&type=A&single=y&start=1>

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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 [Byron 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.

Astronomy-Universe-Galaxy: Matching *Credit: Discovery Education*

Check out your wits and see how many you can get...or try this on your mom or dad.

_____ universe	1)young hot star
_____ galaxies	2)group of planets orbiting a star
_____ Milky Way	3)name of our galaxy
_____ solar system	4)galaxy with arms coming from the center like pinwheel
_____ yellow	5)middle-aged star-our sun
_____ blue	6)flat round or oval galaxy
_____ red	7)a dying star that explodes
_____ elliptical	8)186
_____ spiral	9)galaxy with no regular shape
_____ irregular	10)groups of stars
_____ supernova	11)old cooler star
_____ light year	12)the stars, galaxies, dust and everything in space

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10. The Sky This Month

By Bryon Thompson

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

The planet that hogs the night sky this month is Saturn. Saturn rises as the sun sets and is at its highest in the sky, sharing the stage with the stars of Virgo, by midnight. The giant ringed planet reaches opposition on **April 3rd** and at magnitude 0.4 it is brighter than it has been in the last three years. Saturn can be found halfway between third magnitude Gamma Virginis and fourth magnitude Theta Virginis. Saturn lies only 800 million miles from Earth or to put it into perspective roughly 2,420 times further than the moon. Saturn looks slightly wider than it is tall due to its gaseous nature and its rapid rotation; a Saturnian day is only 10.7 hours long. Of course the best thing about Saturn is the views of its rings. Now tilted at 9° to our line of sight, you should be able to easily see the Cassini division between the A and B ring systems. While looking at the rings with your scope you can also look for the larger moons of Saturn. Titan is Saturn's largest and the second largest moon in the entire solar system. On its 16 day orbit, magnitude 8 Titan makes four close approaches to Saturn at only 0.5' south of the planet on the **1st** and the **17th** and the same distance to the north on the **9th** and the **25th**. Even with a small, scope you can find the other main satellites around Saturn, Tethys, Dione and Rhea, all 10th magnitude moons with short period orbits. A much smaller target is the moon Enceladus which will require a scope of moderate size to view its 12th magnitude image. If you want a challenge, see if you can find little Iapetus, the two-toned moon. It lies 6.4' west northwest of Saturn on the 3rd and 1.8' north of Saturn on the **12th** but is dimmer then because it will have turned its dark side towards the Earth.

Neptune is visible for a short time only in the minutes before sunrise but even then you will have to wait until the **27th** to try for it. At 04:30am look about 6° to the lower right of the crescent moon to find

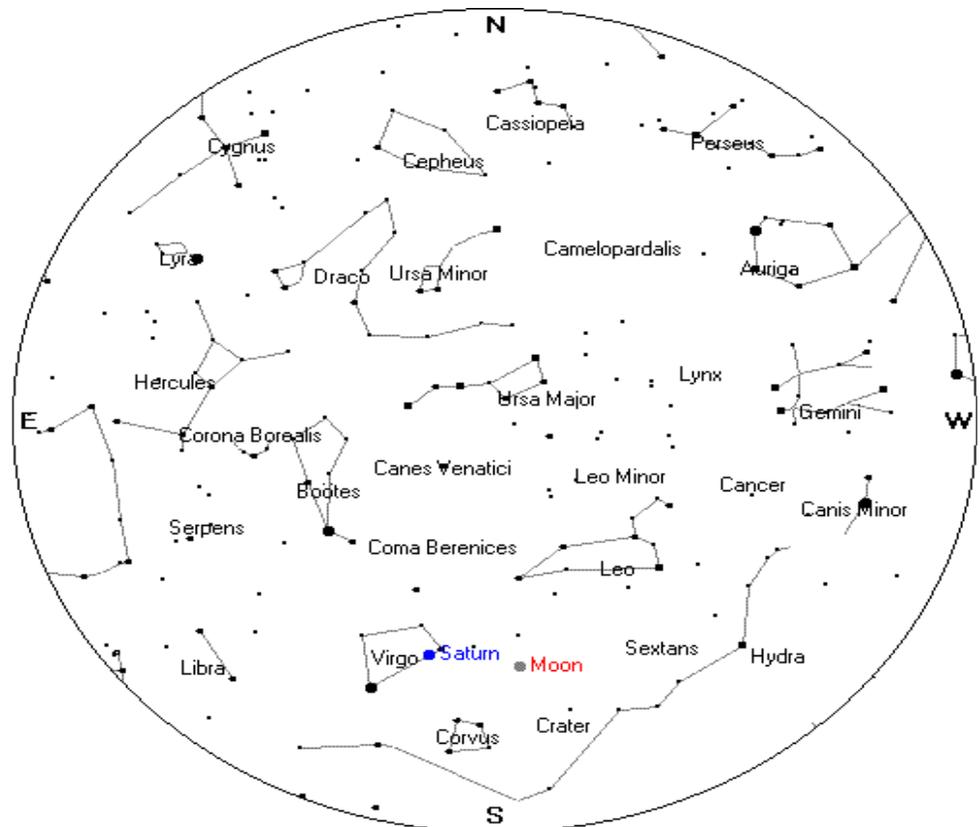
blue green Neptune 10° or one fists width, above the east south eastern horizon. Later in the morning you won't miss the brightest point of light in the sky, Venus, shining at magnitude -3.9 . Venus is joined by a thin crescent moon on the **1st** and again on the **30th**. If you have a clear unobstructed view of the eastern horizon that same morning you may be able to glimpse Mercury below and to the left of Venus. Lower still, Mars and Jupiter creep into view as these planets crawl back into the sky in the morning glow of the rising sun.

The Lyrid meteor shower that usually produces up to 20 bright streaks in good conditions are also muted by stray light this month. The waning gibbous moon adds enough light in the sky on the morning of the **23rd** to effectively block out all but the brightest meteors.

So once again April may only have one planet worth watching as Saturn steals night sky for itself but even if the stage is bare the nights are getting milder and spring is here so try to get out and enjoy the show. Until next time, remember; astronomy is looking up!

Apr 1	Evening PDT	Titan 0.5' South of Saturn
Apr 3	05:00 PM PDT	Saturn at Opposition
Apr 3	07:32 AM PDT	New Moon
Apr 9	Evening PDT	Titan 0.5' North of Saturn
Apr 11	05:05 AM PDT	First Quarter Moon
Apr 17	Evening PDT	Titan 0.5' South of Saturn
Apr 17	07:44 PM PDT	Full Moon
Apr 24	07:47 PM PFT	Last Quarter Moon
Apr 23	01:30 AM PDT	Lyrid Meteor Shower Peaks
Apr 25	Evening PDT	Titan 0.5' North of Saturn
Apr 27	04:30 AM PDT	Neptune 10° above horizon in the East Southeast
Apr 30	Before Sunrise	Venus, Mercury Mars and Jupiter low in the East

Sky Chart —Here's your mid-April 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