SIRIUS ASTRONOMER

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The Newsletter of the Orange County Astronomers

September 2009 *Free to members, subscriptions $12 for 12 issues* **Volume 36, Number 9**

SEPTEMBER AND OCTOBER MEETING DATES HAVE CHANGED! SEE BELOW FOR DETAILS

Mike Daugherty took this photo of the Station Fire on Mt. Wilson on August 29, 2009. In addition to the historic Mt. Wilson Observatory, a large antenna array (near bottom center) serving most of the television and radio outlets in the Greater Los Angeles area was threatened. The dedicated efforts of firefighters from throughout the region have saved both the observatory and the antennae from the massive 120,000-acre fire as of September 2nd.

OCA CLUB MEETING

The free and open club meeting will be held Friday, September 18th at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. The presenter and topic for this month have not yet been announced.

NEXT MEETING: October 16th

STAR PARTIES

The Black Star Canyon site will be open on September 12th. The Anza site will be open on September 19th. Members are encouraged to check the website calendar, for the latest updates on star parties and other events.

Please check the website calendar for the outreach events this month! Volunteers are always welcome!

You are also reminded to check the web site frequently for updates to the calendar of events and other club news.

COMING UP

The next session of the Beginners Class will be held on Friday, September 4th at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana.

GOTO SIG: Oct. 8th

Astro-Imagers SIG: Sept. 15th, Oct. 20th

Remote Telescopes SIG: Sept. 23rd, Oct. 28th

Astrophysics SIG: Sept. 11th, Oct. 23rd

Dark Sky Group: TBA

September 2009 President's Message

By Barbara Toy

Well, the year continues on its way, with the Autumnal Equinox coming up in September. This is usually a great time to observe – nights are longer but still warm, and, if you stay up long enough, you can see some of the wonderful winter sights in reasonable comfort instead of the bundled-up state we usually view them in when they're in the evening sky. I find it particularly satisfying to look at Orion without the need of anything more than a light jacket…

We generally think of warm observing nights as a good thing, associated with comfort and easy living (in an astronomer's terms), but it can be carried to an extreme. The July star party/Starbecue was an example of this – the thermometer in the club observatory dropped briefly to 87° but most of the night it was above that, and readings in some other locations around Anza were even higher. It was definitely shirtsleeve weather, not a night when sleeping bags were needed. It's not often that you can work up a sweat doing standard observing activities at night, but you could that night – and it turns out that's not the ideal way to enjoy the stars. Though, given the choice between that and clouds, most of us would prefer to deal with a bit of heat!

Changes On The Board

Last month, Sheryl Benedict moved across country to start her new job and new life in Tennessee. You may have seen the picture she posted on our website from her new home, showing a dramatic lightning strike – a great welcome, as long as it's not too close! We hope everything goes as well for her in her new job as it did for her in getting that shot!

At the July meeting, the board decided to fill Sheryl's position instead of letting it stay vacant for the rest of the year, and appointed Kyle Coker as our newest board member. Kyle has been an active member of the club for a number of years now, and many of you probably know him through his imaging or from seeing him at Anza. Those of you who went through our Beginners Class may recall him as the gentleman who presented the session on beginning astrophotography – he developed that part of the program and has been presenting it as part of the Beginners Class for the last three or four years, with great success. He has also been active in our outreach program, and he's a regular volunteer to help us with the "How to Use Your Telescope" class. We're really pleased that he agreed to serve on the Board and are looking forward to working with him.

Just What Are The OCA SIGs?

For those of you who haven't gotten involved with any of our club's special interest groups, or who may not be aware that we have a group that's involved in areas of interest to you, here is a quick overview of our formal SIGs, in alphabetical order. These groups are open to all club members, and all of them welcome newcomers (as well as those who are returning, of course), so feel free to come to any of their meetings or events and check them out for yourself!

AstroImage SIG (also known as the AI Group): This is generally the largest of the special interest groups. As you might guess from the name, the AI group is interested in all things having to do with all types of astronomical imaging. This includes video as well as individual images, and there are even some members who still use film, matters related to mounts, telescopes and other necessary equipment beyond cameras, and processing image data as well as capturing it. People of all levels of expertise are welcome, including those who are absolute beginners. It is a great resource for anyone who wants to learn how to get images of the beauties of the night sky for themselves – as well as daytime images of the sun and other astronomical phenomena.

The regular meeting times are at 7:00 p.m. on the third Tuesday of every month, and they are held in a conference room at Gibson, Dunn & Crutcher in Irvine, near Jamboree and the 405, courtesy of Joe Busch, one of the partners in that firm. You can find directions to the meetings on the club website.

Beginners may feel that a lot of the discussions at the meetings are too advanced for them to start out with, but it's well worth attending meetings regularly anyway. It's amazing how much you can pick up by listening to people who are doing different things with different equipment and software, looking at their pictures during Show & Tell and hearing what they did to get those results – and also seeing how the images taken by different members of the group improve over time as their techniques improve. Coming to the meetings also helps you build relationships with more experienced imagers who can help you out with particular problems, and gives you other opportunities for help to get you over the inevitable hurdles to doing this kind of imaging. Even non-imagers like me can pick up a lot of interesting information from the meetings, which usually feature presentations on various topics related to imaging, sometimes with guest speakers, in addition to Show & Tell (where members show their images and discuss them) and other general discussions.

The AI Group has its own website, at http://www.oc-aisig.org/, thanks to Bruce Waddington (who acts as its webmaster and hosts it) and Kevin Nelson (who helped develop it), which you can access through the OCA club website using the link above the images on the right side of the home page. It also has an e-mail group, AstroImagers@yahoogroups.com, which is open to any club member. If you have any questions about the AI Group, please contact the chair, Alan Smallbone, at asmallbone@earthlink.net, or Bruce Waddington, who is also the group's secretary, at bw_msg01 at earthlink dot net.

Astrophysics SIG: If you have any interest in causes and effects of what we see in the night sky, how the cosmos works, the beginning and end of the universe, black holes, dark matter, dark energy and other related areas, you should definitely check out the Astrophysics SIG. We usually meet at 7:30 p.m. on the third Friday of the month at the Heritage Museum of Orange County

in southern Santa Ana, though the meeting dates had to be changed for September and October because the club's general meetings were moved to the third Friday of those months due to scheduling difficulties with Chapman University. These meetings of the Astrophysics SIG will be on September 11 (the 2nd Friday of the month) and October 23 (the 4th Friday of the month) instead of the usual dates.

The Astrophysics meetings are kind of like friendly seminar sessions with guest speakers via videotape; we've been going through several different lecture series from different sources, mainly through the Teaching Company. Right now, we usually have a lecture from the cosmology section of Dr. Alex Filippenko's most recent Astronomy lecture series, along with lectures from Dr. Mark Whittle from his series on *Cosmology: The History and Nature of Our Universe* and Dr. James Gates from his series on String Theory. We generally have group discussions between the different lectures, as well as before and after the lectures, and people bring in various articles and other items of interest to share with the group. Don Lynn regularly brings in his most recent downloads from NASA and other sources showing what different probes, satellites, research telescopes, etc., are collecting and discusses their significance with the group – and gives us the advantage of his expertise in a lot of the different areas we discuss.

Beyond our interest in astrophysics, this is quite a social group, and, thanks to Steve Short, who started the practice of bringing cookies to the meetings, several different group members have been bringing cookies and other refreshments, which we all enjoy with our discussions.

For more information about the group and to get on his email group for updates on what is planned for the next meeting, please contact Chris Buchen, the group Coordinator, at buchen@cox.net.

GoTo Group: This group started as the ETX Group, shortly after the GoTo version of Meade's popular ETX telescopes became available. These were the first fairly low-cost scopes available with GoTo capability, and the group started with Mike Bertin pulling together a bunch of us that had ETXs of various sizes with the goal of helping everyone learn to use their scopes better and improve how the scopes functioned. With time, it became apparent that a lot of the concerns of the original ETX group were shared by people using any telescope with GoTo capabilities, and the group expanded to include all types of scopes and GoTo mounts as well as people who might be thinking about getting one.

The meetings for the group are not on a fixed schedule, but usually are set on a Monday early in the month about every other month. The next meeting, however, is set on the night that LCROSS is scheduled to crash into the moon, October 8-9, and, for those who don't have to be at work early the next morning, is scheduled to run through the time of impact (which could be 4:00 to 5:00 a.m., local time) and beyond – long enough to see if anyone can pick up signs of the cloud of debris kicked up by the impact. The group had a similar all-nighter for a full lunar eclipse, which was a lot of fun for those who could attend.

To find out the main topic of the next meeting and when it will be set, you should get on Mike Bertin's email list, which you can do by emailing him at mcb1@aol.com; you can also find this information on the club calendar on the OCA website (www.ocastronomers.org), and you can contact Mike with any questions you have about the group. The meetings are usually held at Craig Bobchin's house (you can get the directions from Mike or from Craig, who is currently our Vice President), and start with a general discussion session (usually held inside) followed by an observing session outside in Craig's large back yard. The viewing portions of the meetings are usually accompanied by fresh brownies, courtesy of Craig or his wife, who generously allows us to take over major portions of her home on meeting nights even though astronomy is not her particular interest.

The GoTo Group also helps out with our "How to Use Your Telescope" class sessions of the Beginners Class, as a lot of the people who come to those sessions have ETXs, NexStars and other GoTo telescopes that members of the group are familiar with. Speaking as the person who generally organizes those sessions, I don't think they would be nearly as successful as they've been without the help and support of the GoTo Group – and it's another really fun activity the group is involved with.

Remote Telescope Group (formerly the EOA): This group is currently dedicated to working on the club's Remote Telescope (RT) project. The objective is to be able to control the group's telescope from outside of the Anza site and take images remotely for outreach events for schools or at other locations and also for the use of individual members. The real challenge for the group is to do this on a shoestring budget.

The RT observatory is the small building with a clam-shell roof to the west of Anza House, which was salvaged by Tony Obra when it was discarded by Mt. Wilson. It houses a 12-inch Meade LX200, generously donated by John Hoot. The CCD cameras that we've used in the past were also donations from various sources, and most, unfortunately, have developed problems or ceased functioning altogether. The project computers have also all been donations. At this point, JV Howell and Gene Kent are the members of the group who are most directly involved with pulling all of the equipment together and getting it to work together smoothly and accurately.

Besides the work that JV, Gene and others in the group do out at Anza to move the project along, the RT group meets regularly at Coco's Restaurant in Tustin at 7:30 p.m. on the 4th Wednesday of the month to share information, get updates on the Anza end of the project, discuss any problems that have developed, and to have a good evening with a friendly group of people. The project has proven to be a great way to learn a lot about telescope functioning and all the issues one has to be aware of and plan for with a telescope that is operated remotely – and we're all eager to see the final configuration of the telescope and its supporting

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This month's theme of the International Year of Astronomy is "Planets and Moons"

Observe Pluto This Year!

September, 2009

By Tom Koonce

Antelope Valley Astronomy Club

Lancaster, California

How many planets have you observed? How many minor planets and dwarf planets? Even though this month's IYA theme is "Planets and Moons" our new Dwarf Planet, Pluto, offers an interesting challenge. Let's not debate the terms "Planet" or "Dwarf Planet", but instead ask if you have you ever observed faint Pluto? It's a difficult object to see and to verify.

Pluto can be observed through an 8" telescope, but in my opinion it is HARD to do for an intermediate-level observer. In Greek mythology, Pluto was named after Hades, the God of the underworld, and you'll think about sending this challenge to the same location, but stick with it because spotting Pluto on your own for the first time is an extremely rewarding experience.

You need exceptionally dark skies, a decent telescope and a lot of patience! There is an equation to help you work out how far down the magnitude scale you can get with a telescope (Remember big magnitudes = fainter objects):

Telescope Limiting Magnitude = (Visual Limiting Magnitude) – (5*log d) + (5*log D)

where d is the aperture of the human eye in meters and D is the aperture of the telescope in meters. So to give some examples, let's consider a normal sky where the visual limit is around Magnitude 4.5 and using a 3-inch (76 mm) refractor telescope. We'll use 6 mm as an example aperture of the dark-adapted human eye (young eyes can get to 7 mm):

Telescope Limiting Magnitude = 4.5 – (5*log(0.006)) + (5*log(0.076)) = 10.0

So with a small refractor you can theoretically see down to a limit of about Magnitude 10.0 under these conditions. Pluto however is at Magnitude 13.8 so this is well out of the range of such a small telescope. Under very good skies with a limiting Magnitude of 7.0 and using a telescope of 10 inches (254 mm) aperture, the limiting magnitude becomes.

Telescope Limiting Magnitude = 7.0 – (5*log(0.006)) + (5*log(0.254)) = 15.1

This puts Pluto easily into "realistically observable" status. Why not set the goal of observing all the planets, and Pluto – just for fun?

Depending upon the type of telescope you have and if you have astrophotography skill, you may choose to image Pluto instead of working on the drawing recommended here. Either way you'll have to know where to look. It's recommended that you determine (and memorize) the field of view that you will use during your observation. You can utilize the "12DString FOV Calculator" online here: (http://www.12dstring.me.uk/fov.htm) to help figure out the field of view you will see in the eyepiece. You can use a Go-To scope or you can star-hop to the location of Pluto. Either way you must use your telescopes' clock drive to keep the field around the suspected position of Pluto and carefully draw the field of stars. It is critical to spend a lot of time making this drawing because you'll use it over the next two nights to determine which of the faint dots of light is moving and which are static. Fixed = background stars… moving = Pluto! You will see something like this in your eyepiece:

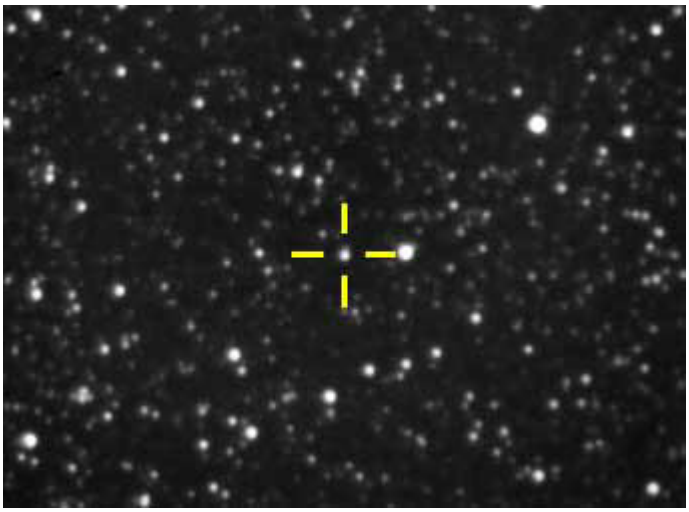
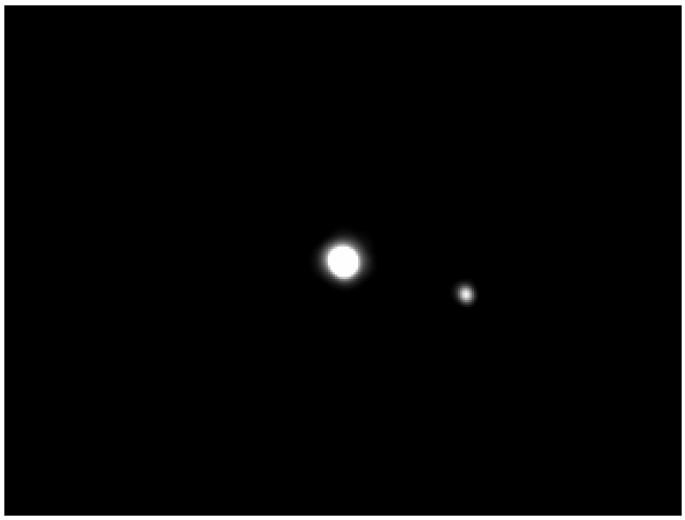


Image by Amateur astronomer Chris Peterson, 12-inch telescope, Cloudbait Observatory, Guffey, CO

NOT something like this: ***Pluto Image from Bill Dirk***



Take the Pluto Observing challenge! Try to observe all of the planets and at least one dwarf planet within the next twelve months! Maybe you'll be able to see or image Charon, Pluto's moon!

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equipment and software in action and to use it. Newcomers to the project are very welcome. If you have questions about the group, the meetings or the project, please contact the group coordinator, Del Christiansen at delmarchris@earthlink.net or me.

Some General Comments…
As you might have gathered, I'm involved in one way or another with all of the SIGs and really enjoy all of their meetings. If you have questions about any of them, I'll be happy to do what I can to answer them. From my own experience, the SIGs are a great way to get to know more people in the club as well as to learn more about things that interest you, and also a great way to get involved in interesting projects that you'd be unlikely to tackle on your own. So, if you haven't gone to any of the SIG meetings yet – do try a few, and give yourself some time to get familiar with what goes on at the meetings and the people who attend. If the group's focus is something you're interested in, I think you'll quickly find that you're having a lot more fun with it and learning more and much more easily than you could on your own.

The OCA would like to acknowledge the death of member Bob Swifka on August 18th after a long illness. While the funeral has already taken place as of the printing of this newsletter, we wish to express our condolences to his wife and family.

Chena Hot Springs (c) Mark Nicholas (2007)

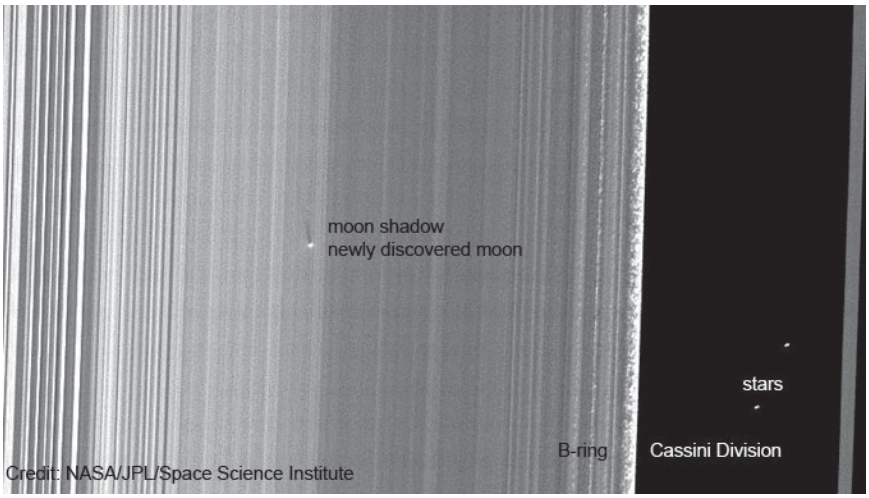
AstroSpace Update

September 2009
Gathered by Don Lynn from NASA and other sources

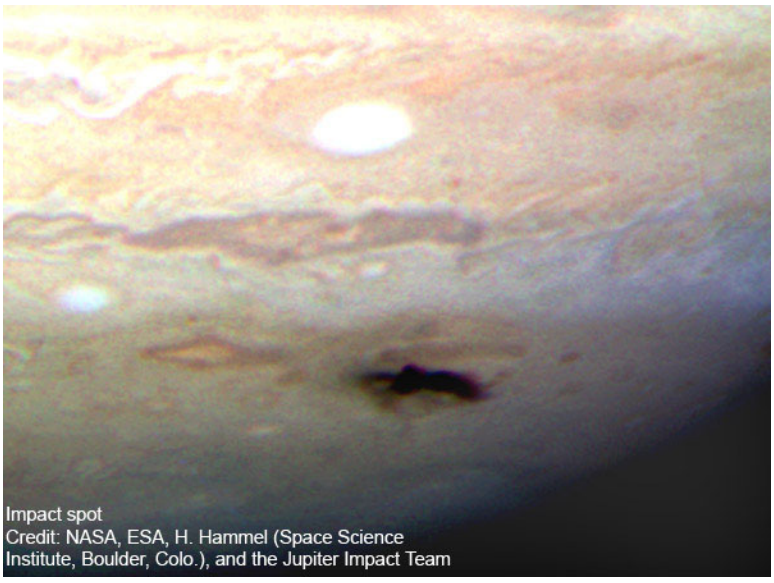
Exoplanet – The largest known exoplanet was discovered, and it is the only one known to orbit retrograde, that is, in the direction opposite to its star's rotation. It was discovered by the WASP system, which watches hundreds of thousands of stars with small telescopes to detect drops in the brightness of stars caused by planets passing in front (transiting). Since it is the 17th planet found by WASP, it is being called WASP-17. The planet has only half the mass of Jupiter, but twice the diameter. That makes its density 70 times less than that of Earth. WASP-17 has a highly elliptical orbit, and at every close pass by its star, huge tidal forces flex the gas giant planet, causing it to heat up and therefore swell to the huge size observed. The retrograde orbit was detected by determining which part of the star's spectrum was being blocked early and late in the transit. When blue-shifted light is being blocked, the planet is in front of the side of the star rotating toward us. Planet formation theory says that planets should form in a dust cloud rotating the same way as the star. So for a planet to be revolving retrograde, it must have suffered a really large disturbance, such as a gravity slingshot during a near encounter with an even larger planet.

Titan (moon of Saturn) – Observations by the Cassini and Huygens spacecraft show what appear to be channels cut by running liquid (probably liquid methane) over much of Titan, including equatorial regions. But methane clouds, which could produce rain to cause the channels, have not been seen in the equatorial regions, only near the poles. Massive areas of clouds formed recently while Titan was being observed with adaptive optics on telescopes in Hawaii. So it appears that equatorial clouds occur in huge amounts but after long cloud-free intervals.

Cassini (Saturn mission) – The Sun passed through the plane of Saturn's rings August 11, giving Cassini great views of extremely long shadows (caused by the low angle) of moons and ring disturbances. A tiny moon (about 400 yards across) was discovered embedded in the B ring, about 300 miles in from the edge. All moons previously found in rings are in gaps or at the edges. The Earth will pass through the plane of the rings on September 4, at which time the rings will be so thin as to be unobservable from Earth. Unfortunately Saturn will be too close to the Sun to observe then.



Enceladus geysers – Last month astronomers debated over whether the presence of salt in the geysers of Saturn's moon Enceladus meant that liquid water was spewing out or that solid ice was the material expelled. Another team has announced identifying ammonia in the geyser plumes. When ammonia is dissolved in water, it acts as antifreeze, keeping it liquid at far lower temperatures, in fact lower than those measured at the geysers (-136° F). If liquid water is being discharged, it probably means that a liquid ocean exists beneath the icy surface. Besides ammonia, various carbon compounds and deuterium (heavy hydrogen) were found in the plumes.


Impact spot
Credit: NASA, ESA, H. Hammel (Space Science Institute, Boulder, Colo.), and the Jupiter Impact Team

Jupiter collision – An Australian amateur astronomer, while taking images of Jupiter on July 19, noticed a spot he had not seen before. He thought it resembled one of the spots made by Comet Shoemaker-Levy 9 when it collided with the planet in 1994. He notified other astronomers and the diagnosis was confirmed after imaging with the Hubble Space Telescope and with ground-based infrared telescopes. Calibration of Hubble's new cameras after the recent repair mission by astronauts had not been completed, but officials decided to shoot Jupiter anyway before the new spot got away. Follow-up observations are being made to try to determine the composition of the spot to figure out whether it was a comet or asteroid that hit the planet.

Mars rover Opportunity has discovered another meteorite sitting on the surface of Mars. Rover controllers, who name everything they see, are calling the meteorite "Block Island". At about 2 feet long, it is the largest meteorite yet seen on the planet. The rover had actually

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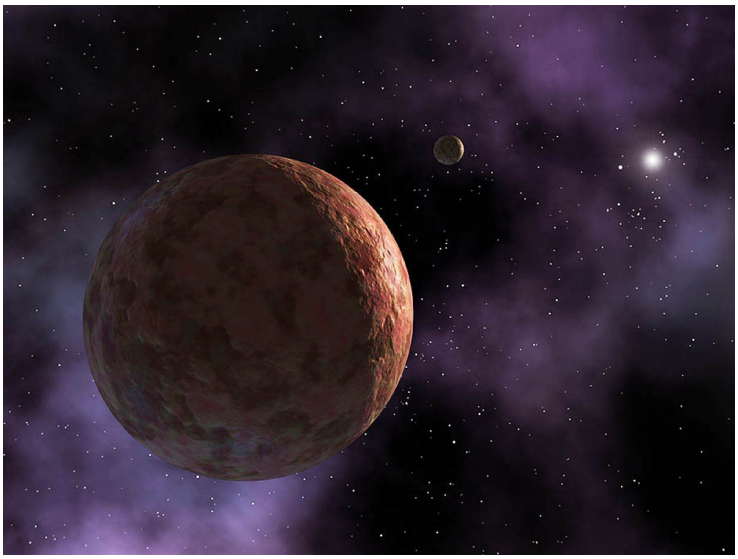
NASA's Space Place

A Planet Named Easterbunny?

You know Uranus, Neptune, and Pluto. But how about their smaller cousins Eris, Ceres, Orcus, and Makemake? How about Easterbunny? These are all names given to relatively large "planet-like" objects recently found in the outer reaches of our solar system. Some were just temporary nicknames, others are now official and permanent. Each has a unique story.

"The names we chose are important," says Caltech astronomer Mike Brown, who had a hand in many of the discoveries. "These objects are a part of our solar system; they're in our neighborhood. We 'gravitate' to them more if they have real names, instead of technical names like 2003 UB313."

Nearby planets such as Venus and Mars have been known since antiquity and were named by the ancient Romans after their gods. In modern times, though, who gets to name newly discovered dwarf planets and other important solar-system bodies? In short, whoever finds it names it. For example, a few days after Easter 2005, Brown and his colleagues discovered a bright dwarf planet orbiting in the Kuiper belt. The team's informal nickname for this new object quickly became Easterbunny.



Artist's rendering of dwarf planet MakeMake, discovered around Easter 2005. Unlikely to gain acceptance their nickname Easterbunny, the discoverers named it for the god of humanity in the mythology of Easter Island.

However, ever since its formation in 1919, the International Astronomical Union (IAU) ultimately decides whether to accept or reject the name suggested by an object's discoverers. "Easterbunny" probably wouldn't be approved.

According to IAU guidelines, comets are named after whoever discovered them—such as comet Hale-Bopp, named after its discoverers Alan Hale and Thomas Bopp. Asteroids can be named almost anything. IAU rules state that objects in the Kuiper belt should be given mythological names related to creation. So Brown's team started brainstorming. They considered several Easter-esque names: Eostre, the pagan mythological figure that may be Easter's namesake; Manabozho, the Algonquin rabbit trickster god. In the end, they settled on Makemake (pronounced MAH-kay MAH-kay), the creator of humanity in the mythology of Easter Island, so named because Europeans first arrived there on Easter 1722.

Other names have other rationales. The dwarf planet discovered in 2005 that triggered a fierce debate over Pluto's status was named Eris, for the Greek goddess of strife and discord. Another dwarf planet with an orbit that mirrors Pluto's was dubbed Orcus, a god in Etruscan mythology that, like Pluto, ruled the underworld. Brown says he takes "this naming business" very seriously and probably spends too much time on it. "But I enjoy it." More tales of discovery and naming may be found in Brown's blog MikeBrownsPlanets.com.

Constellations have also been named after ancient gods, human figures, and animals. Kids can start to learn their constellations by making a Star Finder for this month at spaceplace.nasa.gov/en/kids/st6starfinder/st6starfinder.shtml. There you will also find a handy explanation of why astrology has no place in science.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

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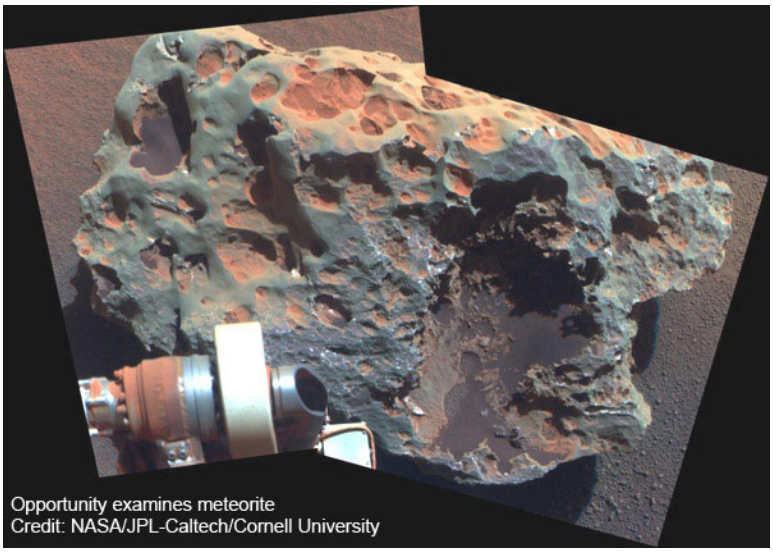
driven past Block Island by a couple of hundred yards before images were analyzed to notice it. So they backtracked Opportunity to examine it with the rover instruments. Preliminary results are that it is definitely a nickel-iron meteorite. Its size, given the current state of the Martian atmosphere, should have caused it to hit the surface so hard as to break it up. So the atmosphere had to have been much thicker when Block Island fell, and therefore slowed the meteorite much more. Scientists are now trying to figure out if it fell billions of years ago, when the atmosphere should have been much thicker, or if the atmosphere occasionally gets much thicker in recent geological times. Observations continue, with a goal of determining how much and what kind of weathering has occurred since it fell. This may give a clue as to when it fell.



Opportunity examines meteorite
Credit: NASA/JPL-Caltech/Cornell University

Mars Reconnaissance Orbiter (MRO) has identified rocks in the rim of Endeavour Crater as being composed of clay that was formed by non-acidic water processes. Previous evidence of Martian rocks formed by water processes, found by the rovers, involved highly acidic and salty water. The clay found is believed to be older than the crater, which is billions of years old. So this may be a remnant left from the warmer wetter climate thought to have existed billions of years ago. Such material would have been habitable for bacterial life. So this area has been made a very high priority target for the rover Opportunity to visit and analyze. As it turns out, the rover was already on its way to Endeavour Crater because of other interesting geology there. The only hitch is that it is still about a year's drive away. The Mars Science Lab, a giant rover scheduled for launch in 2 years, is already targeted to land in an area of clay for exactly these reasons.

Asteroid or comet – In 1996 astronomers discovered an object in the asteroid belt that ejected material like a comet. It was given a comet name: 133P. The question arose as to whether this was a comet that was kicked into the asteroid belt, or this was an asteroid that happened to contain ice that got exposed and is emitting material as it sublimes. If the former, it was considered very unlikely for orbits to be changed in this way, and this might be the only such object. But a search of hundreds of asteroids has turned up other such objects, including one dubbed 176P/LINEAR. So it is likely that many asteroids contain ice. It appears that 176P collided with some other object, which exposed some of its internal ice.

Early Sun – By studying stars like the Sun, but younger, a team of astronomers has determined that the Sun early in its history spun 10 times faster than it does now, had a much more powerful magnetic field and enormous sunspots covering vast areas. X-ray and ultraviolet radiation emitted then were hundreds of times stronger than today. This made the early Earth not very hospitable to life. The team concluded that a smaller orange dwarf star would be more stable than the Sun, particularly early in its life, and make a better place for life to form on one of its planets. They also determined that a planet much larger than Earth, but not large enough to be a gas giant, would have thicker atmosphere and stronger magnetic field to provide more protection from the early violence of a Sun-like star, probably allowing life to form more quickly.

Betelgeuse has been observed with state-of-the-art techniques, revealing a vast plume of gas by it and gigantic bubbles boiling on the star's surface. The star is one of the largest stars known, about 1000 times the size of the Sun and more than 100,000 times as bright. Such giant stars are known to shed mass at huge rates, but the mechanism of shedding is poorly understood. The imaging techniques used 1) adaptive optics, where a mirror in the telescope is flexed to counteract the motions of our atmosphere, 2) lucky imaging, where thousands of images are taken, and only the sharpest are used, and 3) interferometry, where light from 2 telescopes is combined. The plume is evidently material being shed by Betelgeuse. It extends to at least 6 times the diameter of the star, which is about the same distance as Neptune is from us. The observation shows the star is not shedding material equally in all directions.

Planetary nebulas, the glowing gaseous shells thrown off by stars during late stages of their lives, have been found only around stars the size of our Sun or smaller. Theoretically, larger stars should produce them also. Now a team of scientists has discovered planetary nebulas around stars up to 8 times the mass of the Sun. They were found with radiotelescopes and were residing in the Magellanic Clouds, the companion galaxies to our Milky Way. The new objects are unusually strong radio sources and are more massive, and sometimes more luminous, than ordinary planetary nebulas. The next generation of radio telescopes, such as the Square Kilometer Array, is needed to see these objects in detail.

Type Ia supernovas are used to determine cosmic distances because they all have almost exactly the same peak inherent brightness. Thus the apparent brightness allows calculation of how far away they are. A new study has been made to pin down the "almost the same" part. Supercomputers were used to simulated the supernova explosions and determine what factors affect the peak brightness. Much of the variation is caused by chaotic motions that make the explosion off-center in the star, or asymmetric. Viewing the supernova from a different angle was found to produce different measurements of brightness. But averaging observations of many different supernovas will overcome this variation. The simulation duplicated a known factor related to variations in brightness. This is that the peak brightness correlates with the time it takes for the brightness to rise to peak and then fall off. This had already

been observed empirically, and is usually taken into account in supernova studies. Another factor found to affect brightness is the chemical composition of the star. Over the life of the Universe the average amount of heavier elements found in stars has risen as these elements are produced in stars and spread by stellar winds and supernovas into succeeding generations of stars. So this factor should be taken into account when observing supernovas, in order to reduce the errors in calculated distances.

Early galaxies – Looking at galaxies so distant that we are seeing them as they were 11 billion years ago when the light left them, astronomers have measured the motions of stars within the galaxies and found them to be moving over 1 million mph, about twice as fast as nearby stars move in our Milky Way galaxy. The galaxies were found to be much smaller than our Milky Way. Yet the higher speeds require that the galaxies have more mass. The questions that arise are how do such small massive galaxies form, and what happened to those galaxies since (we don't see such galaxies today)? One possibility is that the galaxies turned into the dense cores of the largest galaxies seen today. Further observations will be made with the new camera in the Hubble Space Telescope to see galaxies at an even earlier time in order to try to answer how they formed.

Green Peas – A team of astronomers has discovered a new class of galaxies that is being called Green Peas, since they are bright green, small and round. This discovery was done with the help of the Galaxy Zoo volunteers, people who are helping astronomers classify galaxies online. The galaxies are small and are forming stars at an incredibly high rate. In the Galaxy Zoo database of a million galaxies, only 250 Green Peas were found. So apparently they are just rare enough that no one noticed them as a class before. Those found are between 1.5 and 5 billion light-years away, are 10 times smaller across than our Milky Way and 100 times less massive. The Galaxy Zoo volunteers who helped find the 250 are calling themselves the Peas Corps.

Star formation – A new study from the orbiting Chandra X-ray observatory and Spitzer infrared telescope has shed light on how stars form out of gas clouds. The 2 leading theories are that gas collapses into stars from gravity or that a shock from an external source, such as a supernova, triggers the gas collapse. Cepheus B is a gas cloud lying about 2400 light-years away, and was the object of these observations. The stars in and around the cloud were age dated by the infrared observations. It was found that the stars formed in a wave moving across the cloud, indicating that star formation in this cloud was triggered by an external source. That source appears to be radiation from one bright massive star outside the cloud.

Spitzer has found evidence of a high-speed collision between 2 forming planets around a young star. The evidence included rock vapor (gaseous silicon monoxide), lava particles and rocky rubble. The bodies must have been roughly the size of our Moon and Mercury, and collided at over 6 miles per second, to produce the debris seen. The star is HD 172555, located about 100 light-years away in the constellation Pavo. Previously found evidence of collisions of planets at other stars has not indicated this level of violence.

Spitzer has warmed up to about 405° F below zero since it ran out of coolant this past May. As predicted, 2 of its detectors are working just as well as before, and observations using only these have begun. Projects that can use these observations include refining the value of the Hubble constant (the rate at which the Universe is expanding), searching for extremely distant galaxies, observing near-Earth asteroids and comets, and studying planets expected to be discovered by Kepler.

Kepler (planet hunting space telescope) has detected the atmosphere of a known gas giant planet (named HAT-P-7), after being in operation only 10 days. The daytime temperature of the atmosphere was found to be about 4300° F. This high temperature is due to orbiting quite close to its star, 26 times closer than the Earth is to the Sun. Little of this heat is carried to the night side. Kepler will spend 3.5 years looking for planets that transit stars. It should be able to detect planets as small as Earth, far more sensitive than Earth-bound telescopes. This sensitivity was proved by the observation of HAT-P-7, in which the changing phase of the planet was detected as it orbited its star, as well as the disappearance of the planet behind its star. The time spent behind the star is about equal to the time in front, so the orbit is nearly circular.

Cosmic Rays – An instrument called the Alpha Magnetic Spectrometer (AMS) is scheduled to be sent to the International Space Station (ISS) aboard the last flight of the Shuttle just over a year from now. AMS is a cosmic ray detector. Since cosmic rays are blocked by the Earth's atmosphere, AMS has to operate in space. It produces so much data that it has to feed directly into a supercomputer with 650 processors to reduce the data to manageable amounts before being radioed down to Earth. The need for computer maintenance and the large amount of power used (2.5 kilowatts) makes the AMS unsuitable for any spacecraft other than the ISS. Cosmic rays are subatomic particles, often protons, moving at fantastic speeds. Many of them vastly exceed the energy that any particle accelerator on Earth can achieve. So scientists expect to learn from AMS about high energy physics in realms that no particle accelerator can produce. AMS should be able to detect antimatter galaxies, if they indeed exist, detect strangelets (theoretical particles made of strange quarks), test dark matter theories, and maybe finally pin down what astronomical objects produce cosmic rays (this has remained unsolved for almost a century).

Instant AstroSpace Updates

New high-resolution images of **Titan** show the effects of cryovolcanoes, that is, ones that spew out low temperature liquids. Ammonia frost has been found to appear near the vents after an eruption, but eventually it evaporates.

Mars rover **Spirit** is still stuck in soft material, as controllers test methods of unsticking it using a spare rover in Pasadena. The latest estimate is that they will try moving Spirit the second week in September.

(continued next page)

"The Woman in the Moon" ("Frau im Mond")

A movie by Fritz Lang, 1929

Review by Bob Buchheim

This is a remarkable and prescient movie!

The plot is fairly straightforward: A German industrialist has constructed a rocket ship, in which he and his chief engineer (who bears an uncanny resemblance to ex-Lockheed Martin CEO Norm Augustine), along with an elderly professor, plan to fly to the Moon. They are accompanied by the engineer's fiancé, a blackmailing spy, and a stow-away lad. There is deceit (mostly by the spy), unrequited love (the industrialist and the engineer's fiancé), selfless sacrifice (the industrialist), plucky courage (the stowaway boy), and in the end true love wins out (the industrialist and the fiancée). This is one of the very first cinematic space operas – black and white, and silent – but with a wonderful soundtrack and remarkably well-done visual effects.

The real treat for me was the way that this long-ago vision of space equipment presaged some modern approaches. I noted that, even before the starring players are identified, the opening credits give a list of the film's scientific consultants, including Hermann Oberth. The story may be a bit corny in parts, but the filmmaker clearly wanted to get the technology correct. For example: In one scene, the spies study a chart on the industrialist's wall that shows the relative gravitational fields of Earth and Moon, and the planned trajectory to put the rocket into orbit around the Moon. That chart would have been quite at home in any 1960's-era high school science classroom. The trajectory is also a pretty good match to the path that the Apollo missions actually took. There is also a long scene in which we are told that this manned mission has been preceded by at least two unmanned lunar explorers. One, carrying "automated cameras", orbited the Moon, taking high-resolution imagery (a Lunar Reconnaissance Orbiter?). The other was an impactor "filled with magnesium so that the flash of its impact could be observed from Earth". There's even a photo of the magnesium-enhanced impact flash, with a credit to "Mt Wilson Observatory" printed in the margin.

The manned rocket was assembled standing on its tail, in a huge hangar (they don't call it the "vertical assembly building", but they might as well have), and it was mounted on a huge crawler to make the journey from the hangar to the launch pad. Watching that scene and comparing it to the Space Shuttle Crawler sequence was downright eerie!

(continued next page)

(continued from page 9)

Indian space officials just admitted that the star tracking system in their **Chandrayaan-1** lunar orbiter was permanently damaged by overheating back in May. But the spacecraft was raised to a higher orbit and was reprogrammed to orient itself without star tracking, using only gyroscopes, and may be able to complete its mission.

The organization planning to build the **Thirty Meter Telescope** (completion scheduled for 2018) has announced that their site selection group has settled on Mauna Kea, Hawaii as the place to build it. The primary mirror will be composed of 492 segments and gather 9 times the light of the huge Keck Telescopes already on Mauna Kea.

A new computer simulation of **black hole formation** in the early Universe shows that the star that became the black hole blew away surrounding matter, so the black hole would be starved of matter to feed on for hundreds of millions of years after formation. Even in the starved state, the disk about the black hole produces enough X-rays to suppress star formation in the area.

NASA has selected the proposed **GEMS** mission for development and launch in 2014 to study polarized X-rays emitted by such objects as black holes, neutron stars and supernovas. It will be 100 times more sensitive to polarization, that is, the direction of vibration of X-rays, than any previous X-ray telescope.

Chandra (orbiting X-ray telescope) celebrated 10 years in space in July, double the original plan for the mission. It has made great discoveries regarding dark matter, dark energy, black holes, comets and many other areas.

In August the **Planck** spacecraft completed checkout and began science operations for its 15-month mission to analyze the cosmic microwave background.

The Space Shuttle Discovery is scheduled to launch August 24 on a supply mission to the **International Space Station**. The first Japanese supply ship and a Russian supply spacecraft (both unmanned) and a Russian crew-change spacecraft are scheduled in quick succession after the Shuttle visit.

What happens when you invite a record 13 people to your **space station**? The toilet breaks, of course. Even though there were 2 others (1 of those on the visiting Shuttle), astronauts promptly replaced several parts and got it working again.

■

Magazine Subscriptions

Subscriptions to the Astronomy magazines are now due for renewal, if you subscribed for one year or would like to subscribe at the club rate. You may also extend an existing subscription that does not end in December for one year at the club rate. Bring your check made out to the OCA to the meeting or mail it to:
Charlie Oostdyk, Orange County Astronomers, PO Box 1762, Costa Mesa, CA 92628. ***Checks made out to the magazine publishers cannot be processed and will be returned to you***. If you already subscribe, please provide the mailing label or the billing invoice with your check. One-year rates are as follows:

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The **DEADLINE** for subscribing at the club rates will be the **October monthly meeting, October 16th.** The publishers will send expiration notices to all current club subscribers about November 1st even if you renew through the club. It takes the publishers a few weeks to process renewals.

The rocket is a three-stage design (again, remarkably far-sighted for 1929). There is a mostly-correct description of the need to achieve escape velocity while not exceeding the human capacity to survive high accelerations ("above 4g's is fatal..." according to one of the characters). In order to help deal with this, the crew are prone during take-off, as is still standard. Unlike today, however, they aren't in pressure suits – instead, high-collars and tweed jackets are the uniform of the day. But once they get to the Moon, their first concern is to locate water. That's another parallel with modern lunar exploration (a` la LCROSS).

There were a few technical problems that these rocket-movie pioneers recognized, but solved in ways that don't match modern methods. As the rocket is being prepared for launch, a news commentator points out that the structure is so light that it can't support its own weight, so it is launched while partially immersed in water – not exactly the Sea Launch concept, but still it's remarkable to see that they recognized the conflicting demands of lightness and strength in a launch vehicle. Thermal control during trans-lunar cruise is also a problem. They solved that one by painting the rocket half white and half black: since it's cold in space, the black half is turned to face the Sun, in order to absorb more heat during trans-lunar cruise. A naive, but clever idea.

A knowledgeable modern viewer will see myriad details that the film gets horribly wrong, but still it's a wonderful piece of cinematic and technological history, and a grand ride to boot. I don't think we have it in the OCA Library, but you can get it from NetFlix. ■

For Sale: Celestron C6-R refractor on a CG-4 mount with 2 inch Antares diagonal, 2 inch 32mm wide field eyepiece, 9X50mm finder, 6" white light solar filter by Baader; Baader semi-apo filter for 1 1/4" eyepieces; 20mm Plossl eyepiece, counterweights and dustcap. All kept in good condition. $450 Contact Val Akins at (949) 855-9018.

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