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## Nobody Cried for Argentina During July 11 Solar Eclipse

### By Thomas Haeberle

**Astronomers from around the world,** both amateur and professional, traveled to the Pacific last month to behold a total eclipse of the Sun. The July 11 eclipse went over the South Pacific, with land a prized commodity. Some choices were the Cook Islands, Easter Island and El Calafate at the tip of Argentina.

Professor Jay Pasachoff, who leads the league (if there ever was one) for viewing solar eclipses, notched his 51st. He observed from Easter Island with his students from Williams College. His research team was there to study the corona. "We observed the total eclipse in perfectly clear skies," Pasachoff e-mailed SPACE.com. "The sky was wonderful." The National Geographic channel aired the Easter Island event the same night.

SPACE.com reported that the global sky photography effort The World at Night (TWAN) stationed photographers all along the eclipse's visibility track, including on a chartered jet, cruise ships, islands and in Patagonia.

**TWAN director Babak Tafreshi** told SPACE.com, "Eclipse chasing is not all about eclipses. It's also a way to meet people and learn and respect other cultures. It's a chance to share your passion with others." Eclipse-chaser Bill Kramer watched the eclipse from the deck of the cruise ship Paul Gauguin, which, appropriately enough, was sailing near Tahiti with more than 300 sky watchers.

The chartered flight returned to Papeete after seven hours in which it extended the eclipse duration, making it last more than nine minutes. The eclipse at Easter Island lasted a not too shabby four minutes and 41 seconds.

But the real miracle took place at El Calafate, which wasn't expected to have great weather, and observing would be complicated by a low-lying Sun. Initial forecasts were gloomy, a special local flight had to be cancelled and it was the middle of the Austral winter!

**The people who went there** were taking a big chance. They might not have seen anything because the eclipse would be at the tail end of its path and would be just 1 degree above the horizon. But if the weather cleared, there would be dramatic colors. That's what happened, as well as a golden corona instead of a pearly white.

Dr. Leo Metcalfe of the European Space Agency told me that going to Patagonia was precisely what he wanted. "The Moon's shadow is stretched along the Earth's curve and I expected interesting impacts on the visibility of the shadow. For the first time [in six totalities], I saw the shadow as really moving, and not just a growing [wall of] darkness. It was striking that the shadow stayed blue once totality ended, because it just lifted off the Earth into the sky."

Daniel Fischer of the University of Bonn took stunning photos of the eclipse over the Andes. Stefan Krause, with Fischer at the "Eclipse City" camp along the Mirador highway, nearly 1,000 meters up, also uploaded superb pictures: http://twitpic.com/24jbl.

**Metcalfe reported that the day before** had ended with solid gray clouds, but on the morning of the eclipse and for much of that day there wasn't a cloud in the sky down to the horizon. "Later we would learn that skies as clear as we had are seen perhaps five times a year in Patagonia," Fischer said.

Next total solar eclipse is November 13, 2012, with totality in northern Australia and the southern Pacific. ■

# What's Up

## By Tony Hoffman

## The Sky for August 2010

**A Good Year for Perseids (especially if you have Fridays off).** The Moon, two days past new, won't be a factor for this year's Perseid meteor shower, due to peak the night of August 12-13, with an expected peak rate of 60 to 100 meteors an hour from a dark-sky site. The meteors' radiant, near the head of Perseus, won't be high in the sky until after midnight. If you can't get up in the wee hours Friday morning, you can expect a decent show the previous and following nights, with meteor counts still about half their peak rate.

**A Late-Evening Comet.** Comet 10P/Tempel, which reached perihelion July 4, should shine at about 8th magnitude as it plies its way through Cetus the Whale between the stars Tau and Eta Ceti. Cetus isn't high in the sky until well after midnight, so is best for morning observers. 10P/Tempel is a short-period comet, taking just 5.4 years to orbit the Sun, and this year is making one of its best appearances in recent memory.

**Worlds Abound.** Venus is a dazzling sight in the western sky after sunset, brightening from magnitude -4.3 to -4.6 over the course of the month and reaching its greatest elongation (angular distance from the Sun) August 19. Mars and Saturn spend the month near Venus; they glow at magnitudes 1.5 and 1.1, respectively, more than 100 times fainter than Venus. In the first half of the month, Mercury may be glimpsed near the horizon, well to the lower right of Venus.

Jupiter rises around 10 p.m. at magnitude -2.8, far outshining the faint stars of Pisces. Uranus starts the month 3 degrees from Jupiter and closes to less than 2 degrees by the end of August. Uranus can be seen with the naked eye by keen-eyed observers from dark-sky sites. Neptune, in Capricornus near its border with Aquarius, reaches opposition August 20. Two dwarf planets are also on the scene. Eighth-magnitude Ceres, the first asteroid to be discovered, is a binocular object in southern Sagittarius. Pluto lies in a rich Milky Way star field in northern Sagittarius. It requires at least an 8-inch scope to be visually observed. I've attempted to image it using a digital SLR camera yoked to a 300mm lens.

**August 1** Mars lies near Saturn.
**August 3** Last-quarter Moon at 12:59 a.m.
**August 6** Mercury at greatest elongation in evening sky.
**August 9** Venus near Saturn; new Moon, 11:08 p.m.
**August 10** Moon at perigee, 222,362 miles from Earth, 1:58 p.m.
**August 11** Moon lies near Mercury.
**August 12** Perseid meteor shower peaks.
**August 13** Moon lies near Saturn, Venus and Mars.
**August 16** First-quarter Moon at 2:14 p.m.
**August 19** Venus' greatest elongation in evening sky.
**August 20** Neptune is at opposition.
**August 23** Venus lies near Mars.
**August 24** Full Moon at 1:05 p.m.
**August 27** Moon lies near Jupiter.

# Jupiter Aligns With Uranus

## By Joseph A. Fedrick

**The clouds and haze parted** in mid- and late June, and early July, to allow my observing of Jupiter as it overtook Uranus on its orbit around the Sun. I pointed my f/15 60mm achromatic refractor at Jupiter around 4:30 on the morning of June 7 and used an eyepiece that yielded 50x. Uranus appeared well within the same field of view. It appeared as a tiny, distinctly bluish disk, just barely non-stellar and slightly less than four seconds of arc in diameter, while Jupiter displayed a much larger disk around 40 arc seconds and appeared ivory-white with faint belts crossing it.

Jupiter's South Equatorial Belt was still very much faded, in fact barely visible, while the North Equatorial Belt was a prominent orange tan. I watched as Jupiter pulled away from Uranus during the rest of June and in early July. By July 2, Jupiter was no longer in the same field of view in my 60mm refractor at 50x, but still in the same field of view as seen in my 10x50 binoculars. In my six-inch Newtonian reflector, Jupiter still revealed a much faded South Equatorial Belt. Uranus appeared as a distinctly non-stellar but tiny bluish disk.

**There will be two more times** this year when Jupiter and Uranus will be in conjunction. These conjunctions will be observable at a more convenient evening hour as Earth overtakes both Jupiter and Uranus on its trip around the Sun. ■

# MIT Professor Kicks Off AAA Lecture Series October 1

**Dr. Max Tegmark, professor** of physics at MIT, will kick off the AAA's 2010-11 lecture series on Friday, October 1 when he discusses "The History of the Universe in One Hour." The free public lecture is in the Kaufmann Theater of the AMNH at 6:15 p. m.

"With a cosmic flight simulator, we'll take a scenic journey through space and time. After exploring our local galactic neighborhood, we'll travel 13.7 billion years back to explore the Big Bang itself and how state-of-the-art measurements are transforming our understanding of our cosmic origin and ultimate fate." If attendees have questions about dark matter, dark energy, black holes, parallel universes or other matters cosmological, this will be a great opportunity to ask them, Tegmark says.

A native of Stockholm, Tegmark received his B.Sc. in physics from the Royal Institute of Technology. He received M.A. and Ph.D. degrees from the University of California at Berkeley. Tegmark worked at the Max Planck Institute for Physics in Munich, the Institute for Advanced Study and the University of Pennsylvania before joining the MIT faculty in 2004.

**Other lectures** are as follows:

**November 5,** Michael Tuts, Columbia University, "Particle Physics at the Large Hadron Collider and Cosmology." **December 3,** Suzanne Young, University of New Hampshire and NASA, "Top 10 Discoveries of the Phoenix Mission to Mars." **January 7,** Robert Nemiroff, Michigan Technological University, "Best Astronomy Pictures of the Day, 2010." **February 4,** Neil Weiner, NYU, "Illuminating Dark Matter." **March 4,** Andrea Dupree, Harvard-Smithsonian Center for Astrophysics, "Searching for Extrasolar Planets with Kepler." **April 1,** Greg Matloff, New York City College of Technology, "Regreening the Earth Using Space Resources." **May 6,** David J. Thompson, NASA, "Exploring the Extreme Universe with the Fermi Gamma-ray Space Telescope."

Dupree's talk will be the club's annual John Marshall Memorial Lecture, which honors a past president and executive director of the AAA who was instrumental in its growth. Marshall died in 1997.

## A Note from the President

*Hello members:*

I hope you're enjoying yourself this very hot summer. I've been having fun going from one observing session to the next, and I hope you are also. Otherwise, not much is going on, so I'll keep things short. Our next board meeting is at 6:30 p. m. Wednesday, August 18 at headquarters, 120 Warren Street. You're invited.

*Rich Rosenberg, president@aaa.org, (718) 522-5014*

# Report on the AAA Seminar

## By Jason Kendall

**In May, we covered** a recent finding about overluminous supernovae. There's a concern that many Type 1a supernovae are too luminous for their progenitors to be simply accreting white dwarfs. Some of these supernovae imply the progenitor white dwarf is too massive to actually be a white dwarf before it explodes. Resolution of this issue has profound implications for cosmology.

In addition, Rich Rosenberg finished a topic he presented in the AAA class on "Caveman Astronomy". Rich's excellent subject choice and novel approach to introductory astronomy is a winning combination, and all in attendance exhorted him to turn his lectures into a book. His PowerPoints are available at aaa.org.

**In June, we covered** a paper on Titan which elucidates the possibility of methanogenic life there. We examined the paper and supplementary material I gathered as part of my NASA/JPL outreach. I'd attended a lecture by a Cassini mission specialist, and presented his insights. Titan's surface is too cold to sustain liquid water. But in 2005, researchers suggested organisms might exist by breathing hydrogen and eating organic molecules such as acetylene and ethane. Cassini has found evidence there's less acetylene on Titan than expected by the atmospheric chemistry, and that levels of hydrogen may be actively being depleted at the surface, raising the possibility exotic life forms are consuming these substances. I

***Seminar continued on page 12***

# The Intensifying Search for Life on Other Planets

## By Evan Schneider

**What's being implemented** to advance discovery of Earthlike planets existing in "habitable zones," near enough to their stars for warmth but far enough away to support life? What's needed to create the perfect environment for the creation and development of life? How can we identify these worlds in our own solar system, the Milky Way or deep into the universe?

On June 14, James F. Kasting, professor of geosciences at Penn State, speaking at the Hayden, sought to answer many of these questions. His new book, "How to Find a Habitable Planet" (Princeton University Press, $29.95), provides a perspective on how best to utilize technology to find life on other worlds.

Kasting discussed recent history and hypotheses of several well-known authors in this field, then brought his audience to the present, sharing methodologies being used and planned to seek life on other worlds.

**The lecture began with a review** of several authors. James Lovelock, scientist, inventor at NASA and environmentalist, posits in "Gaia: A New Look at Life on Earth" and "Ages of Gaia" that the biosphere regulates our environment that acts to sustain life. Peter Ward, paleontologist and professor of biology, and Earth and Space Sciences at the University of Washington, asserts in "The Medea Hypothesis" that complex life is rare in the universe and that life itself is actually harmful to Earth.

These perspectives show how life developed on Earth and its sustainability, but their hypotheses don't explore the possibility or extent of life on a universal scale. Kasting's new book responds to Ward's "Rare Earth," which questioned Carl Sagan in his belief that extraterrestrial civilizations number in the millions.

**Kasting showed how today's science** is being used to measure light spectra and characteristics of exoplanets to quantify data supporting parameters for life. Much of NASA is seeking life on Mars. While studying Jupiter, the Galileo probe scrutinized Europa, with its icy surface and liquid-water subsurface, suggesting the possibility of other life in our solar system.

**Today, Kasting observed, telescopes** and spacecraft are measuring the radial velocity of light to calculate the speed and mass of distant planets (www.exoplanets.org). The Kepler telescope mission looks for habitable planets more than 2,000 light-years away, monitoring the brightness of 150,000 stars while waiting to identify planets that may sustain life. Once identified, reflected light from a planet can be observed, providing a chemical-composition analysis of its atmosphere and possible planetary biology.

New and future technologies are being planned and deployed to meet NASA's goals. The astrometric method, in calculating the mass of a planet, determines the ability to sustain life. NASA, Northrop Grumman and JPL are developing the Space Interferometry Mission Lite telescope, scheduled to launch in 2015. It will use optical interferometry (two mirrors collecting light) to hunt for exoplanets, map the Milky Way and assist in determining spatial distribution of dark matter.

**Large space-based telescopes** will use direct imaging to observe planetary spectra. The James Webb Space Telescope, launching in 2014, will use infrared equipment to peer through dusty clouds of our galaxy to look for galaxies formed in the early universe. This may help to explain the evolution of planets and their relationship to stars, supporting the exoplanet search.

Direct imaging also has the capability of finding biomarkers: water, ozone and evidence of photosynthesis. If free oxygen is detected, life may not be far behind. Future discoveries may also be achieved by a NASA/JPL plan to block out bright starlight with a remote object, allowing a space-based telescope to see a planet.

Kasting is working to advance this technology as chair of the Terrestrial Planet Finder Coronagraph Mission Definition Team. The concept is also being developed by the New Worlds Mission, headed by Webster Cash, professor of astrophysics at the University of Colorado.

A final detection method to gauge a planet's composition is measuring planet shine, where photons from a moon can be used to calculate a planet's composition. ■

# IMAX's Latest at the AMNH is a Stunning "Hubble" Film

## By John Delaney

**Few would disagree** that the Hubble Space Telescope is the most important scientific instrument since Galileo's handmade refractors revealed the wonder of the Moon, the planets and beyond. Hubble's discoveries have greatly expanded our knowledge of the universe, narrowed estimates of its age and detected entirely new elements of the cosmic realm.

That's why the new IMAX film, "Hubble," is such a great idea. The massive, 40-foot-high screen seems tailor -made for the scale of the scope, its orbital perch and the vastness of all it observes. The medium is the message, but the content is far from irrelevant. It truly rises to the occasion (sorry, Mr. McLuhan).

**The film has proved to be** a crowd-pleaser at the AMNH, where it opened July 3 and will remain until January 10. For show times: amnh.org.

For the most part, this blend of super-sized IMAX format, ground-breaking technology and astronomical imagery triumphs. Made in cooperation with NASA, "Hubble" is the product of the same team that produced "Space Station." One team member, James Neilhouse, is director of photography and astronaut crew trainer.

For the most part, the film highlights the service mission of Atlantis STS-125, launched on May 11, 2009 to replace Hubble's failed gyroscopes and add new instruments. Some of the most impressive sequences of the film are views of the telescope from Atlantis. Space walks to repair the telescope are featured to great effect, in large part because the projected dimensions of the astronauts and the telescope (as large as a bus) are comparable to the actual objects. The narration, by Leonardo DiCaprio, effectively conveyed the difficulties of replacing circuit boards and other hardware in space, "like performing brain surgery with oven mitts."

**While this shuttle mission** to Hubble was the focus of the film, it also featured the telescope's troubled first years in space, interspersing televised news reports of Hubble's slightly flawed mirror, which produced blurry images. The first service mission to Hubble solved the problem with corrective optics, opening the floodgates of discovery that continue to this day.

**The film featured many** of the Hubble's most celebrated images, such as the Helix Nebula and the Eagle Nebula's "Pillars of Creation." Other discoveries were aided by the addition of computer-generated sequences, including a trip to a swaddle of new-born stars in the Orion Nebula, and the supermassive black hole inside Messier 87 (one of Hubble's big discoveries). The benefits of observing in both ultraviolet and infrared were illustrated by images of Omega Centauri, revealing different classes of stars.

Of course, there are always quibbles, and IMAX films sometimes skew slightly into kitsch, either with overly dramatic music or unctuous narration. There was a bit of both here. However, assessing the worth of an IMAX film without considering the target audience--presumably children and families--would be missing the point. Large-format screens like this are a wonderful experience for children and their parents. And footage of a space shuttle blasting off, combined with the rumbling from a state-of-the-art sound system, is a spine-tingling experience for all age groups.

**"Hubble" also conveyed** the importance of the world's most famous telescope in probing the big questions: How old is the universe? How did the planets form? How did the universe itself form? DiCaprio's dialogue provides just enough "There may be 100 billion galaxies across the universe" to engage but not overwhelm viewers.

As an IMAX production, "Hubble" succeeds, not only in its treatment of its gleaming bus-sized star and the astronaut crews who have repaired and maintained it, but in providing an overview of its unprecedented scientific achievements. Curiously, what most impressed me about the film was not the telescope or its haul of incredible images, but the Earth. For instance, high-definition footage of the Cape of Good Hope was mesmerizing in its scale and beauty. The subtle but sharp outlines of the Hawaiian Islands and their volcanic calderas as seen from space were breathtaking. Of all the visual wonders of the universe, the Earth stole the show. ■

# *Sky and Tel*'s Naeye on the Big Gains in Amateur Astronomy

*Earlier this year, Mike Simonsen of the podcast Slacker Astronomy interviewed* Sky & Telescope *editor in chief Robert Naeye about gains in amateur astronomy. An edited version of Naeye's comments follows.*

**This last decade has been** a golden age for amateur astronomy. First of all, the amount of different types of equipment, the quality and affordability has just shot through the roof. For example, the "Go To" telescopes made by companies like Celestron, Meade and others have made it a lot easier for people to take their scopes out in the field, hit a keypad and bingo, they're looking right at the target they want to look at. I think that's helped spread amateur astronomy to a lot of people.

For example, wide-field and ultra wide-field eyepieces make it almost feel like you're looking through the portal of a spaceship into space. It started off with Televue, with its Ethos series. We now have other companies like Explorer Scientific jumping in. I think in terms of plain observing there's been a great profusion of really good equipment, innovation and stuff that's quite affordable.

**When I talk to people** it doesn't seem like Go-To is that big a deal anymore. There are so many of them out there that it has just become accepted. A lot of friends of mine, amateurs in different states, know their way around the sky but still use Go To scopes. They're on stable mounts. They just like the convenience. It makes it more likely that they'll see more maybe obscure objects on a given night. I personally don't yet use Go To scopes. I just use Telrad or Red Dot finders. I guess in that sense I'm a bit of an old-timer. I don't begrudge anyone who uses Go To scopes. I think they've been very good for amateur astronomy.

In the solar field, we've had an explosion of H-alpha and calcium scopes. That was led by Coronado and other companies have jumped in. It's made solar observing much more affordable and more people can do it. It's great because it makes amateur astronomy like a 24-hour around the clock kind of activity. It's kind of too bad that we have these great solar scopes which are more affordable, yet there's not as much to see as there would have been 5 or 10 years ago when the Sun was much more active. We can just hope the Sun starts doing its thing in the new solar cycle. It has sort of gotten underway but it's just very weak.

Another significant change in the last decade has been the CCD and digital revolution in astrophotography. It's exploded, making it much easier for many more people to do outstanding astrophotography. Years ago you had big names kind of dominating the field. Now new people constantly send us their work. It's really good work.

**CCDs are much more sensitive** than film and you can do the processing, stuff you could never do in the past because you didn't want to do the darkroom or pay for it. You can now use a variety of different software programs to get really tremendous results. I'm amazed that there are people who live in fairly light-polluted areas and are still able to get remarkable astrophotos. With digital, you get instant gratification.

For a lot of reasons, I think this has been a great boon for astrophotography and amateur astronomy. One thing our imaging editor Sean Walker has been doing a great job with is that especially when Mars is close to opposition, you can take pictures of Mars at different times, different nights and you can put it together in a movie. You get a time-lapse movie and see Mars rotate. A lot of these movies are really cool. That's been as big a deal as the explosion of astrophotography.

**In the last 10 years,** all this stuff has become available on the Internet and wireless devices like iPods. A lot of the stuff we see today wouldn't have been predicted by anyone 10 years ago. It happened so fast and it's great how amateurs jumped on the bandwagon. Amateurs are now taking better pictures of a whole variety of objects than the best professional observatories.

Amateurs are going down well into the 20s magnitude -wise and catching Kuiper Belt objects and things like that. Two-to-four decades ago, the biggest professional scopes in the world with their older photographic plates couldn't detect these objects. Now an amateur in a light-polluted environment with a relatively small scope can see amazing things and go really deep. ■

# Review: Girdling the Globe to Probe the Edge of Physics

## By Lynn Darsh

**Physicists may be astronomers** and neutrino detectors telescopes. Anil Ananthaswamy's "The Edge of Physics: A Journey to Earth's Extremes To Unlock the Secrets of the Universe" (Houghton Mifflin Harcourt:, $25) explores the frontiers of cosmology. It's a great trip, narrated by a superb storyteller who's a fine science writer. Ananthaswamy tells fascinating stories of visiting the remote outposts of Earth, where cosmologists are searching for dark matter, dark energy and antimatter.

He begins at Mount Wilson "where Hubble discovered that our universe is expanding, thus laying the observational foundation for the Big Bang theory and modern cosmology...Every evening, they open their giant domes to peer more than halfway across the universe, gathering light, sometimes one photon at a time. The instruments that analyze this light are equally powerful, such as the 8.6-ton spectrograph that's helping astronomers study the universe slice by slice with incredible accuracy."

**To learn about the search** for a dark-matter candidate called a WIMP, a weakly interacting massive particle, Ananthaswamy travels 2,341 feet underground into the Soudan Mine in the Mesabi Iron Range in Minnesota. There, Cyrogenic Dark Matter Search experiments have been trying to find WIMPs using direct dark-matter detectors. Along the way, he interviews Vera Rubin at the Carnegie Institution on her pioneering work discovering dark matter, the missing mass in Andromeda and other galaxies. He muses on the Standard Model of Particle Physics and the challenge its silence on dark matter poses to its completeness.

"Nothing in the so-called standard model of particle physics...can explain dark matter. One way to solve the mystery would be to witness a dark-matter particle smashing into a nucleus of normal matter. The knowledge gleaned from even a single such unlikely event would reverberate through all of physics. But on Earth's surface any interaction with a dark-matter particle would easily be swamped by collisions with other kinds of particles, due to everything from radioactivity to cosmic rays. So scientists have been driven underground in search of an unnatural silence that will let them 'hear' the *ping* of a dark-matter particle…"

Ananthaswamy continues to Siberia's Lake Baikal, where he stands on thick ice covering Russia's neutrino telescope. Scientists there are searching for evidence of dark matter indirectly, by finding neutrinos created in the center of our galaxy, where "The mutual annihilation of densely packed dark-matter particles should be spewing out neutrinos." He travels to Antarctica to watch the construction and use of a newer, much larger neutrino telescope, IceCube, 2.5 km under the South Polar ice.

**At CERN near Geneva,** he examines the ATLAS particle detector while it's being built for the Large Hadron Collider. Scientists there seek clues about dark matter in the debris of proton collisions. "Will they find the neutralino?" to "open up our world to supersymmetry."

In the search for dark energy as well as dark matter, he travels to Chile's Atacama Desert and the dry air atop Cerro Paranal, where the Very Large Telescope looks back 8 billion years to capture an Einstein Cross, "the bending of light from a distant object by the gravitational field of a massive galaxy in the foreground."

He attends the ESA's unveiling of the Planck satellite. Instruments aboard Planck and other satellites at L2 will be key to untangling competing mysteries of string theory, inflation and the multiverse. He travels to Mauna Kea, South Africa and the remote Indian Himalayas.

**Ananthaswamy, a consulting editor** on *New Scientist* magazine, writes, "These magnificent telescopes and detectors can work only in the most extreme settings…. The cold, dry air above the Atacama Desert high in the Chilean Andes...allows starlight that has traveled for billions of years to enter a telescope without being smudged...by something as mundane as water vapor."

"The Edge of Physics" is a class by itself, fascinating as well as educational. If I can't get to remote locations, at least I've read about them described by an acute observer with a novelist's eye for telling detail and a reporter's instinct for eliciting compelling commentary by experts. Ananthaswamy took vivid photographs and has arranged them by chapter on www.edgeofphysics.com. I highly recommend the book and his excellent website. ■

# Briefs: Experiment Suggests Matter Prevails over Antimatter

**New results from a Fermilab particle-accelerator** experiment suggest matter seems to win over antimatter. The experiment showed a 1% difference between the amount of matter and antimatter produced, which could hint at how our matter-dominated existence came about.

**A large number of star-forming areas** in the Milky Way have been discovered, concentrated at the end of the galaxy's central bar and in its spiral arms. A separate study located many enormous hydrogen gas clouds in portions of the galaxy above the central bar's junction with a spiral arm. Researchers used infrared and radio telescopes to find these regions. The extremely distant regions are in an area where only two were previously known. Abundance of heavy elements seems to change with distance from the galactic center. Study of 650 clouds in widely-separated areas showed they're well above or below the galaxy plane. They're believed generated as a byproduct of enormous energy emitted into the galaxy from supernova explosions.

**The ESA's Planck satellite** beamed its first map of the entire sky as seen in microwave light, providing a glimpse of the earliest days of the universe. The map also reveals the cosmic microwave background radiation (CMB), which can be seen in the mottled backdrop at the top and bottom of the image. To get a full picture of the CMB, researchers must digitally remove the Milky Way's light from the foreground to reveal dimmer background radiation. Planck's observations are the most precise view ever of the CMB. These data may answer what happened immediately after the universe was formed, and whether we're stuck in a cycle between repeating Big Bangs and Big Crunches. Using Planck, scientists hope to determine whether the Big Bang was followed by incredibly rapid expansion.

**A black hole has been spotted** recoiling from a mysterious slingshot effect, possibly from encounters with several other black holes, a new study found. The cause of the black hole's kickback is still unknown, but scientists have two theories. One suggests the slingshot effect was produced by interactions within a triple-black-hole system. The other attributes the action to gravitational waves produced by two supermassive black holes as they merged together a few million years earlier. The recoiling black hole sits in a galaxy about 3.9 million light-years away. One big clue is a long tail trailing the black hole's host galaxy. The tail suggests a merger between galaxies occurred only a few million years earlier.

**NASA's Kepler spacecraft** hunting for Earth-like planets has found 706 candidates while gazing at more than 156,000 stars packed into a single patch of sky. If the 706 are confirmed as planets, they could nearly triple the number of known exoplanets.

**A new Hubble photo has rev**ealed a space bubble filled with baby stars. The image highlights a complex network of gas clouds and star clusters within the Large Magellanic Cloud. The nebula is a well-studied patch of space spread across more than 1,000 light-years and has produced some of the most massive stars known.

**Scientists are concerned** that the search for signs of life on Mars could be thrown off by microorganisms from Earth. But a new study suggests that fear may be unwarranted. While some bacteria could potentially survive the trip, Mars atmospheric entry and landing, they'd most likely die soon after landing because of the harsh atmosphere, the study found. It's unlikely such microorganisms will be able to replicate on Mars' surface.

**More than 3 billion years ago,** the northern plains of Mars were covered by a vast ocean that blanketed more than a third of the planet's surface, new research suggests. Twenty-nine deltas investigated seem to have sat at roughly the same height some 3.5 billion years ago, apparently ringing a vast ocean shoreline in the northern lowlands. The ocean covered more than 31 million square miles, an area greater than the Atlantic Ocean.

**A peculiar chemical compound** has been found to be ubiquitous in interstellar gas clouds throughout the Milky Way and may provide a better way to track hydrogen across the universe. Hydrogen fluoride molecules can be found in interstellar gas clouds of all sizes. Almost all fluorine in clouds of hydrogen molecules is transformed into hydrogen fluoride.

**The hottest known planet** in our galaxy is being stretched into the shape of a football and rapidly con-

***Continued on page 9***

# Briefs: Matter Seen Falling into Black Hole for First Time

*Continued from page 8*

sumed by its parent star, new Hubble observations show. WASP-12b may only have another 10 million years left. It's superheated to nearly 2,800 degrees and stretched into an elongated shape by huge tidal forces. The planet's atmosphere has thus ballooned to nearly three times Jupiter's radius and is pouring material onto its parent star. WASP-12B is 40% more massive than Jupiter. This effect of matter exchange between two objects is commonly seen in close binary-star systems, but this is the first time it's been seen so clearly for a planet. Planet star WASP-12 is a yellow dwarf in Auriga.

**A halo-like cosmic structure** around M81 has been discovered. Ground-based scopes had only observed stars in halos around the Milky Way and Andromeda. There's now evidence of a faint, halo-like structure extending beyond M81's disk of stars. M81's "halo" could be several times brighter and contain more processed materials than the Milky Way's. Differences between the Milky Way's halo and the structure around M81 bolstert growing evidence that outer structures of apparently similar galaxies are more complex than thought.

**Comets may have formed** around other stars and been snatched into orbit around the Sun when it was packed closely with hundreds of other stars, according to new simulations. Researchers modeled this process as an alternative to the standard picture of formation of the Oort cloud. Until now, the leading model for Oort-cloud formation held that Jupiter's gravity ejected icy balls of planetesimals from inside the solar system.

**Scientists have watched matter** falling into a black hole for the first time. Explosively brilliant light produced from a black hole's gobbling of matter reached telescopes through gravitational microlensing. Scientists studied a quasar in Hydra that dates from 9 billion years ago. They found 99% of its light originates in a region just 1,000 times larger than the black hole. Most ultraviolet light emitted by the quasar comes from a region 12 light-days across, a bit larger than our solar system.

**Enormous black holes** apparently switch on after galaxies collide, researchers have found. The centers of as many as a tenth of all galaxies generate more energy than can be explained by stars, with some of these active galactic nuclei releasing more radiation than the entire Milky Way, but from a space no larger than our solar system. This energy is believed released when matter falls into supermassive black holes at these galaxies' cores. The black holes are up to billions of times the Sun's mass.

**A signal astrophysicists once dismissed** as contamination of X-ray observations could improve forecasts of dangerous space weather. Charged particles within the solar wind give off "soft" X-rays when they collide with Earth's magnetic field. The soft X-rays have longer wavelengths and lower frequencies than their hard X-ray cousins. This signal was once dismissed as local cosmic noise until scientists realized its significance. Measuring soft X-ray emissions could allow scientists to build a real-time picture of what's happening with Earth's magnetic field, which protects us against solar storms.

**Venus may once have had** an ample supply of water, possibly even oceans, and was a potentially habitable place when it was young, a new study suggests. Over time, Venus is thought to have lost a large quantity of water to space. Water could have been mostly locked in the atmosphere and existed only during the very earliest times, when the surface was all molten. Colliding comets may have delivered additional water to the surface that could have created standing bodies of water. If Venus possessed surface water, it may have had an early habitable phase during which life could have formed.

**New photos of the Moon** have revealed the most detailed views yet of a rare hole in the surface, a pit large enough to swallow a football field. The irregularly shaped chasm is in Mare Ingenii in the southern hemisphere. New images show a giant pit 427 feet in diameter. Boulders and debris on the floor of the cavity, partially illuminated, likely originated at the surface, falling through the pit opening during its collapse. The hole is thought to be the result of a partially collapsed lava tube.

**Astronomers have found** what appear to be the coldest failed stars found in the universe. The 14 stars are so cold and faint they'd be impossible to see with visible-

***Continued on page 10***

# Briefs: Mars Water Existed More Recently than Thought

*Continued from page 9*

light telescopes, but Spitzer detected their feeble glow. Their temperatures are 350-620 degrees. Most of the brown dwarfs are believed part of the coolest known class of brown dwarfs, T dwarfs.

**Minerals that can only be formed** in the presence of liquid water have again been detected on Mars, in huge craters in low-lying terrain of the northern hemisphere. A survey found hydrated minerals in nine giant craters. The minerals appear to have been formed by liquid water more than 3 billion years ago, suggesting water altered Mars' surface much more significantly than thought.

**Water flowed on Mars** as recently as several hundred million years ago when sunlight melted a thin layer of glacier ice, researchers say. The evidence lies in dozens of channels on Mars carved by melting glacier water during the cold, dry period that's dominated Mars for 3.5 billion years. Such evidence surprised scientists, because it suggests running water existed much more recently than previously found. Evidence of liquid water since Mars' Noachian era, which ended 3.5 billion years ago, had been scarce.

**A smashup between two galaxies** left one with a wispy tail speckled with stars, according to a new NASA photo. The image reveals the aftermath of a collision between IC 3418 and a member of its neighboring Virgo cluster. The collision occurred 54 million light-years from Earth. Gas in the galaxy is being blown back into a turbulent wake. But stars still manage to form despite rough conditions in the galaxy's tail, which stems from a mix of stellar winds and interstellar gas. Instead of bumping against one galaxy, IC 3418 is mingling with the Virgo cluster. The cluster is pulling IC3418 in, causing it to plunge through the cluster's gas at more than 2 million mph. At this speed, IC 3418's gas is being shoved into the choppy tail that's visible in the image.

**Scientists have discovered evidence** of graphite on the Moon after taking a new look at a lunar rock collected by astronauts nearly 40 years ago. The graphite appears to have originated in a lunar meteorite strike around 3.8 billion years ago. That this form of carbon survived suggests the surface could still possess remnants of carbon-rich organic molecules from ancient impacts. Scientists believe the carbon came from the object that made the impact basin or condensed from carbon-rich gas released during impact.

**A supernova can briefly outshine** a whole galaxy in blowups many astronomers thought exploded with some symmetry. But new observations suggest supernovae explosions can be unbalanced, beginning on one side of the star. Models depicting supernovas as spherical explosions should be replaced with asymmetric depictions.

**The Milky Way snatched up** many of its most ancient stars from smaller galaxies that shredded each other in violent collisions, a new study suggests. Researchers found some ancient Milky Way stars didn't form natively with the rest of the galaxy about 10 billion years ago. Instead, they're leftovers from other galaxies that collided about 5 billion years ago. These stars make up some residents in the Milky Way's stellar halo, which extends above and below the spiral galaxy's main disk. New simulations peered back to about 13 billion years ago, then charted how gravitational attraction of the galaxies' dark-matter halos accumulated stars over time.

**A tiny Saturn moon** has been caught creating ripples in the rings. Daphnis, though just five miles wide, is still large enough that its gravitational pull can disrupt ring material. In Cassini photos, shallow scalloped waves propagate along the edges of the Keeler Gap, a rift in Saturn's outer A ring 26 miles wide that's home to Daphnis. The waves have vertical and horizontal components since the moon moves in an inclined orbit.

**European spacecraft zoomed** past a mysterious asteroid to take the first-ever close look at the space rock while more than 282 million miles from Earth. The Rosetta space probe flew past Lutetia, an object discovered in 1852 that had was only a bright speck to astronomers. New photos revealed it as a rock with a potato-like appearance. Rosetta was some 1,900 miles from the asteroid at closest approach. The rock, some 62 miles wide, is in the main asteroid belt between Mars and Jupiter. ■

# Obama Seeks International Cooperation in Space

**The White House rolled out** a sweeping national space policy for the U. S. June 28, one that aims to boost international cooperation and reiterates plans to send Americans to visit an asteroid by 2025. The policy reaches beyond President Obama's plans for NASA, which would shift the goal of U. S. human spaceflight from the Moon to visiting asteroids and Mars, according to a plan unveiled in February, touching on future needs for Earth observation, space debris and space security.

More robust international cooperation will be vital to develop more comprehensive systems to track global climate change and space weather from orbit, as well as keep taps on the growing risk of space debris collisions with satellites and other vehicles, the White House said. The new policy reiterates Obama's proposed new direction for NASA, which calls on the agency to achieve a goal of sending astronauts to Mars in the mid-2030s. The ISS, which was slated to end its orbital life in 2015, has been extended through 2020 under the new plan.

**Under NASA's new plan,** the agency will retire its space-shuttle fleet by early 2011 and rely on Russian Soyuz spacecraft to ferry astronauts to and from the space station until U.S. commercial spacecraft are available. Supporting that nascent U.S. commercial-spaceflight industry is a vital part of our future in space, Obama said. This would "rapidly increase our capabilities in space while bolstering America's competitive edge in the global economy," he added.

**Despite the new policy's focus** on international cooperation, it's too early to know if countries such as China will be able to participate in current projects involving NASA, such as the ISS, or on future U.S. projects. NASA officials have dismissed recent reports from Russia suggesting its officials invited China to join the ISS project. The $100 billion space station has been under construction by 16 partner countries since 1998 and is nearly complete. ■

## Contacting the AAA

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**Forwarding and Address**
**Correction Requested**

**First Class**

# Events on the Horizon
# August 2010

**M: members; P: open to the public; T: bring your telescopes, binoculars, etc.;**
**C: cancelled if cloudy;**
**HQ: at AAA headquarters, Downtown Community Center, 120 Warren St.**
**AMNH: For ticket information, call (212) 769-5200**

***For directions to AAA observing events, check the club's website, www.aaa.org.***

**Tuesdays August 3, 10, 17, 24, 31**
**Observing at the High Line, Manhattan, P, T, C**
South of 14th Street. Next dates: Tuesdays in September.

**Tuesday, August 3, dusk-10 p. m.**
**Observing at Cadman Plaza, Brooklyn, P, T, C**
Next date: September 14.

**Thursdays August 5, 12, 19, 26**
**Movies with a View, Pier 1, Brooklyn, P**
Learn to operate an 8-inch Dobsonian scope and watch a free movie. Info: www.aaa.org/movieswith a view. Next date: September 2.

**Saturdays August 7, 14, 21, 28**
**Observing at Inwood Hill Park, Manhattan, P, T, C**
Next dates: Saturdays in September.

**Saturday, August 7, dusk-10 p. m.**
**Observing at Fort Greene Park, Brooklyn, P, T, C**
Directions: http://aaa.org/fortgreene.
Next date: September 11.

**Saturday, August 7, dusk-wee hours**
**North-South Lake Observing, Greene County, M,T,C**
For directions: http://aaa.org/northsouthlake or Rich Rosenberg at 718-522-5014. Rain date: August 14.
Next date: September 11.

**Wednesday, August 11, 8-11 p. m.**
**Observing at Prospect Park, Brooklyn, P, T, C**
Next date: September 15.

**Wednesday, August 11, 8:30-10 p. m.**
**Observing at Fort Tryon Park near The Cloisters, Manhattan, P, T, C** Next date: September 8.

**Thursday, August 12, 6:30-8:30 p. m.**
**Recent Advances in Astronomy Seminar, M, HQ**
Pre-meeting dinner at Gee Whiz Diner, Warren and Greenwich streets. Next date: September 16.

**Saturday, August 14, dusk**
**Observing at Great Kills Gateway National Park, Staten Island, P, T, C** Next date: September 11.

**Wednesday, August 18, 6:30 p. m.**
**Quarterly AAA board meeting, M, HQ**
All members are invited to attend.

**Friday, August 20, dusk-11 p. m.**
**Observing at Carl Schurz Park, Manhattan, P, T, C**
Next date: September 24.

**Saturday, August 28, 10-noon**
**Solar Observing at Central Park, P, T, C**
At the Conservatory Waters. Next date: September 25.

**Tuesday, August 31, 6:30-8:30 p. m.**
**Observers' Group, M, HQ**
Pre-meeting dinner at Gee Whiz Diner, Greenwich and Warren streets. Next date: September 28.

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***Seminar continued from page 3***

described the guarded appraisal of the situation.

**Bernie Kleinman discussed** dark matter. He outlined its discovery through galactic rotation curves and galaxy-cluster binding energies. He then gave a brief overview of the standard model of particle physics, highlighting possible candidates for dark matter. Bernie described lab experiments that seek to detect dark matter, which constitutes six times more material than the familiar protons, neutrons and electrons in our everyday life and that's the source of all luminous matter in the universe. ■