EYEPIECE

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'100 Hours of Astronomy' Effort Is Ready to Roll

By Jason Kendall

On January 6 in Long Beach, Calif., the American Astronomical Society kicked off the beginning of the International Year of Astronomy 2009 with a big celebration attended by hundreds of professional and amateur astronomers. I was there, presenting a paper on my efforts at public outreach during this important year for astronomy worldwide.

This year is the 400th anniversary of Galileo publishing the results of his telescopic observations. What he saw shook the world. The heavens above were no longer immutable and perfect, but had lumps and oddities all their own. In his groundbreaking scientific text, "Siderius Nuncius," he described the three key observations that finally overthrew the medieval thinking of his time: the mountains and valleys of the Moon, the "Medician" stars surrounding Jupiter and the phases of Venus. All three amazing discoveries served to help humanity understand a new and bigger universe than had been previously imagined. And this year we celebrate it.

The IYA2009 was established by the International Astronomical Union and UNESCO to "help the citizens of the world rediscover their place in the universe through the day- and night-time sky, and thereby engage a personal sense of wonder and discovery." To this end, the IYA has established a series of cornerstone projects which astronomy professionals and amateurs can use to promote the wonders of the night sky. Of these 10 global initiatives, a few are truly appropriate for our club.

The core effort is simply to have people look at the sky, possibly through a telescope. Every AAA member who has a telescope can do this by simply going to a street corner on a clear night and persuading passersby to take a look. You'll be surprised at the positive response. My paper at the AAS conference outlined my 100 Nights of Astronomy. Every Wednesday and Saturday night this year, I hope to get New Yorkers to look through my telescopes. I've already started in Inwood Hill Park. On January 21, I kicked off the effort in 20-degree weather. A small group stuck with me, and we were occasionally rewarded with breaking clouds. I got to talk with a good bunch and Howard Fink showed up with a scope and two pairs of binoculars to help out.

As we now, our skies are getting brighter. The generation that just got its first vote last year is the first to never have seen the Milky Way. It's our job to help show people that light pollution not only takes away celestial wonders but also costs New York City millions of dollars in wasted electricity. In addition, lack of darkness has adverse health effects on nocturnal wildlife. Did you know that the vertical column of light above the Luxor Hotel in Las Vegas is so bright that birds fly into it, are frightened to leave the light so fly until they die from exhaustion? There are also preliminary indications that there are links between lack of melatonin in humanas and cancer. And glare bombs we all hate so much can be shown to make parks less safe from criminals. I attended a dark-skies workshop at the AAS meeting, and brought back resources for our organization.

The 100 Hours of Astronomy effort is the largest and most important effort in which we as amateur astronomers can engage. On April 2-5 there is a global star party. I'm working to have at least one of those nights as a major public event in Inwood Hill Park. During these 100 hours, amateur and professional astronomers are urged to hold star parties, take a telescope to a mall, anything.

The amazing eclipsing binary system Epsilon Aurigae has a 27-year cycle, and is poorly understood. The IYA hopes to enlist amateurs and professionals globally to watch the eclipse occur. The main star has a companion with a circumstellar disk that appears to be as large as Jupiter's orbit. I plan to be on the top of Inwood Hill with a large scope and

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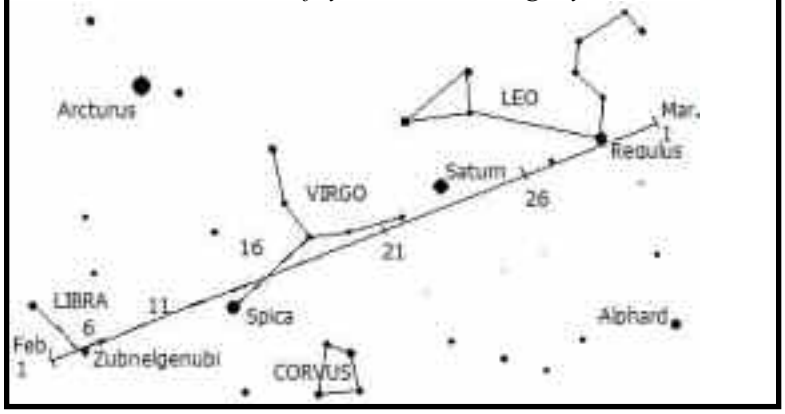
Have You Renewed Your Membership?

What's Up

By Tony Hoffman

The Sky for February 2009

Comet Lulin moves swiftly into the evening sky this month.



A Lulu of a Comet. After 2007, a banner year for comets with the exceptional performances of comets McNaught and Holmes, 2008 was a letdown for comet observers. This year is getting off to a decent start with the arrival of Comet Lulin, which is expected to reach naked-eye visibility (at least from dark-sky sites) as it traverses the midnight sky in late February. Comet Lulin was discovered last July by Quanzhi Ye, a 19-year-old student at Sun Yat-Sen University in Guangzhou, China, on images taken by Chi-Sheng Lin of the Lulin Observatory Sky Survey. Although not officially an amateur discovery, it's another triumph for a cadre of (mostly young) Chinese amateurs who avail themselves of a range of imaging techniques in astronomical research and discovery. Ye has also discovered comets in SOHO images and asteroids in Spacewatch images, as well as in photos from the Lulin survey, for which he is chief investigator. The survey uses a 16-inch telescope in Taiwan. Comet Lulin has been dubbed the "Comet of Cooperation" by the Chinese press due to its discovery through collaborative efforts of both Taiwanese and mainland astronomers.

Comet Lulin lies outside of Earth's orbit, which will make it visible in a dark sky well away from the Sun. It passed perihelion on January 15, and will make its closest approach to Earth on February 24, when it will be 0.41 AU away. Lulin has an unusual orbit, nearly in the plane of the ecliptic but retrograde, moving around the Sun in the direction opposite that of the planets. This will seem to make it move very quickly. It starts the month in Libra in the morning sky, moves through Virgo, passing near Spica at midmonth (when it will rise before midnight), passing Saturn on February 23 and Regulus in Leo on the 27th. It will be opposite the Sun on the 26th, and visible most of the night.

Saturn Unringed. Venus will continue to dazzle observers in the early evening sky, blazing at magnitude -4.8 at midmonth, when it will show a fat crescent 36 arc-seconds across to observers. (I've had several non-astronomer friends ask me recently what that ultra-bright orb they've been seeing is.) Saturn rises as Venus is setting, and a telescope reveals an unusual sight: the rings are gone. They're invisible because they're nearly edge-on to us, though you may be able to see the shadow of the rings as a thin black line on the planet's disk.

February 2 First-quarter Moon at 6:13 p.m.
February 7 Moon at perigee.
February 9 Full Moon at 9:49 a.m.
February 11 Moon lies near Saturn.
February 13 Mercury at greatest elongation in morning sky.
February 15 Comet Lulin lies near Spica.
February 16 Last-quarter Moon at 4:37 p.m.
February 17 Mars lies 0.6 degrees from Jupiter in morning twilight; Moon lies near Antares.
February 19 Venus at greatest brilliancy (magnitude -4.8).
February 22 Moon lies near Mercury and Jupiter.
February 23 Moon lies near Mars; Mercury passes 0.6 degrees from Jupiter; Comet Lulin lies near Saturn.
February 24 New Moon at 8:35 p.m.
February 25 Asteroid 1 Ceres at opposition.February 26 Comet Lulin at opposition.
February 27 Moon lies near Venus; Comet Lulin lies near Regulus. ■

Mercury Overtakes Jupiter in the Evening Sky

By Joseph A. Fedrick

Mercury emerged from the solar glare in the southwest to appear approximately 3 degrees below Jupiter on December 29. A thin crescent Moon with bright earthshine (old Moon in new Moon's arms) appeared within 5 degrees to the upper left (southeast) of Jupiter. Jupiter and Mercury easily fit into the same field of view in my 10x50 binoculars. The Moon and Jupiter also fit to the same field of view but all three objects did not quite fit in to the same field of view. Rather, they fit into overlapping fields of view.

By December 30, Mercury had closed to within 2 degrees to the lower right of Jupiter and then to within approximately 1 1/2 degrees of Jupiter by December 31. The crescent Moon and Venus then fit into the same field of view in the binoculars but were 30 degrees to the Southeast (upper left) of the Jupiter-Mercury pair. By January 1, Mercury was already pulling away at approximately 2 degrees for Jupiter and higher up in the sky. By January 3, Mercury was approximately 5 degrees to the

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A Message from AAA President Richard Rosenberg

Hello members:

The new year got off with a bang on January 2 with a standing-room-only audience at our lecture. One of our most popular speakers, Robert Nemiroff of Michigan Technological University and Astronomy Picture of the Day showed off the best images of 2008 (see page 4). We saw pictures that solved problems, unearthed new questions or were simply beautiful. If you missed the talk, Dr. Nemiroff has allowed us to put his PowerPoint presentation on our website (www.aaa.org), which we shall do shortly.

Our next lecture will take place February 20 (note the date) when Joseph Patterson of Columbia University will speak on "The Center for Backyard Astrophysics."

On January 13, I spoke to another standing-room only audience (well, there were only about 30 seats) at the beautiful Charles A. Dana Center at the northern end of Central Park. Although clouds prevented the scheduled observing session from taking place, we showed off the winter sky using a planetarium program and had a far-ranging discussion on many areas of astronomy.

These meetings illustrated an important point. There are a lot of people out there who really like astronomy but have little or no knowledge of the AAA or other organizations that can satisfy their interest. Let's be missionaries for astronomy.

The comet is coming! In February, Comet Lulin should be visible with binoculars or telescope from the city (see page 2). It's predicted to peak at about magnitude 6 late in the month, when it will be visible at a reasonable hour. Look February 23 when Lulin will be near Saturn. Unless the comet goes the way of Kohoutek we'll have special observing sessions to view it. Check our website or give me a call.

With help from John Swierzbin and Ken Levy, the telescope on the roof of the Solaria condominium in Riverdale is getting close to operational. We hope to have a public observing session there in March. I'll have more info next month.

As you read this, we've just held our first event at our new headquarters. I hope you were there. The next meeting there, of our Observers' Group, will be from 7 to 9 p. m. February 24. If the sky is clear, we'll follow the meeting with observing, and we just might spot a comet.

Thank you for your terrific response to our renewal request. Already more than two-thirds of our membership have renewed and we have a significant number of new members.

If you haven't got around to it, dues are only $25. As a member you can receive a year's subscription to *Sky & Telescope f*or only $32.95, or one- or two-year subscriptions to *Astronomy* magazine for $34 and $60, respectively. Send your check to the Amateur Astronomers Association, Box 383, Gracie Station, New York, NY 10028.

AAA Talk Feb. 20: Backyard Astrophysics Group

Joseph Patterson, professor of astronomy at Columbia University, will address the AAA on Friday, February 20 on "The Center for Backyard Astrophysics." The free public lecture is at 6:15 p. m. in the Kaufmann Theater of the American Museum of Natural History.

"Astronomy, like the building of pyramids, has always relied on organizing the work of many people," Patterson notes. "In time and frequency, small telescopes scattered around the Earth can greatly outperform a single behemoth. In this age of computers and electronic mail, it's likely that these advantages will now cede leadership in the study of variable stars back to amateur astronomers.

"The Center for Backyard Astrophysics is one such organization. It's a collaboration of amateur and professional astronomers to study light curves of cataclysmic variables. We now routinely obtain the best data in the world on this subject, and accidentally stumble on other gems as well, including the first-ever gravitational lens found in the Sun's vicinity."

The website for the center, whuich was established in 1995, is http://cbastro.org.

Discussing his career, Patterson says whimsically: "I

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Top Astronomy Pictures of 2008 Dazzle the AAA

By Terrell Kent Holmes

Speaking with enthusiasm and a wry, self-effacing sense of humor, Dr. Robert J. Nemiroff, professor of physics at Michigan Technological University, delivered the January 2 AAA lecture on "The Best Astronomy Pictures of the Day, 2008". In 1995 Nemiroff co-founded the website Astronomy Picture of the Day (APOD), whose archive contains the largest collection of annotated astronomical images on the Internet. Nemiroff used a diverse selection of pictures as points of departure to discuss other pertinent issues in astronomy.

Describing the process as "chaotic," Nemiroff explained how APOD chooses its photos. "We get sent lots of images, and unfortunately we reject [at a ratio] of about 10 to 1. My in box is usually filled every day with really good images, and some not so good images. Also, we're on the press-release e-mail lists of the American Astronomical Society and many major observatories, so whenever they have something we get an e-mail. I also read some astronomy blogs to see if I missed something."

The selection of photos from the past year covered an impressive range of issues and phenomena. The heavily pixeled photograph of Asteroid TU24, a near-Earth object, brought to mind Salvador Dalì's similarly distorted painting of Abraham Lincoln.

After showing photos taken in 2007 and 2008 to show the changes in Mars' angular diameter, Nemiroff explained that "Every year or so e-mails circulate [stating] that Mars is going to be as large as the Moon. And it never is and it never will be. We don't have the budget for it." He used a photograph of Makemake, a Kuiper Belt object designated as a dwarf planet, to discuss how the solar system has been expanded to include objects that were known about but unclassified, and to make a case for not only restoring Pluto's planetary status but actually making it a fully-grown planet.

Nemiroff described the Sun as acting "a little bit strange" in that it had very few sunspots last year. "Even the biggest, brightest object in the sky is doing things that are [unpredictable]," Nemiroff said. "The activity of the Sun is actually important because it affects satellites that go around Earth. So if your cell phone is bouncing off a satellite it might be knocked out by a big solar event. And if we can predict when that happens we might be able to minimize the effect on the satellites."

Planetary fly-bys were also touched on. Photos taken by the Mercury exploration probe, MESSENGER, led Nemiroff to describe Mercury's landscape of craters and long rays as looking something like a watermelon. MESSENGER will establish an orbit in 2012 to study the planet in greater detail. Everybody says there can't be anything new to learn about Mercury," Nemiroff said, "but it's not true."

A Cassini fly-by of the Saturnian moon Enceladus also provided some compelling images. Nemiroff described it as "probably the most interesting object in the solar system [observed] in the past decade." Enceladus is a top candidate for harboring life, especially with the possibility of liquid water being concealed. One of NASA's long-term goals is to possibly land a space probe on Enceladus' surface. The problem may not be with funding the project but finding a suitable place to land because the moon's surface may be problematic.

Some of the most exciting photos taken in the past year were of planets circling other stars. One was of a planet larger than Jupiter orbiting Fomalhaut, a star 25 light-years away in Piscis Austrinis (the Southern Fish). Another photo showed three planets, all more massive than Jupiter, orbiting another star 100 light-years away. "It's interesting that we're actually able to see planets around other stars," Nemiroff said. "We always thought there were planetary systems like our solar system out there, but it's great to have actual confirmation."

A refreshing aspect of the lecture was its humanistic thread. For example, Nemiroff used photos of a total solar eclipse over China to illustrate how people have the same reactions to the same events in spite of cultural differences. In photos of the recent conjunction of Venus, Jupiter and the crescent Moon, the three objects formed a smiley face, with the crescent Moon as the mouth and the planets as the eyes. "We actually got a whole bunch of images, lots of smiley faces, [and] tried to exclude the frowns," Nemiroff said.

Perhaps the most lasting image of the presentation, though, was of the International Space Station transiting the Sun, a hopeful speck against the great face of our nearest star. It was a perfect metaphor for our true place in the universe, and our timeless, unending quest to solve its mysteries.

To view the Astronomy Photo of the Day and visit the archives, log on to apod.nasa.gov. ■

Palomar: The 60-Year-Old Gift that Keeps On Giving

By Edward J. Fox

"The Palomar Telescope is very dear to my heart." So stated Dr. Ben R. Oppenheimer, assistant curator of the Division of Physical Sciences of the American Museum of Natural History, introductory to a special program January 15 at the Hayden Planetarium in celebration of the United Nations' International Year of Astronomy. He continued, "I spent more than 150 nights working there as a student and I continue to work there on a new instrument we have installed to study exoplanets."

He added, "The real star of the evening is the 1-million pound-Palomar 200-inch Hale Telescope."

Oppenheimer introduced documentary filmmakers Robin and Todd Mason, to present their recently broadcast Public Broadcasting System program "The Journey to Palomar." The Masons spent years researching and producing their film, which documents the efforts of George Ellery Hale to develop a progression of ever-more-powerful telescopes, which led to the Palomar Hale Telescope opening in 1948.

According to Todd Mason, "Hale was a hugely important person in science and astronomy. He wanted science in America to be the best in the world."

The film begins with the description of a young Hale in the milieu of the turn-of-the-last-century, fast-paced world of a rapidly growing Chicago. It was in this "anything-is-possible" atmosphere that Hale's father became wealthy in the elevator business. That wealth provided Hale with a private observatory and allowed him to start pursuing his avid interest in astronomy.

He became aware over time that he could only further his interest in learning about the universe with ever-more-powerful telescopes. They had to be able to gather more light to explore the vastness of space. When they reached the limit in size for a refractive lens, they had to be larger reflecting scopes. When they reached the limits of the tried and true glass technologies of the day, new directions had to be explored.

Lacking governmental support, Hale had to convince very wealthy men to finance his "eye in the sky" interests. This was a time when his efforts were frowned on by other astronomers. Simon Newcomb, a renowned astronomer, said, "We are probably nearing the limit of all we can know about astronomy." After initial funding by a couple of Chicago-area millionaires, the progression of size and higher costs led Hale first to Andrew Carnegie and ultimately to John D. Rockefeller Jr.

The movie describes the tribulations of every progressive project, such as the difficulties of dealing with larger glass lenses and reflective mirrors. Testing the evolving limits of the glass industry are detailed. On the first large reflector telescope, an observation platform collapsed under its own weight, fortunately before the telescope was in operation. There were the excruciating waits of about a year at a time to slowly cool the glass in the annealing processes. There were years of polishing the lenses and mirrors.

Hale died in 1938, 10 years before the Palomar scope saw first light in 1948, having been delayed by World War II. The instrument was named in his honor.

A major benefit of Hale's 100-inch telescope at Mount Wilson is that it provided Edwin Hubble with the platform to realize that there are galaxies outside of the Milky Way. It opened the universe!

Oppenheimer was extravagant in praising the design of the Palomar facility. He believes the design is so good it's conducive to good science, since problems due design flaws don't manifest themselves and therefore don't hinder the scientists.

The facility has been fully booked for the past 60 years. Due to improvements in the technologies, he estimates the facility is 100 times as powerful as it was when into service in 1948. The advent of digital-photography technologies and adaptive optics--including laser-generated guidance—have contributed to the improvements.

In response to a question about just looking through an eyepiece of the telescope to view the heavens, Oppenheimer said that for years this was possible only on Christmas, when the telescope wasn't booked. The workers could look through an eyepiece inserted into a certain place. Now, not even that is possible since that's now the pathway for laser technologies.

Oppenheimer believes the Hale Telescope has a productive life of about 10 more years. Even then, he envisions it will be useful in the production of repetitive images, where the science is to be found in identifying differences in the images.

For further information: www.astro.caltech.edu/palomar/ or www.pbs.org/thejourneytopalomar/. ■

How to Contact the AAA

If you want to join, volunteer your time, participate in events, have a question or need to change your address, e-mail secretary@aaa.org, or leave a message at AAA hq: (212) 535-2922. Also, visit us on the web at www.aaa.org. If you're interested in writing an article for *Eyepiece*, contact editor Dan Harrison at editor@aaa.org.

Review: Spectacular Book on the Hubble

By Dan Harrison

If you like looking at spectacular pictures taken by the Hubble Space Telescope--and who doesn't?--"Hubble: Imaging Space and Time" is a book you'll enjoy over and over again.

But the book (National Geographic, $50), by David Devorkin and Robert W. Smith, is far more than a cornucopia of some 150 pages of one great picture after another. Interleaved among the images is a well-written history of the instrument that has revolutionized modern astronomy.

The book begins with two forewords, one by Hayden Planetarium director Neil deGrasse Tyson. He notes that "Hubble is the first and only space telescope to image the universe in visible light, becoming for us a supreme version of our eyes in space."

Hubble's appeal, Tyson observes, came during "an exponential growth of the public's access to the Internet." And most space telescopes have limited life expectancy, whereas Hubble was "designed, built and launched to be serviced…And Hubble's talents were not simply sustained…mission by mission, they were vastly improved."

Both Tyson and the excellent history of the Hubble that weaves its way through the pictures note that when NASA announced in 2004 that Hubble wouldn't receive its fifth servicing mission, there was an outcry—with the loudest voices not scientists, but the general public. "The public took ownership of the Hubble," Tyson notes. "I know of no time in…history…when the masses banded together to save a scientific instrument."

Or as the book puts it, "In the opinion of many, the Hubble was the most productive scientific instrument ever, one with which they felt a very personal involvement. Furthermore, an upgraded Hubble would produce still more exciting science…."

While the book is a paean to the Hubble, it hardly pulls its punches on negative events in the telescope's history. One of these was the infamous spherical aberration which was detected less than a month after the April 1990 launch. "…if there had been cross-checks in the program to catch such a mistake, it might have been corrected. There were not. With a strained budget and no additional money for extra tests, the small number of people who knew that there might be a problem had rung no alarm bells. The result was a misshapen primary mirror."

Later on, the authors note that after this and other fixes, "No longer was the Hubble synonymous with trouble. Another key stem in [its] public rehabilitation…came in 1994" when it was used to observe the Shoemaker-Levy comet's smashing into Jupiter. "…the HST's extremely public role in observing [the collisions] underlined its capabilities."

By March 2002, the authors state, the HST "was in many ways a very different observatory from the one first launched in 1990. All of the original scientific instruments had been replaced by more powerful ones…In the end, the Hubble's scientific performance had even exceeded the hopes that had sustained its advocates over so many years. By early in the 21st century…it had come to be widely regarded as the most productive observatory ever built."

The book is also interesting when it discusses the nethodology of the Hubble, as illustrated by the following excerpts:

"The key in getting Hubble observing time is persuading the granters that the goals of the proposal are worth the sacrifice of other potential goals. For every individual or team that succeeds in getting a run, many others are left without the use of Hubble's eyes."

"One factor aiding the decision over who gets an observing run is the general value of the data, beyond the specific uses the proposers may have. Ultimately, from this observing run, a contribution will be made to the Hubble Data Archive, which serves as the repository for collected data. In this manner, the data gathered will be of use to astronomy long after [analysis]."

"An observing run on the HST is usually a fully automatic programmed process. For this reason, once the observing schedule is established, almost endless little details have to be thrashed out ahead of embarking on the actual observations."

"There are two major steps in bringing the data to the end user: downloading it...and calibrating and correcting it for both systematic errors due to the instrument and random errors due to momentary peculiarities of the space environment."

You may not have known--I didn't--that full-color images associated with the Hubble are actually composites of three different images of the same object taken through

Review continued on back page

Highlights of January AAS Meeting in California

Scientists have revised the mass of the Milky Way, saying it's half again as heavy as thought, on par with the Andromeda Galaxy. The Milky Way also spins much faster than thought. Astronomers measured distances and motions of different areas of the Milky Way. The galaxy's speed at the position of our solar system, 28,000 light-years from the galactic center, is up to 600,000 mph faster than thought. The new mass is 3 trillion solar masses, so the Milky Way exerts a greater gravitational pull that increases the likelihood of collisions with Andromeda or smaller nearby galaxies. Regions of prolific star formation were observed across the Milky Way. Observations also shed light on the galaxy's spiral structure. Most star-forming regions don't follow a circular path as they orbit the galaxy. Instead, they move slower than other regions on elliptical orbits. These are the result of spiral density wave shocks, which can take gas in a circular orbit, compress it to form stars and cause it to go into a new, elliptical orbit. Measurements indicate our galaxy probably has four, not two, spiral arms of gas and dust that form stars. Recent Spitzer surveys suggest older stars are found mostly in two spiral arms.

Two embryonic stars discovered a few light-years from the Milky Way's center show stars can form in the potentially destructive reach of the black hole at our galaxy's center. The stars were caught in the act of forming. Because gas and dust between Earth and the galactic center blocks visible light from getting out, astronomers used infrared and radio wavelengths to see the region. They found the protostars at 7 and 10 light-years from the galactic center. The finding suggests molecular gas at the Milky Way's center from which stars form is denser than thought. The gas makes it easier for the self-gravity of the condensing cloud to overcome the strong pull of the black hole and collapse to form new stars.

Fourteen young stars racing through clouds of gas, creating brilliant arrowhead structures and tails of glowing gas, have been revealed by Hubble. They represent a new type of runaway bright, high-velocity stellar interloper. Strong stellar winds suggest they're just a few million years old. They appear to be medium-sized, up to eight times more massive than the Sun. The stars' youth is also shown because shapes of nebulas around dying stars are very different from what's seen around these stars, and old stars are almost never found near dense interstellar clouds, as these are. Bow shocks the stars created could be 100 billion-1 trillion miles wide. These bow shocks indicate the stars are traveling more than 112,000 mph, five times faster than typical young stars. Astronomers think the young stars are runaways that were jettisoned from clusters they were born in.

New observations of chewed-up asteroids around white dwarfs bolster the idea that the Earth and other rocky planets in our solar system are far from alone in the universe. Astronomers used Spitzer to see six white dwarfs and found the signature of asteroid debris circling them. Analysis of light from the systems shows the rings are made of some of the same materials as rocky bodies in our solar system. Spitzer had previously observed shredded asteroid pieces around two white dwarfs. New observations bring the count of white dwarfs with asteroid debris to eight. About 1% of white dwarfs are estimated to have these signatures. All eight white-dwarf systems show signatures of a glassy silicate mineral similar to olivine, which is common on Earth. Spectra of asteroid debris also showed no carbon signature, another similarity to asteroids and rocky planets in our solar system. One asteroid is thought to have broken apart within the last million years or so in each white-dwarf system.

A team of astronomers has found a strange noise from the distant cosmos that booms six times louder than expected. Analysis ruled out primordial stars or known radio sources, including gas in the outermost halo of our galaxy. The signal is much brighter than the combined emission of known radio sources in the universe. The signal is obscuring the sought-for signal from the earliest stars. But the static may yield clues to development of galaxies when the universe was less than half its present age.

Supermassive black holes' powerful gravity should lure in galactic matter. However, while plenty of gas is available for these black holes to feast on, few have been observed to accrete gas from their home galaxy. Supernovas may the culprit. A team investigated starvation of supermassive black holes at the center of the Andromeda Galaxy and NGC 5866. The clue the galaxies aren't feeding is lack of large amounts of radiation from the nucleus of the galaxy, which astronomers would expect to detect from an actively eating black hole. What makes the lack of radiation most perplexing is that plenty of gas should be expelled by older stars and their remnants, such as planetary nebulas, and accumulating in the galactic bulges. A study suggests it's a problem generated by supernova explosions. These exploding stars send out a shockwave that propagates throughout the gas in the galaxy. A team simulated the effect of these shockwaves on gas accumulation around the galaxy's center. Hot gas in a galaxy can absorb the supernova's shock, but when the wave reaches the cool gas expelled by dying stars, it steepens and pounds the central disk of the galaxy, evaporating the gas. The gravity of a less massive galaxy can't counteract the evaporating energy of the supernovae, so the gas can't accumulate, and the black hole starves. ■

Briefs: Galaxy Clusters' Mass Has Decreased

New measurements of the accelerating expansion of the universe, caused by dark energy, reveal a decrease in the mass of galaxy clusters in more recent times, which would be a consequence of this hastening and ripping force that some think could eventually tear apart star systems, planets and eventually the very molecules we're made of. The results, from Chandra X-ray observations, suggest dark energy takes the form of what Einstein called the cosmological constant, a term in general relativity that represents the possibility of empty space having density and pressure associated with it. If dark energy is a repulsive force linked with "nothing," and the density of dark energy stays the same over time, astrophysicists say expansion of the universe will continue to speed up. Rather than using Type 1A supernovae, the new study was based on observations of clusters of galaxies at different time points. With dark energy taking over, it would be more difficult for objects such as galaxies to get together and form clusters as space is being stretched. So astronomers would expect to see a slowdown of the growth of galaxy clusters in a dark-energy-dominated universe

Scientists have found two large leaks in Earth's magnetosphere, the region that shields us from severe solar storms. The leaks, in an unexpected location, let solar particles in faster than expected. Scientists thought more solar particles entered Earth's magnetosphere when the Sun's field was oriented southward, anti-aligned to the Earth's, but the opposite turned out to be the case. So Earth's magnetic shield is strongest when scientists had thought it would be at its weakest. While interaction of anti-aligned particles occurs at Earth's equator, those of aligned particles occur at higher latitudes both north and south of the equator. During the last solar peak, fields hitting the Earth were first anti-aligned, then aligned. Anti-aligned fields can energize particles, but in this case, the energy came before the particles themselves, which doesn't create much of a fuss in terms of geomagnetic storms and disruptions. But the next cycle will see aligned, then anti-aligned fields, which in theory should amplify the effects of the storms as they hit.

Data from the now-defunct NASA Phoenix Mars Lander are shedding light on the current water cycle on Mars, particularly how water moves between the surface and the atmosphere in the northern polar region. Data show water in the atmosphere goes away every night, and the amount of water stuck in soil would go up at night and come back down during the day, Changes in humidity and temperature alter how much water is stored in the dirt. The films of water stuck between the surface and the atmosphere could be an ideal habitat for potential Martian microbes. Phoenix's observations also show that the region it landed in is a comparatively young environment Phoenix showed there "are tiny amounts of salts and larger amounts of perchlorate" in the surface layer around Phoenix, which will further build the case for the region's past potential habitability.

Evidence of a key mineral on Mars has been found at several surface locations, suggesting microbial life that might have been there when the planet was wetter could have lived comfortably. Observations by NASA's Mars Reconnaissance Orbiter found evidence of carbonates, which don't survive in conditions hostile to life, indicating not all of Mars' ancient watery environments were as harsh as thought. Because carbonates dissolve quickly in acid, finding them shows some areas escaped the acid bath. If primitive life sprang up in these pockets, it could have persisted and left clues of its existence. The sites are dry now, however, so researchers aren't expecting to find biology there. Scientists had expected to find extensive layers of carbonate because they would be a natural consequence of the chemistry between Mars' carbon dioxide-rich atmosphere and weathering products formed by water acting on volcanic rocks. But no carbonate deposits could be found. But now, MRO's finer resolution has allowed scientists to locate carbonate. Carbonate exposures are small. This could be a local environment that's somewhat unique, but it's possible that other regions will turn up carbonate signatures, or that carbonate layers could be hidden beneath the surface. Researchers have theories how carbonates might have formed, including slightly heated groundwater percolating through olivine-rich rocks exposed at the surface and altered by running water or precipitation in small, shallow lakes.

The water in Venus' atmosphere is gone with the wind, new detections suggest. This absence is strange, because astronomers think Venus and Earth likely began with similar amounts of water since they are about the same size and formed some 4.5 billion years ago. Yet today, Earth's atmosphere and oceans contain 100,000 times the water on Venus. Due to Venus' greenhouse effect, surface temperatures can soar to 870 degrees, so surface water boils off. But the atmosphere is also relatively dry, so the question: Where did that initial atmospheric water go? Scientists found evidence of hydrogen loss from the atmosphere on Venus' day side. Solar wind could be responsible for stripping away hydrogen atoms. Hydrogen may have been part of water molecules. This day-side process is responsible for 20% of the hydrogen lost from Venus' atmosphere. Data have revealed a loss of hydrogen and oxygen on Venus' night side, with twice as many hydrogen atoms as oxygen

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Briefs: Scientists Figure Out Mars Rock Pattern

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atoms escaping the atmosphere. This suggested water was being broken up in the atmosphere. On the day side, however, scientists have yet to detect any oxygen atoms, which would help seal the deal for a watery source. Compared with the night side, hydrogen atoms stripped from the day side exist much higher in the atmosphere, 6,200-31,000 miles above the surface. Results show there could be at least twice as much upper-atmosphere hydrogen than thought.

Martian rocks are in some areas scattered in a strangely uniform fashion had puzzled scientists. Now they've figured it out. Researchers had thought the rocks were picked up and carried downwind by extreme high-speed winds in the past. Although Mars is windy, its atmosphere is very thin, so it would be difficult for the wind to carry the small rocks. But it's now thought the rocks are constantly on the move, rolling into the wind, not away from it, and creating a natural feedback system that results in their tidy arrangement. Because the middle and outer rocks aren't directly hit by the wind, the wind creates pits to the sides of those rocks. And so, instead of rolling forward, the rocks roll to the side, not directly into the wind, and the cluster begins to spread out.

Strange weather on the dwarf planet Eris could be causing changes at the methane-ice surface. Eris is the largest known solar-system object beyond Neptune's orbit, with a 1,490-1,860-mile diameter. Researchers looked at concentrations of methane ice based on light reflection and absorption. Results show possible nitrogen ice mixed with methane ice. The relative amount of nitrogen ice increases with depth into the ice. Due to Eris' tilt, a different hemisphere faces the Sun when at perihelion and aphelion. On the sunlit hemisphere or pole at perihelion, lots of sublimation would have occurred to turn nitrogen into gas. This gas would build up in the atmosphere to increase pressure and drive winds toward the shaded pole. At the shaded pole or winter hemisphere, the gases would condense into snow or dew-like material that would fall on the surface as nitrogen ice. As Eris moved closer to the Sun, this process would occur for methane, with methane sublimating on the sunlit hemisphere and falling as methane ice on the shaded pole.

The National Academies is on the lookout for scientific and technically credible ideas to respond to the threat of near-Earth objects (NEOs). The Space Studies Board, in coordination with the Aeronautics and Space Engineering Board of the National Research Council, has put in gear a two-part study on NEOs. A group of experts has been selected to address issues concerning the detection, tracking, and characterization of NEOs, and approaches to mitigating identified hazards. The committee is soliciting ideas to survey, detect and characterize NEOs, as well as potential mission concepts for deflection/mitigation of them. The deadline for ideas is March 20. Info: dday@nas.edu.

A pair of brown dwarfs are the dimmest ever detected. Each is 1 million times fainter than the Sun in total light on the electromagnetic spectrum, and at least 1 billion times fainter in visible light alone. Until now, astronomers thought this dim duo was a single brown dwarf. Past research has shown the object is the fifth closest known brown dwarf to us, 17 light-years away toward the constellation Antlia. A team found the singlet was actually twins by observing the "object" in infrared light using Spitzer. Data showed what was still thought to be a single object had a warm atmospheric temperature of 560-680 degrees. While this is hundreds of degrees hotter than Jupiter, it's still cold as far as stars go. The brown dwarfs are among the coldest brown dwarfs measured so far. The brightness was found to be twice what would be expected for a brown dwarf with its particular temperature. So the object must have twice the surface area, and each body shines only half as bright. Each has a mass 30-40 times Jupiter's.

A black hole and its surrounding material take the shape of a doughnut regardless of the mass of the black hole. Scientists analyzed data for 245 active galactic nuclei which contain supermassive black holes at their cores. The black holes feed on infalling gas and can emit powerful radiation beams that shine with the energy of billions of stars. Black holes studied weighed 1 million-100 million times the mass of the Sun. Researchers measured X-rays and infrared light around them, testing a hypothesis about the relationship between these two types of extreme radiation. They knew X-rays should come from hot material close to the black hole, while infrared light should come from warm material more distant. This pattern allowed researchers to tell if matter around the black hole was being observed face-on or edge-on. Some infrared light should also come from part of the doughnut fried by X-ray bombardment. By comparing the proportion of X-rays to infrared light coming from around a black hole, researchers figured out how material may be distributed around the black hole. After partitioning the data into those observed edge-on and those observed face-on, the team found 90% of active galactic nuclei observable face-on had the same proportion of X-rays to infrared light.

Steven J. Ostro, a pioneering radar astronomer at the Jet Propulsion Laboratory, died December 15 at 62. Ostro invented the technique of using powerful radar antennas to

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probe asteroids, beginning with a successful "ping" of the main-belt heavyweight 1 Ceres while he was an MIT grad student Sky & Telescope's Kelly Beatty noted that "Steve realized radar's potential not only for determining the surface characteristics of small rocky bodies but for pinpointing their line-of-sight distance and velocity with incredible accuracy. Guided by his skill at wringing every bit of information from a radar echo, both of these capabilities became powerful analytical tools in the effort to understand near-Earth asteroids and the threat they pose to Earth." Ostro showed results that could be obtained with new, powerful radar telescopes at Arecibo (Puerto Rico) and Goldstone (California). In 1989, he and his team used the 300-meter dish at Arecibo to image asteroid 4769 Castalia for the first time. His observations confirmed that 99942 Apophis won't collide with Earth when it passes under the orbits of geosynchronous satellites in 2029. With 1999 KW4, which crosses the orbits of Mercury and Venus, then approaches Earth's orbit, Ostro's observations showed a collision is unlikely for at least 1,000 years.

Meteorite hunters discovered dozens of fragments from a 10-ton space rock that exploded over the Canadian prairie in late November. A large search team picked up more than 60 pieces from a 24-square-km patch in Saskatchewan. Amateur treasure seekers walked away with many more pieces, including a 13-kg chunk. Cold, dry conditions meant any volatile materials and soluble minerals within fragments should be well-preserved. A spectacular fireball was seen by thousands across Alberta and Saskatchewan. Based on density of finds, there could be 10,000 fragments waiting to be found. The real payoff is the likelihood that an accurate orbit can be calculated for the object, allowing researchers to trace its trajectory back to the asteroid belt. So far, only nine meteorites have known orbits. Preliminary analyses suggested the parent object was a fairly common type of asteroid, an H chondrite; H specifies high iron content. The many pieces recovered and their relatively pristine condition should help researchers identify any unusual features that could illuminate details of the solar system's formation. ■

Hubble Exhibit in Rye

The Rye Arts Center in Westchester is hosting the traveling exhibition "Heavens Above: Photographs of the Universe from the Hubble Space Telescope" through February 21. It features 30 images presented as large-format transparencies mounted in light boxes: stars being born, stars at the end of life, swirling masses of galaxies and celestial clouds. The show is a joint project between the Alden B. Dow Museum of Science and Art of the Midland Center for the Arts in Michigan and NASA's Space Telescope Science Institute. Info: www.ryeartscenter.org. ■

Tyson's New Pluto Book

Hayden Planetarium director Neil deGrasse Tyson's latest book is out. It's "The Pluto Files," a whimsical look at the controversy surrounding Tyson's--and the International Astronomical Union's--demotion a few years ago of Pluto from planetray status. Included are letters pro and con from schoolchildren responding to the decision and some hilarious cartoon funning the controversy.

Look for Tom Haeberle's review of "The Pluto Files" in next month's *Eyepiece*.

Also on the Pluto front, a new postscript has been added to the paperback edition of "Is Pluto A Planet?" by David A. Weintraub (Princeton, $18.95), who believes Pluto should qualify as a planet ■

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studied history and philosophy in college, but then had my life changed forever by the 1970 solar eclipse. The next day, I bought my first telescope, and within four years, couldn't afford the telescopes any more, so I had to become a professional astronomer and use other people's telescopes. Along the way, I had brief careers as a sportswriter, high-school teacher, and summer-camp director... and have been professing astronomy at Columbia since 1983."

Remaining lectures in the AAA'S 2008-09 lecture series are: **March 13**: Neil de Grasse Tyson, Hayden Planetarium, "The Rise and Fall of Pluto—Witness to Demotion" (John Marshall Memorial Lecture); **April 3**: Rick Fienberg, Phillips Academy, "The More Things Change; and **May 1**: Denton Ebel, AMNH, "The Stardust and Genesis Sample Return Missions." ■

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southeast (upper left) of Jupiter and the pair barely fit into the same field of view in the binoculars.

Mercury reached greatest elongation from the Sun on January 4, and on January 3 and 4 Mercury presented a gibbous disk slightly more than 50% lit in my 60mm refractor at 100x. Mercury appeared to have a slightly pink tint when contrasted with the pale off-white tint of Jupiter in late December and early January. The Mercury-Jupiter pair was very low in the sky near the horizon and setting into the tree tops to my west by 5:30 p. m. Seeing near the horizon was too poor to enable my getting a clear view of Jupiter's cloud belts. Mercury's surface brightness was much more than that of Jupiter because of the fact that while Mercury and Jupiter appeared close together, Jupiter was really more than 300 million miles behind Mercury and far away from the Sun. Jupiter then sank into the solar glare towards solar conjunction on January 24. ■

Events on the Horizon
February 2009

M: members; P: open to the public; T: bring your telescopes, binoculars, etc.;
C: cancelled if cloudy;
HQ: at AAA headquarters, Dowbtown Community Center, 120 Warren St.
AMNH: For ticket information call (212) 769-5200.
For directions to AAA observing events, check the club's website at www.aaa.org

Monday, February 9, 7:30 p.m.
Hayden Planetarium Lecture P, AMNH
In "Touching the Heart of Magnetism in Our Nearest Star," Juri Toomre of the University of Colorado at Boulder explores the origin of the Sun's evolving magnetism and its 22-year cycles of activity. The speaker will also discuss the close interplay between recent 3D simulations and helioseismology to understand the complex operation of solar magnetism. Tickets are $15 ($13.50 for museum members, students, senior citizens).

Thursday, February 12, 6 to 8:30 p.m.
Recent Advances in Astronomy Seminar, Room 801, 239 Greene Street M, NYU
Discussion of new findings in astronomy and astrophysics. Next date: March 12.

Wednesday, February 18, 7 to 9 p.m.
Quarterly AAA Board Meeting M, HQ
All members are invited to attend.

Friday, February 20, 6:15 to 8 p.m.
AAA Lecture Free, P
Joseph Patterson, professor of astronomy at Columbia University, will discuss "The Center for Backyard Astrophysics." The free public lecture will be in the Kaufmann Theater of the American Museum of Natural History. Next lecture: March 13.

Tuesday, February 24, 7 to 9 p.m.
Observers Group M, HQ
Upcoming celestial events, astronomy resources on the internet, using telescopes and binoculars. Weather permitting, after the meeting we will go to a nearby park for observing. Next date: March 31.

Saturday, February 28, 10 a.m. to Noon
Solar Observing, Central Park FREE, P, S
At Conservatory Water. Next date: March 28.

Saturday, February 28, 7:30 to 11 p.m.
Stargazing, Great Kills Gateway National Park, Staten Island Free, P, T
Observing on the model airplane flying field. Next date: March 28.

Amateurs Are Sought For Lunar Observation

An online discussion group has been set up to facilitate amateur-astronomer participation in NASA's Lunar CRater Observation and Sensing Satellite (LCROSS) observation campaign. Interested amateurs can join the group: http://groups.google.com/group/lcross_observation.

Observations by amateurs will help refine new protocols for observing the Moon and increase our knowledge of it. Prior to the April 25 launch, amateurs are encouraged to image the north and south poles of the Moon. The goal is to obtain images that determine the scale of recognizable features observed in the wider field of view on amateur telescopes when compared the higher spatial resolution near-infrared Infrared Telescope Facility images. A secondary goal is to compare the dynamic range of images that allow the verification of detection of subtle variations in topography and albedo.

This exercise also may help amateurs prepare for obtaining images of impact plumes. The plumes will occur in shadowed regions, but these regions likely will be adjacent to lit regions of the Moon. The LCROSS mission will launch together with the Lunar Reconnaissance Orbiter (LRO). LCROSS will aim into one of the Moon's permanently shadowed polar craters. LCROSS will fly directly through the resulting plume of debris, analyzing it for signs of water ice that may have accumulated within the crater. The debris plume will also be studied by LRO and Hubble, ground-based observatories, and amateur telescopes.

NASA wants to facilitate amateur participation in LCROSS by posting and sharing images that will be of scientific value before launch, during flight and during impact. Info: Brian.H.Day@nasa.gov. ■

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a photometer in late June through the fall taking data and doing differential photometry with a team of neighbors and AAA members. Come up the hill, where there are no lights to be covered up!

These events and many more await you if you take a peek at http://astronomy2009.us.

In closing, 400 years ago Galileo peered up at the heavens and what he saw amazed him. As a member of the AAA, you are amazed as well. Just think, the Pleiades are about 400 light-years away. We're now just seeing the light that started from that little cluster as Galileo trained his homemade telescope on the stars. Think what you can do with your enthusiasm and your telescope! ■

From the editor:

Those members who contribute to the paper are terrific. But I am interested in broadening participation in the paper. If you like to write, I'd love to hear from you and see what you're interested in: observing, equipment, covering a lecture, reviewing a book or something else.

If you are interested please contact me at dsharry2@aol.com. - *Dan Harrison*

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three different filters. "Each image is assigned a different color, usually red, blue, or green, to create a full-color composite image. The physical conditions in the celestial object often influence which colors are associated with these filtered views."

Part of the what the authors call the Hubble era is the effect on ground-based amateur and professional astronomers: "The electronic and computer-based image processing technologies have not remained the Hubble's exclusive domain. [Hubble images] have shown all of us what is possible, and…amateurs and professionals alike have rushed to adapt these new techniques to their own backyard telescopes. Leaving behind photographic recording and the home darkroom, they have embraced the powerful new format of digital imaging. In so doing, they have sparked a new fascination for the deep sky.

"They have connected simple Webcams to small commercial telescopes and homemade contraptions. They have downloaded freeware capable of stacking thousands of electronic images automatically…In so doing, astronomers have produced enhanced images of planets, stars, nebulae, and galaxies that compete with and even surpass those taken by the great mountain observatories of the 20th century." ■

Amateur Astronomers Association
Gracie Station
P.O. Box 383
New York, NY 10028

Forwarding and Address Correction Requested

First Class