EYEPIECE

Journal of the Amateur Astronomers Association of New York
September 2009
Volume 57 Number 9, ISSN 0146-7662

Eclipsed by Clouds, and Other Chinese Adventures

By Tony Hoffman

In mid-July, I went to China on the Planetary Society's eclipse tour, to see the 21st Century's longest total solar eclipse from near Shanghai. Although the eclipse didn't turn out the way we'd hoped, it was an unforgettable trip with astronomical and terrestrial adventures.

On our first full day in China, after spending the morning at the Forbidden City, we went to a lesser-known but fascinating museum, the Beijing Ancient Observatory. On the old Ming Dynasty-era city wall that once encircled Beijing, this pre-telescopic observatory contains ornate bronze astronomical instruments: sextants, armillary spheres, theodolite, quadrant and more. One large armillary sphere, decorated with four dragons, is a particular beauty. Beijing's original observatory was built in 1227. The current structure was completed in 1442. The instruments on display were rebuilt from older versions in the 1670s by the observatory's director, Jesuit missionary Ferdinand Verbiest.

From Beijing, we flew to Xi'an, a former capital of China that around 700 A. D. was the world's largest city. On our last night there, our tour's leader told me he'd come across a man with a telescope showing people Jupiter a few blocks from our hotel. My curiosity piqued, I went for a walk through the city's Muslim quarter until I reached the place where he'd encountered the man. I was surprised to find no fewer than five large telescopes, each with a mirror about 10 inches in diameter. I had a look through two of them, paying 10 yuan (about $1.50) to each of their owners.

The view through the first scope was poor, with glare from stray light rendering Jupiter's Galilean moons all but invisible. Before I looked through the second telescope, its owner handed me a small, dark slab of glass. I couldn't figure out what it was until the owner pointed to the side of his scope, to which he had taped a picture of a solar eclipse. I realized that he was giving me a solar filter--a piece of smoked glass--through which I could view the eclipse four days hence, and it came in handy.

The view through the second scope was much better, revealing three of Jupiter's moons and several cloud belts. As I looked at our largest planet late in the evening of July 18, I had no way of knowing that in the hours to come, an asteroid or comet would collide with Jupiter, leaving a dark blemish that would be discovered by an Australian amateur the following night. If the impactor had been a bit further along in its plunge towards Jupiter, it's possible that I would have been able to view the collision or at least its immediate aftermath.

From Xi'an, we flew to Hangzhou, a city southwest of Shanghai. Although Hangzhou was in the eclipse path, we'd planned to move on and view the eclipse from a beach at Jinshanwei, nearer Shanghai. Our leaders were having second thoughts due to increasingly poor weather prospects. They considered staying in Hangzhou for the eclipse, but instead forged on to Jinshanwei. After a night of thunderstorms, eclipse day, July 22, began with a solid overcast. Nonetheless, we went to a beach we'd reserved for eclipse-watching. Although the clouds briefly thinned enough for us to see the partially eclipsed Sun from time to time, and I got some decent photos, the clouds closed in again 10 minutes before the start of totality, so we were denied any view of the totally eclipsed Sun in the otherwise dramatic midmorning darkness. Within 15 minutes of the end of totality, it was pouring rain. We quickly left the beach and headed to Shanghai.

I felt bitterly disappointed. We'd been teased by the

(Eclipsed continued on page 6)

What's Up

By Tony Hoffman
The Sky September 2009

September's Constellations. The heart of our galaxy is well-placed for observing early on September evenings, with Scorpius to the southwest and Sagittarius in the south. Cassiopeia rises in the northeast, Cygnus stands high in the east and Lyra lies at the zenith. The Milky Way spans these constellations, flowing through Aquila and Ophiuchus down to the center of the galaxy. From the city, binoculars will show a hint of the Milky Way's star clouds and clusters, while dark-sky sites will reveal our galaxy in all its glory. Orange Arcturus twinkles in the west, with Hercules following Bootes westward, while the Big Dipper swings down into the northwest. The Great Square of Pegasus climbs in the east, trailed by Andromeda and Perseus. To the southeast, Jupiter blazes in Capricornus at magnitude -2.8. (For nearly two hours on the night of September 2-3, none of Jupiter's Galilean moons will be readily visible, with Io and Callisto passing behind the planet, and Europa and Ganymede in transit across its face.) Fomalhaut twinkles blue-white, well to Jupiter's lower left. Even Capella and the Pleiades get into the act, rising before midnight.

Juno at its Best. On September 17, Uranus reaches opposition near the circlet of Pisces. At magnitude 5.7, it's an easy enough binocular target for urban observers, and can even be seen with the naked eye by keen-eyed observers from dark-sky sites. While Uranus is a giant planet, a much smaller world also glides through southern Pisces. Asteroid 3 Juno comes to opposition September 21, when it will glow at magnitude 7.6, and should be visible in binoculars from the city on a good night. While asteroids such as Ceres and Vesta become fairly bright every time they reach opposition, the relatively small Juno is easily visible only when it passes particularly close to Earth, as it does this year.

September 2 Moon lies near Jupiter.
September 3 Between 12:43 and 2:29 a. m., none of Jupiter's Galilean moons are easily visible.
September 4 Full Moon at 12:03 p.m.
September 11 Last-quarter Moon at 10:16 p.m.
September 13 Moon lies near Mars.
September 16 Moon at perigee, 226,212 miles from Earth, 3:56 p.m.; Moon lies near Venus.
September 17 Uranus at opposition.
September 18 New Moon at 2:44 p.m.
September 20 Venus lies near Regulus.
September 21 Asteroid 3 Juno at opposition.
September 22 Autumnal equinox at 5:19 p.m.
September 26 First-quarter Moon at 12:50 a.m.
September 29 Moon lies near Jupiter.

Jovian Observations

By Joseph A. Fedrick

While observing Jupiter on the night of July 14-15 between 11:45 p. m. and 1 a. m., I saw a dark black spot transiting the Jovian disk between the equatorial belts. The spot was near the Jovian meridian around half past 12. I observed the spot first with my 6-inch reflector at 150x and then with my 60mm refractor at 100x. I checked the timetables from skyandtelescope.com and found this was a shadow transit of Ganymede, the largest Jovian moon. Ganymede's shadow appeared bigger and darker than the shadows of other Jovian satellites that I observed transit the Jovian disk during August and September 2008.

Four nights later (the night of July 18-19), I observed Jupiter from 11:20 p. m. to 12:30 a. m. using my 6-inch reflecting telescope. I saw the Great Red Spot—which actually appeared rather small and very pale tan--transiting the Jovian disk. The spot fit into a notch in the South Equatorial belt, the so-called red spot hollow. Unfortunately, as Jupiter travelled westward across the sky, it drifted behind a tree in my line of sight. Had I been able to watch it for two more hours, I might have been able to see the new Jovian black spot discovered by Australian amateur astronomer Anthony Wesley nine hours after I quit watching Jupiter. The new spot was following the Great Red Spot by two to two-and-a-half hours so it would have transited the Jovian meridian 2-2:30 a. m. Virtually all other opportunities to see the new spot were clouded out. Images of Jupiter reveal the spot is black, in high southern latitudes and quickly began to smear out and fade. The spots therefore probably will have virtually disappeared by the time our hazy, cloud weather pattern changes enough to allow making more Jovian observations. ■

A Message from AAA President Richard Rosenberg

Hello, members:

September is here. Let's hope the weather improves. Almost every observing session I was planning to attend this summer was canceled. The only exception was the Movies with a View series at Brooklyn Bridge Park. Even they had two rainouts, and have extended their series for an extra showing on September 3.

I am happy to announce the resumption of our class. The instructor will be Shana Tribiano, an AAA board member and associate professor at Borough of Manhattan Community College. The exact dates are still to be worked out.

Soon it will be possible to receive *Eyepiece* via email. This will save us expense and effort, and help the environment. If you don't have e-mail or wish to receive a hard copy of *Eyepiece*, you will still get it by snail mail.

The club recently purchased a CCD eyepiece, using funds from the Fred Hess Memorial Fund. Light captured by a telescope is sent through the CCD and onto a monitor. The CCD is extremely efficient at capturing photons of light so images are brighter. This will allow several people to view an object simultaneously, and for an experienced observer to point out lunar craters, moons of Jupiter, stars in the Pleiades, etc. to newcomers. We hope to have it ready for Starfest September 26.

Our annual Urban Starfest on Saturday, September 26 will be from 7:30 to 10 p. m. in the Sheep Meadow of Central Park. Rain date is the following evening. If you are planning to bring a scope, free parking adjacent to the meadow is available (send me your name, make and year of car, and license plate). The Moon and Jupiter will be the featured objects, but targets will include Neptune, Uranus, the Andromeda Galaxy, star clusters and nebulae. Bring your friends -- this is a great occasion to introduce them to the night sky.

We have a new observing site in the city. It's the High Line, the elevated former rail line in Manhattan. Organized by board member Joe Delfausse, we'll observe there every Tuesday (when weather permits). We'll have at least one scope set up. Information and maps are at http://www.thehighline.org/. If you don't have Internet access, contact me.

The New York Times asked me to participate in its Ask About feature the week of August 24. The subject was astronomy, and they wanted me to answer questions submitted by the public. I was happy to do so. Selected questions and answers appeared in the newspaper and online. If you want to see them, check aaa.org or contact me.

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

'100 Years of Cosmology' Kicks Off AAA Lectures Oct. 2

Michael Way, astronomer/computer scientist at NASA's Ames Research Center and its Goddard Institute of Space Studies, will give the first lecture of the AAA's 2009-10 lecture series Friday, October 2 when he discusses "100 Years of Cosmology: From Spiral Nebulae to the Cosmic Microwave Background." The free public lecture is at 6:15 p. m. at the Kaufmann Theater of the AMNH.

Other dates and speakers are:

November 6: Alan Guth, MIT, "Inflationary Cosmology: Is Our Universe Part of a Multiverse?" (John Marshall Memorial Lecture);

December 4: Charles Baltay, Yale University, "Exploring the Dark Side of the Universe: Accelerating Universes, Dark Matter, Dark Energy and All That";

January 8: Jerry Bonnell, NASA, "Best Astronomy Pictures of the Day, 2008";

(Lectures continued on page 10)

Recent Advances Seminar Tracks Variety of Missions

By Mary Carlson

Chair, AAA Recent Advances Seminar

As predicted at the AAA's annual meeting, the excitement continues as the Recent Advances in Astronomy Seminar pursues the progress of what's up in our part of the cosmos.

The European Space Agency's dual missions, Herschel and Planck, are well underway in opening up new cosmological doors. We're following the Herschel Space Observatory as it achieves targeted milestones. "First light" observations were obtained by its primary instruments: PACS (Photodetector Array Camera and Spectrometer), SPIRE (Spectral and Photometric Imaging Receiver) and HIFI (Heterodyne Instrument for the Far Infrared).

Photometric surveys of the galactic and extragalactic sky, detailed studies of the physical and chemical composition of gas, dust and the interstellar medium, and spectroscopic/photometric studies of solar-system objects are on track.

PACS' photometer and integral-field spectrometer observed the planetary nebula NGC 6543 (Cat's Eye Nebula), looking at the spectral lines of doubly-ionized nitrogen and neutral oxygen. This demonstrates the capacity for probing the physical properties and chemical composition of objects and their surroundings. SPIRE's camera has centered on galaxies, including M66 and M74, looking for emissions from clouds of dust in regions where stars are forming in our own and in other galaxies. HIFI is detecting ionized carbon, carbon monoxide and water in star-forming regions.

Planck's goal is to answer fundamental questions about how the universe came to be and how it will change in the future. Working in the microwave wavelength, it will measure minute variations in the cosmic microwave background and take us back to that fraction of time after the Big Bang. With the spacecraft's cooling system reaching its ultimate operational capacity at 0.1 degree above absolute zero, its High Frequency Instrument and Low Frequency Instrument are operational.

Herschel and Planck are in separate orbits around the second LaGrange point.

At another session, Rich Rosenberg unraveled the mystique of the recent total solar eclipse. As it was beyond our range of view, he guided us on a virtual tour through the event. With the Earth at aphelion, the Sun at 3l.5 arc minutes and the Moon at perigee and at 33.7 arc minutes, totality was assured. We saw a speeded up version of the six minutes of totality.

We then transitioned to the Lunar Reconnaissance Orbiter (LRO) and the Lunar Crater Observation and Sensing Satellite (LCROSS).

LRO, in lunar orbit, is transmitting images of the lunar surface through its two cameras, a low resolution wide-angle camera and a high resolution narrow angle camera, collectively known as the Lunar Reconnaissance Orbiter Camera (LROC). The first images were along the Moon's terminator. LRO will help NASA identify safe landing sites for future explorations, locate possible resources, analyze the Moon's radiation environment and initiate new technologies.

Additional instruments have been activated and calibrated: the Lunar Exploration Neutron Detector to search for regions with enriched hydrogen for possible water-ice deposits, the Cosmic Ray Telescope to measure the Moon's radiation, the Laser Altimeter to build 3D topographic maps, the Diviner Lunar Radiometer to make temperature maps of the lunar surface, a Miniature Radio Frequency Transmitter to search for subsurface ice and to prepare detailed images of permanently shaded areas using radar and radio waves, and the Lyman Alpha Mapping Project. Its ultraviolet-light imager will use starlight to search for surface ice in deep craters at the poles. LRO's lunar orbit, initially 18 miles over the South Pole and 124 miles over the North Pole, will eventually maintain a 31-mile circular orbit.

(Seminar continued on page 12)

Observing Our Nearest Neighbor—and More

By Jason Kendall

On August 1, it was "IYA Observe the Moon Night with Lunar CRater Observation and Sensing Satellite (LCROSS)." And observe the Moon we did! Over the course of the evening, about 60 people made their way to the top of the Hill in Inwood Hill Park.

I only took up my six-inch Dobsonian, because it is infinitely easier to carry up those hills. The Moon was near full, and a crowd of about 25 was waiting to see our nearest celestial neighbor. Shoba Bindo Rao was there, giving her expertise on the sky. Rob Mahoney had a Galileoscope, a perfect thing to take to the top. Even with a slightly rickety tripod, he was able to get great views all night, including being able to see the bands of Jupiter. Rich Herrera had his four-inch refractor and was able to see quite a bit as well. Maya and Jordan brought up the binoculars, and Jordan refused to look through the Galileoscope since he wanted to build and look through his first. With his laminated lunar map, he helped teach people the wonders of the Moon. Fred, as always, introduced people to how to use telescopes.

I chatted about the LCROSS mission to the interested crowd. Debates popped up as a result: "Why go back to the Moon?" "Water on the Moon?" "Won't the impactor cause something bad to happen here?" "How can you tell if water is there by hitting the Moon?" We had amazing views of the Moon.

As the Moon, not at a great altitude for our location, dipped behind the trees, we were able to point out numerous double stars. But the Moon's glow and approaching clouds made clear it was not going to be a late night. Fortunately, they held off long enough for Jupiter to rise into view. Those late hangers-on got a great view of the moons, and the atmospheric structures on Jupiter. Th e dark patch was nowhere to be seen.

I'd heard that the recent Jupiter impact should be visible if I stayed out late enough and watched pretty close. So on Monday the 3rd, I went out to try to take it in. My wife Donna and I ventured out to the baseball diamonds to see the rising Jupiter. I was immediately rewarded by the best seeing of the summer.

The Moon, while low in the sky, made for a good target. I stayed until 4 a. m. My patience paid off in spades. Not only could I see Jupiter, but the Celestron 8" Nextstar SE coupled with a Meade 5000 UWA 8.8mm made it all jump out. The skies stayed amazingly steady. Io just touched Jupiter's limb. I could make out the disks of all four moons, as well as the 45 Cap in the field, ready to be occulted. I noticed the Great Red Spot was coming around the limb. I knew then that I wouldn't see the impact since it appears on the other side of the Great Red Spot. I saw Uranus as a bright blue disk and Mars as a red crescent. The stars of the Perseus double cluster leaped out, and I wished I had some AAVSO charts to take measurements. Neptune was a faint blue dot.

Most interesting of the fuzzies was M31, the Andromeda Galaxy. As dawn approached and the Moon set, I noticed the nebulosity from M31 overwhelm the sky brightness. Nothing distinct, but you could tell it was there by just going off it a bit, and seeing the sky background change. I watched the Red Spot come around the limb and then across the meridian. I could easily see variations in the bands, and my young guest could see something that might have been smaller white oval storm features. I saw the kinks and secondary bands, as well as the boundary between the Red Spot and the band, and its central peak contrast. It was truly amazing to see such variation so clearly. ■

Whither the Light Bill?

A light-pollution bill that passed the State Assembly earlier this year was to have been heard by the State Senate Environmental Conservation Committee June 16, but that didn't happen because the Senate imploded due to party defections June 8. The staff of the bill's lead Senate sponsor, Antoine Thompson, is trying to get the bill (S2714) moved to the Senate Rules Committee to make it possible for Rules to bring the bill to the floor. ■

Contacting the AAA

If you want to join, volunteer, participate in events, have a question or change your address, e-mail members @aaa.org, or leave a message at AAA hq: (212) 535-2922. Also, visit us on the web at www.aaa.org. ■

Levy Says Object that Hit Jupiter Was Likely a Comet

By Dan Harrison

The object that slammed into Jupiter this summer was probably a comet and not an asteroid, noted comet hunter David Levy told *Eyepiece* last month.

Interviewed after giving two presentations at the Astronomical League convention in Hempstead, N. Y., Levy said the comet thesis made more sense since the behavior of dust over Jupiter's atmosphere was identical to Schumacher-Levy.

Levy applauded the Australian amateur who first spotted evidence of an impact on Jupiter. However, he said beginners shouldn't be encouraged to do comet-hunting because NASA is so active in funding and discovering comets. "If you want to discover a comet and it's a do-or-die approach, don't do it. But if you're having fun with the sky, do it."

In addition to keynoting the convention, Levy spoke at a session entitled "Is There a Future to Visual Comet Hunting?" After being introduced, he said no and sat down.

But he then outlined how he hunts for comets. "I have six cameras running. I get up two hours before dawn and spend an hour setting up." Levy moves in a zig-zag pattern, down and up fields, generally north-south in the eastern sky. He alternates 16 fields per scope and 12 in a pair of binoculars. There are five camera-laden scopes.

"During each lunation, I try to get as much of the sky before dawn as possible, he said.

In July, Levy discovered Comet Christianson close to NGC 7331 in Pegasus. He knew it as a comet because it was a bit brighter than 7331 and had a tail.

Levy, who heads the National Sharing the Sky Foundation, said his path in astronomy began at a meteor camp in 1956. "I put it in my brain, let it fester and it exploded four years later as the only thing I wanted to do. I did a doctoral thesis on the relationship of Shakespeare to astronomy--the night sky from 1572 to 1620, from Tycho's supernova to the invention of the scope.

"I realized I might fail, but it might carry me through the forest of life. I might fail but I might learn. A teacher asked how I expected to make any money doing that, and said that if I hadn't discovered any comets in 25 years he would lower my grade. It took me 19 years, and I have now discovered 22." ■

(Eclipsed continued from page 1)

clouds loosening their grip on the Sun, only to have them close in again with renewed force before the best part of the eclipse. I'd seen many partial eclipses before. Now I've even been in the path of totality, traveling halfway around the world to get there, but I still haven't observed the fully eclipsed Sun and its remarkable phenomena—the Diamond Ring, Baily's Beads, prominences and the delicate streamers of the solar corona, the Sun's rarified yet super-hot atmosphere. My trip to China was wonderful, but the eclipse wasn't among its finer moments. (Many people successfully viewed totality from Hangzhou.)

Yet having come so close (and so far) in my first attempt to view a total solar eclipse, I don't want to stop here. I'll try to be in the path of the 2017 solar eclipse, the first to cross the U.S. mainland since 1979. But I may not wait that long. I'm thinking of going to Australia for a 2012 eclipse. For the right opportunity I'm willing to see this rare, spectacular phenomenon.

After the eclipse, I attended the International Workshop on Cometary Astronomy (IWCA IV) at the Shanghai Museum of Science and Technology. Generally held every five years, this year's conference, which stresses cooperation between amateurs and professionals in comet research, was split into two. IWCA V was held in Rio de Janiero in August. I gave a presentation in Shanghai on Tewfik, a comet observed only during a total solar eclipse in Egypt in 1882, and believed to have been a Kreutz sungrazer fragment similar to an exceptionally bright one seen in SOHO images in 2003.

While at the conference, I met many Chinese amateurs I know from online astronomy projects, and who

(Eclipsed continued on page 12)

Review: 44 Essays on the Development of Cosmology

By Shana Tribiano

In "Finding the Big Bang," edited by P. J. E. Peebles, L. A. Page Jr. and R. B. Partridge (Cambridge University Press, $72), the how and what of cosmology is delivered in 44 essays by contemporary scientists, with 47 cosmologists contributing in total.

They portray their pursuits that brought about general agreement that the cosmic microwave background radiation (CMBR) implied a universe with a past that was described as a hot big bang. Debatably, it might not have been the case.

The first few chapters provide background about the discovery. Committed to conveying the nature of early cosmological research, the authors comprehensively review the history of the field, acknowledging it's incomplete.

That cosmology was revealed to be a testable pursuit at all, in the last century, was remarkable in itself. Around 1950, major momentum towards a consistent interpretation developed. Agreement that the bath of light that permeates all space, the CMBR, is a fossil from a hot past of about 13 billion years ago grew. Measurements of the CMBR, whose temperature today, 3 K, corresponds to the microwave portion of the electromagnetic spectrum, gradually distinguished between possible universes that had been hypothesized. The CMBR effectively ignited what we pursue in trying to understand about the cosmos today.

As you can imagine, the book's essays are technical. There is no informal conversation about megaparsecs and thermal equilibrium. But it's not like a bad textbook in any way. Velocity is succinctly and clearly explained without equations or numbers. In this way, the book can be home to a variety of readers. Although it leans heavily towards numerical detail compared to a non-textbook book, it feels like a biography.

Undergraduates will likely enjoy the footnotes. An undergraduate physics, astronomy, astrophysics, or even engineering or math major will enjoy the footnotes more. There's even nice calculus-level homework suggested.

Digging back to early last century, the essayists describe the cards on the table then. They cite competing theories that reflected the data of the day. Some descriptions depended on a hot Big Bang theory and others, like the steady state, static universe model or cold big bangs, didn't. The writers show how the CMBR sorted things out.

The fifth and last chapter is reflective, beginning with reference to the CMBR as one among a list of cosmological cornerstones. After the last chapter, the appendix provides material that seems like great character sketches in the form of CBR experiment profiles, tabulated by frequency, corresponding temperature and experiment name.

Chapter 4 begins the personal essays, which give the book its flavor. Some recollections are short, some long. They all act as very direct windows into the past. They reflect on many aspects of the field, from personal experiences to pressing arguments and counterpoints.

A noticeable characteristic of the essays is an intimacy in the endeavor. Confessions of the authors' missed opportunities and leading others astray are endearing. Some recollections recount predictions writers made that turned out to be true but were never published.

The essays reveal how conversational progress is. They span a great network of people across continents. The collection is at least as much about people and how they collaborate as it is about the history of the great cosmic discovery that's the Big Bang model.

The recollections are full of interesting facts, concepts and developments: researchers correcting their own results, incrementally adding new pieces to a multifaceted puzzle. The puzzle pieces are described well. Some can easily be put in the pockets of your memory. Others take more time to enjoy, like the detail in predictions that didn't match the data. Not frequent, but quite noticeable, are descriptions of feelings upon scientific realization. However brief, they are distinct, just as each essay is distinct. ■

Briefs: Two Planets Smashed Into Each Other

Two planets orbiting a young star apparently smashed into each other at high speeds thousands of years ago. Plumes of vaporized rock and lava from the collision revealed their existence to Spitzer. The pileup occurred within the last few thousand years. The smaller of the planets--about the size of the Moon, according to computer models--was apparently destroyed by the crash. The other was likely a Mercury-sized-planet and survived, albeit severely dented. The planets were believed moving at 22,400 mph before the crash. The wreck released amorphous silica rock, or melted glass, and hardened chunks of lava. Spitzer also spotted large clouds of orbiting silicon monoxide gas created when the rock was vaporized. Infrared detectors found traces of rocky rubble and refrozen lava around a young star, HD 172555, in early stages of planet formation. The system, some 100 light-years away, is 12 million years old.

A newfound planet orbits backward compared to the rotation of its star. A near-collision may have created the retrograde orbit. The star and its planet, WASP-17, are about 1,000 light-years away. WASP-17 likely had an encounter with a larger planet, and the gravitational interaction put WASP-17 on its odd course. WASP-17 is half the mass of Jupiter but bloated to twice its size. The bloated planet can be explained by a highly elliptical orbit, which brings it close to the star and then far away.

Some comets headed to Earth's neighborhood from outer reaches of the solar system likely follow a different route than thought, new modeling suggests. Comets from this region should rarely cross Earth's orbit, so aren't a collision concern. In turn, these rare encounters mean these comets are unlikely to have caused past mass extinctions. Long-period comets--with highly elongated orbits that take them hundreds or thousands of years to circle the Sun--were long thought to come from the outer region of the Oort Cloud. Astronomers found comets from the inner Oort Cloud could slip past the protective barrier of Jupiter and Saturn and reach an Earth-crossing orbit. New modeling suggests a substantial portion of observable long-period comets actually come from the inner, not the outer, Oort Cloud. An estimate of the comets likely to have struck Earth during the last 500 million years is no more than two or three.

A fundamental ingredient for life has been discovered in a comet sample, supporting the idea that such icy objects seeded early Earth with material needed for living organisms. New research firms up past suggestions of glycine, the simplest amino acid used to make proteins, inside samples from Comet Wild 2. This is the first time an amino acid has been found in a comet. Discovery of glycine in a comet supports the idea that building blocks of life are prevalent in space, and backs the argument that life in the universe may be common, not rare. Glycine molecules from space tend to have heavier Carbon 13 atoms than glycine from Earth.

Armchair astronomers helped discover a batch of tiny galaxies that may help professionals understand how galaxies formed stars in the early universe. Dubbed the Green Peas, the galaxies are forming stars 10 times faster then the Milky Way despite being 10 times smaller and 100 times less massive. They're 1.5 billion-5 billion light -years away and are among the most active star-forming galaxies. The discoveries were made as part of a project where Internet users volunteer to help classify galaxies for an online image database. Reports of a potential discovery began when a group of volunteers started an online discussion about a group of strange bright green objects. The volunteers, many with no astronomy experience, were asked to refine their image samples and submit them to a lab for color analysis. Once findings were verified, researchers analyzed the galaxies' light to determine the degree of star formation.

The first black holes in the universe were born starving. A new study found they lacked nearby matter to gobble up, so lay relatively stagnant. The finding, based on the most detailed computer simulations to date, counters earlier ideas that the first black holes accumulated mass quickly and ballooned into supermassive black holes. In fact, the first black holes grew by less than 1% of their original mass over 100 million years. These black holes may have played an important part in evolution of the first galaxies. They likely produced significant amounts of X-ray radiation, which is released when mass falls onto a black hole. This radiation could have reached gas even at a distance and heated it up to temperatures too high to condense and form stars. These hot gas clouds may have carried on for millions of years without creating stars, then collapsed under their own weight to create supermassive black holes.

(Continued on page 9)

Briefs: 'Super-Planetary Nebula' Is New Cosmic Class

(Continued from page 8)

A new class of object--super planetary nebula--has been identified. Planetary nebulas are shells of gas and dust expelled by stars near the end of their lives and are typically seen around stars comparable or smaller in size than the Sun. Scientists identified the new objects when they surveyed the Magellanic Clouds with radio telescopes. They noticed 15 radio objects that match well-known planetary nebulas observed by optical telescopes. Members of the new class of objects are unusually strong radio sources. Whereas existing populations of planetary nebulas are found around small stars comparable in size to our Sun, the new population may be the long-predicted class of similar shells around heavier stars. The team thinks detections of these new objects may help solve a missing-mass problem, the absence of planetary nebulas around central stars originally one to eight times the mass of the Sun. The nebular material around each star may have as much as 2.6 times the mass of the Sun; material around smaller stars is 0.3 times the Sun's mass.

The U. S. can't afford to return astronauts to the Moon under the NASA budget proposed by the Obama administration, a presidential panel said. Nonetheless, the panel will offer at least two options for human spaceflight programs that could be done within the $81.5 billion budgeted for NASA through 2020. The committee strongly favored encouraging commercial vehicles for launching astronauts into orbit and suggested setting $2.5 billion aside between 2011 and 2014 to spur such development. Meanwhile, a federal report said NASA doesn't have the money to finish spotting most asteroids that pose a threat to Earth. That's because although Congress assigned the agency that mission four years ago, it never gave it the money to build the necessary telescopes. The mission calls for NASA, by 2020, to locate 90% of potentially deadly rocks. The agency has been able to complete about one-third of its assignment with current scopes.

New observations of Betelgeuse may help scientists finally understand how stars begin to shed mass at a tremendous rate near the end of their lives. Images reveal a vast plume of gas spewing off Betelgeuse. The star is many times the mass of the Sun, but is losing about one Sun's worth of mass every 10,000-100,000 y ears. That's about 1 million times faster than the rate at which the Sun loses mass. Observations of the plume imply Betelgeuse isn't shedding mass evenly in all directions. Betelgeuse is set to die in a supernova explosion within the next 10,000 years. Because it's expanding in size while losing mass, its density has become very low. The star is about 1 billion times less dense than air on Earth.

A sudden bright spot in Venus' clouds has scientists stumped as to its cause. First noticed by amateur astronomer Frank Melillo of Holtsville, N. Y., July 19, the spot isn't the first such brightening noticed on Venus, but it's confined to a smaller region. The bright spot appeared in Venus' southern hemisphere four days before Melillo saw it. It's being spread out by winds. Theories as to what happened include a volcanic eruption, solar particles interacting with the atmosphere, and a coronal mass ejection or solar wind that could have interacted with Venus' clouds. Yet another possibility is some internal change in Venus' atmosphere that could alter cloud particles and make them more reflective.

The Air Force will resume sharing data on incoming meteors with astronomers. It collects the data with a network of satellites and sensors designed as a missile early warning system. For more than a decade, it provided them to astronomers on an ad-hoc basis, but the informal relationship came to a halt earlier this year. The Air Force will release data faster and more systematically while in compliance with classification procedures.

The first detection of lightning in a Martian dust storm has likely been made by a new detector on a radio telescope. Scientists have long thought that as with dust devils and storms on Earth, Martian dust storms should produce lightning. The lightning wouldn't look like what we see on Earth, but rather more like a glow in the clouds. Lightning could cause chemical reactions that affect the chemistry of the Martian atmosphere and surface, creating caustic compounds.

Radar observations have revealed that a near-Earth asteroid, 1994 CC, is three rocks. 1994 CC, which came within 1.56 million miles of Earth June 10, is only the second triple system known in the near-Earth population.

(Continued on page 10)

(Briefs continued from page 9)

The setup consists of a central object about 2,300 feet in diameter that has two smaller moons revolving around it. Preliminary analysis suggests the satellites are at least 164 feet in diameter.

A tropical storm was discovered last summer on Titan, it was announced last month. In many ways Titan's climate resembles Earth's, but instead of a water cycle, Titan has a methane cycle. Clouds, rain and lakes exist on Titan, but are made of methane. In the moon's frigid climate, any water is frozen into rock-hard ice. Clouds of vaporized methane aren't uncommon on Titan, though they have never before been observed in Titan's tropics. In April 2008, astronomers spotted a severe storm covering almost 2 million square miles over the equator. The storm's trigger may have been geologic activity on the surface, such as a geyser or new mountain range forming. Atmospheric effects may also have set off the storm. Once the clouds were established they seem to have spread throughout Titan's atmosphere in waves.

Stars in a distant galaxy, 1255-0, 11 billion light-years away, move at more than 1 million mph, about twice the speed of our Sun, because their galaxy is very massive yet strangely compact. It's the first time motions of stars have been measured in a galaxy so distant. The compact nature of this and similar galaxies in the faraway early universe puzzles scientists, who don't understand why some young, massive galaxies are five times smaller than their counterparts today. Among other galaxies we can observe from this period, 30%-40% are compact like this one. But in the modern, nearby universe, astronomers don't find anything similar.

Close encounters of the galactic kind may explain the existence of an unusual type of dwarf galaxy, a new study suggests. Dwarf spheroidal galaxies are small and very faint, containing few stars relative to their total mass. These galaxies appear mostly dark matter. Previous theories have required that dwarf spheroidals orbit near large galaxies like the Milky Way, but this doesn't explain how the dwarfs that have been observed in the outskirts of the local group of galaxies could have formed. Computer simulations were used to examine two formation scenarios: an encounter between two dwarf galaxies far from giants like the Milky Way, with the dwarf spheroidal later accreted into the Milky Way, and an encounter between a dwarf galaxy and the forming Milky Way in the early universe.

Patterns of gamma rays throughout the Milky Way aren't the signature of dark matter as had been suggested, a new study shows. Their distribution across the Milky Way didn't match what astronomers expected to see. Scientists have shown the gamma-ray pattern can be explained by the way so-called anti-matter positrons from radioactive decay of elements propagate through the galaxy. Positrons are born in supernova explosions. Observed distribution of gamma rays is consistent with the standard picture where the source of positrons is radioactive decay of isotopes of nickel, titanium and aluminum produced in supernova explosions.

Most black holes are massive or compact and lightweight, but scientists have discovered a medium-sized black hole. This is the most solid evidence for a class of intermediate -sized black holes. The middleweights, 500 times the mass of the Sun, could represent a missing link between common stellar black holes, created by the death of a star, and the supermassive variety that can pack the mass of millions or even billion s of suns. The discovery is on the outskirts of galaxy ESO 243-49, 290 million light-years away. Astronomers detected a strong source of X-ray light without a counterpart in optical light. These characteristics make the object much more likely to be a black hole than a foreground star or background galaxy. Intermediate black holes are fairly rare because in most environments, stars aren't packed in tightly enough to cause frequent collisions. ■

(Lectures continued from page 3)

February 5: Arlin Crotts, Columbia University, "Liquid Mirror Telescopes Are Looking Up.";

March 5: John Gianforte, Blue Sky Observatory, "In the Footsteps of the Master: Discovering the Contributions of Galileo";

April 9: Glynnis Farrar, NYU, "High-Energy Astrophysics with a Neutrino Telescope in New York City";

May 7: Ruben Kier, Advanced Radiology Consultants, "Best Targets for Amateur Astrophotography and What They Reveal About Our Universe."■

Events on the Horizon
September 2009

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, September 1, 8, 15, 22, 29, 8 to 9:45 p.m.
Stargazing, High Line, Manhattan (FREE) P, T
Most observing near 13th Street. High Line info: http://thehighline.org. Next dates: Tuesdays in October.

Wednesdays September 2, 9, 23, and Saturdays September 5, 12, 19, 26, 8:30-10:30 p. m.
Observing at Inwood Hill Park, Manhattan, P, T, C
Next dates: Wednesdays and Saturdays in October.

Thursday, September 3, 6 to 11 p.m.
"Movies With a View" at Brooklyn Bridge Park, Brooklyn (FREE) P, T Music at sundown, short film, featured film. AAA members will man scopes.

Thursday, September 10, 6:30-8:30 p. m.
Recent Advances in Astronomy Seminar, M, HQ
Dinner at 5:30 at Gee Whiz Diner, Warren and Greenwich street s. Next date: October 18.

Friday, September 11, 8-10 p. m.
Observing at Floyd Bennett Field, Brooklyn, P, T, C
Next date: October 9.

Saturday, September 12, dusk to wee hours
Stargazing at North-South Lake, Haines Falls, N. Y., M, T
This date added due to rainfalls. Contact Rich Rosenberg at president@aaa.org. Next date: September 19.

Monday, September 14, 7:30 p. m.
Hayden Planetarium lecture, P, AMNH
Dr. Robert M. Zubrin, Pioneer Astronautics will discuss a plan to send astronauts to Mars within 10 years.

Wednesday, September 16, 8:30-10:30 p. m.
Observing at the Cloisters, Manhattan, P, T, C
Next date: October 21.

Saturday, September 19, dusk
Observing at Great Kills Gateway National Park, Staten Island, P, T, C Next date: October 24.

Tuesday, September 22, dusk to 1 0 p. m.
Observing at Cadman Plaza, Brooklyn, P, T, C
Next date: October 20.

Wednesday, September 23, 8-11 p. m.
Observing at Prospect Park, Brooklyn, P, T, C
Next date: October 7.

Friday, September 25, dusk to 10 p. m.
Observing at Carl Schurz Park, Manhattan, P, T, C
Next date: October 23.

Saturday, September 26, 10 a. m. to noon
Solar Observing at Central Park, P, T, C
At the Conservatory Waters. Next date: October 31.

Saturday, September 26, 7:30 to 10 p.m.
Urban Starfest, Central Park Sheep Meadow, (FREE) P, T, C The AAA's annual observing session. The public is invited. Rain date: September 27.

Saturday, September 26, noon to 10 p. m.
Custer Institute Astronomy Jubilee, P
Info: www.custerobservatory.org.

Tuesday, September 29
Observers' Group, M, HQ
Dinner at 5:30 at Gee Whiz Diner, Warren and Greenwich streets. Next date: October 27.

(Eclipsed continued from page 6)

have an impressive record of discovery in recent years. Xing Gao and Tao Chen, for example, participated in SOHO comet hunting and the Spacewatch FMO Project in which I'd hunted near-Earth asteroids. Last year they discovered a comet in the night sky, in images from Gao's remotely operated observatory in western China.

At the conference, a young man sat next to me. He's Richard (Rui) Yang, who co-discovered another comet with Gao a few months ago. I met DongHua Chen and Wentao Xu, whom I'd also known from SOHO comet hunting. I met Comet Lulin's co-discoverer, Taiwanese astronomer Chi Sheng Lin, and many other comet enthusiasts from China and around the world.

This string of Chinese discoveries is very recent. It was only in 2002 that DaQing Zhang became the first Chinese amateur to discover a comet, at least in modern times. Much of our knowledge of ancient comets comes from the Chinese, but in recent centuries Chinese astronomy was outstripped by Western achievements. I will discuss the past, present and future of astronomy in this rapidly changing country in a talk at the Custer Institute Jamboree, "The Resurgence of Chinese Astronomy," at 3 p.m. September 26 in Southold, Long Island. ■

(Seminar continued from page 4)

The companion LCROSS mission will determine if water exists inside a permanently shadowed crater at the Moon's South Pole. Water is necessary not only for human hydration but can be split into hydrogen for rocket fuel and oxygen for breathing, mixed with moon dust into concrete for shelter building and is an excellent shield against radiation.

LCROSS' goal is to get possible lunar ice to the surface. The Centaur upper stage of the rocket will be an impactor, excavating a big crater. LCROSS also carries cameras, spectrometers to spot organics, hydrocarbons and byproducts of water ice, and a photometer to analyze the debris plume for possible water vapor, ice, hydrocarbons and hydrogen. Also on board are infrared cameras to record images of hydrated minerals, water ice and water vapor.

We continually track progress of the Mars Reconnaissance Orbiter, NASA's new Constellation Program, Cassini and the Mars rovers along with the many other cosmological events. Through the plethora of missions and discoveries, our universe, while physically expanding is becoming much more intimate for us all. If this excites you, join us at our monthly seminars. Check the events page in *Eyepiece* each month for specific details.■

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

Reminder: Starfest Is September 26!

Forwarding and Address Correction Requested

First Class