

OBSERVER



A HOLIDAY TWO-FER

This year's winter solstice dished up a special treat—a total lunar eclipse! Millions of folks throughout the U.S. watched this auspicious celestial event. This spectacular mosaic shows three phases of the December 21, 2010 eclipse taken from Longmont, CO. Longmont Astronomical Society member Brian Kimball graciously allowed the use of this image in this month's *Observer*. The images were taken with a Canon T2i DSLR on a 10-inch Ritchey at f/6. Exposures range from 1/60 of a second to 10 seconds and were processed and assembled in Photoshop®.

Image © Brian Kimball

Calendar

4.....	New moon
12.....	First quarter moon
19.....	Full moon
26.....	Last quarter moon

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JANUARY SKIES *by Dennis Cochran*

You can see one-third of the solar system if you're awake in the wee hours of the morning. Three planets form a line slanting 45-degrees up from the southeast horizon, with Mercury close to the ground, followed by unmistakable Venus, then Saturn up past Virgo's big star, Spica. Right below Venus are the top three stars of Scorpius, and below that, red Antares, almost level with Mercury. One has to have a clear sky to the southeast to see these celestial wonders. Atmospheric dust, brightened by the ascending sun, might wash them out as it washed out the last rising M-objects I was trying to find once in a Messier Marathon—and I'm still mad!

By prime-time Jupiter is near or past the meridian. Early in January Uranus is very close to Jupiter, a moon's-width north of it, so evening is a great time to look for the greenish planet if you've never seen it. I'm

curious to know if anyone in the club has been able to see any of the moons of Uranus; if you have, let me know. The moons are scattered all around Uranus rather than lined up like Jupiter's satellites, since the Uranus system is tilted end-on to the plane of the solar system. The second edition of the *Peterson Guide to the Stars and Planets* has a photo of the five moons on page 382, taken at Cerro Tololo, Chile. They can be remembered with the mnemonic "M-AUTO" for Miranda, Ariel, Umbriel, Titania and Oberon—characters from a Shakespeare play.

With Taurus visible high in the eastern sky this month, just below the ecliptic and likewise below the dim winter Milky Way, one can look for M1, the Crab Nebula. The Crab is an exploded star, the one that the Chinese saw and recorded in 1054 A.D., and is not the easiest object to observe. Find the "V" of Taurus, fea-

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PRESIDENT'S CORNER

by Ron Pearson

January, 2011, and we've completed another circuit around the sun. I was out yesterday morning between 2 and 4 A.M. watching the Geminid Meteor Shower, and the spring constellation of Leo was high in the sky. It's not even the Winter Solstice yet as I write this, and we amateur astronomers can already be looking into Spring! If you learn anything as a new amateur astronomer, it's that you get a new "do-over" every year to observe those objects you missed last year, or several years ago when you were busy with work, school or kids. Because our universe, as seen from this pale blue dot, is very cyclical, "what goes around, comes around" as the saying goes. Many of the civilizations and cultures on this planet recognize the cyclical nature of the sky and stars, and it's reflected in their religions, from the Wheel of Karma of Hinduism to the Mayan calendar, which, by the way, does not end next year, but begins another cycle. Many

American Indian cultures have the concept of the "hoop of the world," the great circles or hoops that define our being.

We westerners seem to be more linear in our thinking and seem to have lost touch with the sky and the cycles. We have "the arrow of time," always progressing in one direction from left to right, always from a beginning point, whatever that is, to an end point, whatever that is. But if you've just started out in this hobby or avocation of astronomy, you will find yourself back in touch with the cycle of the sky, and the "cosmic wheel." There are winter constellations, spring

constellations, summer and fall. These are bound by our early evening hours when most of us are still awake, but if you stay out late into the morning hours, you get a sneak peek at the coming seasons and all the special stars, galaxies and nebulae that these have to offer to a persistent observer. So if you are just starting out in observing the sky there is no rush to see it all in one year, or even the first six months. If it's cloudy or you can't make it to a star party for the one night of the Messier marathon (we actually get two this year!), hey, the M-objects aren't going anywhere that we can perceive of, and you can catch them another night or even in another year or two. As an amateur or professional, you get many do-overs in astronomy.

Given all that cyclical wheely stuff, there are other things going on up in the sky that don't happen every year, or come only once in a life-time. Many cultures have the cyclical universe concepts down, but the Native Americans and others also have the concept of "the tricksters," usually known as the coyotes, which come in and shake up the routine of our cyclical worlds. In astronomy, most of these have to do with the "shallow-sky" objects, the stuff not going around in our solar system in neat circles, like comets, asteroids and the planets. Of course there are coyotes out in deep space too, the very-occasional nova or supernova in our own or another galaxy, odd-variable stars or nebulae. Every year it seems we have new and unusual objects to observe. A new "great comet" can appear at almost any time, but unusual fainter comets like comet Holmes, which "exploded" into view from the asteroid belt a couple of years ago, grew to naked-eye brightness overnight. Asteroids and other space rocks come

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DAS SCHEDULE

JANUARY

- Dec. 31-Jan. 1 EGK Dark Sky weekend
- 8 Open House at Chamberlin (Begins at 5:30 P.M.) "How to Use Your Telescope" talk at 7:00 P.M.
- 14 General Membership meeting at D.U.'s Olin Hall (Begins at 7:30 P.M.) Officer and E-board nominations, and Dr. Steve Lee (DMNS) with the latest Mars images.
- 21 E-Board Meeting at Chamberlin (Begins at 7:30 P.M.)

FEBRUARY

- 4-5 EGK Dark Sky weekend
- 12 Open House at Chamberlin (Begins at 5:30 P.M.)
- 18 General Membership meeting at D.U.'s Olin Hall (Begins at 7:30 P.M.) Election of officers.
- 25 E-Board Meeting at Chamberlin (Begins at 7:30 P.M.)

Public nights are held at Chamberlin Observatory every Tuesday and Thursday evenings beginning at the following times:
 March 9 - April 14 at 8:00 p.m.
 April 15 - September 1 at 8:30 p.m.
 September 2 - March 8 at 7:00 p.m.

Costs to non-members are: \$3.00 adults, \$2.00 children.
 Please make reservations via our website (www.denverastro.org) or call (303) 871-5172.

Society Directory

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- | | |
|----------------------------------|-----------------|
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The Executive Board conducts the business of the DAS at 7:30 p.m. at Chamberlin Observatory. Please see the Schedule of Events for meeting dates. All members are welcome.

www.denverastro.org

JANUARY SKIES (CONTINUED FROM PAGE 1)

turing bright Aldebaran, a foreground star to the Hyades cluster which make up the rest of the “V.” Check out the 140 light-years distant Hyades stars bunched up east of Aldebaran, then follow the bottom horn of the bull out of the “V” to the left, (east), to the ζ (zeta) star of Taurus located immediately south of the end of five-sided Auriga. The Crab is just on the north side of that star.

Back to Aldebaran, northeast of the big red star is a smaller cluster, NGC 1647, about a moon’s width in size. Then, off to the northwest are the very obvious Pleiades, M45. Now back to M1, where you might want to wander up, north, into Auriga to sample its wonders. First go up to the southern star of Auriga’s pentagon, which is technically the β (beta) star of Taurus since it is the star that the northern horn of the Taurus “V” points to, although visually it belongs to Auriga. South of that and east of β (beta) Tauri, the M36 and M38 star clusters are nestled next to IC 417, a gaseous nebula that you probably won’t be able to see, just west of the clusters, while farther west is the oft-imaged Flaming Star Nebula, IC 405. M36 is the easternmost of the two clusters, and farther east and a bit down from it is M37, yet another cluster lying just outside the pentagon shape of Auriga. South of M37 and east of β (beta) Tauri is what looks like a semi-circular supernova remnant labeled S147 on Peterson Chart #11, but not discussed by authors Menzel and Pasachoff. Finally, remember that the winter Milky Way just above Taurus is the outer curl of our spiral galaxy as seen from the inside. Can you see it through the light pollution?

What you might try finding just for the heck of it is the Pentagon of Cetus, that large hard-to-see sea monster. Usually shown as a sort of whale, Cetus

figures into the Perseus/ Andromeda story as the bad guy. I don’t know which part of him forms that ‘pentagon’, but there it is, west of Taurus. From the point of the “V” of Taurus, follow some dim stars west, down the bull’s back, to get to the pentagon of Cetus, which includes its orange Alpha star. The rest of the sea monster runs kind of southwest from there, past variable Mira, to a big misshapen six-sided figure (on the *S&T* chart, but not the Peterson) that includes its Beta star. Back at the pentagon, the first star southwest of it is δ (delta) Ceti and just to its left is the spiral galaxy M77. At magnitude 10.5 the galaxy is not an easy object in small scopes. Down at the eastern end of the six-sided monster body, the Tau star of Cetus, on the *S&T* map the star closest to Fornax, is the nearest sun-like star to our solar system. More than likely it has its own planets with their own environments and life forms, with green and blue men struggling for power over nature and each other, as on our world.

Back on Earth, the Quadrantid Meteor Shower peaks the night of the 3rd and morning of the 4th at the dark of the new moon. This shower has no associated modern constellation but was named after one invented by J.E. Bode in 1801 called Quadrans Muralis in what is now northern Boötes. Nor is there any identified comet to blame for the debris of the shower.

Meetings: The Open House at Chamberlin Observatory is Saturday the 8th. According to Joe’s schedule there’ll be a talk at 6 P.M. on “How to Use a Telescope,” although this may actually be an activity out on the back lawn at the east end of the telescope field. Folks can bring their new scopes to that location if they need help setting them up or using

them. Non-members are, of course, free to set up their scopes at any of these Open Houses. Then at 7 P.M. we have Jupiter and Uranus, and again, this sounds more like an activity than a talk, but you can always ask. This planet pair will be up in the southwest by sundown. Then on the following Friday, the 14th, we will have our General Meeting in the University of Denver’s Olin Hall on Iliff Avenue at 7:30 P.M. The Friday after that the E-Board meets back at Chamberlin at 7:30 P.M. The fun never ends!



A Geminid Meteor strikes near Orion the Hunter, who is hiding behind the tree during the Geminid Meteor shower on December 14, 2010. Ron Pearson imaged this from his Cosmic Rock Observatory, Evergreen, CO.

PRESIDENT’S CORNER (CONTINUED FROM PAGE 2)

whizzing by our Earth. Big meteors come burning across our sky and may drop a few meteorites.

Saturn’s rings go through a long cycle of opening up and closing that we are always fascinated by and which you don’t want to miss. The great planet Jupiter underwent a major change last year, as amateurs spotted the disappearance of one of its major cloud bands. Now amateurs around the world are imaging and observing the reappearance of this cloud belt in great detail, far more than has ever been witnessed and recorded before. All are using relatively simple equipment: small telescopes and a webcam or more specialized video cams with high frame rates and free software for processing.

Impacts on Jupiter have recently been documented by amateurs and changing storms on Saturn have been frequently seen. Lunar and solar eclipses are cyclical, but are rare enough events over any one area that many people go to great distances to observe them. You don’t want to miss one if it happens over your backyard. Hopefully you caught our lunar eclipse in December of 2010 and not a snow storm.

All this is to say, Happy New Astronomy Year, and may you get out under clear skies and observe as much as possible, and continue to share our love of the cyclical but ever-changing night sky as part of the Denver Astronomical Society.

ABOUT THE DAS

Membership in the Denver Astronomical Society is open to anyone wishing to join. The DAS provides trained volunteers who host educational and public outreach events at the **University of Denver’s Historic Chamberlin Observatory**, which the DAS helped place on the National Register of Historic Places. First light at Chamberlin in 1894 was a public

night of viewing, a tradition the DAS has helped maintain since its founding in 1952.

The DAS is a long-time member in good standing of the **Astronomical League** and the **International Dark Sky Association**. The DAS’ mission is to provide its members a forum for increasing and sharing their knowledge of astronomy, to promote astronomical education to the public, and to preserve Historic Chamberlin Observatory and its telescope in cooperation with the University of Denver.

The DAS is 501 (c)(3) tax-exempt corporation and has established three tax-deductible funds: the Van Nattan-Hansen Scholarship Fund, the DAS-General Fund and the Edmund G. Kline Dark Site Fund. To contribute, please see the bottom of the membership form for details (found on the DAS website: thedas.org).

More information about the DAS, its activities and the special tax-deductible funds is available on the DAS website at www.denverastro.org.



WATCHING OUT FOR THE SKIES THAT WATCH OVER US

by Carla Johns

Few of us can devote as much time to observing as we'd like to, but when we're able to seize the opportunity, preparations shift into hyper-drive to maximize our time under the sky.

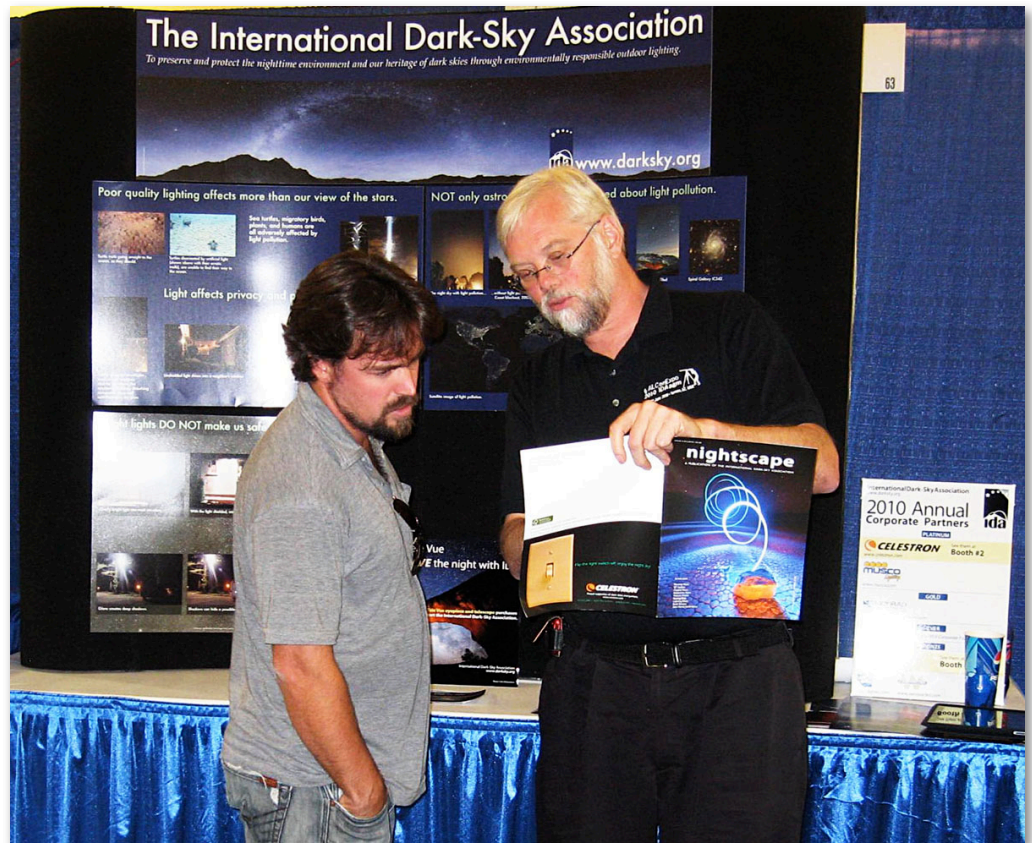
Planning a successful observing session requires more thought and exactitude than our supportive significant others and families might imagine. Once all the filters, eyepieces, flashlights, cords, tripods, telescopes, charts and warm clothes have been collected from various closets and hidey holes, one decision remains: deciding on a location. Where once it was possible to set up a telescope in the backyard or travel down a country road a few miles for a good night's observing, we seem to be driving farther and farther to find that idyllic sky. I've added a thousand miles to my odometer over the course of a weekend seeking such a prize.

Frankly, unless you're observing the Moon, the quality of your equipment, astuteness as an observer or your supernatural ability to screw on a light pollution filter devoid of a smudgy fingerprint won't prevent your starship from plummeting back to Earth if observing under a bubble of light pollution. Novices recently smitten by the hobby must find it agonizing to search in vain for celestial objects reported to be easy targets. Many other forms of pollution have been mitigated, and in a few cases nearly eliminated, but are there any solutions on the horizon for reducing light pollution?

The International Dark-Sky Association (IDA) has been at the forefront of this issue since 1988. The organization has grown by leaps and bounds over the years and now maintains offices in Tucson, Arizona and Washington D.C., as well as international offices supporting Europe and Asia/The Pacific. Currently, the membership includes over eleven thousand concerned individuals whose goal is to preserve dark skies for astronomical observatories, ecological habitats, migratory species and human physical and psychological health. Are you a member of IDA?

The IDA reaches out to kids, teachers, amateur astronomers, scientists, homebuyers, city planners and business owners to educate and inform them about the benefits of shielded and directed lighting fixtures. This simple solution produces energy savings and reduced glare, not to mention the preservation of dark skies.

Recently I spoke with the Executive Director of the IDA, Bob Parks, at the Pasadena Astronomy and Telescope Show (PATS). Bob cares deeply about preserving dark skies for astronomers, but he's also concerned about the health-related problems associated with light pollution and glare. Humans and animals alike depend on a



Bob Parks (right), Executive Director of IDA, explains the mission of the organization to Stephen Everist. September 2010, PATS.

Photo by Carla Johns

regular cycle of daytime and nighttime to regulate the immune system and other physiological functions. As our circadian rhythms fall out of balance due to the perpetually lighted modern world, our immune systems are severely impacted. Recent studies have shown a relationship between higher rates of breast and prostate cancer in health care providers and nurses who work night shifts where they spend little time in the dark. Lack of darkness inhibits the body's ability to produce melatonin, which is a naturally occurring hormone responsible for multiple systemic functions. Links to these studies can be found on the IDA website at <http://www.darksky.org>.

As we age, it's inevitable that our night vision will deteriorate to some degree, but glare affects all of us. Poor lighting designs are often the culprit. Excessive amounts of glare can actually cause physical discomfort and the scattering of light in our eyes makes focusing very difficult, especially as we grow older. Not only are inadequate lighting designs wasting large amounts of energy and money, but they're a safety hazard as well.

As you can imagine, light pollution also has a dire impact on the ability of nocturnal species to find food and reproduce, and on the capacity of migratory species to follow their instinctual patterns and routes. Many cities in the United States and Canada are participating in a "Lights Out" campaign during seasonal bird migrations to save money and limit the amount of fatal bird collisions with brightly lit buildings. Birds, amphibians, bats, turtles, fish, insects, coyotes and many more animals are negatively impacted by the light glow from our cities. Light pollution has drastically diminished the wonder that previous generations were able to experience simply by gazing upon the night sky. Through my work at Griffith Observatory, I've met countless people of all ages who have never seen the Milky Way. Although most have a general awareness of the planets, stars and constellations, any discussion of our own galaxy often produces puzzled looks. I think most of them assume I simply have an obsession with candy bars that, while true, misses the point. Once I describe the complexity of our galaxy, its structure, mass, vastness and sheer

exquisiteness, the question follows as to how they can observe such a magnificent sight.

Isn't it our birthright to be able to gaze upon the Milky Way from most places on Earth? It's often said that the only two things we can count on are death and taxes. I suggest an addition to that old saw. How about the certainty of viewing the Milky Way from moderately populated cities and rural communities across the globe? By curbing light pollution it's possible to make that short list, happily, a bit longer.

Dave Crawford, one of the founding members of the IDA, also attended PATS and delivered a compelling presentation about the ways those of us who care deeply about dark skies can have a dramatic impact on light pollution. Although the population of Tucson, Arizona and the surrounding metropolitan areas currently exceeds over one million residents, the light pollution hasn't increased over the decades despite the growth. The answer to how this is possible provides a roadmap for those of us interested in affecting our communities in the same way.

Dave is a retired professional research astronomer and has always prided himself on being an amateur astronomer as well—one who loves

the night for the sake of it. Dave and other IDA members became involved with their local government and business associations and spoke with anyone who would listen about the causes and effects of light pollution. They successfully preserved their night sky, one of their finest natural resources in the arid land surrounding Kitt Peak Observatory. Dave encouraged all of us to connect with our communities and be committed and persistent while speaking out politely, but firmly.

It will take time and a great deal of effort before our skies darken, but we can make a difference tonight by turning off unnecessary outdoor lights, shielding essential lights, utilizing timers and dimmers and increasing awareness about this critical issue with others at star parties or whenever the opportunity arises. Please consider becoming a member of the IDA or purchasing a gift membership for the astronomer who has everything.

The sky has been our calendar, clock and compass for all of human history - until now. We can preserve our traditions, our stories, our fellow species, our hobby, scientific research and education as well saving energy and money along the



Dave Crawford, founding member of IDA, receives the Holmes Award from Steve Edberg. September 2010, PATS.

Photo by Carla Johns

way. Start safeguarding our sky tonight. We can do it, a single star at a time.



Jack Eastman's 1877 Alvan Clark refractor (photo left) was set up by the campfire at "The Fort" restaurant in Morrison for the Tesoro Foundation's November 14, "The Night the Stars Fell." The event commemorates the Great Leonid Meteor Storm of 1833, which was witnessed all across the U.S. and seen by western pioneers, traders and American Indians from Bent's Fort on the Santa Fe Trail. The Fort restaurant was built as a replica of the original Bent's Fort, now a National Historic Park. The DAS has participated in this annual event for about 10 years. This year Jack Eastman, Dan Wray, Neil Pearson, David Shouldice had telescopes set up for the participants to view the sky. Also present at the event was the great-grandson of Kit Carson. Ron Pearson gave a presentation about the Leonid meteor shower and current pioneering explorations of comets and asteroids.

TOTALITY

An beautiful shot of the total lunar eclipse at totality (photo right), taken at prime focus on a 12.5-inch f/6 Newtonian with a Canon 400D camera.

Photo © Ron Pearson



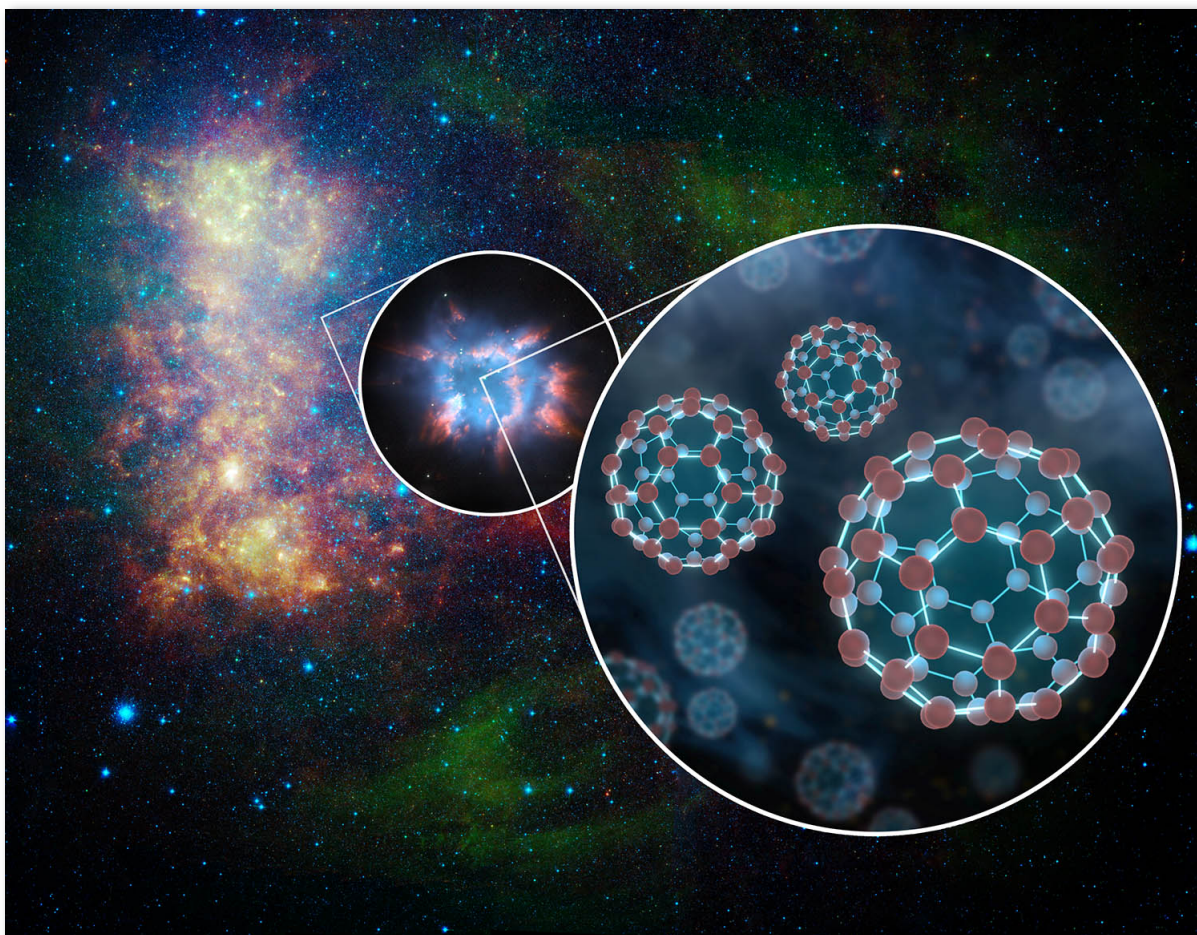
Lunar Eclipse
12.21.2010

Cosmic Rock Observatory

NASA'S SPACE PLACE

ASTRONOMERS STUMBLE ONTO HUGE SPACE MOLECULES

A Space Place Partner Article
by Trudy E. Bell and Dr. Tony Phillips



BUCKYBALLS!

Superimposed on a Spitzer infrared photo of the Small Magellanic Cloud is an artist's illustration depicting a magnified view of a planetary nebula and an even further magnified view of buckyballs, which consist of 60 carbon atoms arranged like soccer balls.

Courtesy NASA/JPL

with its spectroscopy instrument. When he studied the spectrum (infrared signature) of a dim planetary nebula called Tc 1 in the southern-hemisphere constellation of Ara, he noticed several clear peaks he had not seen before in the spectra of other planetary nebulae.

"When he came to me," recounted Cami, an astrophysicist who specializes in molecular chemistry, "I immediately and intuitively knew it I was looking at buckyballs in space. I've never been that excited!" The authors confirmed his hunch by carefully comparing the Tc 1 spectrum to laboratory experiments described in the

Deep in interstellar space, in the swirling gaseous envelope of a planetary nebula, hosts of carbon atoms have joined together to form large three-dimensional molecules of a special type previously seen only on Earth. Astronomers discovered them almost accidentally using NASA's Spitzer Space Telescope.

"They are the largest molecules known in space," declared Jan Cami of the University of Western Ontario, lead author of a paper with three colleagues published in *Science* online on July 22, 2010, and in print on September 3.

Not only are the molecules big: they are of a special class of carbon molecules known as "fullerenes" because their structure resembles the geodesic domes popularized by architect Buckminster Fuller. Spitzer found evidence of two types of fullerenes. The smaller type, nicknamed the "buckyball," is chemical formula C₆₀, made of 60 carbon atoms joined in a series of hexagons and pentagons to form a spherical

closed cage exactly like a black-and-white soccer ball. Spitzer also found a larger fullerene, chemical formula C₇₀, consisting of 70 carbon atoms in an elongated closed cage more resembling an oval rugby ball.

Neither type of fullerene is rigid; instead, their carbon atoms vibrate in and out, rather like the surface of a large soap bubble changes shape as it floats through the air. "Those vibrations correspond to wavelengths of infrared light emitted or absorbed—and that infrared emission is what Spitzer recorded," Cami explained.

Although fullerenes have been sought in space for the last 25 years, ever since they were first identified in the laboratory, the astronomers practically stumbled into the discovery. Co-author Jeronimo Bernard-Salas of Cornell University, an expert in gas and dust in planetary nebulae, was doing routine research with Spitzer's infrared observations of planetary nebulae

literature.

"This discovery shows that it is possible—even easy—for complex carbonaceous molecules to form spontaneously in space," Cami said. "Now that we know fullerenes are out there, we can figure out their roles in the physics and chemistry of deep space. Who knows what other complex chemical compounds exist—maybe even some relevant to the formation of life in the universe!"

Stay tuned!

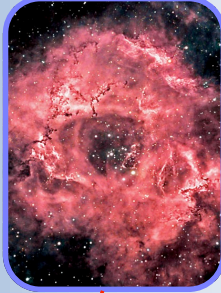
Learn more about this discovery at <http://www.spitzer.caltech.edu>. For kids, there are lots of beautiful Spitzer images to match up in the Spitzer Concentration game at <http://spaceplace.nasa.gov/en/kids/spitzer/concentration>.

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

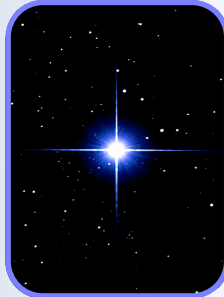
NEW ASTRONOMER'S DEN

January, 2011

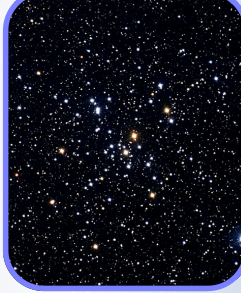
In The Striking Realm Where Dog, Hare and Unicorn Reside



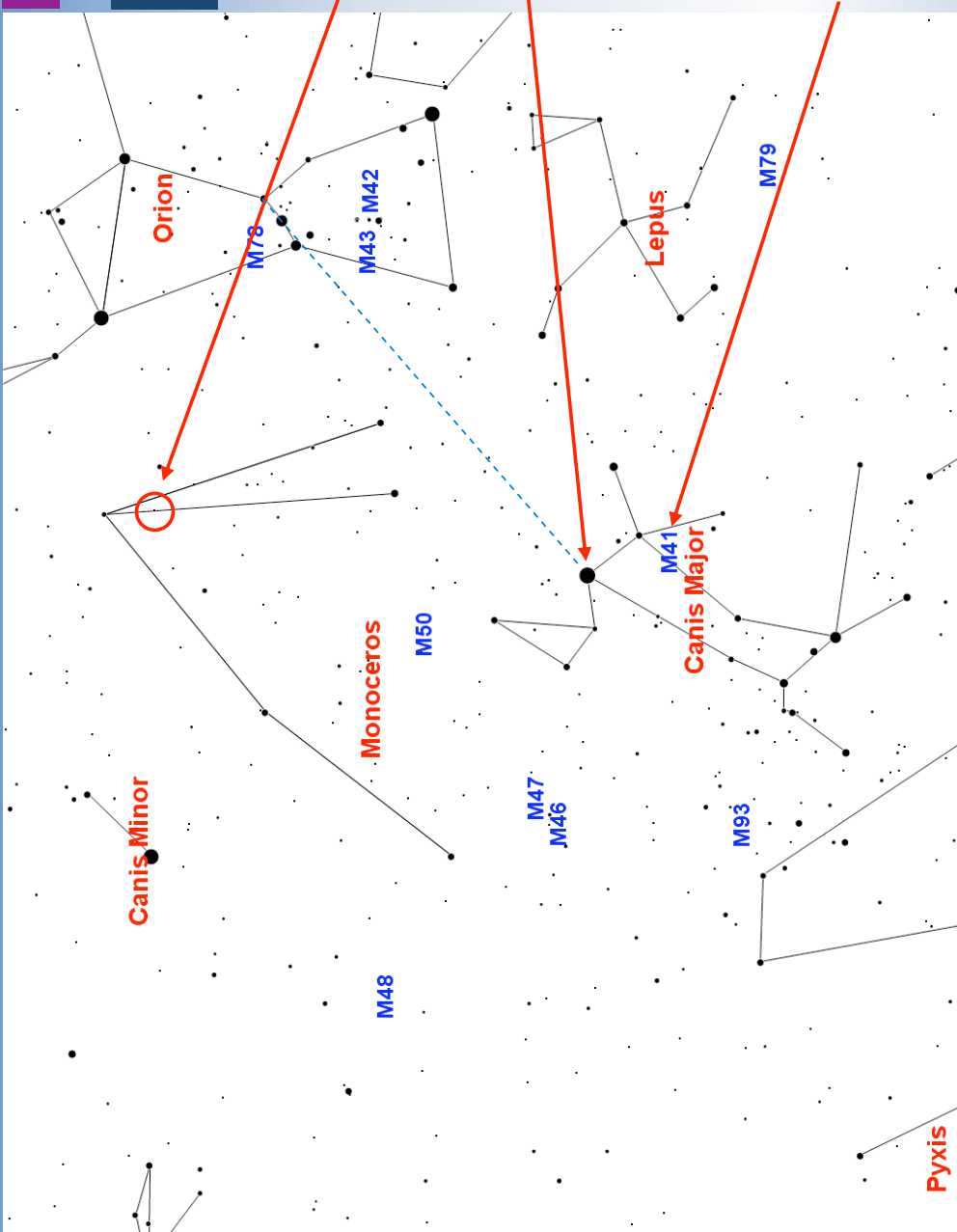
Massive HII regions abound in the Milky Way in all manner of shapes and patterns. Named for one of Earth's most beautiful flora, the Rosette Nebula, with its embedded smoky-dark Bok globules, spans 130 light years.



Sapphire-blue and visually stunning, the brightest gem in the night heavens adorns the collar of Orion's larger hunting dog. A binary star system, Sirius A and B are two of Earth's close neighbors, 8.6 light years distant.



Loosely-bound open clusters have a luster all their own, none more so than NGC 2287, M41 in Canis Major. This 26 light year-wide grouping of 100 stars shines as diamond dust from 2,300 light years away.



Southeastern sky — 9 p.m.

Search the entire celestial dome of the night, and you will be hard-pressed to find two more recognizable patterns than **Orion** the Hunter and **Canis Major**, the Greater Dog. The Hunter's three belt stars align you to brilliant Sirius, a blazing blue spark at magnitude -1.46. This region is rife with Messier clusters and nebulae, but a rose by any other name does not guarantee admission to the famous Monsieur M's catalogue. The hydrogen-rich Rosette Nebula, energized by open star cluster NGC 2244, resides in single-horned Monoceros, yet is not graced with a Messier number. Perhaps the comet hunter was too mesmerized by other wonders in the region.



denverastro.org

S&S OPTIKA
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star chart courtesy
TheSky6 astronomy software suite.
© 2011 Software Bisque



ECLIPSED

This image of the winter solstice total lunar eclipse was taken at 1:15 A.M. on December 21, 2010 in Denver. Joe used an Olympus E-500 DSLR on a 10-inch f/4.5 Newtonian. Exposure time: 1.3 seconds.

Image © Joe Gafford



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