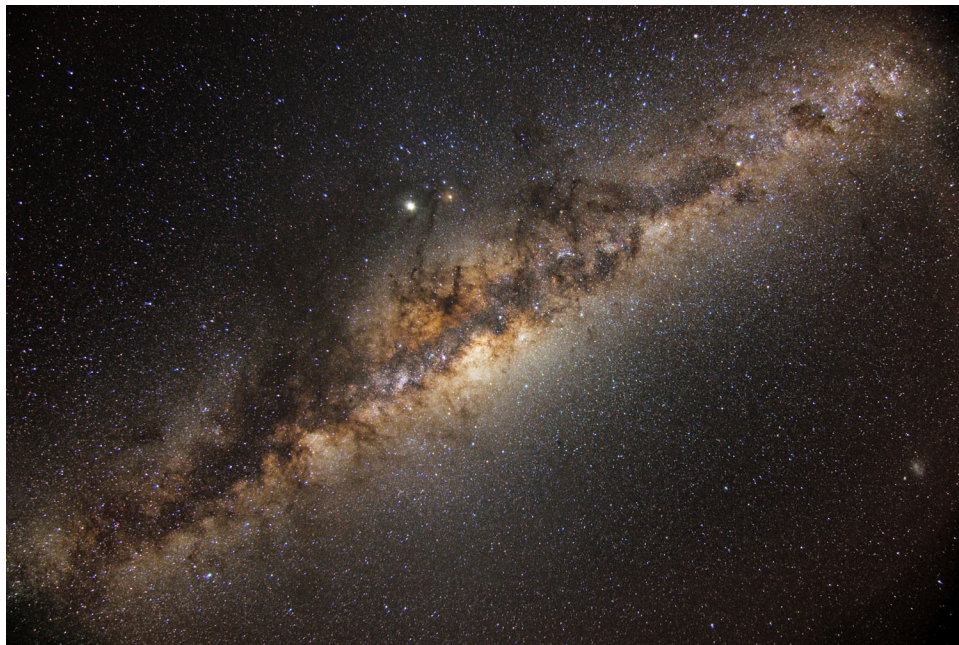


Newsletter of the Baton Rouge Astronomical Society



August, 2015

Next Meeting: Monday, August 10th at HRPO



Now is the perfect time to get out to a dark sky and the heart of our own galaxy!
Image from Extremetech.com

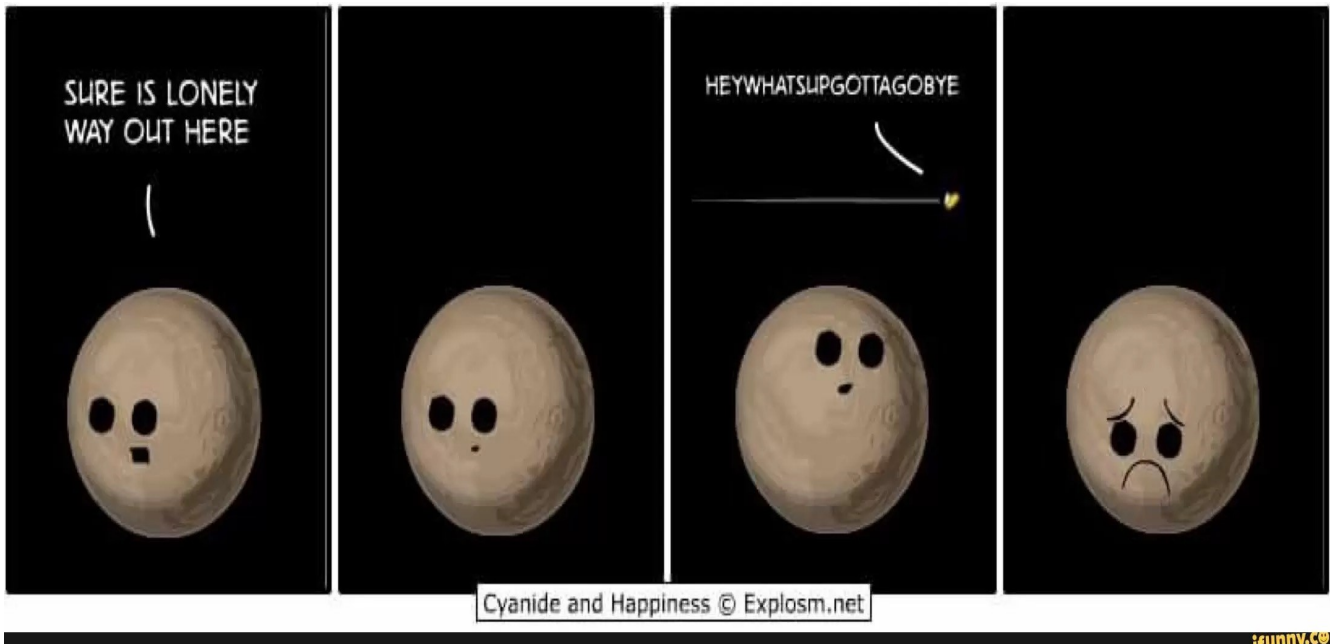
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President's Message

Pretty exciting stuff about Pluto, right? We found some unexpected features and formations that will keep us busy analyzing for years to come. One surprising discovery is its color. It is much redder than expected. It almost looks like a twin of Mars. The satellites are interesting too. Odd shaped Hydra, for example, or pinkish Nix.

The biggest astronomical highlight for August is the ever-reliable Perseid Meteor Shower. I say reliable because, while they have had some years with lower counts than usual, the shower has never really had a dud year. Meteor counts during the Perseids are usually between 50 – 100 meteors per hour. The Perseids will peak the night of August 12-13. However, the Perseids have a broad gradual peak, so you may be able to see quite a few meteors a couple of days before and after the peak, but especially before the peak date. The best time to view will be after Midnight toward dawn. The Moon will only be a thin waning crescent, rising just before dawn the morning of the 13th. That means if the skies are clear, they will be dark. The Perseid meteors tend to be quick, so stay alert. We have some nice conjunctions again in August. Uranus will be 1 degree north of the Moon on the 5th. This will be a good time to find Uranus because the Moon will make a good reference point to star hop to the planet. Mercury and Jupiter are about ½ degree apart on the evening of the 6th. Jupiter and the “Heart of the Lion”, red giant Regulus will approach just less than ½ a degree of each other on the 10th. Lastly, BRAS has acquired a very nice 10” Orion SkyQuest Dobsonian Intelliscope for our next raffle item. Tickets sales will begin at the next meeting.

As always, if you have a topic you would like to present for a future BRAS meeting activity, let me know.

Clear skies,
Merrill Hess

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<http://www.imycomic.com>

#581 - 'ROBOTS'



AGORA: Seeing the Invisible Elephant

You know the familiar fable about the blind men trying to discern the nature of an elephant simply from feeling the animal with their hands: one at the side of the elephant thought it was like a wall, one at the trunk thought it was like a snake, and one at the tail thought it was like a rope. Each accurately perceived the elephant in part, but their tactile observations were inconsistent with one another.

Astronomers are much in the same position in trying to discern the nature of the Universe. Most of the gravitating mass in the cosmos is cold dark matter—a slowly moving, weakly interacting elementary particle that holds together both individual galaxies such as our own Milky Way as well as entire clusters of hundreds of galaxies. But humans are blind to it: dark matter does not emit light or other electromagnetic radiation.

Thus, astrophysicists must rely on two tools to discern dark matter's nature: 1) observations of visible ordinary matter (which scientists call baryonic matter) that reveal dark matter's effects, and 2) supercomputer simulations to “reverse engineer” and test ideas of how dark matter might interact with ordinary matter to form galaxies.

Just one big problem: like the blind men studying only parts of the elephant but whose observational results are not consistent for the entire animal, astrophysicists have been able to model only parts of the universe because of limits to computational power. And the computer models have been inconsistent. Yet reproducibility is a fundamental principle of the scientific method: only if a result from an experiment can be independently reproduced by other scientists can it be regarded as robust.

Now, a new ambitious multiyear international project AGORA is figuring out how to reveal the entire elephant—and also discern which of the inconsistencies are due to complexities of astrophysics versus computational issues.

The challenge of scales

One major challenge, for example, has been numerically modeling astrophysical processes over the vast range of size scales in the Universe—all the way from the formation of individual stars to the formation of galaxies to the formation of the cosmic web of large-scale structure in the cosmos. At small scales, computational models can calculate such details as shock waves from supernova explosions, turbulence, and chemical composition of gas and dust with a resolution (ability to discern details) the size of our solar system. At gigantic scales, cosmological simulations trace the evolution of the cosmic web in volumes hundreds of millions of lightyears across. At such scale, even the biggest supercomputers have been limited to handling just gravitational interactions of dark matter, if calculations are to be completed in reasonable time (months) and at affordable cost.

And in the real Universe, both size scales interact: local star formation within individual galaxies is activated or quenched by the way galaxies “breathe” in and out the gaseous intergalactic medium. Often computational simulations do not create realistic-looking galaxies with the right proportion of stars in the central bulge compared with the flat disk or the right amount of clumpiness.

Major international collaboration

Now supercomputers are starting to have the computational power to simulate large regions of the cosmos with sufficient resolution and realism to create galaxies that look like ones actually observed. AGORA—an ancient Greek word for meeting place, and an acronym for Assembling Galaxies of Resolved Anatomy—aims to understand and resolve inconsistencies revealed among simulations.

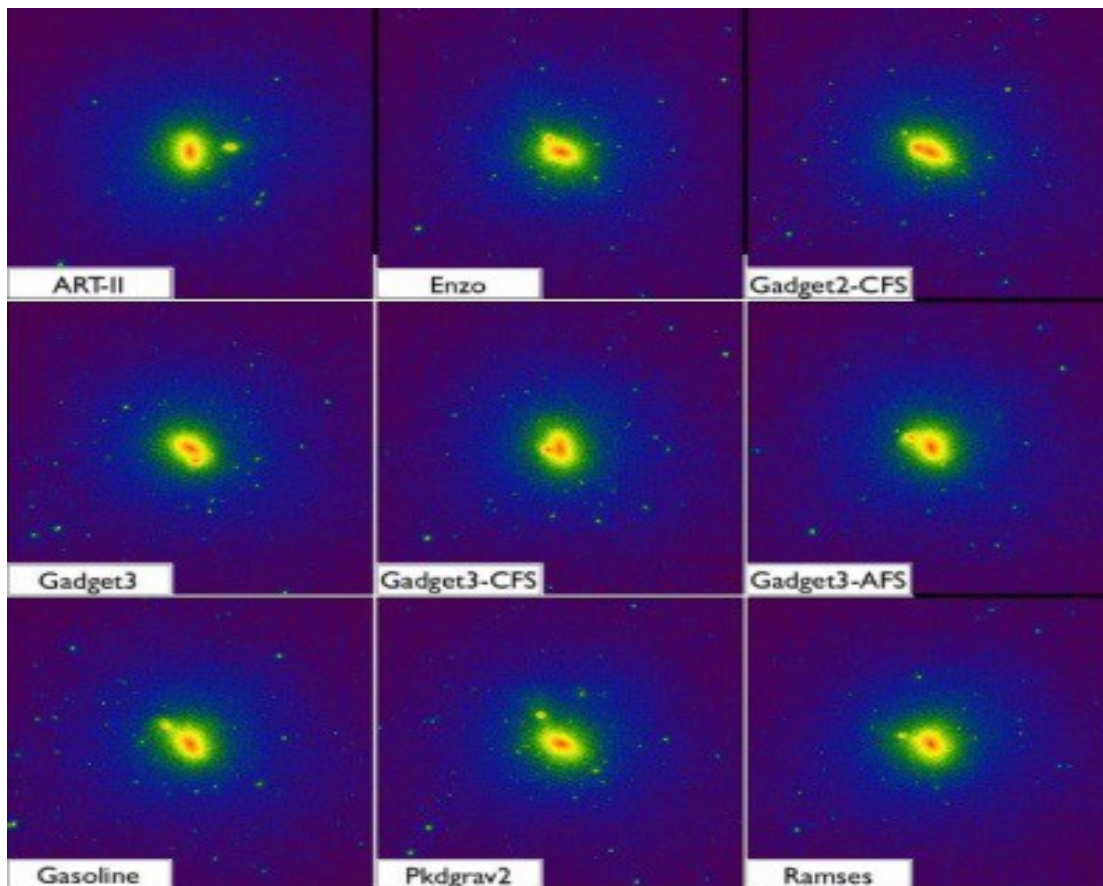
AGORA got its start in a kick-off workshop at the University of California, Santa Cruz, in August 2012, under the sponsorship of the University of California High-Performance AstroComputing Center (UC-HiPACC). A second workshop was held at UCSC in August 2013.

AGORA, a collaboration of more than 90 astrophysicists and computational modelers in over 40 institutions in eight nations, is described in a flagship paper by Ji-hoon Kim and 45 co-authors that has been accepted for publication in *The Astrophysical Journal Supplement*. The collaborators have set up methodology to compare and contrast the results with nine variants of different codes (programs for computer simulations), which numerically handle the physics and the computation in significantly

different ways. Although not the first comparison of supercomputer simulations of galaxy evolution, AGORA is the most comprehensive and the highest-resolution (finest detail). The project is expected to be completed in 2015 and result in many papers. Stay tuned! –*Trudy E. Bell, M.A.*

Further reading: The AGORA website is at <https://sites.google.com/site/santacruzcomparisonproject/>. A UC-HiPACC press release is at <http://hipacc.ucsc.edu/PressRelease/AGORA.html>. A UC Santa Cruz press release at <http://news.ucsc.edu/2013/12/agora-project.html>. The flagship paper preprint “The *AGORA* High-Resolution Galaxy Simulations Comparison Project,” for *Astrophysical Journal Supplement*, is at <http://arxiv.org/abs/1308.2669/>.

The University of California High-Performance AstroComputing Center (UC-HIPACC), based at the University of California, Santa Cruz, is a consortium of nine University of California campuses and three affiliated Department of Energy laboratories (Lawrence Berkeley Lab, Lawrence Livermore Lab, and Los Alamos National Lab). UC-HiPACC fosters collaborations among researchers at the various sites by offering travel and other grants, co-sponsoring conferences, and drawing attention to the world-class resources for computational astronomy within the University of California system. More information appears at <http://hipacc.ucsc.edu>



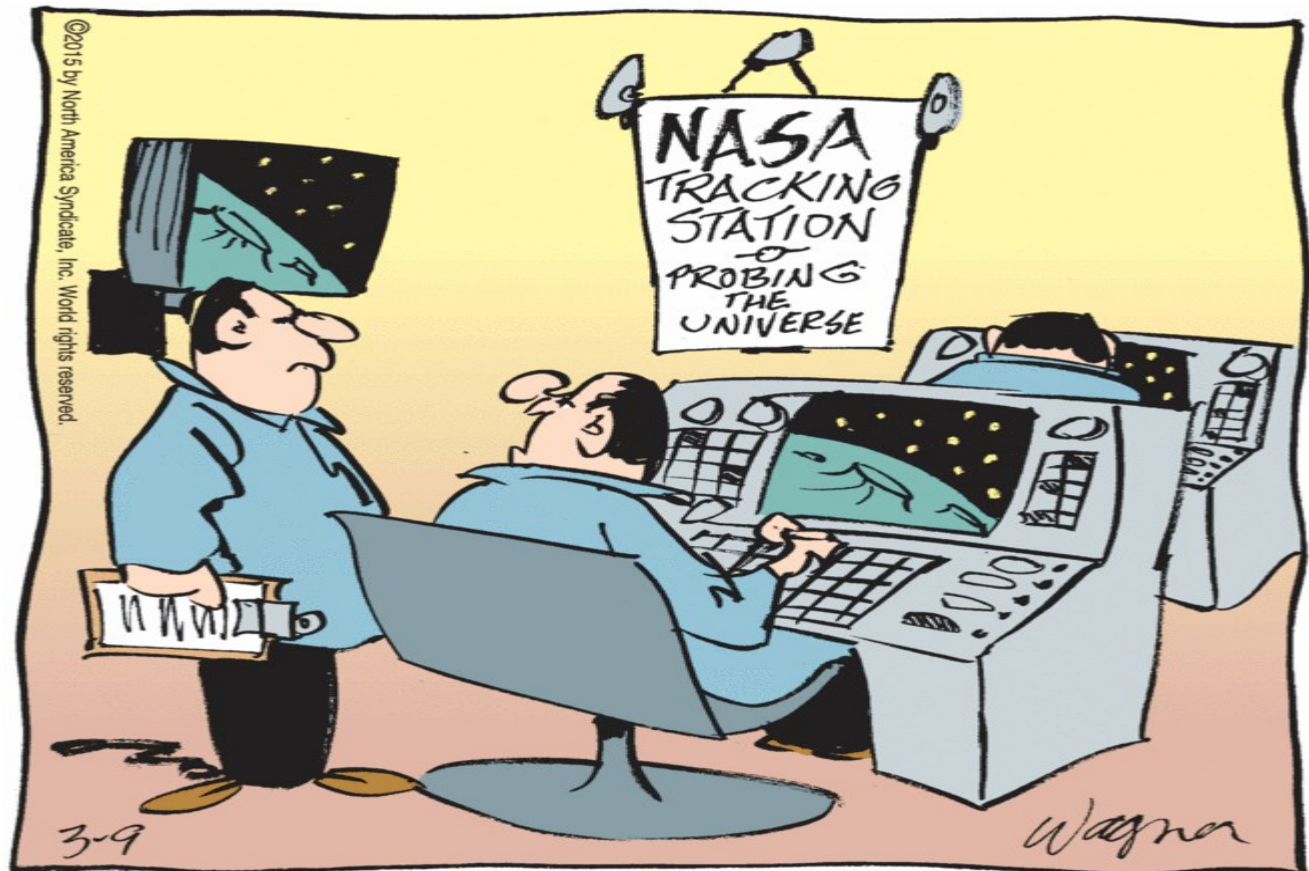
Differences in supercomputer simulations to be compared in the AGORA project are clearly evident in this test galaxy produced by each of nine different versions of participating codes using the same astrophysics and starting with the same initial conditions. The goal of AGORA is to analyze such differences to improve the realism and predictive power of supercomputer simulations, and thus astronomers' understanding of astrophysical processes.

Credit: Simulations performed by Samuel Leitner (ART-II), Ji-hoon Kim (ENZO), Oliver Hahn (GADGET-2-CFS), Keita Todoroki (GADGET-3), Alexander Hobbs (GADGET-3-CFS and GADGET-3-AFS), Sijing Shen (GASOLINE), Michael Kuhlen (PKDGRAV-2), and Romain Teyssier (RAMSES)

Secretary's Summary of July Picnic/Meeting

- This was the annual summer picnic at LIGO. The main event was the lunch itself, featuring jambalaya, sandwiches, and watermelon with side dishes being furnished by other members of the group.
- **Ephraim Craddock** was recognized for receiving the national AL Horkheimer-O'Meara Youth Journalism Award for his essay. This was written from the perspective of the gentleman that discovered Neptune. He read his essay to the group and then passed it around for all to read. This will be published in an upcoming issue of the Reflector.
- LIGO set up a canopy for the volunteers in the group helping out with solar viewing for the public event that began at 1:00 pm. This was appreciated by all who participated as it was a hot afternoon with not much relief in the temperature.
- There was no monthly raffle this month.

Roslyn Readinger
BRAS Secretary



"I keep getting the same message from the deep space probe: 'Are we there yet?'"

Vulpecula – The Little Fox (with a goose in its mouth)

Position: RA 20, Dec. +25

Named Stars:

Anser (Alpha Vul), Lucinda Anseris, Lukida, “The Goose”, mag. 4.44, 19 28 42.41 +24 39 54.6, is a red giant star, and an optical binary star with 8Vul, an orange giant star at mag. 5.81. With a separation of 413.7”, these stars can be split using binoculars.

There are no other named stars in **Vulpecula**.

Deep Sky:

M 27, NGC 6853, “The Dumbbell Nebula”, “The Hourglass Nebula”, “The Apple Core Nebula”, PK60-3.1, mag. 7.3, 19 59.6 +22 43, 8’x4’, is a planetary nebula shaped like a dumbbell or hourglass with a faint outer halo; very bright and very large; central star is at mag. 13.9, and is a cooling white dwarf star that is the largest white dwarf star known. **M 27** is located 3° north of Gamma Sagittae, or 25’ south of 14 Vul. With a large aperture telescope, a soft, bluish-green glow can be seen to surround the ‘dumbbell’; and was the first planetary nebula discovered – by Charles Messier in 1764.

Brocchi’s Cluster, Al Sufi’s Cluster, Collinder 399, The Coathanger (asterism), mag. 3.6, 19 25.4 +20 11, 90’, is a group of stars with magnitudes of 5.2 to 7.2. Recorded as a “little cloud” by the Arabic astronomer al-Sufi more than 600 years before the invention of the telescope. Hipparcos measurements show that this is not a true cluster but a chance alignment of stars at very different distances. This cluster is called “The Coathanger” because of the distinctive star pattern from the 10 brightest stars when observed through binoculars or a low power telescope.

Stock 1, mag. 5.3, 19 35.8 +25 13, 60’, is an open cluster of 40 stars; not well detached from the surrounding star field; moderate range in brightness; mag. of brightest star is 7.0. The cluster is located midway between open clusters NGC 6815 and NGC 6800.

HR 7556, mag. 6.29, 19 49 54.72 +28 26 22.8, is a rotating ellipsoidal variable star.

NGC 6940, Collinder 424, mag. 6.30, 20 34.6 +28 18, 30’, is an open cluster of 60 stars; moderate range in brightness; mag. of brightest star is 9.3; very bright, very large; over 1 billion years old.

HIP 100963, mag. 7.09, 20 28 11.81 +22 07 44.4, is a solar twin.

NGC 6823, Collinder 405, mag. 7.1, 19 43.1 +23 18, 12’, is an open cluster of 30 stars; detached, strong concentration of stars; large range in brightness; mag. of brightest star is 8.8; a slightly elongated cluster. **NGC 6823** is involved in the large (39’x30’) emission nebula **NGC 6820**. **NGC 6823** is surrounded by **NGC 6820**, and the center of **NGC 6823** is believed to be 2 million years old and contains many young blue stars.

HD 190220, mag. 7.31, 20 03 00.77 +28 18 24.7, has one planet in orbit around it.

HD 189733, mag. 7.67, 20 00 43.71 +22 42 39.1, is a binary star. The primary star is believed to be an orange dwarf, and the secondary star is a red dwarf. The stars have an orbital period of about 3000 years. A planet was discovered (2005) orbiting the primary star, and is the first extra-solar planet to be discovered with carbon dioxide in its atmosphere.

NGC 6830, Collinder 406, mag. 7.9, 19 51.0 +23 04, 12’, is an open cluster of 20 stars; detached, weak concentration of stars; moderate range in brightness; mag. of brightest star is 9.9; a large cluster; age is 100 million years; brightest stars are arranged in a distinct “x” shape.

NGC 6882, mag. 8.1, 20 11.7 +26 33, 18’, is an open cluster; detached, weak concentration of stars; moderate brightness range, mag. of brightest star is 9.9; a rather poor cluster, located immediately northwest of open cluster **NGC 6885**.

NGC 6885, Caldwell 37, mag. 8.1, 20 12.0 +26 29, 7’, is an open cluster of 30 stars; detached, no concentration of stars; moderate range in brightness; brightest star is mag. 6 (photo); very bright, very large cluster. Open cluster **NGC 6882** is located immediately to the northwest.

HD 188015, mag. 8.22, 19 52 04.54 +28 06 01.4, has one planet in orbit around it.
NGC 6802, Collinder 400, mag. 8.8, 19 30 35 +20 15 39, 5', is an open cluster of about 50 stars.
BD +23 3912, mag. 8.93, 20 10 48.16 +23 57 54.5, is a halo star.
IC 4954, 4955, 20 04.8 +29 15, 25', is a pair of detached nebulosity separated by about 3.5' and aligned northwest to south east.
NGC 6800, 19 25.1 +25 05, 15', is an open cluster of about 25 stars of magnitude 10, and is located 30' northwest of **Alpha Vul**.
NGC 6813, 19 40.4 +27 18, 3', is a very faint and small nebula located in a very rich star field.
NGC 6815, 19 38.8 +26 41, is a scattered star field, probably not a true cluster.
NGC 6820, 19 43.1 +23 17, 39'x30', is a faint, large, and irregularly shaped nebula with a bright rim and dark clouds; contains open cluster **NGC 6823**.
Sh 2-88, 19 46.0 +25 20, 18'x6', is a bright nebula of irregular shape, with two bright knots southeast of the center – aligned east-northeast to west-southwest and spaced about 2.4' apart.
Sh 2-90, 19 49.3 26 52, 7'x3', is a bright nebula of irregular shape; a nebulosity with an 8.3 mag. star involved.
vdB 126, 19 27.1 +22 43, 7'x5', is a bright nebula with an 8.3 mag. star involved.

Other Stars:

PU Vul, 20 21 13.32 +21 34 18.7, is a nova star.
WR 125, 19 28 15.62 +19 33 21.4, is a Wolf-Rayet star.
PSR B1919+21, 19 21 44.81 +21 53 02.3, was the first pulsar star ever discovered. British Astrophysicist Jocelyn Bell Burnell and her thesis supervisor Anthony Hewish discovered the pulsar in July of 1967, and Hewish shared the Nobel Prize in Physics for the discovery. Astrophysicist Thomas Gold and Astronomer Fred Hoyle eventually identified these signals as a rapidly rotating neutron star that had very strong magnetic fields. This pulsar has a period of 1.3373 seconds and a pulse width of 0.04 seconds.
PSR B1930+22, 19 32 22.86 +22 20 52.1, is a pulsar star.
PSR B1937+21, 19 39 38.56 +21 35 59.1, is the first millisecond pulsar ever discovered, located only a few degrees away from **PSR 1919+21**. This pulsar has a rotational period of 1.557708 milliseconds, which means it completes nearly 642 rotations per second.
PSR B1953+29, 19 55 27.88 +29 08 43.5, is a millisecond pulsar star.
PSR B2020+28, 20 22 37.07 +28 54 23.1 is a pulsar star.
PSR J2007+2722, 20 07 15.77 +27 22 47.7, is a pulsar star.
XTE J1859+225, 18 58 41.58 +22 39 29.6, is a low mass, X-ray binary star.

There are 14 more deep sky objects (stars with planets, nova stars, etc.) and one NGC object that are from magnitude 10 to 20. As usual, see me if you want the info.

Sky Happenings – August

Aug. 1st - Dusk- All month look for Saturn in the south-southwest sky an hour after sunset. Look about 5° to Saturn's left for the telescopic double star Beta Scorpii. To the left or upper left of Beta Scorpii is another fine double star, Nu Scorpii. High power in good seeing reveals Nu Scorpii as the Southern Double-Double.
Aug. 2nd - The Moon is at perigee (225,023 miles from Earth) at 5:03 AM CDT.
Aug. 5th – The Moon passes 1.0° south of Uranus at 4:00 AM CDT
Mercury passes 8° north of Venus at 4:00 AM CDT.
Aug. 6th – Last Quarter Moon occurs at 9:03 PM CDT
Mercury passes 0.6° north of Jupiter at 11:00 PM CDT.
Aug. 7th –Mercury passes 1.0° north of Regulus at 10 AM CDT.
Aug. 8th – Morning – The Moon, just past being Last Quarter, forms a triangle with the Pleiades and Alderbaran

in Taurus.

Dawn – Look for the orange glint of Mars as the planet rises in the east-northeast. Find it approx. 8° below Pollux as the sky brightens

The Moon passes 1.0° north of Alderbaran at 7PM CDT.

Aug. 10th – Jupiter passes 0.4° north of Regulus at 6 PM CDT.

Aug. 11th – Dawn – On this or the next few mornings, look low in the east-southeast about 20 minutes before sunrise for the helical rising (first dawn visibility) of Sirius as it emerges from the Sun's glare.

Aug. 12th – The Moon passes 6° south of Mars at 12 midnight CDT.

Aug. 12th/13th – Late Night – The Perseid meteor shower peaks tonight; a waning crescent moon makes for ideal viewing conditions this year.

Aug. 14th – New Moon occurs at 9:53 AM CDT.

Aug. 15th – Asteroid Lutetia is at opposition at 9 AM CDT

Venus is in inferior conjunction at 2 PM CDT.

Aug. 16th – Asteroid Vesta is stationary at 1 AM CDT

The Moon passes 2° south of Mercury at 10 AM CDT

Dusk – Binoculars show Mercury about 6° to the right of the thin crescent moon, very low in the east.

Aug. 17th – The Moon is at apogee (252,182 miles from Earth) at 9:33 PM CDT.

Aug. 22nd – The Moon passes 3° north of Saturn at 12 noon CDT

First Quarter Moon occurs at 2:31 PM CDT

Dusk – First Quarter Moon shines less than 4° from Saturn, just above and to the right of Beta

Scorpii.

Aug. 26th – Jupiter is in conjunction with the Sun at 5 PM CDT.

Aug. 29th – Venus passes 9° south of Mars at 12 Midnight CDT

Dawn – Look due east about a half hour before sunrise, where Venus is now about 10° above the horizon

Full Moon occurs at 1:35 PM CDT

The Moon passes 3° north of Neptune at 7 PM CDT.

Aug. 30th – The Moon is at perigee (222,631 miles from Earth) at 10:21 AM CDT.

Aug. 31st – Neptune is at opposition at 11 PM CDT.

Mercury – Mercury, at mag. -1.2, resides to the lower right of Jupiter and is just 1° high a half hour after sunset as August begins. On Aug. 6th, Jupiter will be within 1° of Mercury. On Aug. 16th, a 2 day old crescent moon lies 5° to the left of Mercury. By the 31st, mercury climbs 7° high in the west a half hour after sunset. Glowing at mag. 0.1, it won't be obvious unless you use optical aid. Through a telescope, Mercury then appears 7" across and almost 60% illuminated.

Venus – Venus passes 6° south of Jupiter on July 31st. Venus is in retrograde from July 23rd to Sept. 5th, leaving the evening sky after inferior conjunction on Aug. 15th (Venus is at aphelion). After that, Venus veritably vaults into the morning sky. On Aug. 1st, Venus (at mag. -4.4 and less than 7% illuminated and a skinny crescent 53' long) lies to Jupiter's lower left at just 2° altitude, sinking below the horizon only 30 minutes after sunset. Venus rises with the Sun on Aug. 18th, and about 55 min. before the Sun a week later, and more than 1 ½ hours before the Sun at month's end.

Mars – Mars rises about 70 minutes before the Sun as Aug. starts, but 2 hours before the Sun as the month ends. Mars dims from mag. +1.7 to +1.8 in August and displays a disk no larger than that of Uranus. On Aug. 8th, Mars stands about 5° high in the east-northeast, below Castor and Pollux approx. 45 minutes before sunrise. On the mornings of Aug. 20th and 21st, Mars will cross M 44 (The Beehive Cluster) in Cancer.

Jupiter – Jupiter will pass 6° north of Venus on July 31st. Jupiter starts exiting the evening sky, starting the month of Aug. setting a little less than an hour after the Sun. By Aug. 6th, the interval is down to 45 minutes. On Aug. 6th, Jupiter is at mag. -1.7, and is only 0.6° to the lower left of mag. -0.7 Mercury. On Aug. 7th, Jupiter, Mercury, and Regulus fit within a circle of only about 1° in diameter. Jupiter is fully lit, with a disk of 31'. On Aug. 10th and 11th, Jupiter will be 0.4° from Regulus around sunset. Jupiter is lost altogether by mid-month, on its way to its Aug. 26th conjunction with the Sun.

Saturn – As darkness falls on Aug. 1st, Saturn will be about 30° above the southern horizon, remaining in view until 1 AM LDT. Saturn ceases retrograde motion on Aug. 2nd in eastern Libra, just west of Scorpius as it fades from mag. +0.4 to +0.5. The rings remain open at 24° to our line of sight. Saturn makes little progress; however, it spends the entire month 13° northwest of Antares. At mid month, the planet's disk measures 17" across while the rings span 38". Saturn will be at the eastern quadrature (90° angle from Earth) on Aug. 21st. Saturn's largest moon, 8th mag. Titan, appears due north of Saturn on Aug. 7th and 23rd, and due south on Aug. 14th and 30th.

Uranus – Uranus, in Pisces, rises in the south soon after evening twilight and is highest in the south around morning twilight. Uranus shines at mag. 5.8 among the background stars of Pisces the Fish. To find, start with Gamma (Algenib) Pegasi (3rd magnitude), then scan 17° southeast of Gamma to pickup 5.2 mag. Zeta Piscium. Uranus hovers within 0.6° of Zeta throughout August, beginning the month southeast of Zeta, and ending it a bit west of due south. Through a telescope, Uranus shows a disk that measures 3.6" across, and appears distinctly blue-green.

Neptune – Neptune reaches opposition on Aug. 31st, for peak visibility. Neptune rises at sunset, appearing highest in the south around 1 AM LDT, and sets as the Sun comes up. At opposition, Neptune is at mag. 7.8. To locate Neptune, first find mag. 3.8 Lambda Aquarii. It will lie about 10° southeast of Aquarius's distinctive Water Jar Asterism. At opposition, Neptune lies 3.4° southwest of Lambda. Neptune shows a 2.4' diameter disk with a blue-grey hue.

Pluto – To track down the 14th magnitude minor planet, you will need an eight inch telescope or larger, a dark sky, and a detailed star chart. Pluto lies in an area of northeast Sagittarius. On Aug. 1st, Pluto stands 60% of the way along a line joining Xi² Sagittarii to its 5.1 mag. neighbor Xi Sagittarii. As Aug. progresses, the distant planet moves to the west, ending the month 35' west-northwest of Xi² Sgr.

Meteor Shower – The Perseid Meteor Shower peaks on the night of Aug. 12th/13th, just one day before the New Moon. With no moon to interfere, observers under dark skies can expect to see up to 100 meteors/hour. The shower's radiant lies in the constellation Perseus near its border with Cassiopeia.

Comets – Comet 141P/Machholz, discovered in 1994, was thought to be a single object. But subsequent observations showed it consisted of five pieces. If the comet breaks apart as it nears its closest approach to the Sun on Aug. 24th, it might reach 8th magnitude. Comet Machholz is cruising through Auriga, which lies in the northeast before dawn. On the morning of Aug. 7th and 8th, the comet lies between the bright star clusters M 36 and M 38, with M 37 also close by. Comet 22P/Kopff should glow at 11th magnitude as it slides through Virgo a few degrees north of Spica.

Asteroids – 1 Ceres glows at 8th magnitude during August, lying among the background stars of eastern Sagittarius, 20° east of the conspicuous Teapot Asterism. On Aug. 20th or 21st, Ceres will slide 0.3° north of star SAO 211782.

When to View the Planets

Evening Sky

Mercury (West)
Venus (West)
Jupiter (West)
Saturn (Southwest)
Neptune (East)

Midnight

Saturn (Southwest)
Uranus (East)
Neptune (Southeast)

Morning Sky

Venus (East)
Mars (East)
Uranus (South)
Neptune (Southwest)

Dark Sky Viewing: Primary – August 15th, Secondary – August 22nd

Vulpecula – The Fox

A constellation introduced in 1687 by the Polish Astronomer Johannes Helvetius, who depicted it as a double figure of a fox, Vulpecula, carrying in its jaws a goose, Anser. Since then the goose has flown (or been eaten), leaving just the fox. Helvetius is said to have placed the fox near two other hunting animals, the eagle (Aquila), and the vulture (an alternative identification of Lyra). Vulpecula contains no named stars (Anser is all that is left of the missing goose), and has no legends. Although its brightest stars are only 4th magnitude, it is notable for “The Dumb-bell Nebula, reputedly the most conspicuous of the class of so-called planetary nebulae. The Dumb-bell Nebula consists of gas thrown off from a dying star; it takes its name from the double-lobed structure, like a bar-bell, as seen on a long exposure photograph.

