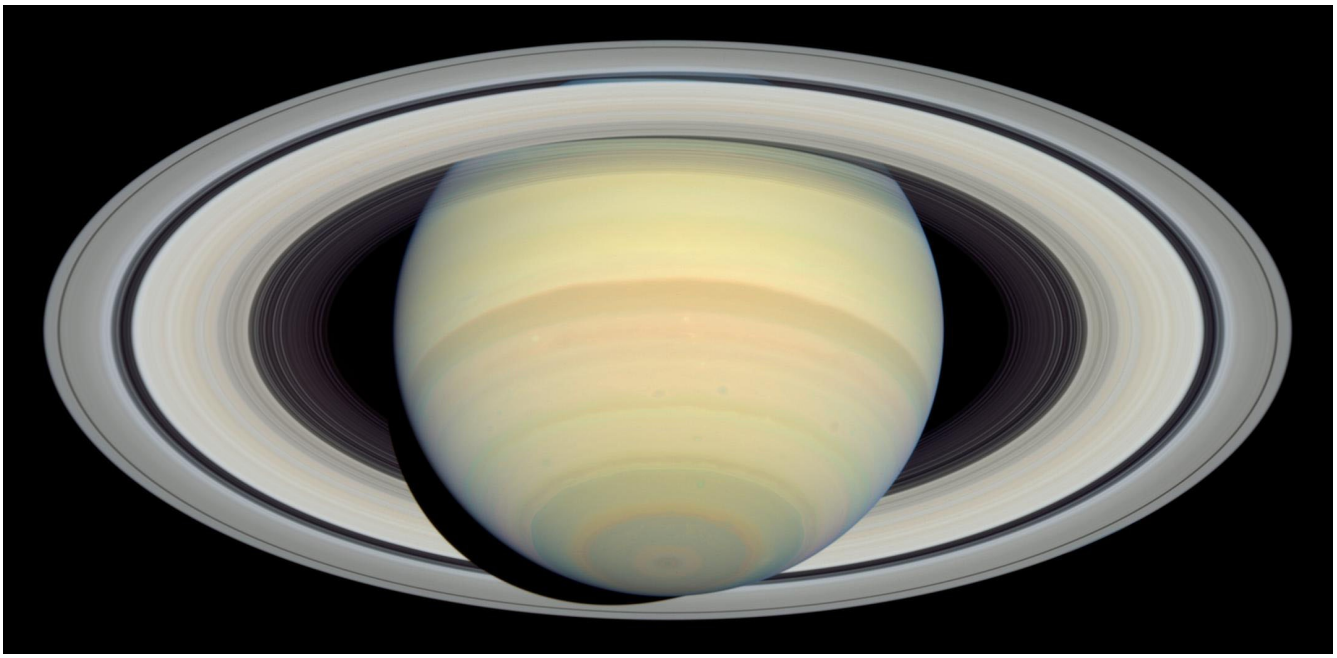
Night Visions

Newsletter of the Baton Rouge Astronomical Society

June 2015

Next Meeting: June 8th at 7PM at the HRPO



Hubble Image of Saturn. Saturn has returned to our night sky and looks awesome!

What's In This Issue:

President's Message

Well, how do you like these daily afternoon showers? I know. Me, too. It's almost like you can tell time by them. "Oh, it's raining? It must be 3:30."

The good thing though is that Saturn is near opposition, so it is up almost all night. Although we have turbulent skies now, once the daily showers settle down, summertime often have some of the stillest nights of the year. That combined with Saturn high in the sky present good viewing conditions. I've already seen some pictures taken by some BRAS members who have taken advantage of the opposition.

We have a couple of months of great BRAS meeting activates. Our June guests will be Louisiana expatriates, who moved to the dark skies of New Mexico, Darin and Melanie Templet. They will talk about their dark sky adventures, including the construction and operation of their public observatory and sundial, still under construction. They also have some neat adventures with ancient ruins in their area. Darin was a former PAS member who now teaches high school math. Melanie was a former BRAS officer who is the school librarian. She also made the first efforts to build an observatory in Baton Rouge, which later developed into the Highland Road Park Observatory.

Mark your calendar. We will not meet at our regular second Monday in July. Instead we have been invited to help out with the Saturday Science day at LIGO Livingston on July 18th. Actually helping out really means having a picnic and then participating in their Saturday Science activities afterward and helping out where we can. If you have never been to LIGO, you owe it to yourself to attend. We are fortunate to have one of the most fascinating, exciting, and cutting edge science facilities in the world right in our back yard.

We are looking for another big (more expensive) item for the club raffle. We need your feedback on what you prefer. We want it to be something that will be of general purpose so it will be usable among the most members. Something too specialized, like a CCD camera, will not appeal to members who do not have motorized or computerized telescopes. We are considering one item but will not purchase it unless we get enough positive feedback from you that you would like to take chances on it. It is an 8 inch Dobsonian reflector made by Sky Watcher of Canada, retail price around $450. It is collapsible, to make a bit more portable and easier to store. Take a look and let us know what you think. I will take a vote at the next meeting to gauge your interest. http://www.skywatcherusa.com/dobsonians/sky-watcher-dobsonian-8-200-mm.html

We still have an open invitation from the EBR Main Library to conduct some kind of teen astronomy class or session of your choice. Maybe June or July, but it's flexible.

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

Planck: Revising the Universe

The Universe is about 100 million years older than previously estimated and is expanding slightly more slowly; it also has slightly more dark matter and a bit less dark energy than previously suspected. There is no evidence for an additional neutrino-like relativistic particle beyond the three families of neutrinos that have already been discovered; their total mass is not more than 0.23 electron volts, about half the upper limit from the earlier results from NASAs Wilkinson Microwave Anisotropy Probe (WMAP).

Those are the key findings revealed by the most accurate and detailed map of the cosmic microwave background (CMB)—the oldest light in the Universe, dating back to 370,000 years after the Big Bang—produced from the first 15.5 months of data from the Planck satellite and analyzed using one of the world's most powerful supercomputers.

The researchers included, among others, University of California faculty from Berkeley (George Smoot and Martin White), Berkeley Space Sciences Laboratory (R. Keskitalo), Davis (Lloyd Knox), the U.S. Department of Energy National Energy Research Scientific Computing Center (NERSC) at the Lawrence Berkeley National Laboratory (Julian Borrill and T.S. Kisner), and Santa Barbara (Philip Lubin, P. R. Meinhold, and Andrea Zonca).

A trillion data points

The Planck satellite, designed and built by the European Space Agency (ESA) with significant contributions from the U.S. National Aeronautics and Space Administration (NASA), was launched in May 2009 and began scientific observations in mid-August.

Like its NASA predecessors the Cosmic Background Explorer (COBE) and WMAP, Planck's mission is to map tiny temperature fluctuations in the microwave background radiation bathing the heavens, left from the Big Bang. But both Planck's sensitivity and its resolution are unprecedented.

Planck is 930,000 miles away, on the opposite side of Earth from the sun, in the gravitationally semi-stable L2 libration point where it keeps up with Earth in its orbit. That orbit plus Plank's spinning on its axis allows the spacecraft's 72 detectors to scan successive narrow (2 arcminutes wide) strips or rings around the heavens, building up a map of rings covering the complete sky twice a year. As Planck measures some 10,000 samples per second, in its first 15.5 months of observing, it has gathered a trillion data points.

Analyzing such a massive data set is a monumental computational challenge. So in 2007, before the spacecraft was launched, NASA and the DOE negotiated a formal interagency agreement that provided the Planck mission multiyear access to NERSC.

Especially challenging is the task not only of separating the CMB from the unavoidable instrumental noise and foreground signals from our Milky Way galaxy, but also of then understanding precisely how well this separation has been done. Using a technique called Monte Carlo simulations, the data were crunched on NERSC's 150,000-core Cray XE6 supercomputer Hopper.

Refining our understanding

Although future data releases in 2014 and 2015 will add in results from polarization and other measurements, this first release of data reveals results that are already surprising.

The Planck data reveal that the Universe is 13.8 billion years old, more precise than the previously accepted age of 13.7 billion years. The Hubble constant—the rate at which the Universe is expanding—is revised downward to only 67.80 plus or minus 0.77 kilometers per second per megaparsec (a megaparsec is about 3 million light-years).

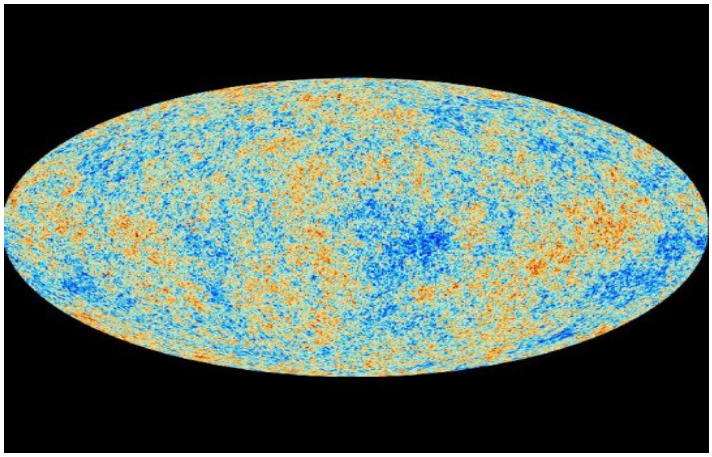
Planck's results also indicate that dark energy makes up "only" 69.1 percent (plus or minus 1.0 percent) of the density of the Universe (instead of 71.4 percent as measured by WMAP). Thus, dark matter and ordinary matter make up a heftier 30.9 percent. *–Trudy E. Bell, M.A.*

***Further reading*:** The LBNL press release appears at http://newscenter.lbl.gov/news-releases/2013/03/14/massive-planck-simulations/, the NERSC release at http://www.nersc.gov/news-publications/news/science-news/2013/planck-results/, the Davis release at http://blogs.ucdavis.edu/egghead/2013/03/21/plancks-new-map-brings-universe-into-focus/, and the Santa Barbara release at http://www.ia.ucsb.edu/pa/display.aspx?pkey=2967.

Papers have been submitted to *Astronomy and Astrophysics;* preprints appear at http://www.sciops.esa.int/index.php?project=PLANCK&page=Planck_Published_Papers .

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 Department of Energy laboratories (Lawrence Berkeley Laboratory, Lawrence Livermore Laboratory, and Los Alamos National Laboratory). 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

CAPTIONS



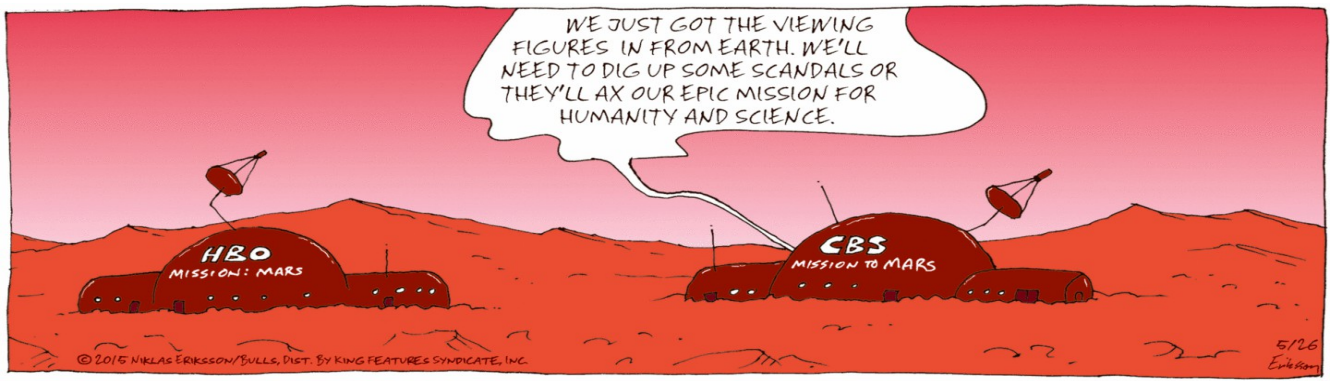
Planck map of the cosmic microwave background shows tiny fluctuations in temperature, which correspond to regions of different densities: denser regions eventually coalesced into today's galaxies and stars.
Credit: ESA and the Planck collaboration

Cray XE6 supercomputer Hopper, named for 20th-century computer scientist Grace Hopper, performed most of the Planck calculations. Hopper is at the DOE National Energy Scientific Computing Center at Lawrence Berkeley National Laboratory, Credit: Roy Kaltschmidt

Secretary's Summary of May Meeting

- Merrill started off by talking about the items for the raffle at the end of the meeting. There were several books, a Messier card, and a 1 ¼" lunar filter available.
- Chris got up to say "thank you" to everyone who participated and supported the Observatory on International Astronomy Day. Even with the rainy weather we had over 400 people show up. We also sold over $1,000 in raffle tickets for the first time ever.
- Chris announced Peter Lazar as the 2014 winner of the Frank Conrad Volunteer of the Year Award.
- Merrill announced that Darrin and Melanie Templet will be the guest speakers for the June BRAS meeting. They were instrumental in getting the Highland Road Park Observatory going back in the 90's and are currently doing the same thing where they live now in Rio Rancho, NM. Merrill was out there visiting with them recently and was able to tour the facility and view the equipment they have in place there.
- Chris reminded everyone about the upcoming meeting on May 12th at the Lod Cook Alumni Center having to do with the upgrade of the LSU and City Park lakes. This is an opportunity to voice support for dark-sky-friendly lighting at the beginning of this major project.
- Brad Schaefer was the guest speaker for the evening. His lecture was entitled "The First Three Steps on the Distance Ladder". This covered calculating the radius of the Earth, the distance to the Moon, and the distance to the Sun using basic mathematics and everyday household items to help with the computations.
- Merrill mentioned that there had been some people with a couple of ideas about a loaner scope program for members of BRAS. He was not sure about demand, but we would be working off rules that have been written up already. Also he passed around an ad from Sky-Watcher USA featuring several scopes. They are looking at an 8" with a collapsible truss for $450 as possibly the next major raffle item. They are planning to take a vote on this at the next meeting.
- The meeting ended with the monthly raffle.

Roslyn Readinger
BRAS Secretary



HRPO

FRIDAY NIGHT LECTURE SERIES

all start at 7:30pm

5 June: "NASA Spinoff Technology" HRPO Center Supervisor Tom Northrop gives the audience an overview of the fascinating objects and technology that developed as a direct result of the American Space Program. Many of these devices and materials may be at the doctor's office, the mall—some might even be in your home!

12 June: "The Universe Through X-Ray Glasses" For over a dozen years the Chandra X-Ray Observatory has orbited Earth, giving us a unique view of areas of the Universe where high magnetic fields or extreme gravity dominate. LSU physics professor Rob Hynes tells us what all of the data means, and how it can shed light on the evolution of the Universe.

19 June: "The Amateur Radio Service" This precursor to ARRL Field Day introduces the Radio Service to the novice! Socializing, contests and emergency support all are part of this venerable tradition. Learn how you and your family can take part!

26 June: {TBA}

SCIENCE ACADEMY

Saturdays from 10am to 12pm

For ages eight to twelve. $5/$6 per child.

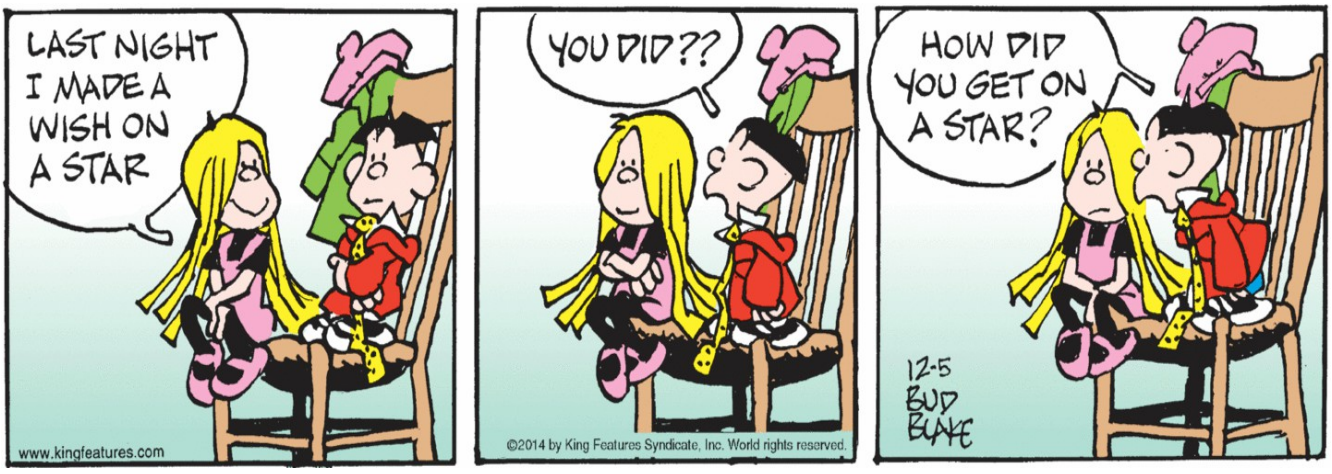
6 June: "Forces of Nature—Nuclear"

13 June: "Expedition 10"

20 June: "New Horizons"

CALL FOR VOLUNTEERS

***Saturday, 20 June from 6pm to 10pm. *Two volunteers in additional to regular complement.* Evening Sky Viewing Plus. Marshmallow roast, demo tables. Easy; training provided.**



American Radio Relay League Field Day

Saturday, 27 June from 2pm to 10pm

No admission fee. For ages eight and older.

Temporary stations will be set up inside the HRPO main building as the Baton Rouge Amateur Radio Club joins similar clubs across the continent in an exciting emergency exercise. Visitors to HRPO will have the chance to communicate with other hams!

Licenses to transmit on the amateur bands are controlled by the FCC, but non-licensed visitors can transmit under the guidance of a licensed ham. The Get-On-The-Air (GOTA) station will be available for the general public to help in the exercise using voice communication. Visitors will also have a chance learn to send their names in Morse code.

This will be a great opportunity for interested parties to learn all about amateur radio. If you like what you see at ARRL Field Day, there will be plenty of friendly "hams" around to tell you exactly what you need to do to obtain your own amateur radio license and start transmitting!

Having a ham license may go a long way toward understanding the requirement of the new AL Radio Astronomy Certificate.

He won't be named at this time, but a BRAS member is inquiring about the Technician license test. If he pass that will make at least four BRAS members who are hams.

To pass the Technician test, one has to get twenty-six out of thirty-five multiple-choice questions correct.

Serpens- The Serpent

Serpens is unique among the modern constellations in that it is split into two disconnected regions of the sky: **Serpens Caput** (the head), and **Serpens Cauda** (the tail). The constellation is also one of the only ones that are dependent on another constellation for context; specifically, it is being held by the **Serpent Bearer Ophiuchus.**

Position: Serpens Caput: RA 15h 10.4m to 16h, is a bright nebula of irregular shape; divided by 22.5m, Dec. 25° 66" to -03° 72".
Serpens Cauda: RA 17h 16.9m to 18h 58.3m, Dec. 06° 42" to -16° 14".

Named Stars:
Unukalhai (Alpha Ser), "The Serpent's Neck", mag. 2.63, 15 44 16.00 +06 23 31.9, is also called "Cor Serpentis", 'The Heart of the Snake', and is located in **Serpens Caput. Alpha Serpentis** is a red giant star with a faint companion (mag. 11.6) at a separation of 58 arc seconds.
Alya (Theta Ser), "The Fat Tail (of a sheep)", Struve 2417, is a multiple star system – **Theta Ser^{1},** mag. 4.62, 18 56 13.16 +04 12 12.7; **Theta Ser^{2},** mag. 4.98, 18 56 14.61 +04 12 07.4; both stars are main sequence dwarfs, have a separation of 22 arc seconds and an orbital period of 14,000 years. The third component is a yellow star, mag. 6.71, and a separation from **Theta Ser^{2}** of 7 arc minutes. **Theta Serpentis** is located in **Serpens Cauda.**

Deep Sky:
M 5 (NGC 5904), mag. 5.8, 15 18.6 +02 05, 21' size, is a galaxy with a medium concentration of stars; very bright, very large, and extremely rich; slightly oval in shape in the northeast-southwest direction; located in **Serpens Caput. M 5** has over 97 short period variable stars, and is found just 20' northwest of **5 Serpentis** (mag. 5.04, 15 19 18.58 +01 46 00.0), and contains over 100,000 stars.
M 16 (NGC 6611), "The Eagle Nebula", "The Star Queen Nebula", mag. 6.0, 18 18.8 -13 47, 34'x27' in size, is a large, bright nebula containing a 7' open cluster; brightest star is at mag. 8.1; cluster of small stars, mingled with a feeble glow. **M 16** is located in **Serpens Cauda,** just 3° north of **The Swan Nebula (M 17)** in Sagittarius. The **Eagle Nebula** contains the "**Pillars of Creation",** a large region of active star formation. The Pillars were likely already destroyed by a supernova explosion believed to have occurred 8,000 to 9,000 years ago, but the image of the aftermath will not reach Earth for another 1,000 years or so. **M 16** is a part of the emission nebula **IC 4703.**
IC 4756, mag. 4.6, 18 39.0 +05 27, 50' in size, is an open cluster of 80 stars; detached, no concentration of stars; moderate range in brightness; a very large cluster; mag. of brightest star is 8.7, located in **Serpens Cauda.**
NGC 6604, mag. 6.5, 18 18.1 -12 14, 2' in size, is an open cluster of 30 stars; detached, strong concentration; large brightness range; mag. of brightest star is 7.5; involved in nebulosity; located about 2° north of **M 16** in **Serpens Cauda.**
NGC 6539, mag. 8.9, 18 04.8 -07 35, 7' in sized, is a globular cluster with a low concentration of stars; very small and faint; located in **Serpens Cauda.**
NGC 6535, mag. 9.3, 18 03.9 -00 18, 3.3' in size, is a globular cluster with a low concentration of stars; pretty faint and very small; located in **Serpens Cauda,** just north of **Zeta Serpentis.**
Red Square Nebula (MWC 922), is a bipolar nebula notable for its square shape. It is one of the most symmetrical deep sky objects ever discovered. It is unclear how the central star,**MWC 922,** produces the nebula's shape.
Seyfert's Sextet (NGC 6027), mag. 14.7, is six galaxies with magnitudes from 14.9 to 16.7, numbered as **NGC 6027 a** through **e.**
LDN 557, 18 38.6 -01 47, 60'x9' in size, is an irregular or crescent shaped dark nebula with high opacity.
Sh 2-46, 18.06.1 -14 10, 30'x19' in size, is a bright nebula with an elliptical shape, rich in stars, especially to the east.

Sh 2-64, 18 31.6 -01 55, 19'x7' in size, is a bright nebula of irregular shape; divided by absorption matter, into three main components.
vdB 123, 18 30.5 +01 11, 3'x2' in size, is a bright nebulosity involving a 9.1 magnitude star; brightest part is west-northwest of the star.
IC 4703, 18 18.6 -13 38, 35'x28' in size, is a small patch of a diffuse emission nebula associated with the **Eagle Nebula (M 16)**; brightest area is to the southeast; contains a conspicuous absorption patch that on photographs resembles a horse and rider. **M 16** is part of **IC 4703,** located in **Serpens Cauda.**

There are 18 NGC's, 1 IC, 1 Arp, 1 Palomar, and Hoag's Object – all beyond magnitude 10. As usual, see me for the info on them.

Other Stars:
Eta Ser, mag. 3.23, 18 21 18.92 -02 53 49.6, is an orange giant star having a mag. 12 companion halfway between the sub giant and giant evolutionary star, and is located in **Serpens Caput.**
Mu Ser, mag. 3.54, 15 49 37.27 -03 25 48.5, is a white, main sequence dwarf star, located in **Serpens Caput.**
Xi Ser, mag. 3.54, 17 37 35.23 -15 23 54.3, is a triple star system. The primary component is a yellow-white giant star, and the secondary is a spectroscopic binary with an orbital period of 2.29 days. The third component is a 13th magnitude star located 25 arc seconds away from the main pair
Beta Ser, Struve 1970, is a probable quintuplet system, with all five components visible through a small telescope. **Beta Ser,** located in **Serpens Caput,** is a member of the Ursa Major Moving Group of stars. **Beta Ser A,** mag. 3.65, 13 46 11.21 +15 25 18.9, is a main sequence white dwarf star that has two companions; **Beta Ser B**, west of the primary, mag. 9.1, AB separation is 31 arc seconds; **Beta Ser C, 3.3' south-southwest of the primary,**mag. 10.7, AB to C separation is calculated to be 9,500 AU; **Beta D**, is a fairly close pair with the brighter star at mag. 8.2 and its companion is mag. 10.7 located to the north-northwest, **Beta Ser D** lies 27.4' west-southwest of **Beta Ser A.** The colors of the stars are as follows: **Beta Ser A** – white; **Beta Ser B** – yellow-orange; **Beta Ser C** – unknown; **Beta Ser D** – pale yellow or yellow-orange. **Beta Ser D** pair is also known as **ROE 75.**
Delta Ser, mag. 3.80, 15 34 48.19 +10 32 19.9, is a double binary system. The primary is a yellow-white sub-giant star at mag. 4.2, and the binary companion is also a sub-giant star at mag. 5.2. The two stars are 4 arc seconds away from each other and have an orbital period of 3200 years. The second binary pair (15 34 48.10 +10 32 21.0) consists of a 14th magnitude star and a companion 15th magnitude star, both separated by 4.4 arc seconds, and is located in **Serpens Caput.**
Gamma Ser, mag. 3.85, 15 56 26.99 +15 39 53.0, is a yellow-white main sequence dwarf star in **Serpens Caput.** The star is a suspected variable, and has two 10th magnitude optical companions.
Kappa Ser, mag. 4.09, 15 48 44.41 +18 08 30.4, is a red giant star located in **Serpens Caput.**
Tau Ser, is a multiple star system – 8 stars. **Tau Ser 1,** mag. 5.16, 15 25 47.41 +15 25 41.0, is a red giant star. **Tau Ser 2,** mag. 6.22, 15 32 09.68 +16 03 22.1, is a blue-white main sequence star. **Tau Ser 3,** mag. 6.10, 15 35 33.28 +17 39 20.1, is a yellow giant star. **Tau Ser 4,** mag. 6.51, 15 36 28.19 +15 06 05.0, is a pulsating bright red giant star. **Tau Ser 5,** mag. 5.93, 15 36 29.20 +16 07 08.8, is a yellow-white main sequence dwarf star. **Tau Ser 6,** mag. 6.0, 15 40 59.09 +16 01 28.7, is a yellow giant star. **Tau Ser 7,** mag. 5.80, 15 41 54.76 +18 27 50.0, is a white star. **Tau Ser 8,** mag. 6.15, 15 44 42.15 +17 15 51.2, is a white main sequence dwarf star.
R Ser, mag. 5.20, 15 50 41.70 +15 08 01.0, 1.1° east-southeast of **Beta Ser,** is a pulsating Mira variable red giant star that is very red in color (mag. 5.2 to 14.4 over 356 days). This red giant star will expel its outer envelope to form a planetary nebula and become a white dwarf star within a few million years.
HD 168443, mag. 6.92, 18 20 03.93 -09 35 44.6, is a yellow main sequence star, and has a confirmed planet and a brown dwarf star in orbit around it. The planet has an orbital period of 58.116 days, and the brown dwarf's orbital period is 1,739.5 days.
HD 136118, mag. 6.94, 15 18 55.47 -01 35 32.6, is a yellow-white dwarf star with a brown dwarf star orbiting it every 1209 days.

Omega Ser, mag. 5.21, 15 50 17.53 +02 11 47.8, is an orange giant star with one planet orbiting it every 277 days, and a separation of 1.1 AU.
HD 142245, mag. 7.63, 15 52 56 +15 25 51, has one planet orbiting it.
HD 168746, mag. 7.95, 18 21 49.78 -11 55 21.7, has one planet in orbit around it.
HD 175541, mag. 8.03, 18 55 40.88 +04 15 55.2, has one planet in its system.
Gliese 710, mag. 9.66,18 19 50.84 -01 56 19.0, is an orange main sequence dwarf star that is a suspected variable. Within the next 1.4 million years, the star will approach Earth's Sun within a very small distance, possibly under 1 light year. When it does approach, it will be as bright as Antares. The star's proximity will have the potential to send a shower of comets into the solar system.
There are three more stars beyond mag. 10 that have a transiting planet.
PSR B1534+11, is a system consisting of two neutron stars in orbit around each other. One of the neutron stars is a pulsar with a period of 37.9 milliseconds.
GX 17+2 is a low mass x-ray binary star consisting of a neutron star and a low mass star.
Serpens X-1 is also a low mass X-ray binary star, undergoing occasional X-ray bursts. One burst lasted nearly 4 hours, possibly explained by the burning of carbon in "a heavy element ocean ".
Serpens Cloud is a massive star forming molecular cloud located in the southern part of **Serpens Cauda,** and containing many proto-stars.

Sky Happenings:

June 1st – The Moon passes 1.9° north of Saturn at 3:00 PM CDT.
Night – Saturn is low in the southeast at dusk; the nearly Full Moon shines a few degrees away.

June 2nd – Full Moon occurs at 11:19 AM CDT.

June 3rd – Night- a double shadow transit occurs on Jupiter from 8:59 PM to 10:14 PM CDT.

June 6th – Venus is at greatest eastern elongation (45 degrees) at 1:00 PM CDT.
Asteroid Ceres is stationary at 5:00 PM CDT.

June 8th – The Moon passes 3° north of Neptune at 10:00 PM CDT.

June 9th – Last Quarter Moon occurs at 10:42 AM CDT.

June 10th – The Moon is at perigee (229,728 miles from Earth) at 11:44 AM CDT.

June 11th – Mercury is stationary at 3:00 PM CDT.
The Moon passes 0.5° south of Uranus at 3:00 PM CDT.
Asteroid 2 Pallas is at opposition in Hercules (brightest for 2015) at 8:00 PM CDT.

June 12th – Neptune is stationary at 3:00 PM CDT, 2° west of Lambda Aquarii.
Venus, low in the west, will be 1/2° from the Beehive Cluster (M 44).

June 13th – Dusk: Look west to see Venus and Jupiter, now just 10° apart. The Beehive Cluster (M 44) gleams just below the brilliant light of Venus.

June 14th – Mars is in conjunction with the Sun at 11:00 AM CDT.
The Moon passes 0.04° south of Mercury at 9:00 PM CDT.

June 15th – The Moon passes 1.0° north of Alderbaran at 7:00 PM CDT.

June 16th – New Moon occurs at 9:05 AM CDT.

June 19th – The waxing Crescent Moon is 6° from Venus in the evening sky.

June 20th – The Moon passes 6° south of Venus at 6:00 PM CDT.
The Moon passes 5° south of Jupiter at 7:00 PM CDT.

June 21st – Summer Solstice occurs at 11:38 AM CDT.
Evening: The waxing crescent Moon hangs about 5° to the left of Regulus, with Jupiter and Venus to the lower right.

June 23rd – The Moon is at apogee (251,116 miles from Earth) at 12 Noon CDT.

June 24th – Mercury passes 2° north of Alderbaran at 3:00 AM CDT.
First Quarter Moon occurs at 6:03 AM CDT.
Mercury is at greatest western elongation (22°) at 12 Noon CDT.

June 25th – Night: Look for Spica about 4° southeast of the first quarter Moon, which sets after midnight.

June 27th – Dusk: Venus is less than 2° from Jupiter for the next week. Watch every evening until their conjunction on June 30th.

June 28th – The Moon passes 2° north of Saturn at 8:00 PM CDT.

June 30th – Venus and Jupiter are in conjunction – within 0.3° of each other – look low in the west after the Sun sets.

Mercury – Mercury was at inferior conjunction on May 30th, and during June climbs gradually into the dawn. On June 24th, Mercury will reach greatest western elongation (22° west of the Sun), and stands 7° high a half hour before sunrise. Mercury shines at mag. +0.4 to +0.5, and is only about 35% lit. Alderbaran (at first magnitude) lies just 2° south (lower right) of Mercury (with a disk of 8" across). By the end of the month, Mercury is still only about 6° or 7° above the horizon around 45 minutes before sunrise.

Venus – June's first evening reveals two brilliant planets lighting up the western sky. Venus and Jupiter stand 20° apart that night. Venus appears lower in the sky, but it shines 10 times brighter than Jupiter (mag. -4.4 compared to Jupiter's -1.9). Venus will be 30° above the horizon within 30 minutes of sunset. Venus lies among the background stars of eastern Gemini on June 1st, forming a straight line with Castor and Pollux. Venus crosses into Cancer the Crab on June 3rd, reaching greatest elongation 3 days later, when it lies 45° east of the Sun, and sets after 11:30 PM local daylight time. Venus then approaches M 44, the Beehive Cluster, and on June 13th and 14th, it appears less than 1° of the cluster's center. Look for M 44 at the lower left of Venus on the 13th, and below Venus on the 14th. On June 13th, Venus, Jupiter, and Regulus form a diagonal line of lights, nearly equidistant from each other. As Venus pulls within 7° of Jupiter on June 19th, a crescent Moon joins the scene some 7° below Venus. Compare the Moon's 13% lit disk to a telescopic view of Venus' fatter crescent, which is 42% lit. The next evening, the waxing moon lies 5° to Jupiter's lower left. Venus crosses into Leo the Lion on June 25thy. The separation between Venus and Jupiter has now shrunk to 3°, and the brilliant planets look like a pair of cat's eyes catching a car's headlights in the dark. Starting on June 27th, Venus and Jupiter linger within 2° of each other for eight evenings, and burn about 15° high in the west-northwest an hour after sunset on the last day of June. On June 30th, the separation between Venus and Jupiter is only 0.3° (two-thirds of the Full Moon's diameter), with both planets appearing in a single field of view at low power. On June 1st, Venus appears 22" across and just over ½ lit. It reaches 50% illumination at greatest elongation on the 6th, when it will resemble a miniature First Quarter Moon. By month's end, the planet's disk spans 32" and is about 1/3 lit.

Mars – Mars passes through conjunction with the Sun on June 14th, and so it is not visible this month.

Jupiter – Jupiter is in conjunction with Venus this month – see Venus notes above. Early June offers superior views of Jupiter because it lies more than 1/3 of the way to zenith an hour after sunset. The Galilean satellites orbit Jupiter with periods ranging from 1.8 to 16.7 days. Unfortunately, the current series of mutual events is winding down, and with Jupiter visible for only a few hours each night, North American observers can see only a half dozen or so during June. A nice event visible from the eastern half of North America occurs as darkness falls on June 3rd. Ganymede eclipses Io for 28 minutes starting at 8:43 PM CDT. Io shines at only 3/4th of its normal brightness at mid-eclipse. Ganymede – the solar system's largest moon – adds extra spice by appearing to transit across Jupiter's disk during the event. Io begins to transit Jupiter at 9:47 PM CDT, followed by its shadow at 10:56 PM CDT. Just one minute after that, Ganymede clears the gas giant's disc. The big moon's shadow, which got this whole affair started, touches the Jovian cloud tops beginning at 11:58 PM CDT, after Jupiter has set for east coast observers. On June 10th, for the western North America, Ganymede occults Io

from 9:55 to 10:18 PM PDT, while both moons are transiting Jupiter.

Saturn – Saturn was at opposition on May 22nd, so in June is already visible in the southeast at nightfall, not setting until morning twilight. Saturn is set against the faint backdrop of eastern Libra, retrograding, and is only about 3° from the fine double star Beta Scorpii. During the second half of the month, Saturn transits in the south in the late evening before Venus and Jupiter set. This is an ideal time to observe Saturn's globe (more than 18" wide this month) and its rings, which in June span more than 41" and are tilted a wide 24° from edgewise. The best viewing of Saturn is at roughly midnight local daylight time on June 1st, and two hours earlier by June 30th. Saturn's giant moon Titan glows at 8th magnitude, and is the brightest point of light in Saturn's vicinity, except on June 23rd and 24th, when the planet and its attendants slide within 2' of a 7th magnitude background star. Titan revolves around Saturn once every 16 days. Three 10th magnitude moons – Tethys, Dione, and Rhea – circle the planet inside Titan's orbit. Enceladus, at 12th magnitude, is the innermost moon. Outer moon Iapetus is easiest to spot on the evenings of June 7th thru 9th, when it will pass north of Saturn and glows at 11th magnitude. Iapetus fades thereafter as it heads toward greatest eastern elongation on June 28th.

Uranus – Uranus shows up best shortly before dawn starts to paint the sky. The mag. 5.9 planet lies against the faint backdrop of Pisces. Use mag. 5.2 Zeta Piscium as a guide. Uranus lies within 1° of the star all month and passes 0.5° due south of it on June 18th. Uranus has a 3.5" diameter disk and a blue-green color.

Neptune – Neptune is a binocular object before dawn, when it lies in the southeast sky among the background stars of Aquarius. It remains 2° southwest of 11th magnitude Lambda Aquarii all month. The planet glows at mag. 7.9, and has a blue-gray disk measuring 2.3" across.

Pluto – Pluto reaches opposition in July. Pluto is in northern Sagittarius all month.

Sun – The Sun arrives at the solstice at 11:38 AM CDT on June 21st, commencing summer in the northern hemisphere, and winter in the southern hemisphere.

Moon – The Moon is less than one day short of full when it shines less than 6° to the lower left of Saturn at dusk on June 1st. The waxing crescent Moon is directly below Venus at dusk on June 19th. Then, on June 20th, it glows to the farther left of Venus – but only about 6° to the lower left of Jupiter. The next night, the thickening lunar crescent is to the left of Regulus. At nightfall on June 28th, the waxing gibbous moon moves to less than 2° to the upper left of Saturn, and the Moon's thin, invisible dark limb will occult the 4.1 mag. star Theta Librae, for the eastern North America. Occultation times – Atlanta, 10:38 PM EDT; Chicago, 9:36 PM CDT; Austin, 9:06 PM CDT.

Meteor Showers – There are no major meteor showers this month, but the month's best minor shower is the June Boötids, which peak on June 27th. The waxing gibbous Moon will set around 2:00 AM local daylight time, leaving an hour or two of darkness. The June Boötids are the slowest of any showers, hitting Earth at only 11 miles/second.

Asteroids – Asteroid 2 Pallas stands out from the family of asteroids like a black sheep. Pallas's orbit inclines steeply to the plane of the solar system (a 35° inclination). Pallas reaches opposition and peak visibility on June 11th. Pallas glows at 9th magnitude among the background stars of Hercules. On June 1st, Pallas will be about 1/2° northwest of 83 Her, or about 21/2 ° east-southeast of Lambda Her. On June 12th thru 14th, Pallas will pass just 33' south of Lambda Her (4.4 mag.). On June 30th, Pallas will be within 26' of Delta Her.

Comets – Comet Catalina (C/2013 US10) is predicted to be visible to the naked eye late this year. This visitor from the Oort Cloud gives preliminary views of it during June as it dives south through Sculptor. This constellation hangs low in the southeast sky shortly before morning twilight begins. Comet experts expect Catalina to be glowing around 8th or 9th magnitude in June. Northern Hemisphere viewers will have to wait for Catalina to make a long sojourn through the southern sky before it returns to view in late November. By then,

the comet could be glowing at 4th to 5th magnitude as it shares the morning sky with Venus. On June 16th, Catalina will be about 1° west of Zeta Sculptor, and on June 9th about 1° east of Delta Sculptor. On about June 28th, Catalina will be about 2 ½ ° east of Theta Sculptor.

When to View the Planets:

EveningSky	Midnight	Morning Sky
Venus (west)	**Saturn** (south)	**Mercury** (northeast)
Jupiter (west)		**Uranus** (east)
Saturn (southeast)		**Neptune** (southeast)

Dark Sky Viewing: Primary – June 13th, Secondary – June 20th

Serpens – The Serpent

This constellation is unique, for it is divided into two parts – Serpens Caput, the head, and Serpens Cauda, the tail. But astronomers regard it as a single constellation. Serpens represents a huge snake held by the constellation Ophiuchus. In his left hand Ophiuchus grasps the snake's head, which is turned to look back at him, while his right hand holds the tail. Aratus and Manilius agreed that Serpens was coiled around the body of Ophiuchus, but most star atlases show the snake simply passing between his legs. In mythology, Ophiuchus was identified as the healer Asclepius, son of Apollo, although why he appears to be wrestling with a serpent in the sky is not fully explained. His connection with snakes is attributed to the story that he once killed a snake that was miraculously restored to life by a herb placed on it by another snake. Asclepius subsequently used the same technique to revive dead people. Snakes are the symbol of rebirth because they shed their skins every year. The star Alpha Serpentis is called Unukalhai from the Arabic meaning "The serpent's neck", where it is located. The tip of the serpent's tail is marked by Theta Serpentis, called Alya, an Arabic word that actually refers to "a sheep's tail". The most celebrated object in Serpens is a star cluster called M 16, embedded in a gas cloud called the Eagle Nebula.