

Newsletter of the Baton Rouge Astronomical Society



November, 2015

Next Meeting: Monday, Nov 9th at 7PM at the HRPO



The Witch Head Nebula for a little seasonal fun. Credit & Copyright: [Star Shadows Remote Observatory](#)
(Steve Mazlin, Jack Harvey, Rick Gilbert, Teri Smoot, Daniel Verschate)

What's In This Issue?

President's Message

Astro Short: Planet Formation

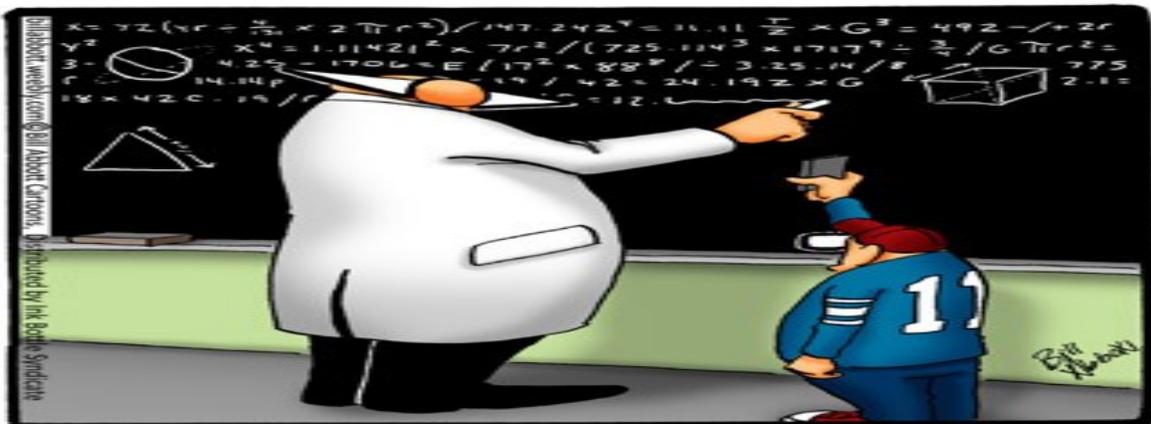
Secretary's Summary of October Meeting

Message From the HRPO

Recent BRAS Forum Entries

20/20 Vision Campaign

Observing Notes by John Nagle



“See? Two seconds with my quantum physics app.”

President's Message

I hope you will have recovered enough after the Deep South Regional Stargaze to attend the BRAS meeting the next night. It takes a while to recover from the long nights under pristine skies observing the sky all night long. That is what I am ordering for the weather that week, so if the weather doesn't cooperate, don't blame me.

Barry has a lot of nice prizes for the raffles, including AR 127mm Explore Scientific refractor tube assembly, Stellarvue 80 mm erect image right angle finderscope with bracket, several Televue eyepieces, Star! Shoot Solar System Imager IV, and many other prizes. Your registration serves as your raffle ticket so you don't have to purchase anything else, but you have to be there to win. Scott Roberts, the head of Explore Scientific is scheduled to attend the opening day of the Stargaze. If you want to speak firsthand about any of their equipment or offers, here is your chance.

The Leonids should peak on November 17th. This is an off year from the 33-year storm cycle, but it should still be a fine event.

Trey has 2016 astronomical calendars. If you want one, bring your money or check to the next meeting. Also, dues will be coming up in January. You can always pay ahead. Please be diligent in this. It would help Trey tremendously.

We have BRAS officer elections coming up in December. Please think about who you want as your next President. I am term-limited and cannot run. Besides the demands of my job are becoming such that I have not been able to give the Presidency the attention it truly deserves. Additionally, Roslyn wants to hand the Secretary torch to someone else. Secretary may not be a glamorous position but it is very important. Roslyn has done a fine job of it and your work will be appreciated as well. We have a very good crew of fine people in our club whom I think would represent BRAS very well. Of course, all of us former officers are always available to help

Clear skies,

Merrill Hess

Planet Formation: More Questions Than Answers

847 and counting: that's the number of planets confirmed as existing around 642 stars within several hundred light-years of our Sun. And more than 2,000 additional detections are awaiting confirmation by follow-up observations. By far, the most potential exoplanets have been found by the NASA spacecraft Kepler (launched in 2009), whose mission is to find Earthlike planets in a habitable zone around other stars, by staring at 150,000 stars and recording minuscule dips in brightness.

So far, Kepler hasn't yet found an identical twin to Earth: a rocky body of similar mass, sweet with liquid water, in the "Goldilocks zone" for temperatures just right for life as we know it to evolve. In fact, Kepler hasn't yet found even an exoplanetary system resembling our Solar System, with rocky planets on the inside, gas giants in the outer reaches, and orbital periods ranging from months to centuries. Instead, most exoplanetary systems are—by the standards of our Solar System—so bizarre they are challenging astronomers and computational astrophysicists to reexamine long-held models of how planets form

Constrained by the data

"With many observations, theorists have less freedom to speculate how planets form," explains Brad M. S. Hansen, associate professor of physics and astronomy at the University of California, Los Angeles. "Any theoretical or computational models have to explain what we actually find."

One big early surprise (1995) was the ground-based discovery of "hot Jupiters:" gas giants the size of Jupiter in orbits around their parent stars much closer than Venus—or even Mercury—is to the Sun. How does something that massive form so close to a parent star? Would there have been enough material for such a big body to form in place, without being ripped apart by tidal forces? Or might it accrete from dust and rocks farther out in its planetary system and later migrate inward toward its parent star?

Later, lower mass, rocky planets—"super-Earths" only a few times the mass of Earth—were identified from Kepler data. "Now there also is an intermediate class of 'hot Neptunes' midway between the super-Earths and the hot Jupiters," Hansen continues. In a paper published in June 2012, he and coauthor Norm Murray describe an analysis of their formation from a set of numerical simulations based on a purely gravitational calculation of planetary scattering, collision and assembly.

Meantime, in December 2011, confirmation was announced of two rocky Earth-sized planets in the Kepler-20 system. They are two of five planets orbiting a G-type star a little smaller and cooler than our Sun. But the entire planetary system could almost fit inside the orbit of Mercury; both Earth-sized planets zoom around their star in less than three weeks; the three other planets are slightly smaller than Neptune; and the sequence of planets from star outward neatly alternates large-small-large-small-large.

Working models

So what do the observations and calculations tell astrophysicists about how planetary systems form? One key is the relative distribution of mass among planets in a system. "Higher mass systems seem consistent with planets assembling in place," Hansen says. "That is somewhat unsettling because the mass required for *in situ* formation is a hundred times what we see in our own Solar System." One possibility is that the mass still moved radially inward, but early when it was smaller chunks like gravel, boulders, or asteroids.

That still leaves an important question: what processes in a whirling solar nebula allow smaller chunks to stick together to accrete larger objects and eventually planets? Especially, notes Hansen, "the dust-to-pebbles step is poorly understood."

One possibility is very cold temperatures. "At 100K, small objects may be covered with water ice,

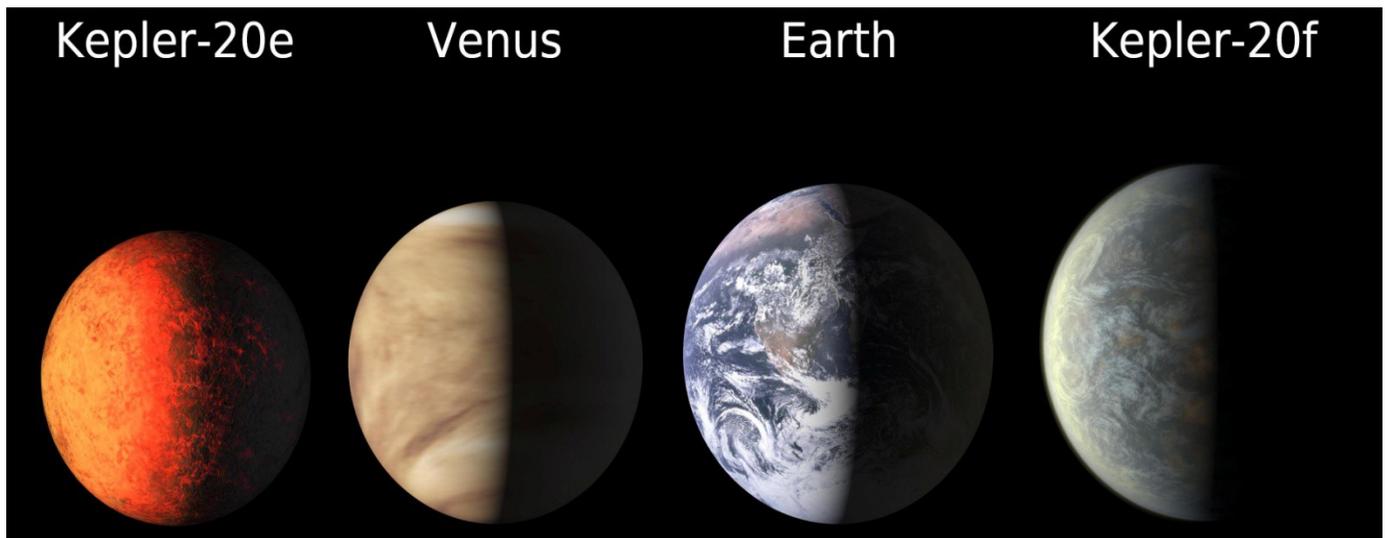
dry ice, and other ices,” Hansen says, “so when objects collide, they stick together. My money is on another possibility suggested by fluid-dynamics simulations: turbulence in the collapsing solar nebula causing some fluid wavelike behavior in local areas of the gravitational collapse that triggers a jump from dust to boulders.”

Stay tuned!

—Trudy E. Bell, M.A.

Further reading: Hansen, Brad M.S., and Norm Murray, “Migration then assembly: Formation of Neptune mass planets inside 1 AU,” *Astrophysical Journal* 751 (2): 158–174 (06/2012) <http://iopscience.iop.org/0004-637X/751/2/158/>

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 sponsoring an annual advanced International Summer School on AstroComputing (ISSAC), 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>.



The first Earth-sized planets were found in December 2011 by NASA's Kepler mission around a sun-like star Kepler-20. Kepler-20e is slightly smaller than Venus with a radius 0.87 that of Earth; Kepler-20f is a bit larger than Earth at 1.03 times the radius of Earth. Both are rocky but with scorching temperatures, as their “years” (orbital periods) are only 6.1 and 19.6 days, respectively. Three larger, likely gaseous, planets also circle Kepler-20.
Image credit: NASA/Ames/JPL-Caltech

Secretary's Summary of October Meeting

- The meeting opened with Brad Schaefer's lecture on The Modern Eddington Experiment. This was a discussion about Sir Arthur Eddington's experiment in 1919 that proved Einstein's theory of general relativity. Brad also explained how this could be done by amateur astronomers for the upcoming solar eclipse on August 21, 2017.
- Old business: People going to the Deep South Regional Star Gaze were encouraged to go ahead and postmark their registration by Oct. 16th before the price goes up by \$40. They usually have excellent equipment available for their Saturday raffle.
- It was announced that the last couple of outreaches went well. There were roughly half a dozen members who showed up at the Mini Maker Faire at the main EBR Parish Library on Sept 26th. We used Ben's light box to educate about light pollution as well as the educational material from the NASA Night Sky Network to demonstrate the relative sizes of the planets. There was a Cub Scout event at Lamar Dixon on a recent weekend that was attended by approximately 650 families. Ben had his scope out there along with Barrow who had his hydrogen alpha scope available for solar viewing.
- New business: The BREC Farr Equestrian Event Open House is coming up; there is one volunteer that is scheduled to assist with this outreach, but more are needed. This will probably include passing out information and helping with solar viewing, weather permitting. The Spooky Spectrum at the Observatory on Oct 24th from 6:00 – 10:00 pm is likewise coming up; they are looking for volunteers for this also.
- Madeleine, a student at Baton Rouge High, is using Globe@Night for her astronomy science fair project, relating population density to increases in light pollution. She is asking for as much participation from our group as possible on this. In addition to the online site, it was suggested that this could be done with the free Dark Sky Meter app.
- Andrew, a local middle school student, is one of 5 students from the US going to Brazil for a science fair competition. His project is the economic placement of cell phone towers (a hexagonal pattern seems to work the best). There will be a link on the BRAS forum for this.
- Trey announced that the 2016 calendars are in; he is also collecting dues for next year.
- The HRPO donation drive is in full swing; this will be continuing until Spooky Spectrum.
- The meeting concluded with raffle.

Roslyn Readinger
BRAS Secretary

HRPO

*HRPO is closed on Thursday 26 November
and Friday 27 November.*

FRIDAY NIGHT LECTURE SERIES

all start at 7:30pm

6 November: “The Brushy Creek Crater” Paul Heinrich of LSU will discuss the investigation leading him and his colleagues to an actual impact crater just northeast of Baton Rouge!

13 November: “Buying a First Telescope” Purchasing a telescope requires knowing who will use it, where it will be used and what the main celestial targets will be. Patrons will learn tips and tricks to increase the likelihood of a good buy. Patrons will also be introduced to a variety of telescopes firsthand.

20 November: “The Life and Death of Stars” Young blues, middle-aged yellows and ancient reds. Professor Juhan Frank will help the audience discover amazing stellar secrets during a visually fascinating trip through the billions-year lives of stars!

SCIENCE ACADEMY

Saturdays from 10am to 12pm

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

7 November: “Mercury”

14 November: “Uranus and Neptune”

21 November: “Expedition 2”

28 November: “Weather Forecasting”

SOLAR VIEWING

For all ages. Free admission.

28 November, 12pm to 2pm

CALL FOR VOLUNTEERS

*Saturday, 21 November from 7pm to 10pm. *Two volunteers in addition to regular complement.* Evening Sky Viewing Plus. Marshmallow roast, demo tables, desk duty. Easy; training provided.

NEW HRPO HOURS

Monday to Thursday, 10am to 2pm

Friday, 5pm to 10pm

Saturday, 9am to 2pm / 6pm to 10pm

Recent Entries in the Forum

Below are selected recent additions to the BRAS Forum. There are also [nine active polls](#).

[Orion Explorer 10x50](#) Good for Uranus and Vesta
[Deep South Regional StarGaze](#) May be Renamed
SA Cadets Learn about [Light Pollution](#)
Season Here to Hunt [Zodiacal Light](#)
[Martian Mystery](#) Announcement Made by [NASA](#)
[Belt of Venus](#), The [Green Flash](#), [Crepuscular Rays](#), [Aurorae](#) and [Lunar Features](#)
[Uranus](#) and [Neptune](#), and [Andromeda Galaxy](#) Found with 10x at HRPO
Cassini Swings to Within 1900km of [Enceladus](#)
[Eight Visible Passes](#) Spotted from HRPO
[Total Lunar Eclipse](#) Spotted Briefly by Many in Local Area
Last [Bright Star Lunar Occultation](#) of 2015
AR2422, AR2427 and AR2430 Cross the [Sun](#)
[Fireball Spotted](#) at HRPO on 1 October
Obscure [Sextantids](#) Appear
[15 Eunomia](#) Found in [Great Square of Pegasus](#)
[Vesta Culmination Times](#) Posted
Good Times with [Vega](#), [Albireo](#), [Delphinus](#), [Polaris](#), [Algol](#) and [Fomalhaut](#)
[Twenty-Five Pleiads](#) Counted with Bushnell 10x
Finding [Perseus Double Cluster](#) Easy with Cassiopeia

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20/20 Vision Campaign

GLOBE at Night: 2 November to 11 November

Light Pollution Committee: 9 November, 6:15pm

HRPO partners will be assisting two young ladies from St. Joseph's Academy. Both girls will be gathering light pollution data for their . These are the two science fair hypotheses...

*Light pollution increases in proportional to population density in those areas without full-cut off lighting.

*Details of Messier objects are diminished in proportion to increases in light pollution.

Please, if at all possible, BRAS members should definitely take one GLOBE at Night measurement during the session beginning on the 2nd. Meanwhile, BRAS will probably speak about light pollution in November to the Greater Baton Rouge Federation of Homeowners Association—specifically about how homeowners can reduce light pollution on their properties.

Pisces – The Fishes

Position: RA 1, Dec. +15

Named Stars:

Al Rischa (Alpha Psc), Alrescha, Alrisha, "The Cord", Struve 202, is a close binary star. **Alpha Psc A**, mag. 4.33, 02 02 02.80 +02 45 49.5; **Alpha Psc B**, mag. 5.23, 02 02 02.80 +02 45 49.0, are both blue-white main sequence stars with a separation of 1.8 arc-seconds, and an orbital period of 933 years.

Fum al Samakah (Beta Psc), "Mouth of the Fish", mag. 4.48, 23 03 52.61 +03 49 12.3, is a blue-white, main sequence star.

Simmah (Gamma Psc), mag. 3.70, 23 17 09.49 +03 16 56.1, is a yellow giant star, is in the asterism "The Circle of Pisces".

Lintium (Delta Psc), mag. 4.44, 00 48 40.90 +07 35 06.7, is a binary star. The primary is an orange giant star, and the companion is a 13th magnitude star with a separation of 2 arc-minutes. The companion star is thought to be a dwarf star or merely a star in the same line of sight.

Khat (Epsilon Psc), "Cord", mag. 4.27, 01 02 56.66 +07 53 24.3, is an orange giant star. This star is a suspected occultation double, composed of two stars with the same magnitude separated by 0.25 arc-seconds.

Alpher (Eta Psc), "pouring point of water", Kullat-Nunu, "cord of the fish", mag. 3.62, 01 31 28.99 +15 20 45.0, is a yellow giant star. **Alpher** has a faint companion about one arc-second away.

Torcularis Septentrionalis (Omicron Psc), "northern thread", Torcular, "thread", mag. 4.26, 01 45 23.59 +09 09 27.5, is a yellow giant star.

Anunitum (Tau Psc), mag. 4.51, 01 11 39.59 +30 05 23.0, is a star in Pisces.

Dzaneb al Samkat (Omega Psc), Cauda Piscis, Vernalis, mag. 4.03, 23 59 18.60 +06 51 48.9, is a yellow-white sub-giant star that is suspected to be a close binary variable star.

Van Maanen's Star, mag. 12.36, 00 49 09.90 +05 23 19.0, is a white dwarf star, the third closest white dwarf star to the Sun, and the nearest known solitary white dwarf located about two degrees south of **Delta Piscium**.

Deep Sky:

M 74, NGC 628, mag. 9.2, 01 36.7 +15 47, 10.2'x9.5', is a fine, face-on spiral galaxy; round and very large; very small nucleus; two major arms that can be partially resolved with large instruments. **M 74** is located ½ ° north and 1 ½ ° east of **Eta Piscium**. Due to its large size and low surface brightness, **M 74** is an elusive object to see. Two supernovae have been observed in **M 74**, SN 2002ap, and SN 2003gd. Sn2002ap was one of the rare Type 1C supernovae, also known as hyper-novae – super novae explosions with a substantially higher amount of energy than a regular supernovae, and are believed to be the origin of long-duration gamma-ray bursts. In March 2005, an ultra-luminous X-ray source was discovered in **M 74** – a suspected intermediate-mass black hole. The X-ray source is designated as CXOU J013651.1+154547.

NGC 676, mag. 9.6, 01 49.0 +05 54, 4.3'x1.6', is a galaxy with a very small and bright nucleus; it has a bright star superimposed on it.

M 74 Group (or NGC 628 Group), is a small group of 5 to 7 galaxies in the **Pisces** constellation, the brightest of which is **M 74**. Other members of the group include **NGC 660** (mag. 11.2), a peculiar spiral galaxy, and a few smaller irregular galaxies.

CL 0024 + 1694, is a large galaxy cluster primarily made up of yellow elliptical and spiral galaxies, at a distance of 3.6 billion light years (red shift of 0.4), that lenses a galaxy behind it (at a distance of 5.7 billion light years and a red shift of 1.67).

3C31 is an active galaxy with a super-massive black hole at its center, with jets that extend for millions of light years in both directions. It is a double radio galaxy having a quasar-like appearance with a visible magnitude of 13.4. Four galaxies located nearby – **NGC 379, NGC 380, NGC 385, and NGC 384** are believed to be closely associated with it.

There are 24 more NGC objects, The Pisces Dwarf Galaxy (PGC 3792), and Arp 284 – all are over 10th magnitude – see me for the info if you want it.

Other Stars:

Zeta Psc, Struve 100, is a binary star. **Zeta Psc A**, mag. 5.21, 01 13 43.80 +07 34 31.8; **Zeta Psc B**, mag. 6.44, 01 13 45.17 +07 34 42.2, have a separation of 23".

Iota Psc, mag. 4.13, 23 39 56.82 +05 37 38.5, is a yellow-white dwarf star and is a suspected variable star that has two line-of-sight companions.

Nu Psc, mag. 4.45, 01 41 25.91 +05 29 15.4, is an orange giant star that used to have a designation of **51 Ceti**.

Psi Psc, Struve 88, mag. 5.55, 01 05 41.68 +21 27 55.7, is a double star with a companion and a separation of 30". **Psi¹Psc**, mag. 5.33, 01 05 40.93 +21 28 23.6; **Psi²Psc**, mag. 5.56, 01 07 57.11 +20 44 21.6; **Psi³Psc**, mag. 5.57, 01 09 49.20 +19 39 30.2.

19 Psc (TX PSC), mag. 4.95, 23 46 23.54 +03 29 12.7, is one of the reddest stars known, and is a variable carbon star – a late type star that resembles a red giant star that has an atmosphere with more carbon than oxygen. **19 Psc** is found 2° north of **Lambda Psc** and 1° east, between **Iota Psc** and **Lambda Psc**.

107 Psc, mag. 5.87, 01 42 29.95 +20 16 12.5, is a main sequence orange dwarf star that has two visual companions. **107 Psc** used to have the designation **2 Arietis**.

54 Psc, mag. 5.88, 00 39 22.09 +21 15 04.9, is an orange dwarf star that has one planet and one brown dwarf star in orbit around it. The planet orbits at a distance of 0.28 AU (corresponding to the orbit of **Mercury**), and has an orbital period of 52 days.

HD 217107, mag. 6.17, 22 58 15.54 -02 23 43.2, is a yellow sub-giant star with two planets in orbit. One planet orbits in 7.1 days, the second planet orbits in about 8 years.

109 Psc, mag. 6.27, 01 44 55.85 +20 05 00.3, has one planet in orbit.

HD 8574, mag. 7.11, 01 25 12.52 +28 34 00.1, has one planet in orbit.

HD 217786, mag. 7.80, 23 03 08 -00 25 47, has one planet in orbit.

HD 4313, mag. 7.82, 00 45 40.36 +07 50 42.1 has one planet in orbit.

HD 5891, mag. 8.25, 01 00 33 +20 17 33, has one planet in orbit.

HD 1502, mag. 8.52, 00 19 17 +14 03 17, has one planet in orbit.

HD 218566, mag. 8.63, 23 09 11 -02 15 39, has one planet in orbit.

HD 4203, mag. 8.68, 00 44 41.20 +20 26 56.1, has two planets in orbit.

WASP 76, mag.9.5, 01 46 32.0 +02 42 02, has a transiting planet in orbit.

There are two more stars beyond 10th magnitude with planets in orbit around them.

Asterisms:

The astronomer Johannes Hevelius divided **Pisces** into four sub-divisions in his *Firmamentum Sobiescianum* in 1690; the North Fish (Piscis Boreas), The North Cord (Linum Boreum), The South Cord (Linum Austrinum), and The South Fish (Piscis Austrinus).

Piscis Boreas – The North Fish – is formed by the stars **Sigma Psc, 68 Psc, 65 Psc, 67 Psc, Psi¹Psc, Psi²Psc, Psi³Psc, Chi Psc, Phi Psc, Upsilon Psc, 91 Psc, T Psc, 82 Psc, and 78 Piscium**.

Linum Boreum – The North Cord – is formed by the stars **Chi Psc, Rho Psc, 94 Psc, VX (97) Psc, Eta Psc, Pi Psc, Omicron Psc, and Alpha Piscium**.

Piscis Austrinus – The South Fish – is formed by the stars **Omega Psc, Iota Psc, 9 Psc, 7 Psc, 8 Psc, 5 Psc, Kappa Psc, Lambda Psc, TX Psc, Theta Psc, and Gamma Psc**.

Linum Austrinum – The South Cord – is formed by the stars **Alpha Psc, Xi Psc, Nu Psc, Mu Psc, Zeta Psc, Epsilon Psc, Delta Psc, 41 Psc, 35 Psc, and Omega Piscium**.

The Cirlet asterism is located south of the **Pegasus** constellation, in the western fish of **Pisces**. It is formed by the stars **Gamma Psc, Kappa Psc, Lambda Psc, TX Psc, Iota Psc, and Theta Piscium**.

Testudo – The Turtle – is formed by the stars **24 Psc, 27 Psc, YY (30) Psc, 33 Psc, and 29 Piscium**.

Sky Happenings:

Nov. 1st – Daylight Saving Time ends at 2:00 AM.

Nov. 2nd – Dawn - A close paring (less than 1° apart) of Mars and Venus, with Jupiter about 6° to their upper right. This pairing also appears on the morning of Nov. 3rd.

Nov. 3rd – Last Quarter Moon occurs at 6:24 AM CST.

Venus passes 0.7° south of Mars at 10 AM CST.

Nov. 6th – The Moon passes 2° south of Jupiter at 10AM CST

Asteroid Laetitia is at opposition at 10 PM CST.

Nov. 7th – The Moon passes 1.8° south of Mars at 4 AM CST

Dawn – The waxing crescent Moon shines less than 2° from Venus, forming a triangle with nearby Mars, and Jupiter stands about 11° above them.

Nov. 11th – New Moon occurs at 11:47 PM CST.

Nov. 12th – The Moon passes 3° north of Saturn at 7PM CST.

Nov. 17th – Mercury is in superior conjunction at 9AM CST

Asteroid Vesta is stationary at 10AM CST.

Nov. 18th – The Leonid meteor shower peaks before dawn in a moon-free sky (moon-set is at about 10:30 PM local time).

Neptune is stationary at 3PM CST.

Nov. 19th – First Quarter Moon occurs at 12:27 AM CST

The Moon passes 3° north of Neptune at 8PM CST.

Nov. 20th – Asteroid Nausikaa is at opposition at 3PM CST

Mars is at aphelion (154.9 million miles from the Sun) at 5PM CST.

Nov. 22nd – The Moon passes 0.9° south of Uranus at 1PM CST.

Nov. 23rd – The Moon is at perigee (225,444 miles from Earth) at 2:07PM CST.

Nov. 25th – Full Moon occurs at 4:44PM CST, in the Hyades constellation.

Nov. 26th – The Moon passes 0.7° north of Aldebaran at 4AM CST,

Dawn – Spica shines less than 5° from Venus for the next five days.

Nov. 28th – Venus passes 4° north of Spica at 10AM CST.

Nov. 29th – Saturn is in conjunction with the Sun at 6PM CST.

Mercury – Mercury shines at mag. -1.0 at the beginning of the month, but he is only 4° high in the east-southeast 30 minutes before sunrise. Mercury reaches superior conjunction with the Sun on Nov. 17th, and will return to view in December.

Venus – On November 1st, Venus and Mars rise at about 2:30 AM local time, with Venus appearing 1.1° from Mars. The gap is closed to 0.8° on the 2nd, and to 0.7° on the 3rd. Venus is at mag. -4.4, has a 22 “ wide disk, and is at 55% lit. This conjunction happens at the border of Leo and Virgo. On the 6th, Venus passes about 0.4° from Beta Virginis (mag. 3.6), and the Moon appears within 2° of both Venus and Mars. On the morning of the 13th, Venus is less than 0.2° from Eta Virginis. Venus passes 1° south of Gamma Virginis on the 18th, and 4° north of Spica on the 28th through Dec. 2nd. During November, Venus dims from mag. -4.5 to -4.2, with the final days of the month, Venus appears 18” across and ⅔ lit.

Mars – The first few days of November have Venus and Mars within 1° of each other, with Mars at mag. 1.7 and only 4.3” wide disk at 97% lit. On November 7th, the Moon appears within 2° of both Mars and Venus. By month’s end, Mars is about 20° to the lower left of Jupiter and Venus is about 14° to the lower left of Mars. On November 21st, Mars approaches Eta Virginis, where, depending on your location, you can see them as little as 0.1° apart. Mars will slide 1° south of Gamma Virginis on November 30th. During November, Mars brightens

from mag. 1.7 to 1.5.

Jupiter – Jupiter rises in the east (in Leo) just after 2AM local time on the 1st, and climbs 30° high by the time twilight commences around 5AM CDT. By the 30th, Jupiter rises 2 hours earlier and stands 50° high at first hint of twilight. During Oct., Jupiter, Venus, and Mars were together in the sky, but during November, the line connecting the three lengthens from about 6° long to more than 30°. During Nov., Jupiter's equatorial diameter swells from 33" to 36", and brightens from mag. -1.8 to -2.0. At mid month, Jupiter passes less than 1° south of 4th magnitude Sigma Leonis. By month's end, Jupiter rises soon after midnight near the Leo-Virgo border.

Saturn – On the 1st, Saturn stands between 5° and 10° above the southwest horizon 45 minutes after sunset at mag. 0.5 in the background stars of northern Scorpius, 8.5° northwest of Antares. Saturn, under good conditions, should be about 1° from the wide double star Beta Scorpii (mag. 2.6 and 4.9). On November 7th, another wide double star, Nu Scorpii (mag. 4.0 and 6.3) will be only about 2° south of Saturn. Saturn is lost to view in mid-November, going through a conjunction with the Sun on November 30th.

Uranus – Uranus is in the Fishes, glowing at mag. 5.7, with a disk of blue-green measuring 3.7" across. To find Uranus, start at mag. 2.8 Algenib (Gamma Pegasi) – the star at the southeast corner of the Great Square of Pegasus. Then scan 14° southeast and pick up mag. 4.3 Epsilon Piscium (coincidentally, the Square's eastern side is also 14° long). Uranus lies less than 2° south of Epsilon Piscium throughout November.

Neptune – Neptune lies against the backdrop of Aquarius the Water Bearer. Neptune glows at mag. 7.9, and remains in nearly the same spot all month. To find Neptune, first locate 4th magnitude Lambda Aquarii, and then scan 6° southwest to pick up 5th magnitude Sigma Aquarii. Neptune lies 1.5° northeast of Sigma Aquarii all month, showing a 2.3" diameter disk with a pronounced blue-grey color.

Pluto – Pluto lurks low in the southwest after darkness falls. Hunt for the mag. 14.2 world around 6:15 PM local time in mid-November. Pluto then stands nearly 20° high. Pluto begins the month with a disk of 20.5' west of mag. 3.5 Xi² Sagittarii, in northern Sagittarius. On November 16th and 17th, Pluto skirts 1.1' north of Xi² Sagittarii.

Ceres – Ceres also lingers in Sagittarius. Ceres begins the month in the far eastern part of the constellation. It then crosses northern Microscopium during the second and third week of November, before entering southern Capricornus. Ceres is at 9th magnitude, and can best be seen on the evening of Nov. 27th, when it passes 0.3° north of 4th magnitude Omega Capricorni.

Asteroids – Asteroid 4 Vesta is one of the easiest asteroids to find and track. 4 Vesta shines at 7th magnitude about half-way up in the southern sky during mid-evening. It spends the month within a couple of degrees of mag. 3.5 Iota Ceti, which itself lies 11° north-northwest (to the upper right) of 2nd magnitude Beta Ceti.

Comets – Comet Catalina (C/2013 us10) is predicted to reach 4th magnitude by the end of the month. The comet reaches perihelion in mid-November. Your first opportunity to view the comet comes around Nov. 22nd when it just clears the horizon by the start of twilight. Catalina then lies in southeast Virgo, near its border with Libra. Using mag. 4.5 Lambda Virginis, the comet passes just 0.1° east of this star on the morning of November 27th.

Meteor Showers – The Taurid meteors of Oct. and Nov. have two components: the Southern Taurids running roughly through Oct. and early Nov.; and the Northern Taurids running from late Oct. through mid-November. Both streams originate from the periodic comet 2P/Encke. Between Oct. 10th and Nov. 25th, the shower's radiant moves all the way from north of the head of Cetus to north of Aldebaran. The weak Leonid meteor shower peaks on Nov. 17th/18th.

When to view the Planets

Evening Sky

Saturn (southwest)
Uranus (east)
Neptune (southeast)

Midnight

Uranus (southwest)
Neptune (west)

Morning Sky

Mercury (east)
Venus (southeast)
Mars (southeast)
Jupiter (southeast)

Dark Sky Viewing: Primary – Nov. 14th, Secondary – Nov. 21st

Pisces – The Fishes

The mythological events concerning this constellation are said to have taken place around the Euphrates River, a strong indication that the Greeks inherited this constellation from the Babylonians. The story follows an early episode in Greek mythology, in which the gods of Olympus had defeated the Titans and the Giants in a power struggle. Mother Earth, also known as Gaia, had another nasty surprise in store for the gods. She coupled with Tartarus, the lowest region of the Underworld, where Zeus had imprisoned the Titans, and from this unlikely union came Typhon, the most awful monster the world had ever seen.

According to Hesiod, Typhon had a hundred dragon's heads from which black tongues flicked out. Fire blazed from the eyes in each of these heads, and from them came a cacophony of sound: sometimes ethereal voices which gods could understand; while at other times Typhon bellowed like a bull, roared like a lion, yelped like puppies, or hissed like a nest of snakes.

Gaia sent this fearful monster to attack the gods. Pan saw him coming and alerted the others with a shout. Pan himself jumped into the river and changed his form into a goat-fish, represented by the constellation Capricornus, also inherited from the Babylonians.

Aphrodite and her son Eros took cover among the reeds on the bank of the Euphrates, but when the wind rustled the undergrowth, Aphrodite became fearful. Holding Eros in her lap, she called for help to the water nymphs and leapt into the river. In one version of the story, two fishes swam up and carried Aphrodite and Eros to safety on their backs, although in another version the two refugees were themselves changed into fish. The mythologists said that because of this story, the Syrians would not eat fish. An alternate story, given by Hyginus in the *Fabulae*, is that an egg fell into the Euphrates and was rolled to the shore by some fish. Doves sat on the egg and from it was hatched Aphrodite who, in gratitude, put the fish in the sky. Eratosthenes wrote that the fish, represented by the constellation Pisces, were offspring of another fish that is represented by the constellation Piscis Austrinus.

In the sky, the two fish of Pisces are represented swimming in opposite directions, their tails joined by a cord. The Greeks offered no good explanation for this cord, but according to the historian Paul Kunitzsch, the Babylonians visualized a pair of fish joined by a cord in this area of the sky. So evidently the Greeks borrowed this idea although the significance of the cord was lost.

Pisces is a disappointingly faint constellation, its brightest stars being only of 4th magnitude. Alpha Piscium is called Al Rescha, from the Arabic name meaning "the cord". It lies where the cords joining the two fish are knotted together. Pisces is notable because it contains the point at which the Sun crosses the celestial equator into the northern hemisphere each year. This point, called the Vernal Equinox, originally lay in Aries, but it has now moved into Pisces because of the slow wobble of the Earth on its axis, called precession.

