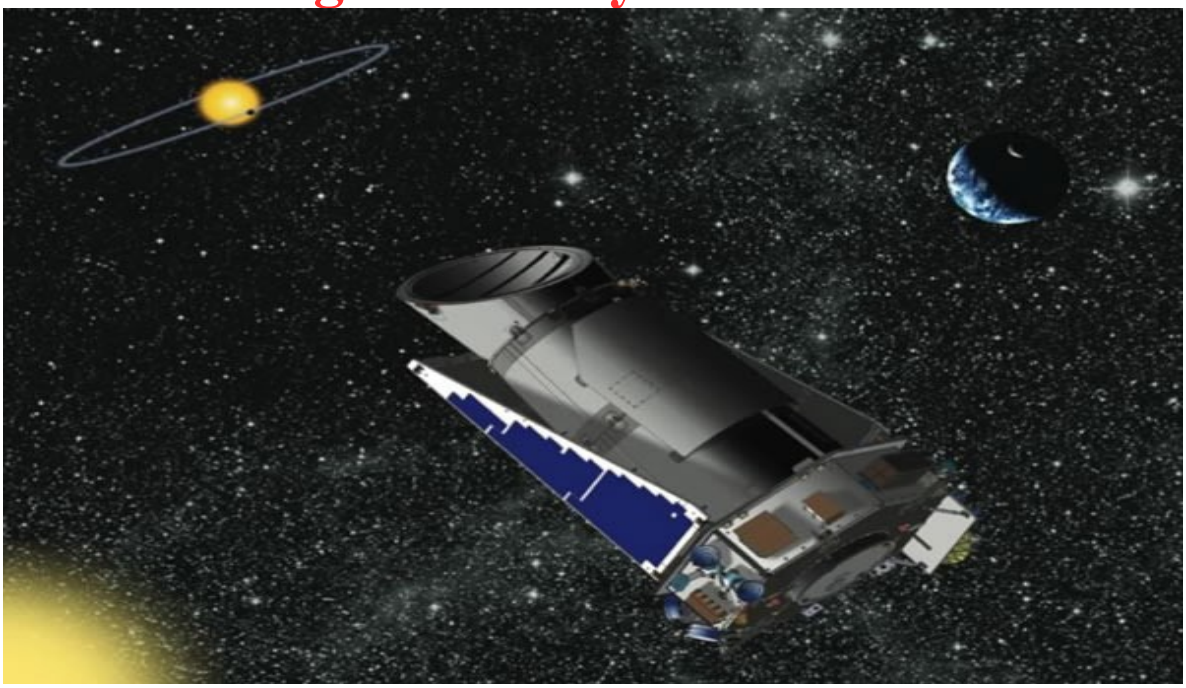
Night Visions

Newsletter of the Baton Rouge Astronomical Society

February, 2015

Next Meeting: February 9th at 7PM at HRPO



Artist concept of the Kepler Space Telescope. Click on image to read about its 1000th alien planet discovery.

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President's Message

The most important thing for BRAS this month is to register for the Hodges Garden Star Party, March 18-22, 2015. Go here for details: http://www.brastro.org/hgsp.html This is BRAS premier stargazing event of the year. The skies are dark and the park is beautiful, offering plenty of outdoor enjoyment during daylight – petrified tree trunks, rose garden, nature trails, and scenic overlooks.

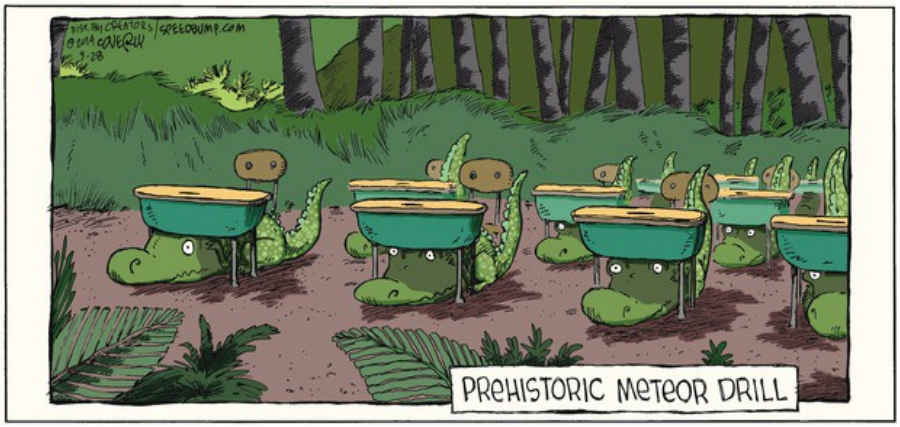
Comet Lovejoy C/2014 Q2 has put on a good show for us. It has been barely visible to the naked eye for over two weeks and a fine binocular object. Amateurs from around the world have taken wonderful photos of it. If you took any photos, please show them off to us at the next meeting. I hope you got to see it. If not, it should be somewhat visible with binoculars but will be mostly washed out as the Moon reaches full. You may be able to see it after the full moon but you will likely need binoculars.

Also the night of January 26-27, the near-earth asteroid 2004 BL86 flew closely to the earth but well beyond the distance of the Moon. It was about 9th magnitude at its brightest. I hope you got to see it.

Jupiter is now visible throughout the night. It will be in opposition on February 6th. We have a special treat this year. The earth is passing through the orbital plane of Jupiter's four Galilean moons. The moons will be in alignment with our line of site. This means we will have more opportunities to observe occultations and transits.

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
BRAS President



Planets Amidst the Noise

Tau Ceti's planets were not supposed to be there.

They revealed themselves when Steven S. Vogt, astrophysics professor at UC Santa Cruz, and his collaborators were testing a new noise-analysis method on spectrometer data to calibrate their technique. Indeed, the team of 15 astronomers from seven institutions on four continents had picked Tau Ceti specifically because meticulous observations strongly suggested the star had no planetary system.

From the earliest days of the hunt for exoplanets almost 20 years ago, astronomers suspected that evidence of Earth-like planets might be buried in the noise of spectroscopic measurements of stellar radial velocities (stars' velocities in space toward or away from us). Such noise arises from flares and other activity on a star's surface.

The tiny signal…

Earth-like planets are low mass compared to stars. Even so, planets revolve not around a host star's center (axis of rotation); instead, both star and planets revolve around the planetary system's barycenter (center of mass). Like a smaller boy gamely wrestling a bigger one, the gravitational mass of a planet throws a star's weight around just a little, even though the bigger mass is in control.

The barycenter for our own solar system, for example, slowly wanders from near the center of the Sun to farther than a solar radius above the Sun's surface: when all the planets are on the same side of the solar system as Jupiter, the barycenter is farther from the center of the Sun toward Jupiter than it is when all the planets are on the opposite side of the solar system from Jupiter. In other words, the Sun itself is doing a slow dance like a meandering box step of hundreds of thousands of kilometers around the solar system's barycenter.

In the 1980s, exoplanet hunters began to wonder whether the barycentric wandering of a distant star could betray the existence of planets. Would it be even detectable? Most stars speed toward or away from Earth by 10,000 or more meters per second. A star's barycentric wandering due to the pull from an orbiting Earth-sized planet, however, would speed or slow that RV by under a meter per second, Vogt noted.

But it might be measurable by a precision spectrometer, such as the High Resolution Echelle Spectrograph (HIRES) Vogt had designed, built, and used at Keck Observatory for 20 years. Its 25-megapixel CCD detector measures Doppler shifts of spectral lines finer than 1 part in 300,000,000, a precision of stellar RV to under 1 meter per second.

…amidst stellar "jitter"

Detecting the barycentric wandering of a distant star is a colossal challenge for both measurement and computational analysis. Vogt and his collaborators needed a nearby Sun-like star whose RV had been meticulously measured for years, with no evidence of a planetary system. They needed a bright star to eliminate so-called Poisson noise due to statistical variations in the rate of photons detected. By studying noise signatures from the planetless star, they hoped to learn precise characteristics of noise produced by stellar surface activity—so as to remove its masking of extremely weak variations in a star's RV from the gravitational effect of Earth-sized planets.

Seeming to fit the bill was Tau Ceti, a 3.5-magnitude G8 star about three-quarters the size of the Sun closer than 12 light-years, speeding toward us at 16.4 kilometers per second. Some 6000 precision radial velocities existed in three independent sets of high-precision RV measurements by three different teams, in runs ranging from 6 to 13 years.

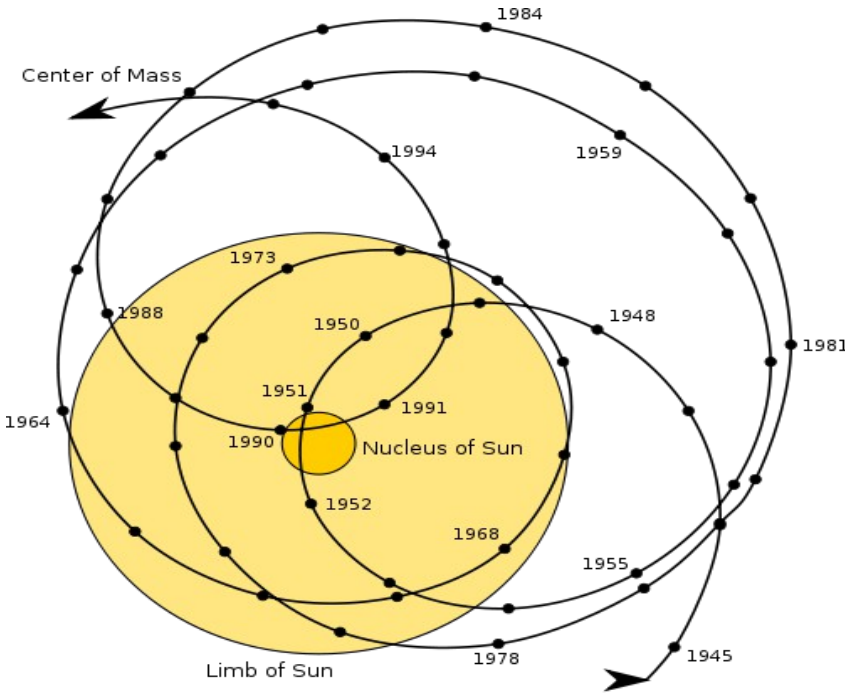
Vogt's mathematician collaborator Mikko Tuomi at the University of Hertfordshire developed statistical techniques for analyzing and comparing the three data sets, identifying and removing noise. The goal: to identify variations in signals appearing periodically and simultaneously in all three sets of data (and therefore due to real planetary-induced changes in Tau Ceti's RV) versus variations in only one set of data due to stellar surface activity and/or instrumental errors. Tuomi also developed methods for analyzing the long-term pattern of a star's barycentric motion to calculate number of possible planets, their masses and orbits.

When the group applied the computational techniques to Tau Ceti's runs of spectrometry data as a dry run for the stellar surface noise calibration, "five statistically significant planet-like signals popped out!" Vogt exclaimed. "It was a surprise!" The signals suggested the planets were not much bigger than Earth, with the outermost two *e* and *f* being in the habitable zone where water could be liquid.

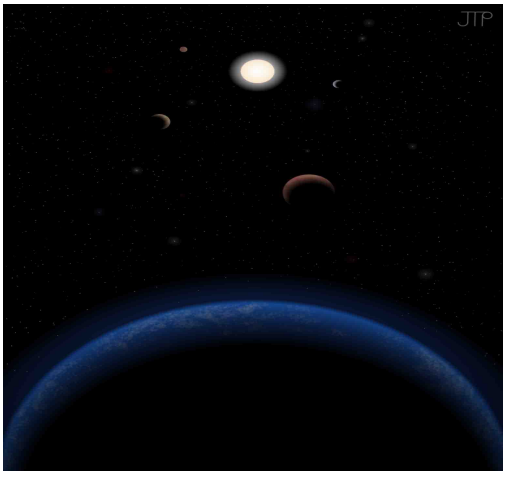
The team is now applying their new techniques to runs of RV data for other nearby stars. *–Trudy E. Bell, M.A.*

***Further reading*:** "Signals embedded in the radial velocity noise: Periodic variations in the τ Ceti velocities" *Astronomy & Astrophysics* 551: 79, March 2013, http://arxiv.org/abs/1212.4277 .

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



The Sun moves around the barycenter (center of mass) of our solar system, depending on the positions of the planets. Detecting barycentric movement of other stars from precision radial velocity (RV) measurements can reveal the presence of Earth-mass planets; the pattern of movement can reveal number, masses, and orbits.
Credit: Carl Smith, Rubik-wuerfel http://en.wikipedia.org/wiki/Barycentric_coordinates_%28astronomy%29



Rendering of the Tau Ceti planetary system shows the five planets b, c, d, e, and f, from closest to farthest from the star. All range in mass from 2.0 to 6.6 times the mass of Earth with orbital periods ranging from 13.9 to 642 days. The two outermost planets e and f are at 0.5 and 1.5 A.U. from Tau Ceti.

Credit: J. Pinfield for the RoPACS network at University of Hertfordshire, 2012.

Secretary's Summary of January Meeting

- Merrill mentioned in his opening remarks that the bad news was that there would be no comet hunting for Lovejoy this evening due to sky conditions (the good news was that there were oatmeal cookies courtesy of Ashley Toman). He's seen Lovejoy from his house with binoculars. He suggested that using equipment with low magnification may be the way to go to find this comet. Last week (before the meeting) was its closest approach to earth; perihelion is coming up. It will start to get dimmer sometime from January 23rd – January 30th. For once the northern hemisphere has the best look at the comet. Jupiter is coming up earlier these days. Currently the earth is passing through the planes of the Galilean moons. Because of this on the 23rd of January there will be a triple transit during a 25-minute period.

- Don Weinell let us know that he had contracted for the port-a-potties at Hodge Gardens (star party is scheduled for March 18th – March 22nd); he suggested that reservations should be made now if you are going to be staying in a cabin. He also announced that those who are interested in going to the star party at Rockefeller could sign up on the list on the side table. This is officially an opportunity to stargaze, but birdwatching and crabbing have been known to happen. This is one of the largest bird refuges for wintering waterfowl; you can possibly also see deer, otter, and alligators.

- There were two Astronomical League certificates and pins for 50 hours of outreach a piece awarded to John Nagle and Trey Anding. Chris mentioned that he thought that we were the most active club in terms of membership in proportion to certificates.

- Ben introduced the speakers for the evening, Matt Vecchio and Zack from the Backpacker. They gave an interesting presentation on Cold Weather Observing – How to Stay Warm with samples of clothing and equipment and tips for staying warm while we're out stargazing on cold winter nights. These included tips for diet (ginger, non-caffeinated tea, and starchy food are good, whiskey and caffeinated drinks not so much) as well as clothing (dressing in layers is good with the lighter clothes closer to your skin and the heavier stuff on top of that) as well as equipment (make sure your first aid kit has a heat-reflective blanket and don't forget handwarmers).

- There was a final reminder after the lecture to sign up for Rockefeller, and then a raffle was held. Prizes this month included an Orion pin, an Orion model, a Redshift disk, a Messier card, a Caldwell card, a Peterson Guide for Stars and Planets, a book on cat telescopes, and a Clif bar and handwarmers from the guys from the Backpacker.

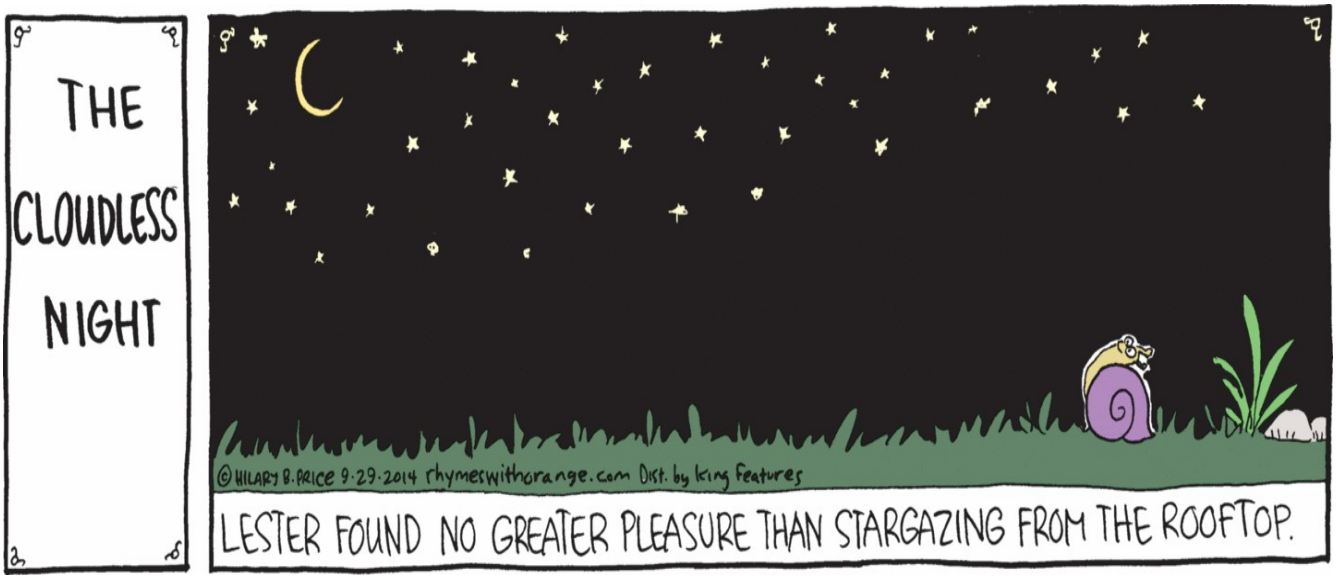
-Roslyn Readinger
BRAS Secretary

HRPO

FRIDAY NIGHT LECTURE SERIES
all start at 7:30pm
6 February: "GLOBE at Night"
13 February: "Journeys to the Moon"
20 February: {no lecture}
27 February: "The Dawn Mission"

SCIENCE ACADEMY
Saturdays from 10am to 12pm
For ages eight to twelve. $5/$6 per child.
7 February: "Cadet's Choice"
14 February: "Historic Experiments I"
21 February: "Historic Experiments II"
28 February: "Historic Experiments III"

CALL FOR VOLUNTEERS
*Friday, 20 February from 5:45pm to 7:45pm. *Two volunteers needed.* **Moon-Venus-Mars Conjunction.** Promoting BRAS and HRPO, small telescope operation. Easy; training provided.
*Saturday, 21 February from 6pm to 10pm. *Two volunteers in additional to regular complement.* **Evening Sky Viewing Plus.** Marshmallow roast, demo tables. Easy; training provided.
*Saturday, 28 February from 12pm to 2pm. *One volunteer.* **Solar Viewing**. Three viewing instruments. Moderate; training provided.



20/20 Vision Campaign

The Baton Rouge Area Foundation is interested in restoring the Lakes around LSU. Apparently these lakes are, on average, fewer than eighty centimeters in depth. BRAF's $750,000 idea is using as its springboard a U.S. Army Corps of Engineers dredging proposal. The collaborators include EBRP government (the owners of the lakes), LSU and BREC. A final plan is slated for the summer of 2015. On 29 January from 6pm to 8pm there will be a public function at the **Lod Cook Alumni Center** concerning this project. As many BRAS members as possible should attend.

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This Month's **GLOBE At Night** runs from 9 February to 18 February. Participants should use the constellation Orion.

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Good news! Three preliminary SQM measurements was taken at the HRPO back viewing pad on the evening of 18 January. The resulting mean of 18.72 is comparable with the means obtained in 2014, suggesting the light pollution in the HRPO area has not increased.

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The East Baton Rouge Parish Library wants to introduce its **five-year Strategic Plan** to the public and receive input. One of the Plan's six goal areas is entitled "Facilities & Operations". This is an opportunity to continue promoting full-cut off shielding in library parking lots while maintaining the club's good relationship. The EBRP Library hosts BRAS outreaches for children every summer, and sponsored last year's Mini Maker Faire (in which BRAS was a participant).

A member represented BRAS at the 27 January meeting, expressing gratitude for EBRPL mentioning the fight against light pollution on its website (probably the first non-HRPO partner in the local area to do so).

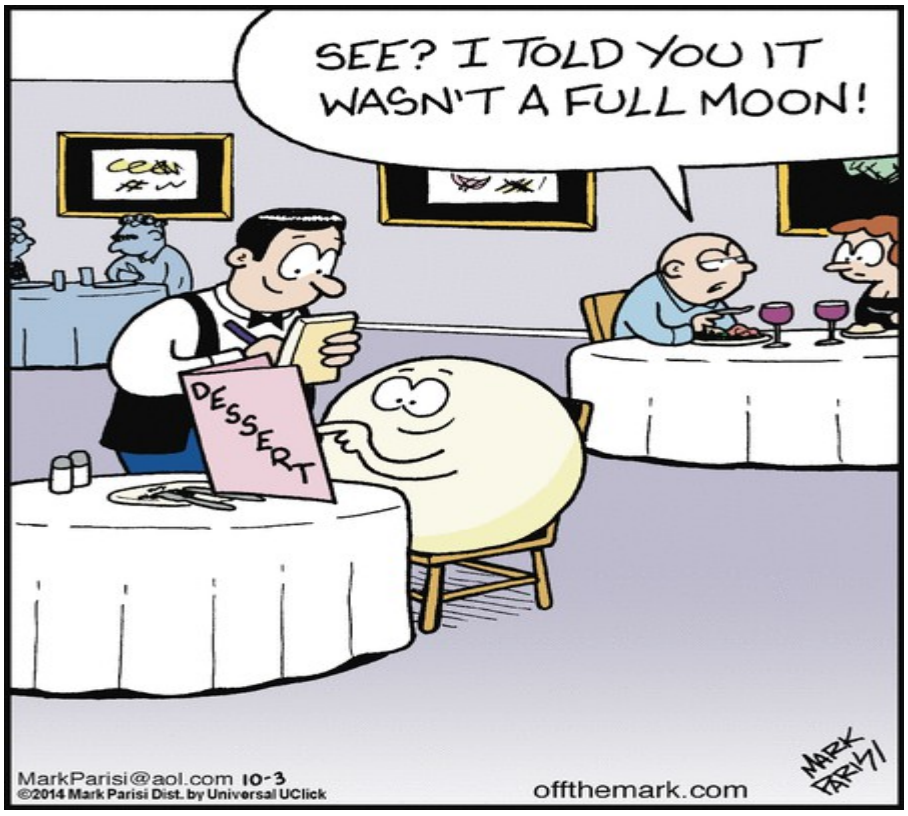
The remaining meetings are…
Tuesday 24 February, 12pm to 1:30pm = River Center Library
Tuesday 24 February, 5:30pm to 7pm = River Center Library
Thursday 26 February, 7pm to 8:30pm = Bluebonnet Regional Library

Recent Entries in the Forum

Below are selected recent additions to the BRAS Forum. There are also nine active polls.

Skywatch 2015 Available at HRPO
BRARC's Ham Radio Classes Begin on 12 February
Second BRAS Good Lighting Award goes to Woman's Hospital
Chris Desselles Uses Binocs on New Year's Eve Morning…
…Spots Moon-Saturn Conjunction on 16 January
2015 Learn Your Telescope Course a Success
Hodges Gardens Star Party Soon; Cabins On Site; Other Lodgings Nearby
First Quarter Moon Pic from Chris Desselles
Next Light Pollution Committee Meeting is 12 January
Chris Desselles' Astrophotography Lecture on 16 January Well-Received
February Viewing Times for the Great Red Spot Now Posted
Cloud-Aerosol Transport System Now on ISS
Inclement Weather Ruin Locals' Chance to See Triple Shadow Transit
BRAS Members Hunt 2004 BL_{86}; Visitor Captured with 20OGS CCD
Several BRAS Members, Hundreds of Patrons View Comet Lovejoy

Baton Rouge Culmination Times Posted for Cassiopeia A, The Christmas Tree Cluster, the Monkey Head Nebula and NGC 1097.



Monoceros – The Unicorn

Position: RA 7.15, Dec. -5.74

Named Stars:
Ctesias (Alpha Mon), mag. 3.94, 07 41 14.88 -09 33 03.9, is an orange giant star.
Cerastes (Beta Mon), mag. 3.74, is a triple star system forming a triangle with circum-stellar disks orbiting them. **Beta Mon A**, mag. 4.60, 06 28 49.07 -07 01 59.0, is a hydrogen fusing dwarf star with a projected rotational velocity of 346 km/sec.; **Beta Mon B**,mag. 5.40, 06 28 49.50 -07 02 04.0, is also a hydrogen fusing dwarf star with a projected rotational rate of 123km/sec.; **Beta Mon C**, mag. 5.60, 06 28 49.50 -07 02 04.0, is yet another hydrogen fusing dwarf star with a projected rotational rate of 331km/sec.. There is also a fourth companion, a 12th magnitude star, but is a line of sight companion and not physically related to **Beta Mon.** Separation of the **Beta Mon** stars are: AB- 7.3"; AC- 10"; BC- 2.8".
Tempestris (Gamma Mon), mag. 3.99, 06 14 51.34 -06 16 29.0, is an orange giant star, and the primary star in a multiple star system.
Kartajan (Delta Mon), mag. 4.15, 07 11 51.86 -00 29 34.0, is a white, main sequence, giant star.
Plaskett's Star (HD 471291, HR 2422 Mon, V640, GC 8631), mag. 6.05, 06 37 24.04 +06 08 07.4, is a spectroscopic binary, consisting of two massive blue supergiant stars, orbiting a common center of gravity every 14.4 days (separation is about 50 million miles). This pair of stars are the most massive pair yet identified in our galaxy. Located about 1 1/2° southeast of 13 Monocerotis, the stars are probably a member of the huge aggregation of NGC 2244, and it's associated nebula, NGC 2237, less than 2° distant. The dimmer star of the pair is a very fast rotator with a projected rotational rate of 300km/sec., resulting in a bulge at the equator of this star.
Nova Monocerotis 2002 (V838 Mon, GSC 04822-00039), mag. 15.74, 07 04 04.85 -03 50 51.1, is a red variable supergiant star that had an outburst starting on Jan. 6th, 2002. In Feb. of 2002, its brightness increased by a factor of 10,000 in one day.

Deep Sky:
M 50 (NGC 2323), mag. 5.9, 07 02.8 -08 23, 15'x20' in size, is an open cluster of 80 stars, with curving arcs of stars, giving the perimeter a rather heart shaped outline; detached, weak concentration of stars; large range of brightness; very large; magnitude of brightest star is 7.9. A red star is located near the southern verge and a pretty little equilateral triangle just north of it. To find **M 50,** draw a line between Sirius and Procyon – you will find the cluster about 1/3rd of the way up from Sirius. Another way to find **M 50** is to locate the roughly shaped square formed by **Alpha, Beta, and Delta Mon**, along with Sirius. Right in the middle of that square lies **M 50.**
NGC 2232, mag. 3.9, 06 28.0 -04 54, 30' in diameter, is an open cluster of 20 stars; not well detached; large range in brightness; a large cluster; includes bright star 10 Mon (mag. 5.1).
NGC 2264 ("The Christmas Tree Cluster", "The Cone Nebula"), mag. 3.9, 06 41.1 -09 53, 35'x15' in size, is a cluster of 40 stars. The 40 stars are bathed in bright nebulosity; not well detached; large range of brightness; large; magnitude of brightest star is 4.7. **The Cone Nebula** is the small dark nebula southeast of the cluster. There are two other objects within the **NGC 2264** designation but are not officially included: "The Snowflake Cluster and The Fox Fur Nebula (a diffuse dark nebula). The star S Mon marks the trunk of the tree, and the variable star V429 Mon represents the top of the tree. **The Cone Nebula** is an H II region in the southern part of **NGC 2264.**
CR 106, mag. 4.6 (photo), 06 37.1 +05 57, 44' in size, is an open cluster of 20 stars; detached; no concentration of stars; large brightness range; located about 1° north east of the Rosette Nebula (NGC 2237, 38, 39).
NGC 2244 (Caldwell 50), mag. 4.8, 06 32.0 +04 55, 23' in size, is an open cluster, located in the **Rosette Nebula (NGC 2237, 38, 39, 46),** of 100 stars; weak concentration of stars; large brightness range; large, bright; brightest star is mag. 5.8; involved in nebulosity. The star at the center, 12 Mon. (6th magnitude), probably does not

belong to the group.
CR 107, mag. 5.1 (photo), 06 37.7 +04 44, 34’ in size, is an open cluster of 15 stars; not well detached; large brightness range. Located about 1° east-southeast of **The Rosette Nebula (NGC 2237, 38, and 39).**
CR 97, mag. 5.4 (photo), 06 31.3 +05 55, 20’ in size, is an open cluster of 15 stars; not well detached; large brightness range.
NGC 2301, mag. 6.0, 06 51.8 +00 28, 12’ in size, is an open cluster of 80 stars; detached, strong concentration of stars; large range in brightness; large; brightest star is mag. 8.0. It is a curving group topped with a flying wedge of stars.
CR 91, mag. 6.4 (photo), 06 21.7 +02 22, 16’ in size, is an open cluster of 20 stars; not well detached; has moderate brightness range.
NGC 2343, mag. 6.7, 07 08.3 -10 39, 7’ in size, is an open cluster of 20 stars; detached, no concentration of stars; large range in brightness; quite large; magnitude of brightest star is 8.4.
CR 111, mag. 7.0 (photo), 06 38.7 +06 54, 3.2’ in size, is an open cluster – it is probably an asterism and not a true cluster.
NGC 2353, mag. 7.1, 07 14.6 -10 18, 19’ in size, is an open cluster of 30 stars; detached, weak concentration of stars; moderate range in brightness; large; contains a very bright star. The cluster is located on the northern tip of bright nebula LBN 1036.
NGC 2335, mag. 7.2, 07 06.6 -10 05, 12’ in size, is an open cluster of 35 stars; detached, no concentration of stars; large range in brightness; large; involved in nebulosity; brightest star is mag. 9.5.
CR 96, mag. 7.3, 06 30.3 +02 52, 7’ in size, is an open cluster of 15 stars; not well detached; moderate brightness range; magnitude of brightest star is 8.8. Located about 2° south-southwest of **The Rosette Nebula (NGC 2237, 38, and 39).**
NGC 2251, mag. 7.3, 06 34.7 +08 22, 10’ in size, is an open cluster of 30 stars; detached, no concentration of stars; moderate range in brightness; elongated and large; magnitude of brightest star is 9.1.
NGC 2286, mag. 7.5, 06 47.6 -03 10, 15’ in size, is an open cluster of 50 stars; not well detached; large range in brightness; magnitude of brightest star is 9.7. The cluster is curiously studded in pairs and triplets.
Do 25, mag. 7.6, 06 45.1 +00 18, 23’ in size, is an open cluster of 50 stars; not well detached; moderate brightness range; involved in nebulosity; brightest star is mag. 8.9.
NGC 2506 (Caldwell 54), mag. 7.6, 08 00.2 -10 47, 7’ in size, is an open cluster of 150 stars; detached, strong concentration of stars; moderate range in brightness; pretty large; magnitude of brightest star is 10.8.
NGC 1152, mag. 7.7 (photo), 06 35.0 +05 23, 19’ in size, is an open cluster of 30 stars; not well detached; moderate range of brightness; involved in nebulosity; brightest star is photo mag. 9. The cluster is located on northeast edge of **The Rosette Nebula.**
NGC 2215, mag. 8.4, 06 21.0 -07 17, 10’ in size, is an open cluster of 40 stars; detached, weak concentration of stars; moderate range in brightness; a large cluster; magnitude of brightest star is 10.5.
NGC 2324, mag. 8.4, 07 04.2 +012 03, 7’ in size, is an open cluster of 70 stars; detached, weak concentration of stars; moderate range in brightness; large; brightest star is magnitude 10.4.
NGC 2236, mag. 8.5, 06 29.7 +06 50, 7’ in size, is an open cluster of 50 stars; detached, no concentration of stars; moderate range in brightness; magnitude of brightest star is 11.0.
CR 92, mag. 8.6 (photo), 06 22.9 +05 07, 11’ in size, is probably not a true cluster. **CR** 92 is located about 2° west of **The Rosette Nebula.**
NGC 2346, “The Butterfly Wing Nebula”, PK 215+03.1, mag. 11.6, 07 09.4 -00 48, 52” in size, is a planetary nebula that is small, fairly faint, hazy, easily seen object; irregular disk with traces of ring structure; central star is at magnitude 11.5.
Rosette Nebula, NGC 2237, 2238, 2239, 2244, and 2246 (Caldwell 49), mag. 9.0, 06 32.3 +05 03, 80’x60’ in size, consists of emission nebulae **NGC 2237, 2238, and 2239,** along with the open cluster **NGC 2244.** It is a large, bright, roundish nebula involved in a sparse cluster of 100 stars. All designations (NGC) except **NGC 2244** designate parts of the H II nebulous region, and **NGC 2237** is also used to denote the entire nebula. There are many Bok Globules present in the nebula.
Hubble’s Variable Nebula (NGC 2261), Caldwell 46, 06 39.2 +08 44, 2’x1’ in size, has a bright and fan shaped

apex at its south end. The variable star R Mon illuminates the nebula. The nebula has an apparent magnitude of 9.0. Some observers question the existence of R Mon, and some star atlases do not show the star. Observations at Kitt Peak and Mauna Keo have concluded that R Monocerotis is a proto-planetary system. This nebula is tricky to find – locate Epsilon Mon, then star hop up to 13 Mon. Farther up, to the northeast, is S Mon. Between the stars 13 Mon and S Mon, just about half-way, the great nebulosity surrounding S Mon begins. At the extreme southern edge of this nebulosity is **Hubble's Variable Nebula.** This nebula was the first object to be photographed with the 200 inch reflector at Palomar Observatory, on Jan. 26, 1949.
IC 446, 06 31.0 +10 27, 5'x4' in size, is a faint, easily seen patch of nebulosity; involved with a mag. 9.5 star.
IC 447, "Dreyer's Nebula", 06 31 +09 53, is a large reflection nebula that is about 25 arc minutes in diameter.
IC 448, 06 32.7 +07 19, 15'x10' in size, is a large and faint nebula; illuminated by light from a 4.5 magnitude star (13 Mon).
IC 466, 07 08.6 -04 09, 1' in size, is a very small, very faint nebula containing an 11.5 magnitude star.
IC 2169, 06 31.2 +09 54, 25'x19' in size, contains a small open cluster; has a large absorption patch in its northeast part.
IC 2177,"The Seagull Nebula", 07 05.1 -10 42, 2.0°x0.7° in size, is a pretty bright, extremely large, very diffuse nebula extending north-south; illuminated by a 6.2 magnitude star. Bright nebula Ced 90 (in CMa) is located at the nebula's southern tip.
LBN 1036, 07 16.0 -10 40, 60'x10' in size, is a very faint and diffused nebula; the S-shaped half of the nebula is brightest. Open cluster **NGC 2353** is located in the north- west part of the nebula.
NGC 2149, 06 03.5 -09 44, 3'x2' in size, is a 9.3 magnitude star involved in a small, faint patch of nebulosity.
NGC 2170, 06 07.5 -06 24, 2' in size, is a 9.5 magnitude star involved in a small, very faint patch of nebulosity.
NGC 2182, 06 09.5 -06 20, 3' in size, is a 9.0 magnitude star involved in nebulosity.
NGC 2183, and 2185, 06 11.0 -06 13, 3'x1' in size, is a small, bright patch of nebulosity.
NGC 2245, 06 32.7 +10 10, 5'x3' in size, is a pretty large nebula with a comet like appearance; has an 11^{th} magnitude star involved in nebulosity.
NGC 2247, 06 33.2 +10 20, 4'x3' in size, has an 8.5 magnitude star involved in the northern part of an extremely faint patch of nebulosity,
NGC 2282, 06 46.9 +01 19, 3' in size, is a 10^{th} magnitude star involved in faint nebulosity in the southeast part of the nebula.
NGC 2316, 06 59.7 -07 46, 4'x3' in size, is a double star involved in a pretty faint, small, and roundish patch of nebulosity.
NGC 2349, 07 11 -08 36, is an open cluster discovered by Caroline Herschel on March 4^{th}, 1783.
Sh2-282, 06 38.0 01 31, 39'x14' in size, is an irregular shape containing several stars involved in nebulosity.
Sh2-294, 07 16.6 -09 26, 7'x6' in size, has an irregular shape.
Gum 1, 07 04.3 -10 28, 19' in size, is a small, bright nebula that is located about 0.5° northwest of bright nebula **IC 2177.**

Other Stars:
Epsilon Mon is a binary system. **Epsilon Mon A,** mag. 4.39, 06 23 46.10 +04 35 34.25, and **Epsilon Mon B,** mag. 6.72, 3 46.5 +04 35 45.1, is a yellow-white main sequence dwarf star. The two stars are separated by 12.1 arc seconds, and have an orbital period of at least 6,000 years. The primary component is a rapid rotator with a projected rotational velocity of 137km/sec. The brighter star has a dim, line of sight companion. **Epsilon Mon**is located just west of **The Rosette Nebula.**
S Mon (15 Mon), mag. 4.66, 06 40 58.66 +09 53 44.7, is a massive spectroscopic binary system consisting of two stars that cannot be resolved, orbiting each other with a period of 25 years. The spectrum matches that of a main sequence dwarf star. **S Mon** is in **The Christmas Tree Cluster in NGC 2264,** and is surrounded by the nebula Sharpless 273. It is located just to the north of **The Cone Nebula.**
HD 52265, mag. 6.29, 07 00 18.10 -05 22 02.5, is a yellow, main sequence dwarf star having two planets in its system. **HD 52265b** has an orbital period of 120 days, and is 1.1 Jovian Mass.

HD 44219, mag. 7.70, 06 20 14.32 -10 43 30.0, is a yellow, main sequence dwarf star with one planet having an orbital period of 472 days, and has a 0.58 Jovian Mass.
HD 46375, mag. 7.84, 06 33 12.62 +05 27 46.5, has one planet with an orbital period of 100 days, and is a hot sub-Saturn planet.
HD 45652, mag. 8.13, 06 29 13.19 +10 56 02.0, has one planet with an orbital period of 43 days, and a 0.47 Jovian Mass.
HD 66428, mag. 8.25, 08 03 28.67 -01 09 45.8, has one planet with an orbital period of 1,973 days, and has a 2.82 Jovian Mass.
HD 44179, "The Red Rectangle Nebula", mag. 8.94, 06 19 58.22 -10 38 14.7, is a webbed, X-shaped proto-planetary nebula, creating an intriguing mystery: why is it such a strange shape? We do not know.
Ross 614 (V 577), mag. 11.08, 06 29 23.40 -02 48 50.3, is a binary system with the primary component being a "flare" star. Both stars are red dwarfs, with the companion star at mag. 14.23.
A0620-00 (V 616), mag. 11.2, 06 22 44.50 -00 20 44.7, is an x-ray nova and a rotating ellipsoidal variable star.
AFGL 961, 06 34 37.63 +04 12 42.8, is a young stellar object.
Monoceros R2IRS3, 06 47 47.8 -06 22 55, is a young stellar object.
NGC 2264 IRS1, 06 41 10.06 +09 29 35.8, is a young stellar object in **NGC 2264.**
UGPS J072227.51-054031.2, 07 22 27.87 -05 40 31.1, is a brown dwarf star.
There are 10 stars below magnitude 11.5 that have a total of 11 planets in orbit around them.

Two meteor showers are associated with Monoceros, the December Monocerids and the Alpha Monocerids.

There are over 90 Double and Multiple stars in Monoceros, 65 Variable stars, and 26 Star Clusters, Nebulae, and Galaxies.

Sky Happenings:

Feb. 1st – Venus passes 0.8° south of Neptune at 5:00 AM CST.
Feb. 3rd – Full Moon occurs at 5:09 PM CST
Jupiter is 5° above the Moon in the evening sky.
Feb. 3rd/4th – Jupiter shines about 6° from the Full Moon.
Feb. 4th – The Moon passes 5ã south of Jupiter at 3:00 AM CST.
Feb. 4th/5th – Night- the Moon shines about 5° from Regulus, with Jupiter farther to their west.
Feb. 6th – The Moon is at apogee (252,370 miles from Earth) at 12:26 AM CST
Jupiter is at opposition at 12:00 PM (Noon) CST
Jupiter reaches its peak magnitude today, shining at -2.6 magnitude and appearing 45.4" across through a telescope.
Feb. 6th-20th –Dusk – Zodiacal light is on a good display in dark areas. Look to the west in about 80 minutes after sunset for a huge, tall pyramid of diffuse light; it slopes along the ecliptic, with Venus and Mars at its base.
Feb. 9th – The waning gibbous Moon rises about an hour before midnight (local time). Look about 6° to its upper right to find Spica.
Feb. 11th – Mercury is stationary at 1:00 AM CST.
Last Quarter Moon occurs at 9:50 PM CST.
Feb. 12th – The Moon passes 2° north of Saturn at 6:00 PM CST
I start my 63rd year at 01:47 AM CST.
Feb. 13th – Predawn – The Last Quarter Moon trails Saturn by about 5° in the eastern sky.
Feb. 15th – Asteroid Flora is at opposition at 5:00 AM CST.
Feb. 17th – The Moon passes 3° north of Mercury at 12:00 AM CST.

Feb. 18th – New Moon occurs at 5:47 PM CST.

Feb. 19th – The Moon is at perigee (221,826 miles from Earth) at 1:28 AM CST.

Feb. 20th – The waxing crescent Moon passes 2° north of Venus at 7:00 PM CST
The Moon passes 0.5° south of Mars at 7:00 PM CST.

Feb. 21st – Venus passes 0.5° south of Mars at 2:00 PM CST.
The Moon passes 0.3° north of Uranus at 4:00 PM CST
Venus and Mars are less than 1° apart in the west. The planets set about 2 hours after sunset, with the thin crescent Moon chasing them down.

Feb. 24th – Mercury is at greatest western elongation (27°) at 10:00 AM CST.

Feb. 25th – First Quarter Moon occurs at 11:14 PM CST
The Moon passes 1.0° north of Aldebaran at 5:00 PM CST
Neptune is in conjunction with the Sun at 11:00 PM CST.

Mercury – Mercury reaches greatest western elongation on Feb. 24th, when it lies 27° west of the Sun. Mercury climbs to just over 4° above the southeastern horizon 45 minutes before sunrise. You can use binoculars to pick out the magnitude 0.0 object out of the twilight glow.

Venus and Mars – Venus hangs in the western twilight sky all month, at mag. -3.9 and a nearly round 11" diameter disk. By Feb. 7th, viewers observing an hour after sunset will find Venus around 10° high in the west-southwest, with Mars 8° above Venus. Venus and Mars draw closer together each evening. Starting on Feb. 17th, Mars shines less than 2° from Venus for a day. They are less than 1° from each other from Feb. 20th – 23rd. On Feb. 21st, the two planets have their closest pairing, appearing just 0.4° apart at dusk. Venus will have a dazzling 11.8" wide, 88% illuminated disk, while Mars will have a 4.2" orange-gold disk. Venus is still less than 4° from Mars at the end of Feb., with Mars being lower in the sky. Mars sets about 2 hours after the Sun, and about 20 minutes before Venus.

Jupiter – Jupiter is in retrograde in Cancer, reaching opposition on Feb. 6th, when it shines at magnitude -2.6, with an equatorial diameter close to 45" all month. On the night of Feb. 3rd/4th, a Full Moon passes 5° south of Jupiter. Jupiter is visible essentially from dusk to dawn during Feb. There will be more mutual eclipses, during Feb., involving the four Galilean moons. On the night of Feb. 26th/27th, there are four events involving Io, Ganymede, and Callisto happening over a six-hour period. The series begins with Io occulting Ganymede, starting at 8:17 PM CST and runs until 8:24 PM CST. Later, at 9:31 PM CST to 9:41 PM CST, Io's shadow will envelope Ganymede's disk. Nearly an hour later, at 10:28 PM CST, Callisto eclipses Ganymede for 11 minutes. The night's final mutual event starts at 11:49 PM CST when Callisto's shadow sweeps across Io to initiate a 12 minute eclipse. All three of these moons lie well west of Jupiter during these encounters, while a lonely Europa appears east of Jupiter as soon as it exits Jupiter'3 PM CST.

Saturn – Saturn is in Scorpio, crossing its northern flank. On Feb. 1st, Saturn lies 9° northwest of Antares, with both appearing prominent in the southeast by 4:00 AM Local Time, after rising around 2 or 3 local time. Saturn glows at mag. 0.5, but has an equatorial diameter of only 16" to 17" all month, with the rings tilted almost 25° from an edge-wise presentation – practically the most open they ever become. By month's end, Saturn lies 0.4° due north of Nu Scorpii (mag.4.1). The Last Quarter Moon on Feb. 12th points the way to Saturn, which lies 7° to the Moon's lower left. The next morning, the crescent Moon has moved to 6° to the lower left of Saturn.

Uranus – Uranus is some 4° to the upper left of Venus at the end of the month, pretty low for finding a 6th magnitude speck with a disk span of only 3.4". On March 4th, Uranus will pass sensationally close to Venus. During the final 10 days of Feb., Venus, Mars, and Uranus will all lie in the background stars of Pisces the Fish. On Feb. 28th, all three planets stretch along a 7.5° arc of the ecliptic, with Venus approximately midway between Uranus and Mars.

Neptune – On Feb. 1st, Neptune is just 1° northwest (to the right) of Venus, at 8th magnitude, making it hard to

see during twilight. Neptune is not visible the rest of the month, going through conjunction with the Sun on Feb. 26th.

Pluto – Pluto is in Sagittarius, at mag. 14.2, and a diameter of 0.1". On Feb. 15th, Pluto will be at 19 01.7 -20 34.

Moon – On Feb. 3rd, a Full Moon glows to the right of Jupiter. On the next night, the Moon is much closer to the right of Regulus. The waning Moon is well to either side of Saturn at dawn on Feb. 12th and 13th. The Moon forms a nearly equilateral triangle with Saturn and Antares on the 13th. In the morning twilight on Feb. 17th, a very thin waning crescent Moon is just a few degrees to the left of the elusive Mercury. At nightfall on Feb. 20th, the waxing crescent Moon is within a few degrees of Venus and Mars, themselves within 1° of each other. On Feb. 21st, the crescent Moon's dark limb occults 6th magnitude Uranus. A waxing gibbous Moon is very near Aldebaran on Feb. 25th.

Meteor Showers: The Beta Herculids and the Delta Serpentids each delivers at most one meteor per hour.

Asteroids: Asteroid 3Juno is a potato-shaped rock spanning some 170 miles. Asteroid 3Juno was at opposition in Jan., but is now well placed for viewing. Remaining at 8thmagnitude near the head of Hydra for the first half of Feb., crossing into Cancer in mid Feb. Best viewing time is after 9:00 PM local time, after it has climbed high in the southeast.

Comets – Comet Lovejoy (C/2014 Q2) will be in Andromeda and Perseus during Feb. On Feb. 4th, Lovejoy passes less than 1° east of 2nd magnitude double star Gamma Andromedae and 3° west of the spectacular edge on galaxy NGC 891. Lovejoy is at 8th or 9th magnitude, but the nearly Full Moon will hinder the view. On Feb. 18th, Lovejoy passes less than 0.5° west of The Little Dumbbell Nebula (M 76). Lovejoy hails from the distant OORT Cloud.

Planet Viewing:

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

Dark Sky Viewing – Primary on Feb. 21st. Secondary on Feb. 28th.

Monoceros – The Unicorn

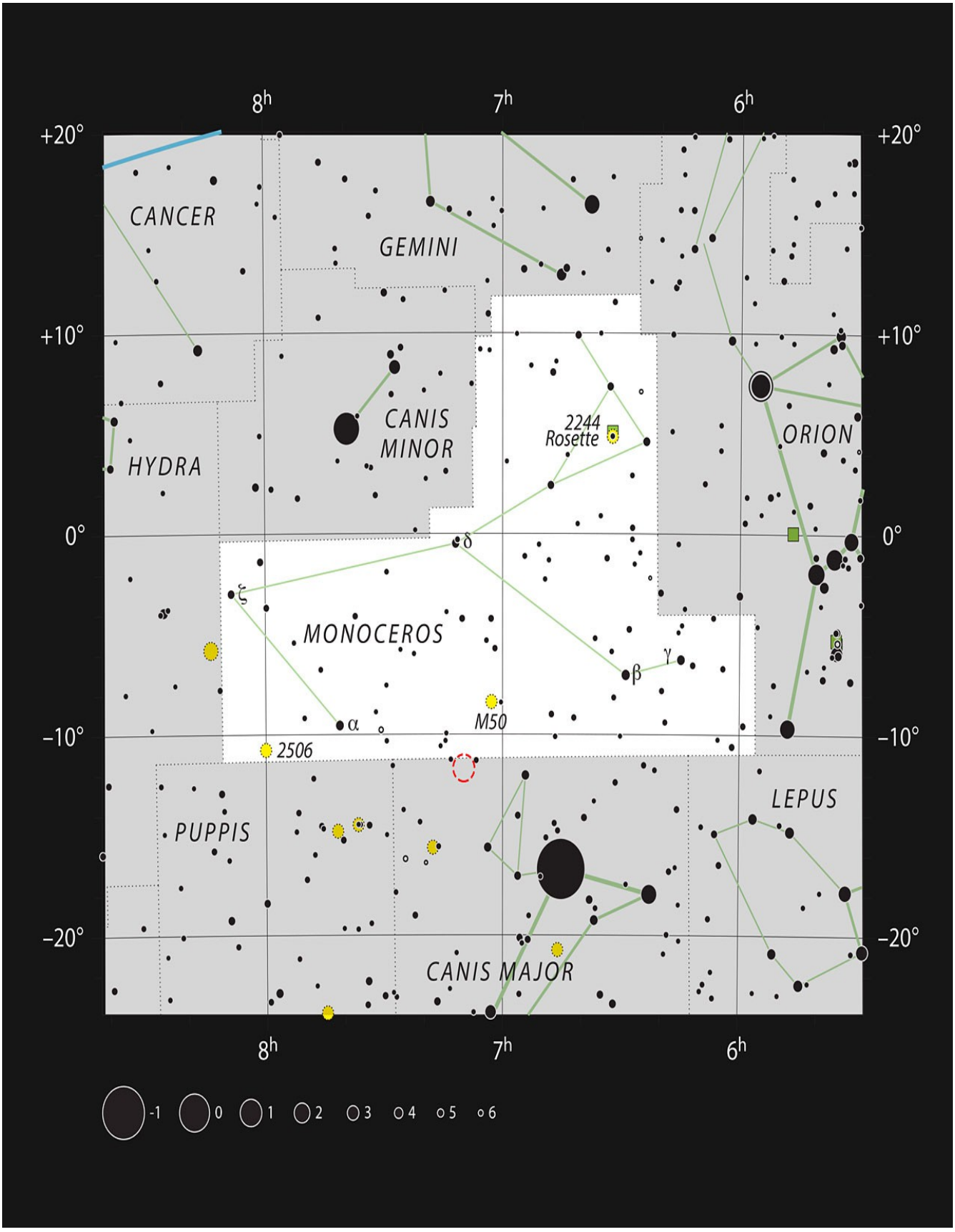
Unicorns, horses with a single horn protruding from their forehead, are legendary magical creatures whose blood can supposedly render immortality upon the drinker. However, to slay a Unicorn was said to condemn one's soul to eternal damnation (shades of Harry Potter and "He Who Must Not Be Named"!).

In ancient Babylon, the cradle of civilization, people worshiped the Unicorn as far back as 3500 BC. The most widely accepted reason for the Unicorn's extinction was that they preferred to play in the rain rather than accept Noah's invitation to board the Arc. Consequently, none were saved to repopulate the Earth after the Great Flood.

A Unicorn (depending upon the translation) is mentioned in the Old Testament of the Bible. Because of

this, the Dutch Cartographer Petrus Plancius (1552-1622) is credited with introducing the constellation. Johann Bayer (1572-1625) included Monoceros in his Uranometria, a 1603 sky atlas.

Amalthea was the she-goat which nourished Jupiter; hence its horn became proverbially used for nourishment and abundance. This modern constellation, Monoceros, is a likely representation of the “horn of plenty”, the Cornucopia, which Zeus broke off his goat-nanny nurse, Amalthea, while playing with her as a baby; Amalthea, herself, was placed amongst the stars as Capra, the star Capella on the arm of the constellation Auriga, the Charioteer. The position of the horn is not known. It is suggested that “…the sacred goat, having broken off one of her horns, Amalthea filled it with flowers and fruits, and presented it to Zeus, who placed it together with the goat amongst the stars, although the one-horned goat was not identified with the Unicorn by the Greeks…”. Ovid relates, “When he controlled the sky and sat upon his father’s throne…Jove (Jupiter, Zeus), he made stars of the nurse and the nurse’s fruitful horn, which bears even now its mistress name”.


8h
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CANCER
GEMINI
CANIS MINOR
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ORION
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PUPPIS
LEPUS
CANIS MAJOR
-1
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1
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6