

PRIME fOCUS

M 16

In This Issue

This Month's Club & Celestial
Events

Planetary Data & Charts

AL Observing Program
Highlight

Cloudy Night Library

Constellation of the Month:
Serpens



Contact information:

Info Officer (General Info) – info@fortworthastro.com
Website Administrator – webmaster@fortworthastro.com

Postal Address:

Fort Worth Astronomical Society
c/o Matt McCullar
5801 Trail Lake Drive
Fort Worth, TX 76133

Web Site: <http://www.fortworthastro.org> (or .com)

Facebook: <http://tinyurl.com/3eutb22>

Twitter: <http://twitter.com/ftwastro>

Yahoo! eGroup (members only): <http://tinyurl.com/7qu5vkn>

Officers (2018-2020):

President – Chris Mlodnicki , president@fortworthastro.com
Vice President – Fred Klich , vicepres@fortworthastro.com
Tres – John Giromini , sec.tres@fortworthastro.com
Secretary—Pam Klich, sec.tres@fortworthastro.com

Board Members:

2018-2020

- ◆ Phil Stage
- ◆ Robin Pond
- ◆ Michelle Theisen
- ◆ Larry Barker



Cover Photo:

M16

Photo contributed by
Robert Cargill

Observing Site Reminders:

Be careful with fire, mind all local burn bans!

Dark Site Usage Requirements (ALL MEMBERS):

- Maintain Dark-Sky Etiquette (<http://tinyurl.com/75hjajy>)
- Turn out your headlights at the gate!
- Sign the logbook (in camo-painted storage shed. Inside the door on the left-hand side)
- Log club equipment problems (please contact a FWAS board member to inform them of any problems)
- Put equipment back neatly when finished
- Last person out:
 - * Check all doors – secured, but NOT locked
 - * Make sure nothing is left out

The Fort Worth Astronomical Society (FWAS) was founded in 1949 and is a non-profit 501(c)3 scientific educational organization, and incorporated in the state of Texas. This publication may be copied and distributed for free only. This publication cannot be uploaded or distributed into any media unless it is in its original, full, unaltered, published form. All rights reserved by FWAS.

Inside this issue:

	Page
September Club Calendar	3
Tandy Hills Star Party Info	4
Equipment Review	5
Cloudy Nights Book Review	6,7
Celestial Events	8
Constellation of the Month	9,10,11
AL Observing Program	12,13,14,15
ISS visibility info	16
Planetary Visibility info	16
Sky Chart for Month	17
Lunar Calendar	18
Lunar Info	19
Mars/Saturn/Jupiter/Mercury Data	20
Meeting Minutes	21
Fundraising/Donation Info	22,23
Foto Files	24,25

FWAS
Editor:
George C. Lutch

Issue Contributors:
Pam Klich
Matt McCullar
Robert Cargill

SEPTEMBER 2019

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1   FWAS Monthly APSIG Meeting Starts @ 7pm	2	3	4	5	6 FQ 	7 
8	9	10   FWAS Board Meeting	11 	12	13  Moon Apogee	14  FM 
15 	16 	17   FWAS Monthly Meeting Starts @ 7pm	18 	19 	20  FWAS Picnic Watch your Mail for Info.	21  FWAS Picnic Watch your Mail for Info.
22   LQ 	23	24	25	26	27	28 NM  Moon Perigee
29	30					
<p>See our full FWAS Event Calendar at: http://www.fortworthastro.com/meetings.html for the latest updates on what our club has scheduled</p>						

 Click calendar icons above to see details of bright ISS passes this month.

TANDY HILLS PRAIRIE SKY/STAR PARTY: ASTRONOMY-COMMUNITY ENGAGEMENT

AFTER MANY YEARS AT THE FORT WORTH MUSEUM OF SCIENCE & HISTORY, THE WELL-ATTENDED, MONTHLY PUBLIC STAR PARTIES PRESENTED BY THE [FORT WORTH ASTRONOMICAL SOCIETY \(FWAS\)](#) HAVE MOVED TO TANDY HILLS NATURAL AREA.

ESTABLISHED IN 1949, FWAS IS ONE OF THE FIRST ADULT AMATEUR ASTRONOMY CLUBS FORMED IN THE COUNTRY AND ONE OF THE LARGEST WITH MORE THAN 200 ACTIVE MEMBERS.

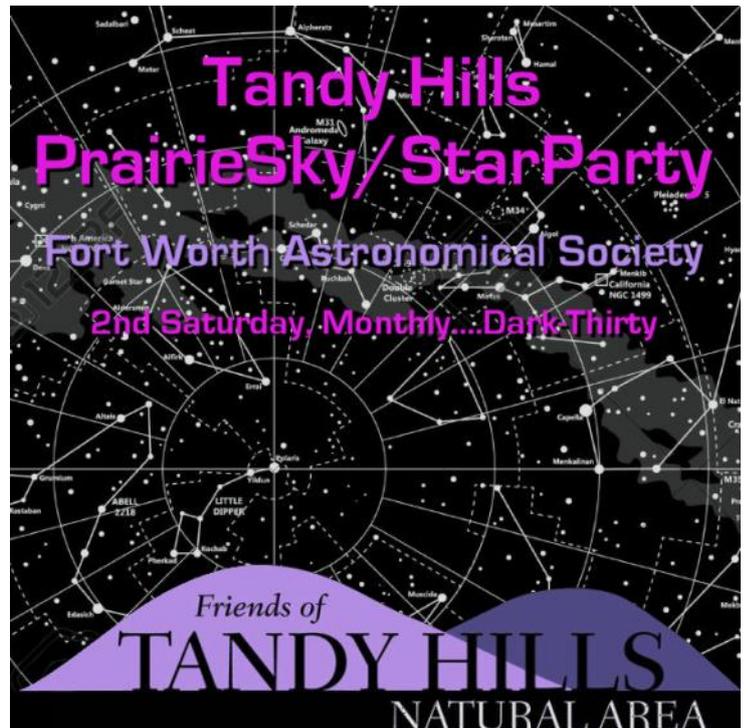
MEMBERS WILL HAVE SEVERAL TELESCOPES SET UP AT TANDY HILLS FOR VIEWING THE NIGHT SKY.

FREE & OPEN TO THE PUBLIC. ALL AGES WELCOME. FAMILY/KID-FRIENDLY - NO DOGS - COOLERS WELCOME - STEEL CITY POPS WILL BE ON HAND
MORE DETAILS AT THE NASA WEBSITE: [HTTPS://NIGHTSKY.JPL.NASA.GOV/EVENT-VIEW.CFM?EVENT_ID=76024](https://nightsky.jpl.nasa.gov/event-view.cfm?event_id=76024)

STAR PARTY ETIQUETTE: [HTTP://WWW.FORTWORTHASTRO.COM/ETIQUETTE.HTML](http://www.fortworthastro.com/etiquette.html)

WHEN: SEPTEMBER 7TH ALWAYS CONSULT THE BELOW SITE FOR DATE CHANGES DUE TO WEATHER.

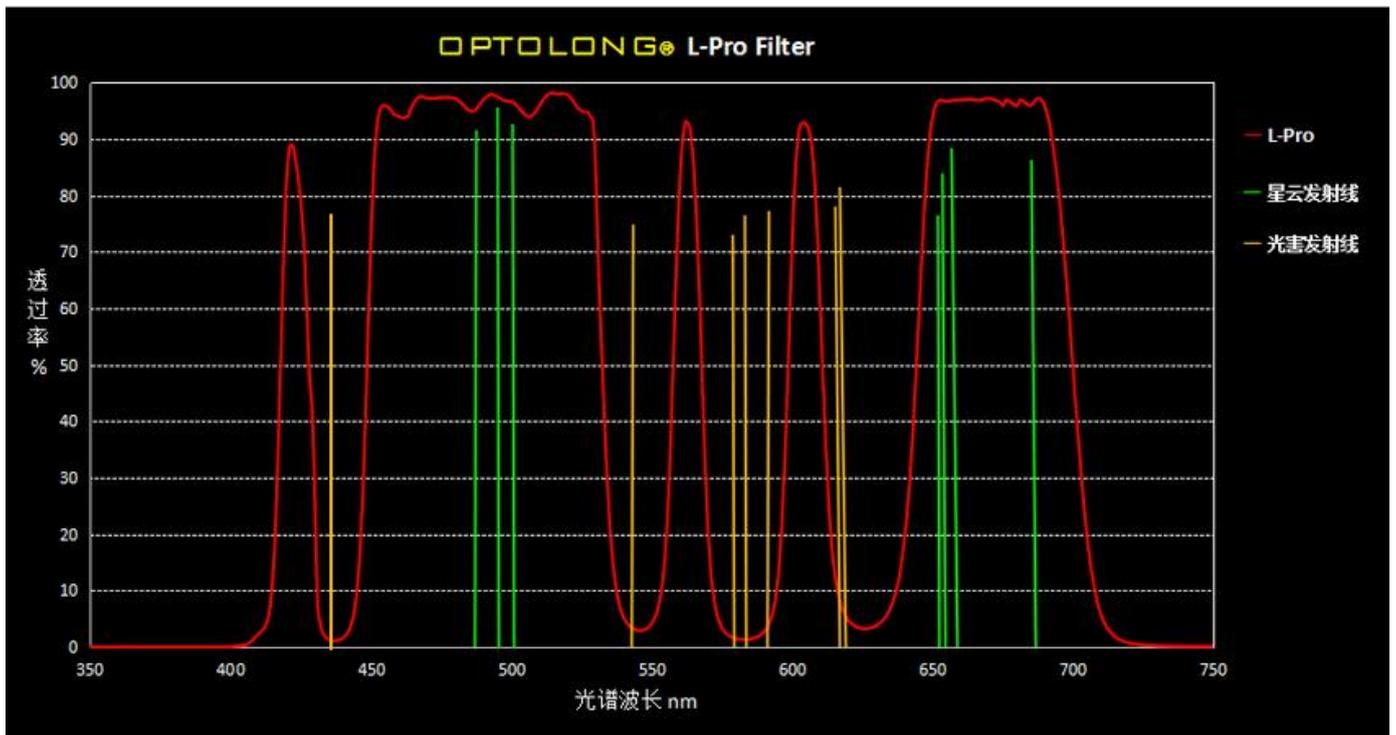
[HTTP://WWW.TANDYHILLS.ORG/EVENTS/PRAIRIE-SKY-STAR-PARTY](http://www.tandyhills.org/events/prairie-sky-star-party)



Equipment Review

Optolong L-Pro Filter

A couple of months ago I made the decision to purchase a filter to help combat the light pollution in my area which shows as a bortle 8 on the light pollution map. I chose the Optolong L-Pro broadband filter based on recommendations and price. After using the filter a number of times I have found that it makes a lot of difference in being able to see and photograph all the objects I have pointed my scope at so far. The filter comes in many form factors for use in DSLR or telescopes. I use it with a 127mm refractor as well as an 11 inch SCT and have not seen any artifacts caused by it's use. Price varies from \$199.00 used on Cloudy nights to \$229.00 new. Here is a graphic showing the spectrum allowed and blocked. The red line denotes the filters allowed and denied spectrums. The green lines are Hb, Ha, OIII and SII.



In summary if you live in a light polluted area and use a One Shot Color camera then this filter is a good one to use for general object photography.

George C. Lutch



Media Reviews

Media reviews by Matt J. McCullar, FWAS

Mars as Viewed by Mariner 9

A Pictorial Presentation by the Mariner 9 Televi-

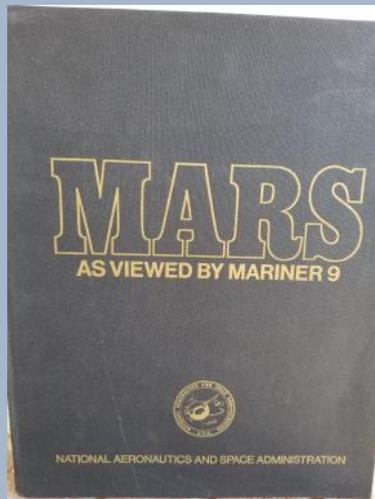
M

ariner 9 was the first space probe to orbit another planet. It was launched from the Kennedy Space Center on May 30, 1971 and entered orbit around Mars the following November 14th. It was an overwhelming success, photographing the vast majority of the entire planet. Mariner 9 returned over 7,000 photos of the Martian surface. The pictures may seem primitive by today's standards, but nothing like them had ever been seen from Mars before. Only fly-by missions (with even more primitive photography) had visited Mars previously, which did not provide much in the way of detail. *Mars as Viewed by Mariner 9* is a good guide for the major features discovered by the spacecraft, and several of the program scientists provide excellent descriptions of what we see. These photos paved the way for the later Viking probes.

What's more amazing about the Mariner 9 mission is that it had to pull double duty. Its twin spacecraft, Mariner 8, was lost shortly after launch. Mariner 9 had to be quickly reconfigured to try to perform the work of two spacecraft, and we are very fortunate in that it succeeded in that regard. But as Mariner 9 approached Mars, its cameras revealed one teeth-grinding detail: a huge dust storm was forming on Mars, obscuring more and more features with each passing day. By the time the spacecraft entered Martian orbit, the entire surface of the planet was obscured! But since this spacecraft was an orbiter instead of a fly-by, it was able to "ride out" the storm and wait until the dust subsided. When it finally did, Mars opened up many of its secrets for the first time. According to the book, "From January 1972 onward, every week was punctuated by new

and startling discoveries. First there were the enormous volcanoes standing as much as 15 miles above the average surface, each one about the size of Arizona. Then, totally unanticipated, immense canyons appeared, including a great equatorial chasm more than 10 times the size of the U.S. Grand Canyon."

This book is crammed with geological information, comments by the planetary geologists who worked on the mission. Mariner 9 discovered volcanoes – the largest in the solar system; tremendous canyons; craters with long debris curtains; and plenty of evidence of high winds and erosion. Some of the captions were written by Carl Sagan and Eugene Shoemaker – both of whom would later become famous. "Most martian channels are indicative of past erosion, transport, and deposition of surface materials that only running water could produce. Under present martian atmospheric conditions, liquids would not exist on the surface except during rare conditions... Fractures and faults are abundant on the martian surface."



We see crater chains, steep cliffs, dust storms (smaller and more localized, but still as big as the state of Ohio), clouds, craters (volcanic and impact), the polar ice caps (water and carbon dioxide), and the two tiny satellites, Deimos and Phobos, close up. Some "before" and "after" photos show identical locations of the planet during the dust storm and after it dissipated.

Published by U.S. Government Printing Office – 1974

NASA SP-329

225 pages

Lots of black & white photographs

The Mariner 9 mission ended after almost a year in Mars orbit, on October 27, 1972, when the spacecraft ran out of its attitude-control gas

for its steering thrusters. The spacecraft therefore began tumbling out of control, and the mission was over. It is still circling Mars, but its orbit has been steadily decaying and it may enter the atmosphere within the next couple of years.

The book is filled with dozens of detailed photographs, on practically every page. There are also shaded relief maps of

(Continued on page 7)

(Book Review—Continued from page 5)

Mars provided.

Mars as Viewed by Mariner 9 reads like a college-level geology textbook and is not that clear about its geologic terms. I would have appreciated a glossary to help explain what some of the captions talked about.

Another fault I find with this book is that all the photographs are in black and white. This is not the fault of the publisher, as the cameras on board Mariner 9 were strictly black and white (this was late 1960s technology, after all). Future spacecraft would take even more amazing photographs of Mars in color, particularly from the surface. You will probably be better off reading books about those missions, published more recently. But it is fascinating from a historical standpoint to learn how we have managed to learn so much, step by step, about the Red Planet.

The End



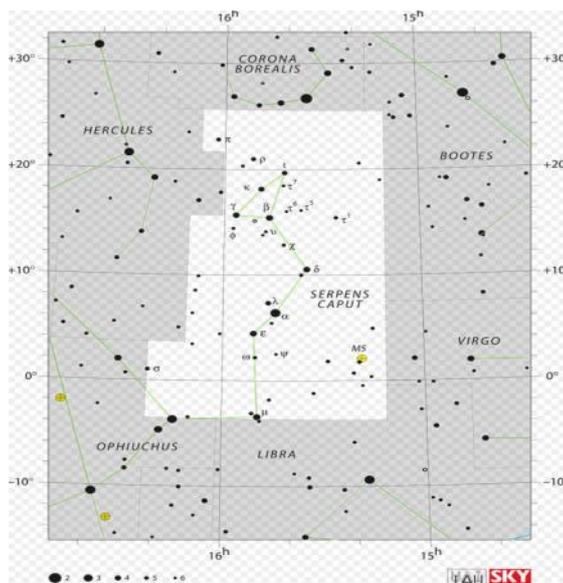
CELESTIAL EVENTS THIS MONTH

Sep	01	Su		Venus: 5.2° E
	02	Mo	05:18	Mars Conjunction
	03	Tu	20:26	Mercury Superior Conj.
	05	Th	22:10	First Quarter
	06	Fr	01:52	Moon-Jupiter: 2.4° S
	08	Su	04:39	Moon South Dec.: 22.5° S
	08	Su	08:53	Moon-Saturn: 0°
	08	Su	12:35	Moon Descending Node
	10	Tu	01:18	Neptune Opposition
	13	Fr	08:32	Moon Apogee: 406400 km
	13	Fr	23:33	Full Moon
	20	Fr	11:14	Moon-Aldebaran: 2.8° S
	21	Sa	21:41	Last Quarter
	22	Su	20:54	Moon North Dec.: 22.7° N
	23	Mo	01:30	Moon Ascending Node
	23	Mo	02:49	Autumnal Equinox
	24	Tu	16:15	Moon-Beehive: 0.4° S
	27	Fr	21:27	Moon Perigee: 357800 km
	28	Sa	13:26	New Moon
	28	Sa	23:13	Mercury-Spica: 1.3° N

Data Source: [NASA SKYCAL - SKY EVENTS CALENDAR](#)

(* Times are Local)

Serpens



Characteristics

Serpens is the only one of the [88 modern constellations](#) to be split into two disconnected regions in the sky: *Serpens Caput* (the head) and *Serpens Cauda* (the tail). The constellation is also unusual in that it depends on another constellation for context; specifically, it is being held by the Serpent Bearer Ophiuchus.^[4]

Serpens Caput is bordered by [Libra](#) to the south, [Virgo](#) and [Boötes](#) to the east, [Corona Borealis](#) to the north, and [Ophiuchus](#) and [Hercules](#) to the west; Serpens Cauda is bordered by [Sagittarius](#) to the south, [Scutum](#) and [Aquila](#) to the east, and [Ophiuchus](#) to the north and west. Covering 636.9 [square degrees](#) total, it ranks 23rd of the 88 constellations in size. It appears prominently in both the northern and southern skies during the Northern Hemisphere's summer.^[4] Its main [asterism](#) consists of 11 stars, and 108 stars in total are brighter than magnitude 6.5, the traditional limit for naked-eye visibility.^[4]

Serpens Caput's boundaries, as set by [Eugène Delporte](#) in 1930, are defined by a 15-sided polygon, while Serpens Cauda's are defined by a 25-sided polygon. In the [equatorial coordinate system](#), the [right ascension](#) coordinates of Serpens Caput's borders lie between 15^h 10.4^m and 16^h 22.5^m, while the [declination](#) coordinates are between 25.66° and -03.72°. Serpens Cauda's boundaries lie between right ascensions of 17^h 16.9^m and 18^h 58.3^m and declinations of 06.42° and -16.14°.^[5] The [International Astronomical Union](#) (IAU) adopted the three-letter abbreviation "Ser" for the constellation in 1922.

Deep-sky objects

Head objects

As the galactic plane does not pass through this part of Serpens, a view to many galaxies beyond it is possible. However, a few structures of the Milky Way Galaxy are present in Serpens Caput, such as [Messier 5](#), a [globular cluster](#) positioned approximately 8° southwest of α Serpentis, next to the star [5 Serpentis](#). Barely visible to the naked eye under good conditions,^[84] and is located approximately 25,000 ly distant.^[85] Messier 5 contains a large number of known RR Lyrae variable stars,^[86] and is receding from us at over 50 km/s.^[87] The cluster contains two [millisecond pulsars](#), one of which is in a binary, allowing the [proper motion](#) of the cluster to be measured. The binary could help our understanding of [neutron degenerate matter](#); the current median mass, if confirmed, would exclude any "soft" [equation of state](#) for such matter.^[88] The cluster has been used to test for [magnetic dipole moments](#) in neutrinos, which could shed light on some hypothetical particles such as the [axion](#).^[89] Another globular cluster is [Palomar 5](#), found just south of Messier 5. Many stars are leaving this globular cluster due to the Milky Way's gravity, forming a [tidal tail](#) over 30000 light-years long.^[90]

The [L134/L183](#) is a [dark nebula](#) complex that, along with a third cloud, is likely formed by fragments of a single original cloud located 36 degrees away from the galactic plane, a large distance for dark nebulae.^[91] The entire complex is thought to be around 140 parsecs distant.^[92] L183, also referred to as L134N, is home to several infrared sources, indicating pre-stellar sources^[93] thought to present the first known observation of the contraction phase between cloud cores and prestellar cores.^[94] The core is split into three regions,^[95] with a combined mass of around 25 solar masses.^[96]



Cygnus(Cont)

Deep-sky objects

Outside of the Milky Way, there are no bright deep-sky objects for amateur astronomers in Serpens Caput, with nothing else above 10th magnitude. The brightest is [NGC 5962](#), a [spiral galaxy](#) positioned around 28 megaparsecs distant^[97] with an apparent magnitude of 11.34.^[98] Slightly fainter is [NGC 5921](#), a [barred spiral galaxy](#) with a [LINER](#)-type [active galactic nucleus](#) situated somewhat closer at a distance of 21 megaparsecs.^[99] A [type II supernova](#) was observed in this galaxy in 2001 and was designated SN 2001X.^[100] Fainter still are the spirals [NGC 5964](#)^[101] and [NGC 6118](#), with the latter being host to the [supernova SN 2004dk](#).^[102]

[Hoag's Object](#), located 600 million light-years from Earth, is a member of the very rare class of galaxies known as [ring galaxies](#). The outer ring is largely composed of young blue stars while the core is made up of older yellow stars. The predominant theory regarding its formation is that the progenitor galaxy was a barred spiral galaxy whose arms had velocities too great to keep the galaxy's coherence and therefore detached.^[103] [Arp 220](#) is another unusual galaxy in Serpens. The prototypical [ultraluminous infrared galaxy](#), Arp 220 is somewhat closer than Hoag's Object at 250 million light-years from Earth. It consists of two large spiral galaxies in the process of [colliding](#) with their nuclei orbiting at a distance of 1,200 light-years, causing extensive [star formation](#) throughout both components. It possesses a large cluster of more than a billion stars, partially covered by thick dust clouds near one of the galaxies' core.^[103] Another interacting galaxy pair, albeit in an earlier stage, consists of the galaxies [NGC 5953 and NGC 5954](#). In this case, both are [active galaxies](#), with the former a [Seyfert 2 galaxy](#) and the latter a [LINER](#)-type galaxy. Both are undergoing a burst of star formation triggered by the interaction.^[104]

[Seyfert's Sextet](#) is a [group](#) of six galaxies, four of which are [interacting gravitationally](#) and two of which simply appear to be a part of the group despite their greater distance. The gravitationally bound [cluster](#) lies at a distance of 190 million [light-years](#) from Earth and is approximately 100,000 light-years across, making Seyfert's Sextet one of the densest galaxy group known. Astronomers predict that the four interacting galaxies will eventually [merge](#) to form a large [elliptical galaxy](#).^[103] The radio source [3C 326](#) was originally thought to emanate from a giant elliptical galaxy. However, in 1990, it was shown that the source is instead a brighter, smaller galaxy a few arcseconds north.^[105] This object, designated 3C 326 N, has enough gas for star formation, but is being inhibited due to the energy from the radio galaxy nucleus.^[106]

A much larger galaxy cluster is the redshift-0.0354 [Abell 2063](#).^[107] The cluster is thought to be interacting with the nearby galaxy group [MKW 3s](#), based on radial velocity measurements of galaxies and the positioning of the [cD galaxy](#) at the center of Abell 2063.^[108] The active galaxy at the center of MKW 3s—[NGC 5920](#)—appears to be creating a bubble of hot gas from its radio activity.^[109] Near the 5th-magnitude star [Pi Serpentis](#) lies [AWM 4](#), a cluster containing an excess of metals in the intracluster medium. The central galaxy, [NGC 6051](#), is a [radio galaxy](#) that is probably responsible for this enrichment.^[110] Similar to AWM 4, the cluster [Abell 2052](#) has central cD radio galaxy, [3C 317](#). This radio galaxy is believed to have restarted after a period of inactivity less than 200 years ago.^[111] The galaxy has over 40,000 known globular clusters, the highest known total of any galaxy as of 2002.^[112]

Consisting of two quasars with a separation of less than 5 [arcseconds](#), the quasar pair [4C 11.50](#) is one of the visually closest pairs of quasars in the sky. The two have markedly different redshifts, however, and are thus unrelated.^[113] The foreground member of the pair (4C 11.50 A) does not have enough mass to refract light from the background component (4C 11.50 B) enough to produce a [lensed](#) image, although it does have a true companion of its own.^[114] An even stranger galaxy pair is [3C 321](#). Unlike the previous pair, the two galaxies making up 3C 321 are interacting with each other and are in the process of merging. Both members appear to be active galaxies; the primary radio galaxy may be responsible for the activity in the secondary by means of the former's jet driving material onto the latter's [supermassive black hole](#).^[115]

An example of [gravitational lensing](#) is found in the radio galaxy [3C 324](#). First thought to be a single overluminous radio galaxy with a redshift of $z = 1.206$, it was found in 1987 to actually be two galaxies, with the radio galaxy at the aforementioned redshift being lensed by another galaxy at redshift $z = 0.845$. The first example of a multiply-imaged radio galaxy discovered,^[116] the source appears to be an elliptical galaxy with a [dust lane](#) obscuring our view of the visual and ultraviolet emission from the nucleus.^[117] In even shorter wavelengths, the [BL Lac object PG 1553+113](#) is a heavy emitter of [gamma rays](#). This object is the most distant found to emit photons with energies in the [TeV](#) range as of 2007.^[118] The spectrum is unique, with hard emission in some ranges of the gamma-ray spectrum in stark contrast to soft emission in others.^[119] In 2012, the object flared in the gamma-ray spectrum, tripling in luminosity for two nights, allowing the redshift to be accurately measured as $z = 0.49$.^[120]

Several [gamma-ray bursts](#) (GRBs) have been observed in Serpens Caput, such as [GRB 970111](#), one of the brightest GRBs observed. An optical transient event associated with this GRB has not been found, despite its intensity. The host galaxy initially also proved elusive, however it now appears that the host is a [Seyfert I galaxy](#) located at redshift $z = 0.657$.^[121] The X-ray afterglow of the GRB has also been much fainter than for other dimmer GRBs.^[122] More distant is [GRB 060526](#) (redshift $z = 3.221$), from which X-ray and optical afterglows were detected. This GRB was very faint for a long-duration GRB.^[123]

MYTHOLOGY

SERPENS



History

In [Greek mythology](#), Serpens represents a [snake](#) held by the healer [Asclepius](#). Represented in the sky by the constellation [Ophiuchus](#), Asclepius once killed a snake, but the animal was subsequently resurrected after a second snake placed a revival herb on it before its death. As snakes shed their skin every year, they were known as the symbol of rebirth in ancient Greek society, and legend says Asclepius would revive dead humans using the same technique he witnessed. Although this is likely the logic for Serpens' presence with Ophiuchus, the true reason is still not fully known. Sometimes, Serpens was depicted as coiling around Ophiuchus, but the majority of atlases showed Serpens passing either behind Ophiuchus' body or between his legs. ^[1]

In some ancient atlases, the constellations Serpens and Ophiuchus were depicted as two separate constellations, although more often they were shown as a single constellation. One notable figure to depict Serpens separately was [Johann Bayer](#); thus, Serpens' stars are cataloged with separate [Bayer designations](#) from those of Ophiuchus. When [Eugène Delporte](#) established modern constellation boundaries in the 1920s, he elected to depict the two separately. However, this posed the problem of how to disentangle the two constellations, with Delporte deciding to split Serpens into two areas—the head and the tail—separated by the continuous Ophiuchus. These two areas became known as Serpens Caput and Serpens Cauda, ^[1] *caput* being the Latin word for head and *cauda* the Latin word for tail. ^[2]

In [Chinese astronomy](#), most of the stars of Serpens represented part of a wall surrounding a marketplace, known as [Tianshi](#), which was in Ophiuchus and part of [Hercules](#). Serpens also contains a few [Chinese constellations](#). Two stars in the tail represented part of [Shilou](#), the tower with the market office. Another star in the tail represented [Liesi](#), jewel shops. One star in the head ([Mu Serpentis](#)) marked [Tianru](#), the [crown prince](#)'s wet nurse, or sometimes [rain](#). ^[1]

There were two "serpent" constellations in [Babylonian astronomy](#), known as Mušḫuššu and Bašmu. It appears that Mušḫuššu was depicted as a hybrid of a dragon, a lion and a bird, and loosely corresponded to [Hydra](#). Bašmu was a [horned serpent](#) (c.f. [Ningishzida](#)) and roughly corresponds to the "Ὀφίς" constellation of [Eudoxus of Cnidus](#) on which the "Ὀφίς" (*Serpens*) of Ptolemy is based. ^[3]



Bright Nebula Observing Program

OBSERVING EXPERIENCE LEVEL ADVANCED

Introduction

Welcome to the Astronomical League’s Bright Nebula Observing Program. Bright nebulae are interstellar clouds of gas and dust where stars are born or have died. Their complex shapes and rich colors make them objects of great interest and beauty to amateur astronomers. If you don’t already have an appreciation of these magnificent objects, it is hoped that this Observing Program will inspire you to study them and gain an understanding of stellar evolution.

Bright nebulae, also called diffuse or Galactic nebulae, occur in two main classes depending on their source of illumination: emission and reflection, although they occasionally are a combination of the two (R+E). Much less common is a third type of the bright nebula, the supernova remnant (SNR).

Emission nebulae are clouds of dust and glowing hydrogen gas, sometimes referred to as H II regions. The atoms in the cloud are ionized by nearby hot stars and when the excited electrons fall back to their previous energy state, the process releases energy in the form of visible light. Since most of the light visible from emission objects comes from just the three bright lines produced by hydrogen (H β at 4861Å) and oxygen (OIII) at 5007Å and 4959Å, the use of narrow band nebula filters can be helpful in viewing them. Emission nebulae typically appear red in images, but not to the naked eye.

Reflection nebulae have the same composition as emission objects, but lack stars sufficiently hot to cause the gas comprising them to fluoresce. Therefore, they shine merely by the dust in the nebula scattering starlight (the gas does not actually reflect any light). Because these objects scatter starlight of all colors, filters are not generally helpful in viewing them. Reflection nebulae appear blue in images.

A supernova remnant is the remains of a catastrophic stellar explosion, wherein much of a star’s material is ejected, often as a highly-structured cloud. These objects have strong lines similar to emission nebulae, hence also benefit from the use of nebula filters.

Quick View of Requirements	
Bright Nebula Observing Program	
Regular / Advanced	
Uses Eyes	
Uses Binoculars	Yes
Uses Telescopes	Yes
Must be an AL Member	Yes
Date Deadline for Submission	
Minimum Instrument Size	8 inch
Manual Observations Required	
Go-To Telescopes Allowed	Yes
Remote Telescopes Allowed	Yes
Number of Observations	60 / 100
Option for Imaging	Yes
Special Equipment Required	
Equipment Must Be Constructed	
Observations Must Be Submitted to an On-Line Database	

HIGHLIGHT OF THE MONTH

Bright Nebula Observing Program

OBSERVING EXPERIENCE LEVEL ADVANCED

List of Objects

Among the 150 bright nebulae chosen for this program are some of the most famous showpieces in the northern and southern skies. The list also contains examples across the entire range of bright nebulae. Some are bright and large enough to be visible with unaided eye or binoculars from a dark site. Others will appear in a telescope as ghostly apparitions that will severely test your powers of observation. You will need a telescope 8" or larger to complete this program.

Nebulae are easily washed out by light pollution, so finding a dark location from which you can observe will greatly assist in the amount of detail that you can see. Make sure to allow time for your eyes to become dark-adapted. Use averted vision and slight tapping of the telescope to detect the subtlest variations in brightness and contrast. Nebula filters (UHC and OIII) will help you expand the level of detail you can discern. Beware that even if you use these tips, there is much you will miss if you do not take your time with an observation.

There is the possibility that a few of the objects may simply be beyond detection for some observers and we will allow negative observations in completion of the advanced program. Evidence of diligent efforts to observe an object is required (see Rules and Regulations).

The list has been developed to offer objects that will allow observers in both the northern and southern hemispheres to complete the Bright Nebula Observing Program.

Nebulae vary in brightness according to Lynd's Catalog of Bright Nebula, which uses a scale of 1-6, where 1 is brightest and 6 is barely detectable. Provided sufficient aperture is used under dark skies, experience suggests most category 1 and 2 emission nebulae and SNR's are within visual range. Category 3 objects will prove difficult, while those rated 4 and above are likely to be beyond visual range and thus candidates for imaging instead. When compared with the same scale, reflection nebulae are generally considered to be more difficult to observe visually. In this program, you are to estimate the brightness of the nebulae using the Lynd's Brightness Scale. This will give you an additional way to describe and compare the bright nebulae you observe.

The list of observing targets has been updated to include these brightness estimates from Lynd's Catalog. In addition, coordinates of each object have been updated to match those in the Field Guide of the Uranometria 2000 Deep Sky Atlas.

Awards

The program offers three levels of accomplishment: a basic and advanced visual level and an imaging level. The basic visual program requires you to observe at least 60 objects on the list. A certificate is awarded for the basic program. The advanced visual program requires you to attempt to observe at least 100 objects for which you will receive a certificate and pin, which sports a colorful image of the Great Orion Nebula. To complete the program by imaging, 100 objects must be successfully imaged. An advanced certificate and pin will be awarded for the imaging program. Observers are encouraged to try imaging as well as visual observing, but only one pin will be awarded.

Observation Requirements	
Stellar Evolution Observing Program	
Object Name/Number	Yes
Observer's Latitude	Yes
Observer's Longitude	Yes
Observer's Location (City)	Yes
Observer's Altitude	
Date of Observation (LT or UT)	Yes
Time of Observation (LT or UT)	Yes
Description of Object	Yes
Sketch of Object	
Seeing	Yes
Transparency	Yes
Sky Conditions	
Size of Instrument Used	Yes
Power/Magnification	Yes
Filters Used	Yes



HIGHLIGHT OF THE MONTH

Bright Nebula Observing Program

OBSERVING EXPERIENCE LEVEL ADVANCED

Rules and Regulations

You must be a member of the Astronomical League, either through membership in an affiliated astronomical society or as a Member at Large.

Device-aided searches are allowed. Observers reporting that 100% of the objects observed were located manually by traditional star-hopping techniques will receive special recognition on their certificate. Use of publicly available remote controlled telescopes via internet connection is not allowed.

“Negative observations” will be accepted for the ADVANCED visual program only if sufficient evidence is submitted to establish that the proper field was examined on at least two separate attempts and every reasonable effort was made to detect the object. The maximum number of negative observations accepted is limited to 5.

To record a negative observation, the observer must make at least two observing attempts on different nights, record all of the data required for a standard observation and describe in detail the methodology used to confirm that the proper position was examined. Each negative attempt MUST include a sketch of the star field. Observers are encouraged to make as many attempts to detect the object as possible and to submit negative observations only as a last resort. Negative observations will not be accepted for the basic program.

The observer may use the log sheet provided with this guide or may use a log of his/her own design so long as all of the required information is recorded. The record of observations must include for each object:

1. The name of the object.
2. Observer's latitude and longitude.
3. Date and time of the observation (either UT or local time).
4. Sky conditions including seeing, transparency, darkness of the site and degree to which moon interferes with the observation.
5. Instrument used including aperture and focal length of the telescope or binocular specifications.
6. Magnification.
7. Filters used.
8. Estimate of nebula brightness compared to other nebula using Lynd's scale with 1 being brightest and 6 dimmest.
9. A detailed description of the object that includes at a minimum:
 - Does the edge of the nebula stand out clearly from the background or fade away without sharp boundaries?
 - Are there stars embedded in the nebula? How many?
 - Is the nebula a uniform glow or uneven, with bright patches or dark lanes?
 - What is the shape and size of the nebula?
 - How does the nebula respond to different filters and magnifications?
 - Is the object visible by direct vision or does it require averted vision?
 - What else is visible in the field (clusters, bright stars, other bright nebula)?

A detailed description of the object in the observer's own words, or a detailed sketch of the object.

If you choose to make a sketch of the nebula, please note that artistic talent is not required. Just draw what you see as well as your ability allows. Use a number 2A lead pencil for best results. To make a drawing first mark the brightest field stars, then use these to guide you to the area you shade in to represent the shape and extent of the cloud of gas and dust. To indicate a brighter area simply shade that spot more darkly with the pencil. A dark lane through the nebula would be indicated by simply leaving the area blank white.

The record of observations for imaging is the same as for the visual certification, except that instead of a detailed description of the object, this information should be included:

- The specifics of the instrument used to make the image should be recorded.
- Exposure times, image software, number of stacked images and the like should also be provided.

Any camera that records an image through the optics of a telescope may be employed. In cases where there is more than one nebula present in an image, an overlay, companion sketch or other method must be used to clearly identify the target nebula.

Stellar Evolution Observing Program Coordinator:



HIGHLIGHT OF THE MONTH

Bright Nebula Observing Program

OBSERVING EXPERIENCE LEVEL ADVANCED

Submitting for Certification

Observers should submit their observing logs and drawings or images along with the completed submission form to their society's awards coordinator. The awards coordinator shall exam the log and images and report completion of the program to the League's Bright Nebulae Observing Program Coordinator either by mail or e-mail using the submission form. Please indicate if the certificate should signify that 100% of the objects were located manually.

Members at Large or members of societies that do not have awards coordinators should submit logs and images along with the submission form directly to the Bright Nebulae Observing Program Coordinator. It is recommended that **only** copies of your log and drawings/images be sent; we will **not** return originals unless the observer provides for postage.

Images in electronic format may be forwarded by any convenient means that accomplishes transfer or makes the images available for review. This may include mailing of a storage device such as a CD or flash drive, or posting the images on the web. Please avoid sending prints or slides unless you do not want them back.

A certificate and pin will be mailed to the address provided, either to the observer or to a society officer for presentation.

It is hoped that this Observing Program will whet your appetite for observing additional bright nebulae. There are many hundreds more visible in amateur size telescopes.

Clear Skies!

Vincent S. Foster (Original Developer)

Bright Nebula Coordinator

Bob Scott
20663 English Rd.
Mount Vernon, WA 98274
Re.bob.scott@gmail.com

Links

List of Bright Nebulae: [download as pdf](#), [download as Excel Spreadsheet](#)

Observing Log: [download as Word Doc](#)

Observing Log: [download as PDF](#)

Submission Form: [download as Word Doc](#)

Submission Form: [download as PDF](#)

[Find your Bright Nebulae Award](#)

Recommended Reading:

Coe, Steven R., **Nebulae and How to Observe Them**, Springer-Verlag, NY 2007

Handy, R., et al, **Astronomical Sketching, A Step-by-Step Introduction**, Springer-Verlag, NY 2007



September Sky Chart

Fort Worth, TX (32.7555°N, 97.3308°W)

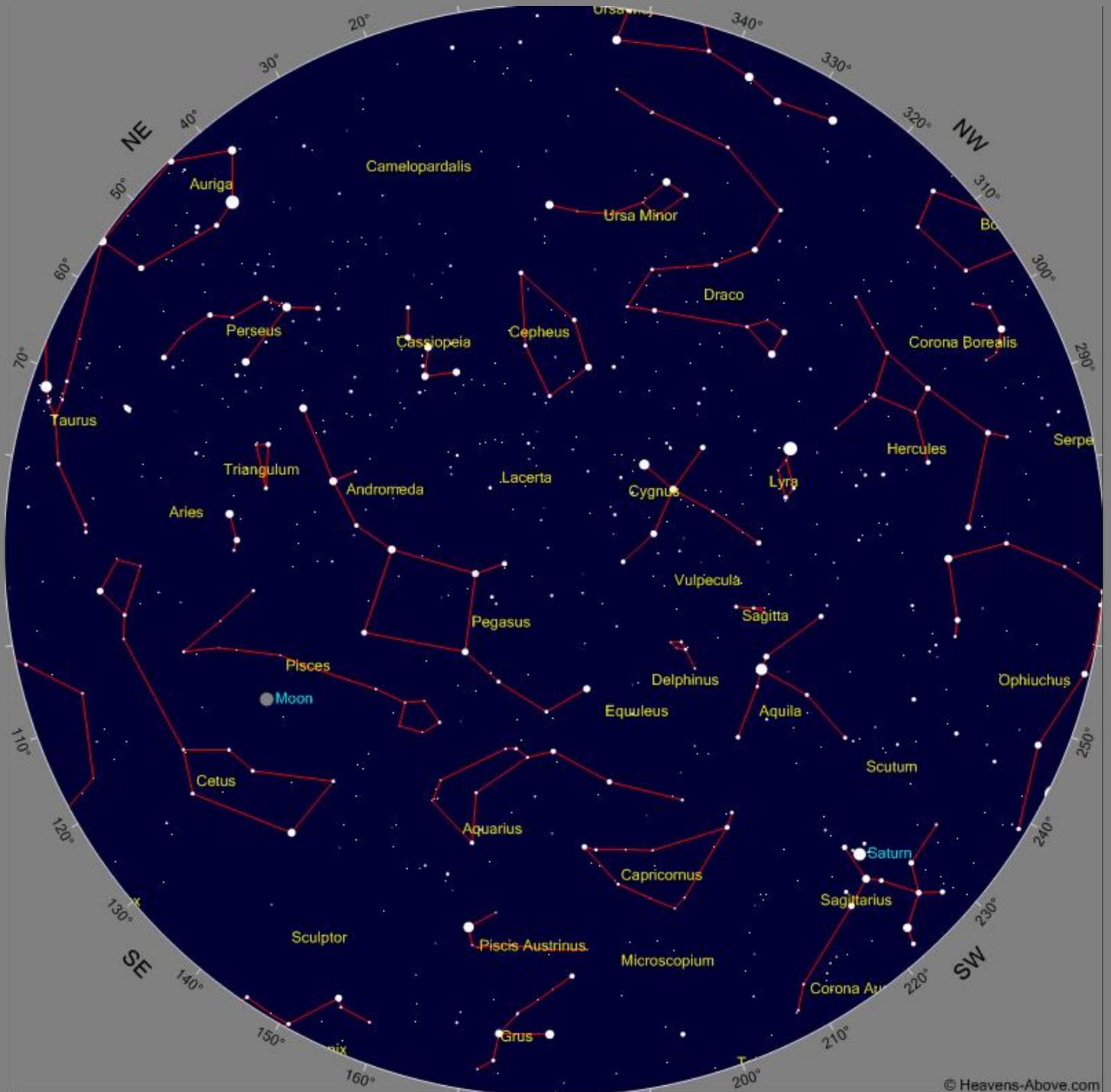
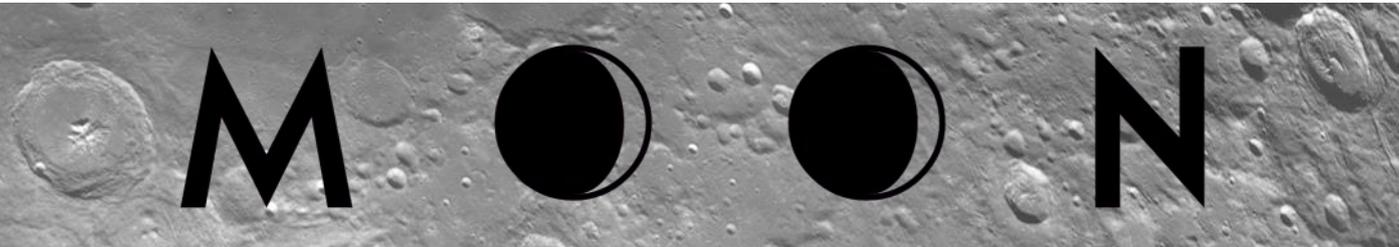
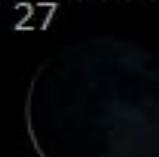
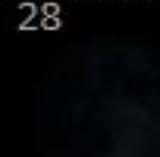


Chart displayed is for September 15, 2019 @ 2400 Local Time



<< August September 2019 October >>

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1  Waxing crescent Visible: 7% ↑ Age: 2.42 days	2  Waxing crescent Visible: 14% ↑ Age: 3.55 days	3  Waxing crescent Visible: 23% ↑ Age: 4.65 days	4  Waxing crescent Visible: 33% ↑ Age: 5.72 days	5  First quarter Visible: 44% ↑ Age: 6.74 days	6  First quarter Visible: 54% ↑ Age: 7.73 days	7  First quarter Visible: 64% ↑ Age: 8.70 days
8  Waxing gibbous Visible: 74% ↑ Age: 9.64 days	9  Waxing gibbous Visible: 82% ↑ Age: 10.56 days	10  Waxing gibbous Visible: 89% ↑ Age: 11.47 days	11  Waxing gibbous Visible: 94% ↑ Age: 12.37 days	12  Waxing gibbous Visible: 98% ↑ Age: 13.26 days	13  Full moon Visible: 100% Age: 14.15 days	14  Full moon Visible: 100% Age: 15.05 days
15  Full moon Visible: 99% ↓ Age: 15.94 days	16  Waning gibbous Visible: 96% ↓ Age: 16.84 days	17  Waning gibbous Visible: 91% ↓ Age: 17.75 days	18  Waning gibbous Visible: 84% ↓ Age: 18.67 days	19  Waning gibbous Visible: 76% ↓ Age: 19.61 days	20  Waning gibbous Visible: 67% ↓ Age: 20.56 days	21  Last quarter Visible: 57% ↓ Age: 21.54 days
22  Last quarter Visible: 46% ↓ Age: 22.54 days	23  Last quarter Visible: 36% ↓ Age: 23.58 days	24  Waning crescent Visible: 25% ↓ Age: 24.65 days	25  Waning crescent Visible: 16% ↓ Age: 25.76 days	26  Waning crescent Visible: 8% ↓ Age: 26.89 days	27  Waning crescent Visible: 3% ↓ Age: 28.05 days	28  New Visible: 1% ↓ Age: 29.22 days
29  New Visible: 1% ↑ Age: 0.85 days	30  Waxing crescent Visible: 5% ↑ Age: 2.00 days	1 	2 	3 	4 	5 

First and Last Lunar Crescent Visibility

Friday 27 September 2019

Time (24-hour clock)	Object (Link)	Event
6.7h	● Moon	Lunar Crescent visible, 30.1 hours before new moon Elongation: 17.8°, 2.7% illuminated, Position angle of crescent (from Zenith to East): 184.6° - crescent is horizontal like a boat, width of the crescent: 0.80°, Length of the crescent: 160°, Moon lower limb relative to sunrise point at sunset: dalt=16.4° daz=-1.6° (i.e. eastward), Altitude of moon center at listed time: 8.9°, Azimuth: 84.77°, Altitude of Sun: -9.8°, Moon rises at 5h53m, 87 minutes before the Sun (Azimuth: 78°/ENE) The Yallop (1998) criteria additionally states for this event with q=1.205:

Sunday 29 September 2019

Time (24-hour clock)	Object (Link)	Event
19.7h	● Moon	Lunar Crescent visible, 30.3 hours after new moon Elongation: 17.8°, 2.6% illuminated, Position angle of crescent (from Zenith to East): 222.3° - crescent points to the lower right, width of the crescent: 0.79°, Length of the crescent: 140°, Moon lower limb relative to sunset point at sunset: dalt=11.9° daz=-12.0° (i.e. eastward), Altitude of moon center at listed time: 6.5°, Azimuth: 259.37°, Altitude of Sun: -6.8°, Moon sets at 20h20m, 64 minutes after the Sun (Azimuth: 264°/W) The Yallop (1998) criteria additionally states for this event with q=0.734:

DATA SOURCE: [HTTPS://WWW.CALSKY.COM](https://www.calsky.com)

Geocentric Ephemeris for Moon : 2019

00:00 UTC (Coordinated Universal Time)

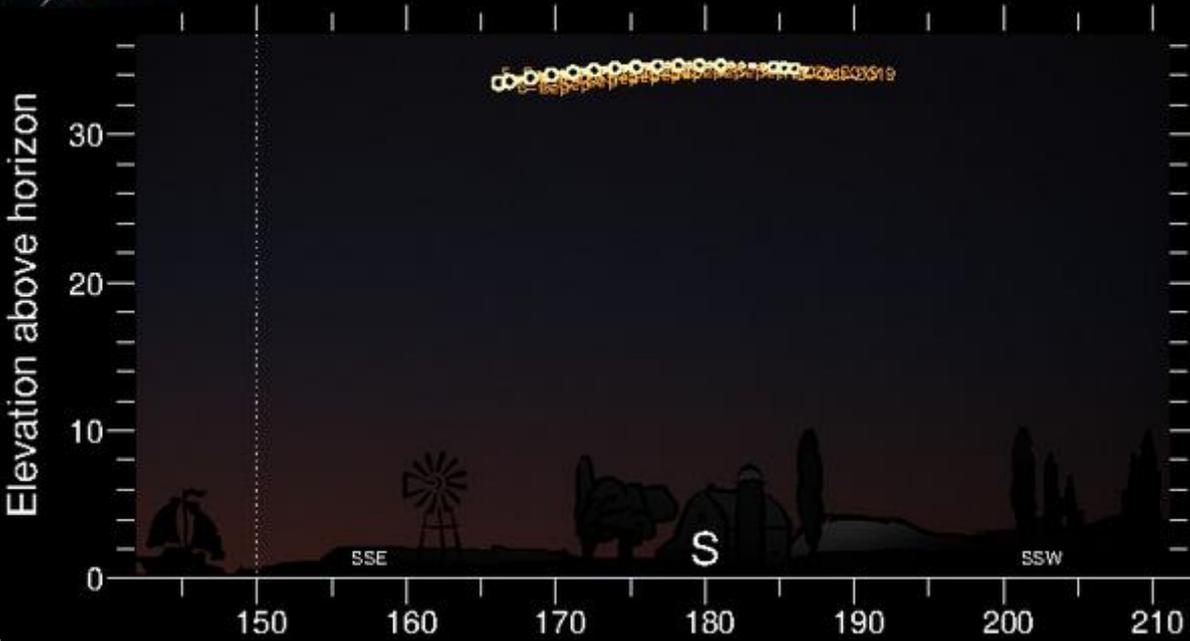
Date (0 UT)	Apparent R.A.			Apparent Declination			Distance km	Hor. Par. "	Ang. Diam. "	----Libration----			Sun Colng	P.A. Limb	Phase Age days	Phase Illum	Solar Elong	Lunar_Events
	h	m	s	°	'	"				l	b	c						
Sep 01	12	09	50.23	+04	17	25.6	358901	3665.8	1997.0	2.7	-6.4	23.9	289.5	281.7	1.6	0.039	22.8E	
Sep 02	13	05	14.85	-01	25	07.3	362236	3632.0	1978.6	4.6	-6.6	22.5	301.8	285.6	2.6	0.099	36.6E	
Sep 03	13	59	35.82	-06	55	05.0	366935	3585.5	1953.3	6.2	-6.4	19.8	314.0	286.1	3.6	0.181	50.2E	
Sep 04	14	53	30.71	-11	53	08.9	372517	3531.8	1924.1	7.3	-5.8	16.1	326.2	284.6	4.6	0.277	63.4E	
Sep 05	15	47	27.82	-16	04	18.2	378476	3476.2	1893.9	7.9	-4.8	11.5	338.5	281.6	5.6	0.381	76.1E	
Sep 06	16	41	39.66	-19	17	40.8	384357	3423.0	1864.9	8.0	-3.7	6.4	350.7	277.6	6.6	0.487	88.4E	FIRST 03:12
Sep 07	17	36	00.10	-21	26	20.1	389810	3375.1	1838.8	7.6	-2.4	0.9	2.9	272.7	7.6	0.591	100.3E	
Sep 08	18	30	06.22	-22	27	08.9	394601	3334.1	1816.4	7.0	-0.9	355.5	15.1	267.3	8.6	0.687	111.9E	D.NOD 17:36
Sep 09	19	23	25.30	-22	20	42.9	398599	3300.7	1798.1	6.0	0.5	350.3	27.3	261.7	9.6	0.775	123.2E	
Sep 10	20	15	24.75	-21	11	00.2	401748	3274.8	1784.1	4.9	1.9	345.7	39.5	255.9	10.6	0.850	134.3E	
Sep 11	21	05	41.43	-19	04	39.2	404047	3256.2	1773.9	3.7	3.1	341.9	51.6	249.9	11.6	0.911	145.2E	
Sep 12	21	54	06.84	-16	10	04.0	405534	3244.2	1767.4	2.3	4.3	339.0	63.8	242.9	12.6	0.957	156.0E	
Sep 13	22	40	47.85	-12	36	32.6	406268	3238.4	1764.2	1.0	5.2	337.0	76.0	231.3	13.6	0.986	166.5E	APO 13:33
Sep 14	23	26	04.21	-08	33	38.1	406307	3238.1	1764.0	-0.3	6.0	336.1	88.2	181.4	14.6	0.998	175.0E	FULL 04:34
Sep 15	00	10	25.18	-04	10	49.6	405689	3243.0	1766.7	-1.5	6.4	336.1	100.4	95.1	15.6	0.992	169.9W	
Sep 16	00	54	26.41	+00	22	31.6	404422	3253.1	1772.3	-2.7	6.6	337.1	112.5	80.8	16.6	0.969	159.6W	
Sep 17	01	38	47.75	+04	57	03.2	402482	3268.8	1780.8	-3.9	6.5	339.0	124.7	77.0	17.6	0.928	148.8W	
Sep 18	02	24	11.31	+09	23	02.5	399835	3290.5	1792.6	-4.9	6.1	341.8	136.9	76.3	18.6	0.871	137.8W	
Sep 19	03	11	19.14	+13	30	03.0	396457	3318.5	1807.9	-5.8	5.5	345.4	149.1	77.6	19.6	0.799	126.5W	
Sep 20	04	00	49.47	+17	06	29.7	392354	3353.2	1826.8	-6.5	4.5	349.7	161.3	80.2	20.6	0.713	115.1W	
Sep 21	04	53	10.31	+19	59	30.4	387587	3394.5	1849.2	-6.9	3.3	354.8	173.4	84.0	21.6	0.617	103.4W	
Sep 22	05	48	30.66	+21	55	19.6	382289	3441.5	1874.9	-7.1	2.0	0.3	185.6	88.9	22.6	0.513	91.4W	LAST 02:42
Sep 23	06	46	31.94	+22	40	41.4	376687	3492.7	1902.7	-6.9	0.5	6.1	197.8	94.5	23.6	0.405	79.0W	A.NOD 06:31
Sep 24	07	46	25.72	+22	05	17.5	371112	3545.2	1931.3	-6.3	-1.1	11.8	210.1	100.7	24.6	0.299	66.1W	
Sep 25	08	47	03.63	+20	04	43.9	365990	3594.8	1958.4	-5.3	-2.7	16.8	222.3	106.9	25.6	0.199	52.9W	
Sep 26	09	47	17.91	+16	42	45.6	361789	3636.5	1981.1	-3.8	-4.1	20.6	234.5	113.4	26.6	0.114	39.3W	
Sep 27	10	46	22.09	+12	11	42.7	358955	3665.2	1996.8	-2.0	-5.3	23.1	246.7	120.8	27.6	0.049	25.5W	
Sep 28	11	44	00.54	+06	51	00.8	357831	3676.8	2003.1	0.0	-6.1	24.0	258.9	136.4	28.6	0.011	11.9W	NEW 18:27
Sep 29	12	40	25.03	+01	04	27.7	358589	3669.0	1998.8	2.1	-6.5	23.3	271.2	236.7	0.2	0.003	6.0E	
Sep 30	13	36	03.66	-04	42	51.8	361197	3642.5	1984.3	4.1	-6.4	21.1	283.4	276.1	1.2	0.025	18.1E	

DATA SOURCE: [HTTP://ASTROPIXELS.COM/EPHEMERIS/MOON/MOON2017.HTML](http://astropixels.com/ephemeris/moon/moon2017.html)

S A T U R N



Evening Visibility of Saturn



Sept 1



Sept 15



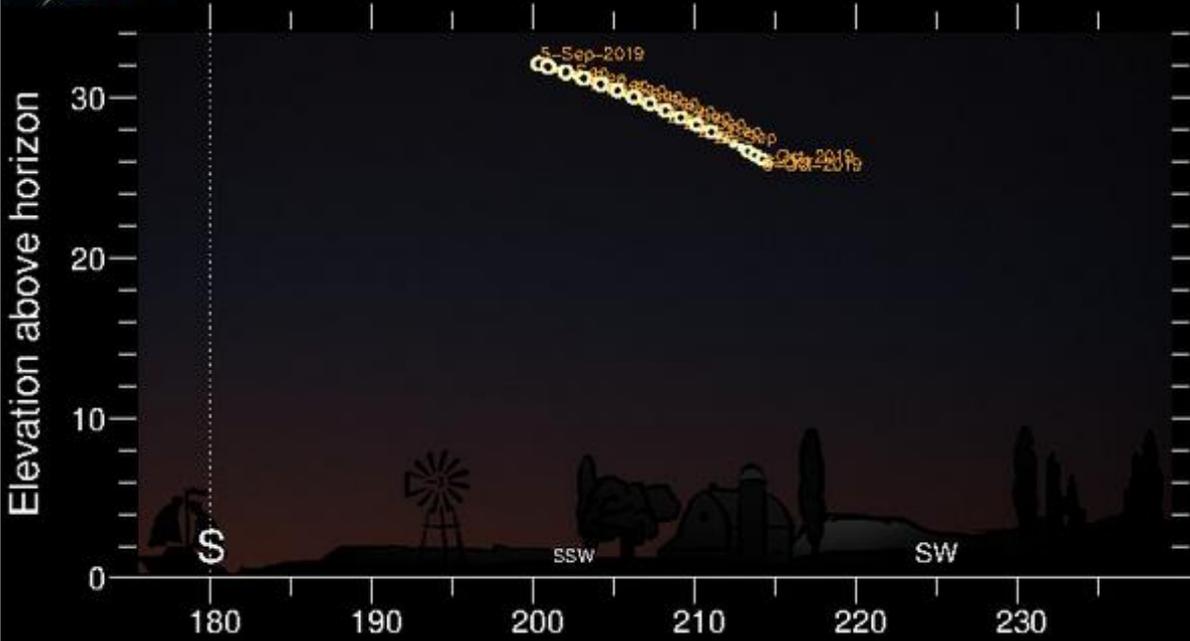
Sept 30

LOCAL SUNSET

J U P I T E R



Visibility of Jupiter



Sept 01

Sept 15

Sept 30

LOCAL SUNSET

Data and Image Sources: www.calsky.com

Club Meeting Minutes— August 20th ,2019

Pam Klich, Secretary

The meeting was called to order by Chris Mlodnicki, President.

52 members and visitors were in attendance.

Chris welcomed everyone and recognized visitors and new members. Chris also reviewed the club mission statement, the dark sky sites, upcoming star parties and outreach, and upcoming astronomical events.

General Session

Presentation – The speaker was David Bergman, a FWAS member. His presentation was titled “Juno: Jupiter from the Inside”. David talked about mission origins, Jupiter facts, instruments used to study Jupiter, how Juno is powered, Jupiter’s composition, and mission details.

Business Session

Starr Ranch – needs to have the grass cut and brush cleared and the deck sealed. A suggestion was made to hire a tractor for mowing the easement.

Vice President Elected – Member Ed Gill volunteered to take the Vice President position. The club nominated and seconded the motion. Ed Gill was voted in by the majority of members in attendance.

3RF – The annual 3RF event is scheduled for 9/20-9/22. Will be the last quarter moon. Dinner will be set up for Saturday night.

Prime Focus Newsletter – George Lutch is the editor. Please send articles and pictures.

Upcoming Presentations –

September Review of Chile visit to most recent full eclipse..... presenter to be determined
October Visit to Ft. Worth Museum to see Sarah's latest planetarium technology
November Swap meet, FWAS
December Holiday Party

Treasurer Report Submitted by John Giromini

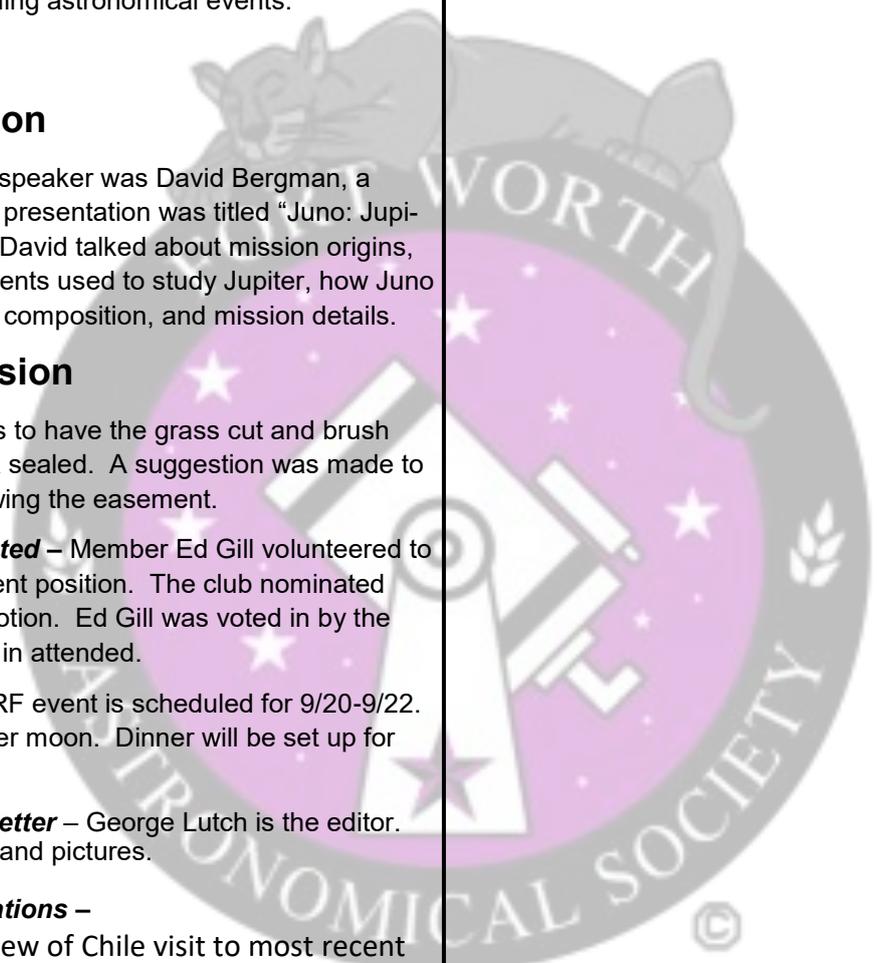
Checking account balance is \$8,311

Savings account balance is \$45,940

John reminded members to use smile.amazon.com for donations to FWAS.

Meeting Adjourned

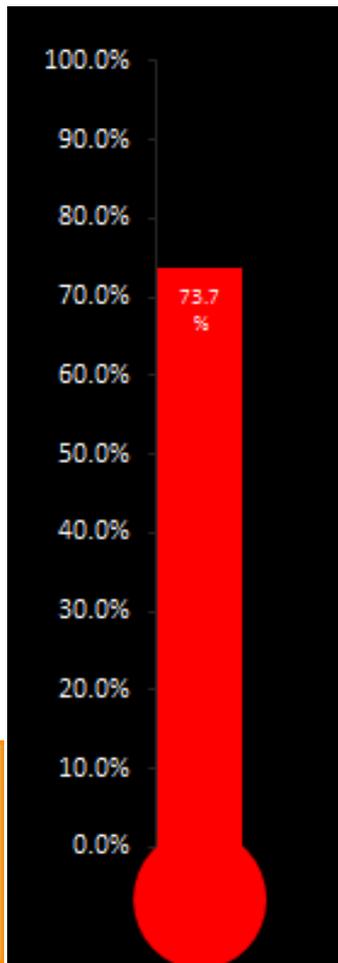
Submitted by Pam Klich, Secretary



FWAS CLUB FUNDRAISER

FWAS is still asking for donations to raise the \$3000 to cover the costs of purchasing our new Lunt LS60THa solar telescope and an iOptron ZEQ25 GT mount. We have already used this at some outreach and educational events, and it was a hit!

Donations are tax deductible. We are a 501(c)3 non-profit organization dedicated to educating and sparking the interest in Astronomy and Space in the public. If you would like to help us recoup this expense, it's still not too late. You can still donate. Please click the button below or go to the URL shown at the bottom. Any amount is welcome and greatly appreciated.



CLICK HERE TO MAKE A SECURE ONLINE DONATION TO FWAS THROUGH
PayPalTM

<http://www.fortworthastro.com/donate.html>

Shop at AmazonSmile

and Amazon will make a donation to:

FORT WORTH
ASTRONOMICAL
SOCIETY

Get started

amazon smile

AmazonSmile is a website operated by Amazon that lets customers enjoy the same wide selection of products, low prices, and convenient shopping features as on Amazon.com. The difference is that when customers shop on AmazonSmile at smile.amazon.com, the AmazonSmile Foundation will donate 0.5% of the price of eligible purchases to the charitable organizations selected by customers.

To participate, visit AmazonSmile and select Fort Worth Astronomical Society as your charity upon log-in. For more information visit org.amazon.com. The site will remember your charity automatically when you visit AmazonSmile to shop. If you are already an Amazon.com user, you can use the same account to log-in to AmazonSmile to shop. You must sign-in to AmazonSmile each time you shop in order for your purchases to count towards a donation to your charitable organization. If you do not have an Amazon account, signing up is free!

Newsletter:

The FWAS newsletter, *Prime Focus*, is published monthly. Letters to the editor, articles for publication, photos you've taken, personal equipment reviews, or just about anything you would like to have included in the newsletter that is astronomy related should be sent to: primefocus@fortworthastro.com

Meetings:

FWAS meets at 7:00 PM on the third Tuesday of the month at the UNT Health Science Center – Research & Education Building, Room 100; 3500 Camp Bowie Blvd; Ft. Worth. Guests and visitors are always welcome.

Outreach:

Items regarding FWAS Outreach activities, or requests for FWAS to attend an event, should be sent to: outreach@fortworthastro.com

FWAS Annual Dues:

\$60 for adults / families & households
 \$50 for adults (individual)
 \$30.00 for students (half-price Dec 1 thru May 31); Membership runs June 1st through May 31st. Please make checks payable to:

Fort Worth Astronomical Society

See our Secretary/Treasurer for more info:

sec-treas@fortworthastro.com

Cash and checks should be paid in-person at the next indoor meeting, or checks can be mailed in the traditional way. Members should check the eGroup for the latest postal mailing address listed by the Secretary/Treasurer.

Credit card payments (for existing membership renewals only) can be made through our PayPal link (private link is on the club's Yahoo eGroup – no PayPal account required).

Discount Magazine Subscriptions:

Sky & Telescope, Astronomy, and StarDate (McDonald Observatory) magazines are available for discounted subscription rates through our association with the NASA Night Sky Network and the Astronomical Society of the Pacific. The link can be found on the club's Yahoo eGroup. (Members Only)

Astronomical League Membership:

Your FWAS membership gives you associate membership in the Astronomical League. This gives you access to earn various observing certificates through the AL observing clubs. You also receive their quarterly magazine, *Reflector*. AL Observing clubs: <http://tinyurl.com/7pyr8gq>

That's a Fact!

A single day on Venus is longer than an entire year on Earth.

Source

Seen a Fireball Lately? Report it to the American Meteor Society (AMS)

Just go to their website at <http://www.amsmeteors.org/> and hover your cursor on the Fireball menu item at the top of the page and you will see the link to report a fireball. They will ask you several questions in a web questionnaire and your observations will be added to the other witnesses for the same event. These will be compiled and analyzed to determine the location and direction from which the object entered the atmosphere.

FULL MOON NAME

September

“Full Corn Moon”



Source: Old Farmer's Almanac

This full Moon corresponds with the time of harvesting corn. It has also called the Barley Moon, because it is the time to harvest and thresh the ripened barley. (See note below regarding the “Harvest Moon” timing.)



FWAS Foto Files

Photos from some of our great outreach folks. Keep up the great work.



FWAS FOTO FILES



Have an interesting photo you've taken of the sky? Discovered a technique and want to show the results to fellow FWAS members? Submit your photos to primefocus@fortworthastro.com or send them in the **Yahoo! eGroup** to the attention of the newsletter editor. Your participation in showing off your personal astrophotography is greatly appreciated by all FWAS members.