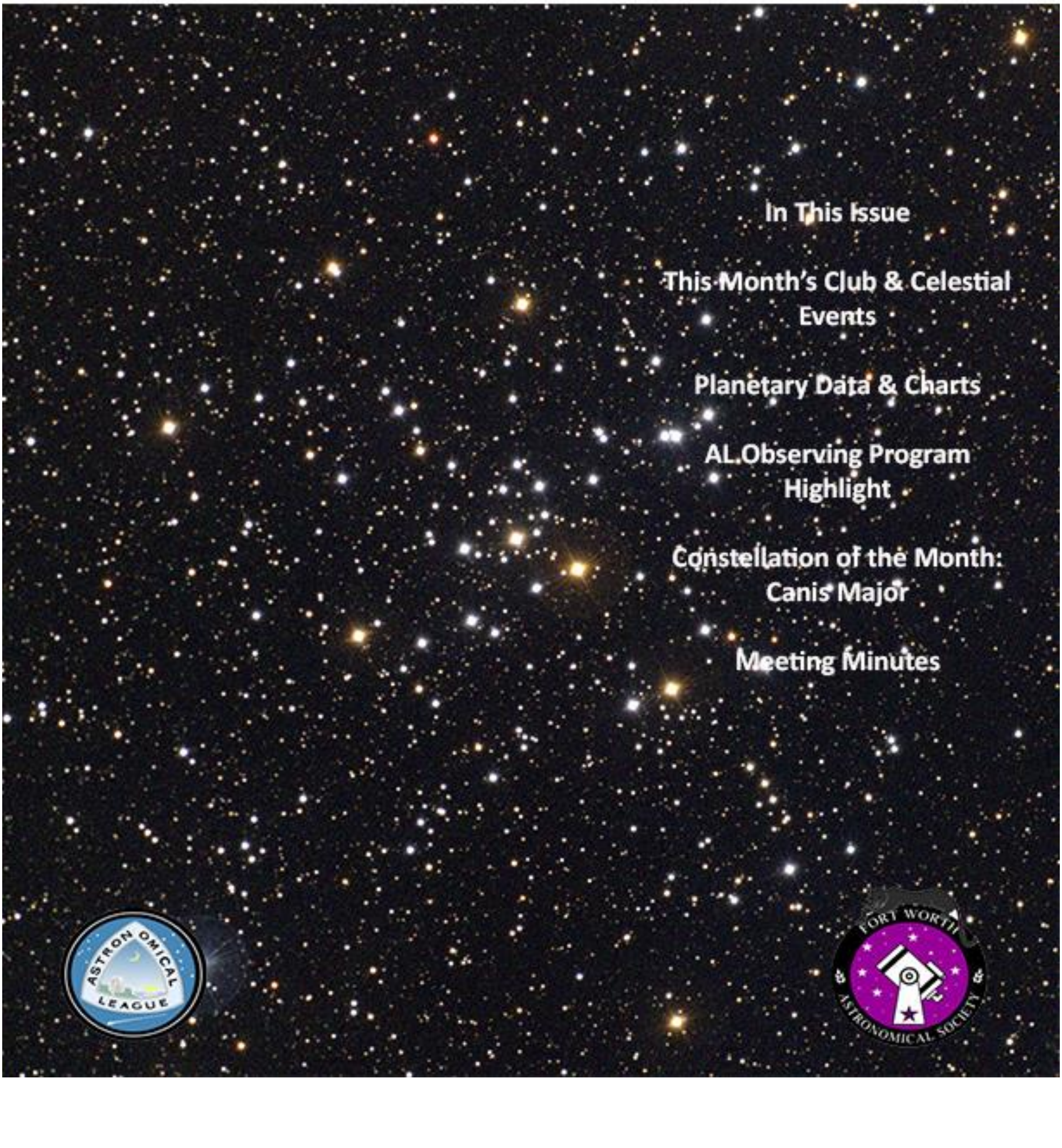
FORT WORTH ASTRONOMICAL SOCIETY (est. 1949) February 2023

PRIME FOCUS

M41



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AL Observing Program Highlight

Constellation of the Month: Canis Major

Meeting Minutes

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Officers (FY 2022):
President – Robert Sirkis
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Secretary—M. Monica Merritt

Board Members:
2022-2024
- Zach Smith
- Bill Hall

2022-2023
- Robert Cargill
- Phil Stage

Cover Photo: M41
Coutesy of
Wikipedia

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 (When one is available)
- 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

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George C. Lutch

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Wikipedia
Hubble\ESA

FEBRUARY 2023

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1	2	3	4 Moon Apogee
5 FM○	6	7 FWAS APSIG Meeting	8	9	10	11
12	13 LQ◑	14	15	16	17	18
19 Moon Perigee	20 NM●	21 FWAS Monthly Meeting Starts @ 7pm	22	23	24	25
26	27 FQ◐	28				

See our full FWAS Event Calendar at:
http://www.fortworthastro.com/meetings.html
for the latest updates on what our club has scheduled

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

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

ESTABLISHED IN 1949, FWAS IS ONE OF THE FIRST ADULT AMATEUR ASTRONOMY CLUBS FORMED IN THE COUNTRY AND ONE OF THE LARGEST. .

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

MORE DETAILS AT THE NASA WEBSITE: FORT WORTH ASTRONOMICAL SOCIETY | FWAS EVENTS | NIGHT SKY NETWORK (NASA.GOV)

STAR PARTY ETIQUETTE: HTTP://WWW.FORTWORTHASTRO.COM/ETIQUETTE.HTML

WHEN: NONE FOR FEBRUARY

CHECK THE TANDY HILLS FACEBOOK PAGE AS WELL AS THEIR WEB PAGE FOR ANY ANNOUNCMENTS
PRAIRIE SKY / STAR PARTY FRIENDS OF TANDY HILLS

Equipment Review

Buckeye Stargazer Filter Masks

I recently went looking for a solution to a problem I was having with my AstroPhotography filters. Most unmounted filters do not come with light blocking on the outside edges and if you get any stray light in the filter chamber you will see what is called an artifact on the image. These artifacts are very hard to remove from the image during processing and you generally try not to have them occur. It was while looking for a solution to this that I came upon a solution from Buckeye Stargazer, a small company that does 3d printed parts for telescopes. They offered a filter mask that was 3d printed that had a channel built into the mask that covered the edge of the filters and generally just fit better in the filter wheel. Long story short I bought a set of these for my 50mm unmounted LRGB filters and when I received them I was quite impressed by the quality I saw. After installing them I was also impressed by how they took care of the issue I was seeing and how they fit in the filter wheel. I would recommend this product to anyone using a filter wheel that also used unmounted filters.

As a side note Buckeye Stargazer makes several other well made products that I am looking at for future projects or upgrades. Check them out at buckeyestargazer.net

Clear Skies

George Lutch

Media Reviews

Media reviews by Matt J. McCullar, FWAS

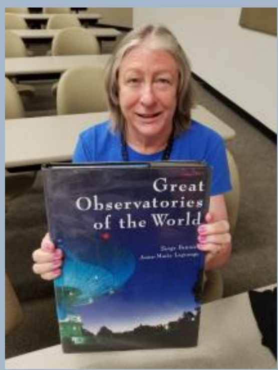
Great Observatories of the World

by Serge Brunier and Anne-Marie Lagrange

"Nothing ever built arose to touch the skies unless some man dreamed that it should, some man believed that it could, and some man willed that it must."

Charles F. Kettering, electrical engineer and General Motors executive

This is a truly awesome book, a collection of articles and photographs of the truly great astronomical observatories around the world. As you can see in the photo, it is a real handful... very large and very heavy. A coffee-table book for astronomers if there ever was one.



It is not easy to build a world-class astronomical observatory. Particularly with today's technology and requirements, everything must be assembled with precision greater than that of the finest watch. New developments in sensor technology, optics, photography, computers, etc., keep pushing back the limits and help build even larger telescopes and upgrade older ones to record data that their original designers never dreamed they could.

The average person never really hears much about astronomical observatories, unless something big happens in the sky. Such structures are usually built far away from large cities and their media outlets. (Some of these places I had never heard of.) Most people, including those who live nearby, have no idea what goes on inside. *Great Observatories of the World* describes the histories, equipment, capabilities and discoveries of dozens of observatories of all kinds, all over the planet, even underground and in space. (Would you have guessed that there are well over 100 professional observatories?) It is absolutely amazing to see what astronomers can do nowadays, and the plans for the future and what objects may be yet found are truly incredible.

The book reveals the history of the telescope itself, describing how it has changed over the centuries. What would Galileo have thought, had he seen the machines we are building today? There are also very good explanations of various astronomical principles, explaining why these tremendous structures are built the way they are, why they were built in those particular locations, and how they all work.

Published by Firefly Books – 2005

ISBN 1-55407-055-4

240 pages

Astronomical observatories examine the sky from many countries: Canada, Japan, China, Mexico, Egypt, Russia, Australia, Chile, Italy, South Korea, India, Spain, France, England, Greece, and of course the United States. Paradoxically, most of these are not designed for direct viewing; such world-class telescopes are built to record various wavelengths of light (some of which we cannot see) over the course of several hours, or even several nights. Astronomers learn more from a spectrogram of a star's light, splitting it with a prism and viewing the component colors. They can determine a star's temperature, chemical makeup, its velocity through space, whether it has other stars circling it, etc.

Some observatories are designed to examine only one star: the Sun. Other observatories do not even look for light at all, but for gravity waves or high-energy particles called neutrinos and gamma rays. The same part of the sky can look dramatically different at different wavelengths. We may not be able to see into the heart of a nebula with our eyes, but it's a piece of cake for infrared detectors.

The earliest telescopes were simple refractors. Their lenses grew larger and larger until they reached their practical limit, beyond which the heavy glass would sag under its own weight and distort the image. Reflecting telescopes came next, with parabolic mirrors being ground from huge disks of glass. Such mirrors were constructed (taking years for grinding and polishing) in larger and larger dimensions until they, too, reached a practical limit. Today even larger telescopes do not rely on one giant disk of glass, but sets of individual mirrors grouped together. Such segmented mirrors allow even clearer images due to small actuators constantly adjusting their positions according to how the sky above distorts incoming starlight (a technique called "adaptive optics"), permitting ultra-precise focusing that astronomers generations ago never could have dreamed of. Plans for one future telescope include a mirror 100 meters across; astronomers love to think big.

It seems incredible that only a hundred years ago professional astronomers thought there was only one galaxy in the entire universe, and that the faint smudges of light visible in their primitive telescopes were just "nebulae." Now we know that, according to the book, "The full celestial sphere contains more than 100 billion galaxies as faint as 30th magnitude." (One photograph shows thousands of *individual* stars in the Andromeda galaxy!) These observatories have compiled hundreds of different stellar databases, each dedicated to different stellar objects and their properties; data now flows in so fast that it is difficult to keep up with the latest results.

One of my favorite parts of this book is a detailed account of how an

(Continued on page 7)

(Book Review—Continued from page 6)

observatory actually works. How do astronomers apply for observing time? What should their justifications be for a particular request? They must know what a particular observatory can and cannot do, for maximum efficiency. (It is a very competitive process; it costs about $10,000 per hour to operate these giant telescopes, so some have their viewing time parceled out in half-nights or even quarter-nights. Only about a third of all requests are approved. And if an observing run you've planned for a solid year gets clouded out that night, tough luck.) If a project request is approved, then the astronomers must prepare weeks in advance. A minute-by-minute itinerary of the actual observation is required. Afterwards, a detailed report must be turned in, describing any problems encountered. All data recorded is copied and stored, and for the visiting astronomer the real fun begins: analyzing the data. This process can take weeks or even months because it involves "cleaning up" the results, such as removing visual artifacts or spurious samples. Scientific papers are then written and submitted to other astronomers before publication. Yet imagine the sheer pleasure of observing something in the universe that no one else ever saw or predicted before! What a time to be an astronomer! Imagine getting your hands on one of these tremendous machines! What would <u>you</u> like to look at?

It may well be possible in the not-too-distant future to build an entirely new family of telescopes (groups of them) that can not only detect exoplanets visibly, but do so with enough detail to resolve cloud patterns and continents. Their ultra-sensitive detectors would be blinded by anything brighter than a magnitude 26 star. Zodiacal light, dust clouds, asteroids and comets around other stars could be studied.

Some observatories do not look like observatories. They are built to accommodate the information the scientists want to study, and much of that information falls outside the capabilities of the human eye. Solar telescopes are sometimes built in towers; neutrino detectors reside in huge pools of water, hundreds of feet underground; radio antennas can come in a wide variety of sizes and shapes. (One observatory in France sports a pair of telescopes that resemble giant bowling pins.)

Radio observatories are included, too, and it's fascinating to see how their technology has progressed over time. Today groups of individual radio dishes are linked together to increase their resolving power. Some of these observatories can therefore be miles long, or even stretch across a continent. And they can work 24 hours a day.

Not to be forgotten are the observatories in orbit around the Earth and the Sun. Several telescopes besides the Hubble Space Telescope and the James Webb Space Telescope have flown already, each designed for a different purpose.

Many of the truly great observatories are in the southern hemisphere, in the mountains of Chile. Here the air is as clear and dry as the Earth can make it, providing the clearest skies possible. (Sometimes planets are visible to the naked eye in the daytime.) In fact, these telescopes are located in altitudes so high that it can be dangerous for people to be exposed to their low oxygen levels for too long. The same holds true for the Mauna Kea Observatory in Hawaii. An observatory even exists at the ends of the Earth, at the South Pole!

Now we can observe surface details of some of the closest red supergiant stars; individual volcanoes on Jupiter's moon Io; and Halley's Comet at any point in its orbit. All this from a guy who stuck two pieces of glass into a tube and pointed it at the Moon over 400 years ago.

Almost all great observatories are actually made up of more than one telescope. A giant telescope is usually surrounded by several nearby smaller telescopes, but they don't get the glory. But often they can do work that consumer-grade telescopes cannot do, but would be a waste of time for the gigantic scopes. Demand for the smaller surrounding telescopes is usually less, freeing them up for long-duration observing programs.

The whole universe is humming with activity, and we are still just beginning to figure it out. What will we find in the next ten years? The next 100 years? The next 1,000 years? Perhaps someday observatories will operate from the back of the Moon, on Mars (too dusty?), or even between solar systems.

I would have liked to read more here about the process of designing and constructing an observatory. They don't go up by themselves. And where, exactly, does the money for each observatory come from?

Anne-Marie Lagrange is a professional astrophysicist and Serge Brunier is a science journalist. The book is well written, the photography superb. Good, descriptive writing which suffers from only a few typographical errors.

I greatly enjoyed *Great Observatories of the World*, and I am sure you will, too. Give it a read if you can!

The End

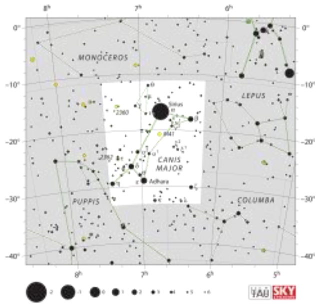
CELESTIAL EVENTS THIS MONTH

Feb 03	13:47	Pollux 1.9°N of Moon
04	02:55	Moon at Apogee: 406476 km
05	12:29	FULL MOON
06	11:44	Regulus 4.5°S of Moon
10	22:23	Spica 3.6°S of Moon
12	01:31	Moon at Descending Node
13	10:01	LAST QUARTER MOON
14	12:09	Antares 1.9°S of Moon
15	14	Mercury at Aphelion
16	10	Saturn in Conjunction with Sun
18	14:53	Mercury 3.6°N of Moon
19	03:06	Moon at Perigee: 358267 km
20	01:06	NEW MOON
22	01:57	Venus 2.1°N of Moon
22	15:58	Jupiter 1.2°N of Moon: Occn.
24	12:56	Moon at Ascending Node
26	08:42	Pleiades 2.1°N of Moon
27	02:06	FIRST QUARTER MOON
27	22:32	Mars 1.1°S of Moon: Occn.

Data Source: Astropixels.com

(* Times are Local)

Canis Major



Characteristics

Canis Major is a constellation in the southern celestial hemisphere. In the second century, it was included in Ptolemy's 48 constellations, and is counted among the 88 modern constellations. Its name is Latin for "greater dog" in contrast to Canis Minor, the "lesser dog"; both figures are commonly represented as following the constellation of Orion the hunter through the sky. The Milky Way passes through Canis Major and several open clusters lie within its borders, most notably M41.

Canis Major contains Sirius, the brightest star in the night sky, known as the "dog star". It is bright because of its proximity to the Solar System. In contrast, the other bright stars of the constellation are stars of great distance and high luminosity. At magnitude 1.5, Epsilon Canis Majoris (Adhara) is the second-brightest star of the constellation and the brightest source of extreme ultraviolet radiation in the night sky. Next in brightness are the yellow-white supergiant Delta (Wezen) at 1.8, the blue-white giant Beta (Mirzam) at 2.0, blue-white supergiants Eta (Aludra) at 2.4 and Omicron^2 at 3.0, and white spectroscopic binary Zeta (Furud), also at 3.0. The red hypergiant VY Canis Majoris is one of the largest stars known, while the neutron star RX J0720.4-3125 has a radius of a mere 5 km.

Deep-sky objects

The band of the Milky Way goes through Canis Major, with only patchy obscurement by interstellar dust clouds. It is bright in the northeastern corner of the constellation, as well as in a triangular area between Adhara, Wezen and Aludra, with many stars visible in binoculars. Canis Major boasts several open clusters.[86] The only Messier object is M41 (NGC 2287), an open cluster with a combined visual magnitude of 4.5, around 2300 light-years from Earth. Located 4 degrees south of Sirius, it contains contrasting blue, yellow and orange stars and covers an area the apparent size of the full moon—in reality around 25 light-years in diameter.[87] Its most luminous stars have already evolved into giants. The brightest is a 6.3-magnitude star of spectral type K3. Located in the field is 12 Canis Majoris, though this star is only 670 light-years distant.[88] NGC 2360, known as Caroline's Cluster after its discoverer Caroline Herschel, is an open cluster located 3.5 degrees west of Muliphein and has a combined apparent magnitude of 7.2. Around 15 light-years in diameter, it is located 3700 light-years away from Earth,[89] and has been dated to around 2.2 billion years old.[90] NGC 2362 is a small, compact open cluster, 5200 light-years from Earth. It contains about 60 stars, of which Tau Canis Majoris is the brightest member.[6] Located around 3 degrees northeast of Wezen, it covers an area around 12 light-years in diameter, though the stars appear huddled around Tau when seen through binoculars. It is a very young open cluster as its member stars are only a few million years old. Lying 2 degrees southwest of NGC 2362 is NGC 2354 a fainter open cluster of magnitude 6.5, with around 15 member stars visible with binoculars.[87] Located around 30' northeast of NGC 2360,[91] NGC 2359 (Thor's Helmet or the Duck Nebula) is a relatively bright emission nebula in Canis Major, with an approximate magnitude of 10, which is 10,000 light-years from Earth. The nebula is shaped by HD 56925, an unstable Wolf–Rayet star embedded within it.[92]

In 2003, an overdensity of stars in the region was announced to be the Canis Major Dwarf, the closest satellite galaxy to Earth. However, there remains debate over whether it represents a disrupted dwarf galaxy or in fact a variation in the thin and thick disk and spiral arm populations of the Milky Way. Investigation of the area yielded only ten RR Lyrae variables—consistent with the Milky Way's halo and thick disk populations rather than a separate dwarf spheroidal galaxy.[94] On the other hand, a globular cluster in Puppis, NGC 2298—which appears to be part of the Canis Major dwarf system—is extremely metal-poor, suggesting it did not arise from the Milky Way's thick disk, and instead is of extragalactic origin.[95]

NGC 2207 and IC 2163 are a pair of face-on interacting spiral galaxies located 125 million light-years from Earth. About 40 million years ago, the two galaxies had a close encounter and are now moving farther apart; nevertheless, the smaller IC 2163 will eventually be incorporated into NGC 2207. As the interaction continues, gas and dust will be perturbed, sparking extensive star formation in both galaxies.[96] Supernovae have been observed in NGC 2207 in 1975 (type Ia SN 1975a),[97] 1999 (the type Ib SN 1999ec),[98] 2003 (type 1b supernova SN 2003H),[99] and 2013 (type II supernova SN 2013ai).[100] Located 16 million light-years distant,[93] ESO 489-056 is an irregular dwarf- and low-surface-brightness galaxy that has one of the lowest metallicities known.[101]

CANIS MAJOR

Mythology

In ancient Mesopotamia, Sirius, named KAK.SI.DI by the Babylonians, was seen as an arrow aiming towards Orion, while the southern stars of Canis Major and a part of Puppis were viewed as a bow, named BAN in the *Three Stars Each* tablets, dating to around 1100 BC. In the later compendium of Babylonian astronomy and astrology titled *MUL.APIN*, the arrow, Sirius, was also linked with the warrior Ninurta, and the bow with Ishtar, daughter of Enlil.[2] Ninurta was linked to the later deity Marduk, who was said to have slain the ocean goddess Tiamat with a great bow, and worshipped as the principal deity in Babylon.[3] The Ancient Greeks replaced the bow and arrow depiction with that of a dog.[4]

In Greek Mythology, Canis Major represented the dog Laelaps, a gift from Zeus to Europa; or sometimes the hound of Procris, Diana's nymph; or the one given by Aurora to Cephalus, so famed for its speed that Zeus elevated it to the sky.[5] It was also considered to represent one of Orion's hunting dogs,[6] pursuing Lepus the Hare or helping Orion fight Taurus the Bull; and is referred to in this way by Aratos, Homer and Hesiod. The ancient Greeks refer only to one dog, but by Roman times, Canis Minor appears as Orion's second dog. Alternative names include Canis Sequens and Canis Alter.[5] Canis Syrius was the name used in the 1521 *Alfonsine tables*.[5]

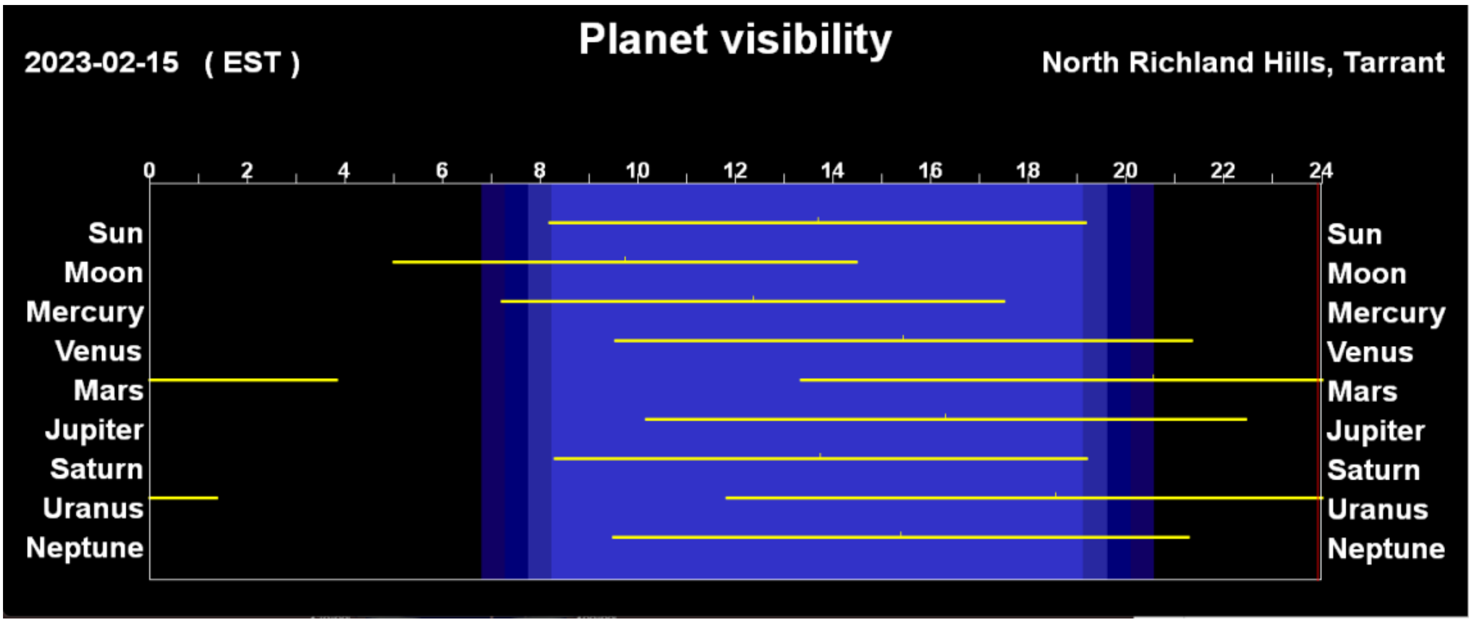
The Roman myth refers to Canis Major as *Custos Europae*, the dog guarding Europa but failing to prevent her abduction by Jupiter in the form of a bull, and as *Janitor Lethaeus*, "the watchdog".[7] In medieval Arab astronomy, the constellation became *al-Kalb al-Akbar*, "the Greater Dog", transcribed as *Alcheleb Alachbar* by 17th century writer Edmund Chilmead. Islamic scholar Abū Rayhān al-Bīrūnī referred to Orion as *Kalb al-Jabbār*, "the Dog of the Giant".[5] Among the Merazig of Tunisia, shepherds note six constellations that mark the passage of the dry, hot season. One of them, called *Merzem*, includes the stars of Canis Major and Canis Minor and is the herald of two weeks of hot weather.[8]

Visibility of International Space Station ISS

Times and Data are for Fort Worth, Texas Locations Only

Date	Bright-ness	Start			Highest point			End			Pass type
	(mag)	Time	Alt.	Az.	Time	Alt.	Az.	Time	Alt.	Az.	
01 Feb	-2.4	19:19:46	10°	NNW	19:22:04	25°	NNE	19:22:04	25°	NNE	visible
02 Feb	-1.9	18:31:33	10°	N	18:33:47	16°	NNE	18:36:02	10°	ENE	visible
02 Feb	-1.4	20:07:27	10°	WNW	20:09:01	24°	WNW	20:09:01	24°	WNW	visible
03 Feb	-3.9	19:18:35	10°	NW	19:21:57	86°	NE	19:23:18	34°	SE	visible
04 Feb	-3.3	18:29:56	10°	NNW	18:33:09	42°	NE	18:36:21	10°	ESE	visible
04 Feb	-0.7	20:07:54	10°	W	20:09:33	13°	SW	20:10:53	11°	SSW	visible
05 Feb	-1.5	19:18:04	10°	WNW	19:20:53	25°	SW	19:23:41	10°	S	visible
06 Feb	-2.8	18:28:52	10°	NW	18:32:09	51°	SW	18:35:23	10°	SSE	visible
08 Feb	-0.5	18:28:49	10°	W	18:30:49	15°	SW	18:32:48	10°	SSW	visible
15 Feb	-1.8	06:13:03	10°	SSW	06:15:59	29°	SE	06:18:56	10°	ENE	visible
16 Feb	-0.8	05:25:01	10°	SSE	05:27:01	15°	SE	05:29:01	10°	E	visible
17 Feb	-3.9	06:11:38	15°	SW	06:14:17	73°	NW	06:17:36	10°	NE	visible
18 Feb	-3.0	05:25:21	50°	ESE	05:25:21	50°	ESE	05:28:23	10°	NE	visible
19 Feb	-0.2	04:38:49	10°	ENE	04:38:49	10°	ENE	04:38:50	10°	ENE	visible
19 Feb	-2.4	06:11:41	21°	WNW	06:12:40	24°	NW	06:15:26	10°	NNE	visible
20 Feb	-2.0	05:24:55	24°	NNE	05:24:55	24°	NNE	05:26:32	10°	NNE	visible
21 Feb	-1.4	06:10:48	11°	NW	06:11:11	11°	NNW	06:12:02	10°	NNW	visible
22 Feb	-1.0	05:23:41	11°	N	05:23:41	11°	N	05:23:54	10°	N	visible

NOTE: NO bright ISS passes visible in the DFW area, for dates not listed.



February Sky Chart

Fort Worth, TX (32.7555°N, 97.3308°W)

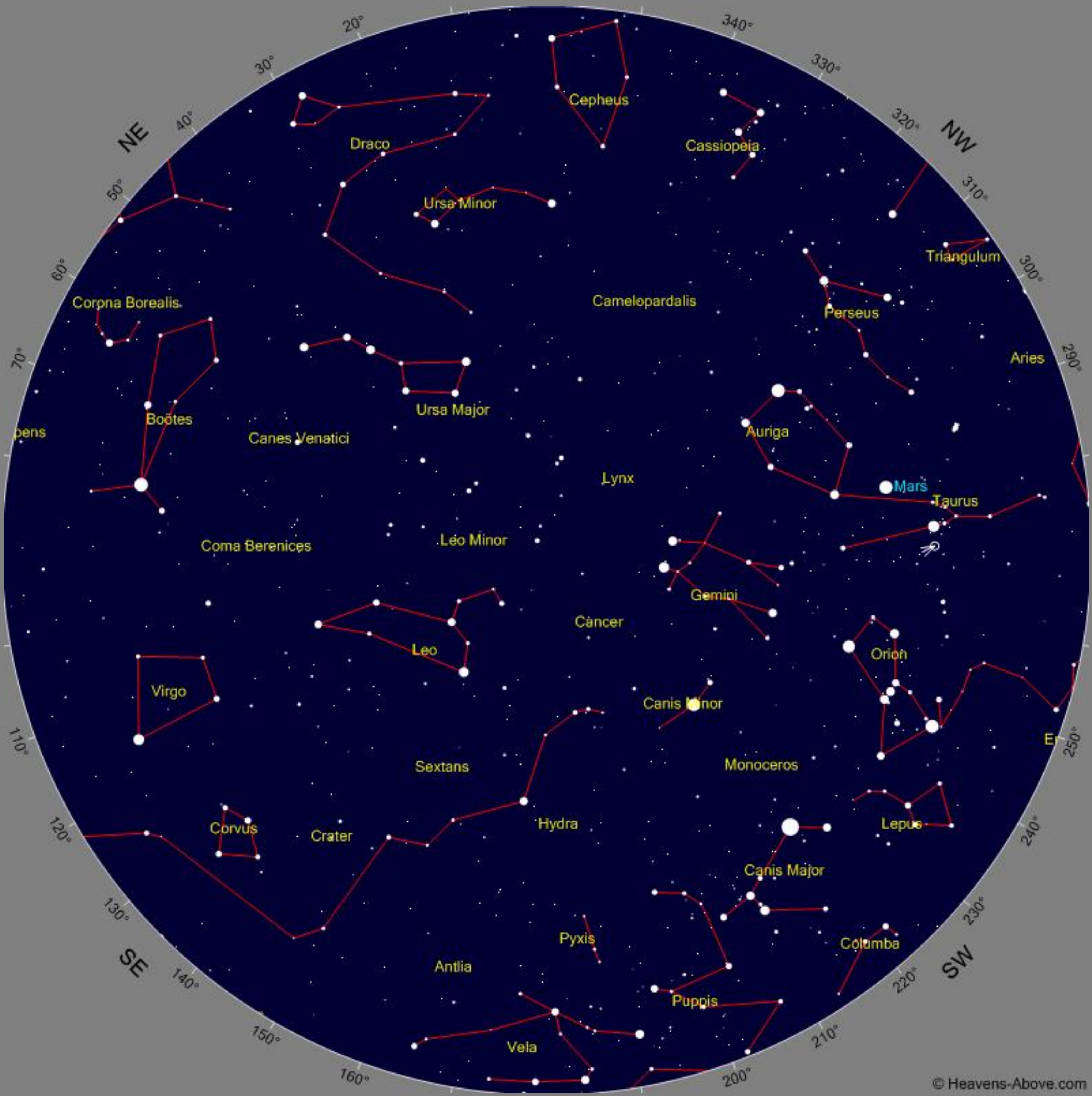
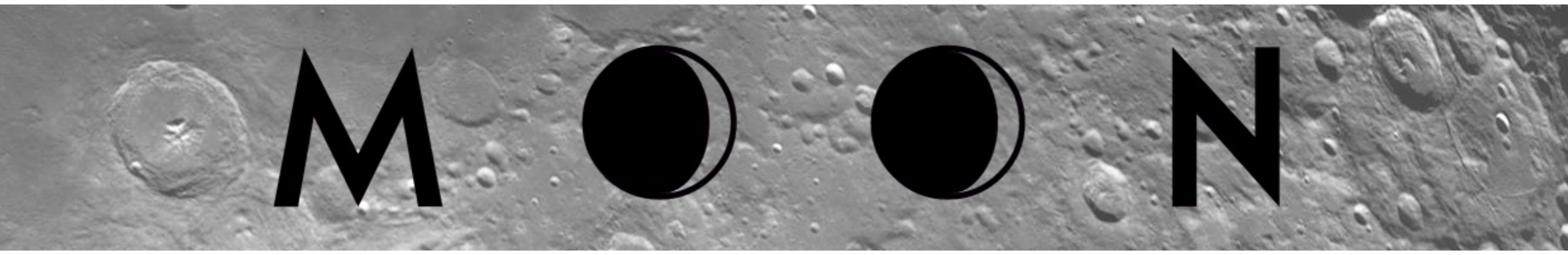


Chart displayed is for February15, 2023 @ 2400 Local Time



<< January — February 2023 — March >>

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
29	30	31	1 Waxing gibbous Visible: 85% ↑ Age: 10.95 days	2 Waxing gibbous Visible: 91% ↑ Age: 11.85 days	3 Waxing gibbous Visible: 96% ↑ Age: 12.74 days	4 Full moon Visible: 99% ↑ Age: 13.63 days
5 Full moon Visible: 100% Age: 14.52 days	6 Full moon Visible: 100% Age: 15.41 days	7 Waning gibbous Visible: 98% ↓ Age: 16.31 days	8 Waning gibbous Visible: 94% ↓ Age: 17.22 days	9 Waning gibbous Visible: 88% ↓ Age: 18.14 days	10 Waning gibbous Visible: 81% ↓ Age: 19.07 days	11 Waning gibbous Visible: 72% ↓ Age: 20.02 days
12 Last quarter Visible: 63% ↓ Age: 20.99 days	13 Last quarter Visible: 52% ↓ Age: 21.99 days	14 Last quarter Visible: 41% ↓ Age: 23.02 days	15 Waning crescent Visible: 31% ↓ Age: 24.07 days	16 Waning crescent Visible: 21% ↓ Age: 25.17 days	17 Waning crescent Visible: 12% ↓ Age: 26.29 days	18 Waning crescent Visible: 5% ↓ Age: 27.44 days
19 New Visible: 1% ↓ Age: 28.60 days	20 New Visible: 1% ↑ Age: 0.23 days	21 New Visible: 3% ↑ Age: 1.37 days	22 Waxing crescent Visible: 7% ↑ Age: 2.49 days	23 Waxing crescent Visible: 14% ↑ Age: 3.57 days	24 Waxing crescent Visible: 23% ↑ Age: 4.61 days	25 Waxing crescent Visible: 32% ↑ Age: 5.62 days
26 First quarter Visible: 42% ↑ Age: 6.59 days	27 First quarter Visible: 52% ↑ Age: 7.53 days	28 First quarter Visible: 62% ↑ Age: 8.44 days	1	2	3	4

Geocentric Ephemeris for Moon : 2023

00:00 UTC (Coordinated Universal Time)

Date (0 UT)	Apparent R.A. (h m s)	Apparent Declination (° ' ")	Distance (km)	Hor. Par. (")	Ang. Diam. (")	----Libration---- l (°)	b (°)	c (°)	Sun Colng (°)	P.A. Limb (°)	Phase Age (days)	Phase Illum	Solar Elong (°)	Lunar_Events
Feb 01	05 15 05.74	+26 21 22.6	402007	3272.7	1782.9	4.7	-4.3	356.7	33.4	268.1	10.1	0.809	128.0E	
Feb 02	06 08 30.56	+27 26 25.6	404347	3253.8	1772.6	3.5	-5.3	1.8	45.6	275.5	11.1	0.877	138.9E	MAX.N 08:19
Feb 03	07 01 57.89	+27 14 33.8	405795	3242.1	1766.3	2.2	-6.0	6.8	57.7	283.9	12.1	0.932	149.6E	
Feb 04	07 54 28.39	+25 47 46.2	406432	3237.1	1763.5	1.0	-6.4	11.4	69.8	294.7	13.1	0.971	160.2E	APO 08:57
Feb 05	08 45 14.16	+23 12 19.8	406343	3237.8	1763.9	-0.3	-6.5	15.3	82.0	315.8	14.1	0.993	170.3E	FULL 18:30
Feb 06	09 33 51.00	+19 37 39.8	405601	3243.7	1767.1	-1.6	-6.4	18.4	94.1	46.0	15.1	0.998	174.5W	
Feb 07	10 20 21.14	+15 14 48.8	404251	3254.5	1773.0	-2.8	-6.0	20.6	106.2	92.8	16.1	0.985	165.8W	
Feb 08	11 05 09.00	+10 15 12.2	402301	3270.3	1781.5	-3.9	-5.3	21.9	118.4	104.0	17.1	0.954	155.2W	
Feb 09	11 48 54.96	+04 50 00.0	399742	3291.2	1792.9	-4.9	-4.4	22.3	130.5	108.8	18.1	0.906	144.3W	
Feb 10	12 32 30.33	-00 49 54.5	396554	3317.7	1807.3	-5.9	-3.3	21.9	142.6	110.9	19.1	0.842	133.1W	
Feb 11	13 16 54.40	-06 33 24.5	392734	3350.0	1824.9	-6.6	-1.9	20.6	154.8	111.2	20.1	0.764	121.7W	
Feb 12	14 03 12.43	-12 08 15.5	388306	3388.2	1845.8	-7.2	-0.5	18.4	167.0	109.8	21.1	0.673	110.1W	D.NOD 07:32
Feb 13	14 52 32.22	-17 19 52.5	383352	3432.0	1869.7	-7.4	1.0	15.4	179.1	107.0	22.1	0.572	98.2W	LAST 16:02
Feb 14	15 45 55.55	-21 50 09.7	378037	3480.2	1896.0	-7.3	2.5	11.3	191.3	102.6	23.1	0.465	85.9W	
Feb 15	16 44 00.08	-25 17 10.2	372633	3530.7	1923.5	-6.8	3.8	6.2	203.4	96.6	24.1	0.357	73.2W	
Feb 16	17 46 32.22	-27 16 57.7	367520	3579.8	1950.1	-5.9	5.0	0.3	215.6	89.1	25.1	0.252	60.1W	MAX.S 14:38
Feb 17	18 52 05.54	-27 28 54.7	363150	3622.9	1973.6	-4.5	5.9	354.2	227.8	80.5	26.1	0.157	46.6W	
Feb 18	19 58 13.68	-25 43 16.0	359984	3654.8	1991.0	-2.7	6.5	348.3	240.0	70.9	27.1	0.081	32.9W	
Feb 19	21 02 25.93	-22 06 18.7	358404	3670.9	1999.8	-0.6	6.5	343.5	252.2	58.7	28.1	0.028	19.1W	PERI 09:07
Feb 20	22 03 06.73	-16 59 03.5	358646	3668.4	1998.5	1.4	6.2	340.1	264.4	21.3	29.1	0.003	6.3W	NEW 07:07
Feb 21	22 59 54.97	-10 50 47.4	360748	3647.0	1986.9	3.4	5.4	338.2	276.6	269.6	0.7	0.009	10.7E	
Feb 22	23 53 25.27	-04 12 04.9	364540	3609.1	1966.2	5.1	4.2	337.7	288.8	253.8	1.7	0.043	23.9E	
Feb 23	00 44 39.40	+02 29 40.8	369667	3559.0	1938.9	6.3	2.8	338.4	301.0	249.8	2.7	0.102	37.2E	
Feb 24	01 34 45.16	+08 52 00.2	375647	3502.4	1908.1	7.0	1.3	340.1	313.2	249.4	3.7	0.180	50.1E	A.NOD 18:57
Feb 25	02 24 44.21	+14 37 09.3	381950	3444.6	1876.6	7.3	-0.3	342.8	325.4	251.1	4.7	0.270	62.5E	
Feb 26	03 15 24.38	+19 31 13.2	388078	3390.2	1847.0	7.1	-1.8	346.3	337.6	254.4	5.7	0.368	74.5E	
Feb 27	04 07 13.40	+23 23 11.8	393620	3342.4	1820.9	6.5	-3.1	350.5	349.7	259.0	6.7	0.468	86.2E	FIRST 08:07
Feb 28	05 00 13.60	+26 04 36.8	398280	3303.3	1799.6	5.6	-4.3	355.3	1.9	264.5	7.7	0.566	97.4E	

FWAS TREASURY REPORT CAN BE FOUND ON THE ONLINE GROUPS.IO FILE LOCATION.

Files: > FWAS Financial Report by Year

Files: > FWAS Monthly Treasurer Report > [YYYY]

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

AmazonSmile has discontinued their AmazonSmile service. If you have used this in the past to donate to FWAS we thank you and ask that you stay tuned for another option to this service. Clear Skies everyone.

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:

glutch@gmail.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.**(Currently we are meeting both virtually and in person)**

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

FWAS Membership
FWAS Membership can be made in-person at a monthly meeting or monthly star party at Tandy Hills Natural Area. To review membership dues and link for the on-line membership, visit
FWAS website (http://www.fortworthastro.com/membership.html), scroll down to the Membership / Come Join Us box and use the link to FWAS Facebook Page.

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 FWAS e-Group . (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/7pyr8qg

That's a Fact!

Did you know that black holes can and do collide? When this phenomenon occurs between supermassive black holes, gravitational waves are released.

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

February

"Full Snow Moon "

Source: Old Farmer's Almanac

February is typically a time of heavy snowfall.