Nightfall

A Publication of the Huachuca Astronomy Club

Huachuca Astronomy Club of Southeastern Arizona

February, 2026

January Meeting Speaker

The speaker at our meeting on February 13th is Michael Borland.

Dr Borland received a B.S. in Physics from the California Institute of Technology and a Ph. D. in Applied Physics from Stanford University, specializing in high-energy particle accelerators. Sadly, in all those years of study he only took one year of Astronomy, despite being interested in the subject from an early age. In 2019, inspired by a coworker, he took up astrophotography as a hobby. In 2022, in search of darker skies and a warmer climate, he moved with his very understanding wife Shirley to Benson, where they live with their cats Darwin and Kepler, along with an increasingly embarrassing amount of astronomy gear.

Abstract: Narrow-band solar imaging.

With the sun still close to maximum activity for the present cycle, now is a golden time to perform solar imaging. Narrow-band techniques provide the ability to image solar flares, prominences, filaments, and other features not accessible to white-light imaging. We discuss two narrow-band techniques, namely, use of etalons and use of a spectroheliograph, including the principles of operation for each. We describe the difficulties encountered with each method and how we've attempted to address those. We also describe use of automation to allow nearly unattended operation for many hours of data collection, as well as techniques for dealing with the flood of data this produces.

Join the speaker and his wife prior to the meeting for dinner at the Olive Garden in Sierra Vista at 5pm.

> "I have loved the stars too fondly to be fearful of the night."
>
> From the poem "The Old Astronomer to his pupil"
> by Sarah Williams

2026 Club Dues

Several HAC memberships expired in December. If you are unsure of your due's status, contact the treasurer, Ted Forte [tedforte511@gmail.com]

Annual dues are $35 family and $25 regular ($25 and $20 for active-duty military). Student memberships are $10. You can pay your dues in person by cash or check made out to Huachuca Astronomy Club. See the treasurer, Ted Forte, at a meeting or event.

You can mail your dues check to the Huachuca Astronomy Club PO Box 922, Sierra Vista AZ 85636

You can pay online by visiting hacastronomy.org and pulling down the membership menu. You'll be directed to Pay Pal where you can use your Pay Pal account OR your credit card. IF YOU ARE PAYING A PRORATED AMOUNT TO EXTEND YOUR MEMBERSHIP FOR A PARTIAL YEAR, YOU'LL NEED TO USE THE DONATE BUTTON – The dues "renew" option will not allow a non-standard amount.

If you have a Pay Pal account, you can use PayPal Direct to send your payment to paypal@hacastronomy.org

If you have a Zelle account with your bank, you can make a dues payment by transferring funds to treasurer@hacastronomy.org. Note that this is a new address.

Patterson Observatory Update

The University of Arizona has vacated the University South Foundation properties. The observatory will no longer be on the university's internet network. Internet in the observatory will be provided by Allo Fiber under contract to the foundation. As of this writing the phone at the observatory is still working (it is a UA digital service).

The address for the University South Foundation (and the Patterson Observatory) has been updated to 913 N Colombo Avenue.

Construction of a road from the Groth Hall parking lot to the rear of the observatory should start very soon and has an anticipated completion date sometime in March. Construction will be accomplished by R.L. Workman. At the time of this writing, there are no plans to interrupt observatory operations during construction.

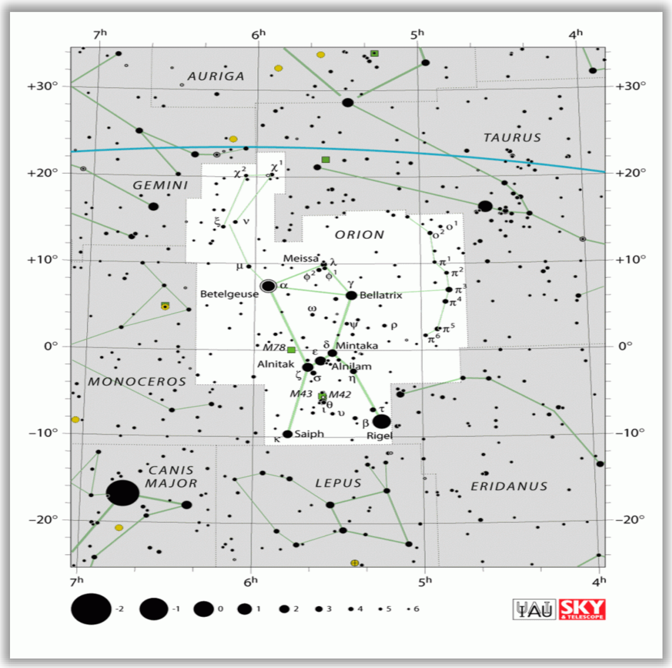
President's Constellation Exploration – Orion (Part 1)

by Penny Brondum

Orion as depicted in Urania's Mirror, a set of star chart cards published in London c. 1825

The Orion constellation is one of the brightest and best-known constellations in the night sky. It lies on the celestial equator and dominates the evening sky from November to February. It is one of the 88 modern constellations; it was also among the 48 constellations listed by the 2nd-century astronomer Ptolemy. It is named after a hunter in Greek mythology. Orion belongs to the Orion family of constellations, along with Canis Major, Canis Minor, Lepus, and Monoceros.

The Orion constellation contains two of the ten brightest stars in the sky, Rigel and Betelgeuse both are super-giants and slightly variable. It also contains 11 formally named stars and over a dozen stars with known planets.



Courtesy of Sky and Telescope

In star maps, Orion is typically depicted either as facing the charge of Taurus, the Bull, or pursuing the Pleiades sisters, represented by the famous open cluster Messier 45. The celestial Hunter is sometimes also shown chasing after the hare (Lepus) with his two hunting dogs, represented by the nearby constellations Canis Major (the Great Dog) and Canis Minor (the Lesser Dog).

Orion is home to a number of famous nebulae, including the Orion Nebula (Messier 42) one of the brightest nebulae in the sky, De Mairan's Nebula (Messier 43), the Flame Nebula (NGC 2024), the Running Man Nebula (Sh2-279), Barnard's Loop, the Monkey Head Nebula (NGC 2174), the reflection nebula Messier 78, and the dark Horsehead Nebula (Barnard 33).

There are two meteor showers associated with Orion, the Orionids and the Chi Orionids. The Orionid meteor shower reaches its peak around October 21st every year coming from the border with the constellation Gemini, as many as 20 meteors per hour can be seen. The shower's parent body is Halley's Comet. The Northern Chi Orionids are active from mid-November to mid-December, and the Southern Chi Orionids can be seen from December 2nd to 18th. They peak around December 10th. The best time of the year to see Orion is during the month of January, when the constellation appears high above the horizon around 9 pm.

Orion's seven brightest stars form a distinctive hourglass-shaped asterism, or pattern, in the night sky. Four stars—Rigel, Betelgeuse, Bellatrix, and Saiph—form a large roughly rectangular shape, at the center of which lie the three stars of Orion's Belt—Alnitak, Alnilam, and Mintaka.

His head is marked by an additional eighth star called Meissa, which is fairly bright to the observer. Descending from the Belt is a smaller line of three stars, Orion's Sword (the middle of which is in fact not a star but the Orion Nebula), also known as the hunter's sword.

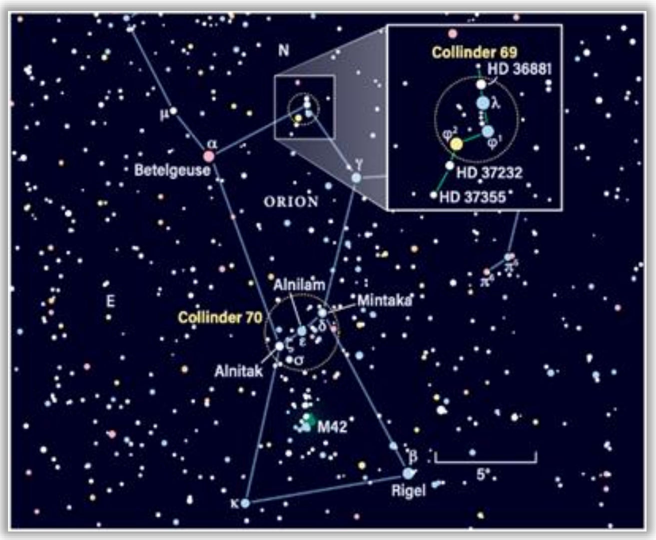
The stars of Orion are also part of several larger cross-border asterisms. Betelgeuse is part of the Winter Triangle and the Egyptian X, and Rigel forms the Winter Circle (Winter Hexagon) with five other first magnitude stars. The Winter Circle and the Winter Triangle are prominent in the evening sky throughout the winter months in the northern hemisphere.

The celestial Hunter hosts several familiar constellation-based asterisms: Orion's Belt, Sword, and Shield, and

Venus' Mirror. These star patterns are quite bright and easy to spot even from light-polluted areas.

Orion's Belt, or The Belt of Orion, is an asterism within the constellation. It consists of three bright stars: Alnitak (Zeta Orionis), Alnilam (Epsilon Orionis), and Mintaka (Delta Orionis). Alnitak is around 800 light-years away from Earth, 100,000 times more luminous than the Sun, and shines with a magnitude of 1.8; much of its radiation is in the ultraviolet range, which the human eye cannot see. Alnilam is approximately 2,000 light-years from Earth, shines with a magnitude of 1.70, and with an ultraviolet light that is 375,000 times more luminous than the Sun. Mintaka is 915 light-years away and shines with a magnitude of 2.21. It is 90,000 times more luminous than the Sun and is a double star: the two orbit each other every 5.73 days.

Hanging from Orion's Belt is his sword, consisting of the multiple stars 42 Orionis, θ1, called the Trapezium, and θ2 Orionis and the Orion Nebula (M42) is anchored by θ1. This is a spectacular object that can be clearly identified with the naked eye as something other than a star. Using binoculars, its clouds of nascent stars, luminous gas, and dust can be observed. The Trapezium cluster has many newborn stars, including several brown dwarfs, all of which are at an approximate distance of 1,500 light-years. Named for the four bright stars that form a trapezoid, it is largely illuminated by the brightest stars, which are only a few hundred thousand years old. Observations by the Chandra X-ray Observatory show both the extreme temperatures of the main stars—up to 60,000 kelvins—and the star forming regions still extant in the surrounding nebula.



Orion's head. Image by Storage.googleapis.com

Orion's Head is another asterism formed utilizing three stars to comprise a small triangle that marks the head of Orion. The apex is marked by Meissa (Lambda Orionis), a hot blue giant of spectral type O8 III and apparent magnitude 3.54, which lies some 1100 light-years distant. Phi-1 (Heka) and Phi-2 Orionis make up the base. Also nearby is the young star FU Orionis.

Orion's Club stretches north from Betelgeuse, Mu Orionis marks the elbow, Nu and Xi mark the handle of the club, and Chi1 and Chi2 mark the end of the club. Just east of Chi1 is the Mira-type variable red giant star U Orionis.

Orion's Shield (or Orion's Bow or the lion from his labors) is formed by six points of light that share the designation Pi Orionis. The six stars and star systems stretch across an area of almost 9 degrees. Some observers extend the Shield to the north by including Omicron1 or Omicron2 Orionis. The stars of Orion's Shield lie at different distances and are not physically related.

Venus' Mirror is a four-sided asterism formed by the stars of Orion's Belt and Orion's Sword with Eta Orionis, the brightest star in the region between Mintaka and Rigel. The asterism is also known as the Saucepan.

The Winter Circle (Hexagon) is the brightest asterism in the northern winter sky. It is formed by six first magnitude stars: Rigel in Orion, Sirius in Canis Major, Procyon in Canis Minor, Pollux in Gemini, Capella in Auriga, and Aldebaran in Taurus. The asterism dominates the evening sky during the northern hemisphere winter.

*Winter **Triangle,** Winter Circle (Hexagon), Egyptian (X) Cross image by Stellarium*

The Winter Triangle is formed by Betelgeuse in Orion with Sirius in Canis Major and Procyon in Canis Minor. It is also known as the Great Southern Triangle. It appears within the Winter Circle. Betelgeuse appears near the center of the larger asterism. The stars of the Winter Triangle can be used to find the Rosette Nebula, the Cone Nebula, Hubble's Variable Nebula, and the bright open star cluster Messier 50 in the faint constellation of Monoceros. Most of the Unicorn constellation appears within the Winter Triangle.

The Egyptian X (or Egyptian Cross) is formed by the stars of the Winter Triangle – Sirius, Procyon and Betelgeuse – with Naos in the constellation Puppis and Phact in Columba. Naos and Phact form a triangle with Sirius, and the two triangles meet at Sirius. The asterism is not easily seen from most of Europe because Naos and Phact do not rise very high above the horizon – if at all – for observers in the mid-northern latitudes.

Orion contains so many Messier Objects and named Nebulae that there is not room to highlight all of them. All these nebulae are part of the larger Orion molecular cloud complex, which is located approximately 1,500 light-years away and is hundreds of light-years across. Due to its proximity, it is one of the most intense regions of stellar formation visible from Earth. The Orion molecular cloud complex forms the eastern part of an even larger structure, the Orion–Eridanus Superbubble, which is visible in X-rays and in hydrogen emissions.

Most of Orion's bright stars form binary and multiple star systems as they have not yet had the time to move away from their birthplace and siblings. These stars formed in the Orion Molecular Cloud Complex (OMCC), a giant stellar nursery that contains many bright nebulae

Messier 42 (The Orion Nebula)

associated with young star clusters, including the Orion Nebula (M42), the Flame Nebula (NGC 2024), and the Lambda Orionis Cluster (Collinder 69).

Next month will feature the 2nd part of this article.

Scattered Reflections

By Chad Davies, PhD

Gerard of Cremona-Bridge Builder

When one traces our knowledge of astronomy backwards from the present, one can find a lineage of figures who build on the works of earlier investigators. In cosmology this might look something like:

Hubble ► Einstein ► Cannon, Leavitt, and Paine ► the Herschels ► Halley ► Newton ► Galileo and Kepler ► Brahe ► Copernicus and Rheticus ► Regiomontanus ► Peuerbach.

Similarly, one might construct a similar line moving from past to present. Again, in cosmology that could be drawn:

Thales ► Plato ► Aristotle ► Eudoxus and Callipes ► Hipparchus ► Ptolemy ► al-Kindi ► al-Battani.

In either case, however, when viewed from the western intellectual tradition, especially in Europe, we see a narrowing in the number of individuals engaged in such investigations. Think of an hourglass whose neck becomes almost impossibly thin in the period following the fall of the Western Roman Empire that only allowed the tiniest stream of classical learning and intellectual tradition to survive into the early medieval period.

While such an analogy does not apply to the Byzantine East or the Islamic Golden Age of the same period, Europe in the period between the Plague of Justinian and the beginning of the Carolingian Renaissance lost almost all access to classical learning and scholarship outside of a few parts of Plato's Timeaus. While subjects such as mathematics, physics, astronomy, geography, and medicine continued to be taught and researched in places like Constantinople, Baghdad, Cairo, and Toledo, such pursuits ceased in the former centers of Roman Gaul and Britannia. Lost was the ability to read or write in the classical language of scholarship, Greek, and in the chaos of the following centuries, the universal church in the West was no longer be able to accurately calculate the date of Easter for the faithful to observe. Known as the "Latinorium Penuria", this period only began to come to an end over the 10th and 11th centuries as the Carolinian dynasty of the Franks began to assert some control over Europe and brought a semblance of stability to the chaos. While some contact with the Islamic caliphate of al-Andulus, modern day Spain and Portugal, during this period brought about the transfer of some technologies such as the abacus and astrolabe, it wasn't until the dawn of the 12th century that a bridge was built that spanned the neck of the hourglass.

The bridge that was built from the banks of the classical period into the European High Middle Ages was constructed by men who arose from a culture experiencing a profound paradigm shift. While the society of the early Middle Ages both lacked institutions that supported learning and fostered an attitude that spoke against the use of reason, relying instead on faith, the 12th century saw several profound changes that would reshape Europe's intellectual focus. From the monastery schools founded by Charlemagne in the 11th century would grow several new centers of learning known as universities. In places like Padua, Metz, Cologne, Oxford, and Paris, scholars would begin to gather to discuss and debate ideas about both God and the natural world using a new process of thesis, antithesis, and, finally, synthesis. Additionally, after centuries of decline, the Christian kingdoms of the Iberian Peninsula were able to reassert themselves and begin reconquering territory long controlled by the Islamic political entities there. In 1085 CE, the conquest of Toledo would set in motion a series of events that would profoundly accelerate this process across Europe.

Toledo, like many Islamic cities, had within its walls a Bayt al-Hakim, or House of Wisdom. A gathering place for scholars of all faiths and traditions, the House of Wisdom in Toledo also contained an enormous library of collected works from antiquity. Writings from Aristotle, Galen, and Euclid in the Greek tradition and al-Faghani, al-Khwarizmi, and al-Haytham in the Islamicate one all resided there along with numerous commentaries and expansions on those works. Most notable for our story here is that the Great Treatise also resided in the walls of the library.

What was this Great Treatise? Known in Greek as the Mathēmatikḕ Sýntaxis, it came to be known by another title, The Almagest, after a series of translations and transliterations. Written by Claudius Ptolemias in the 2nd century CE, the Almagest, as its name implies, was considered among the greatest intellectual works of the Greco-Roman period, laying out a model of the cosmos unparalleled in its accuracy and subtlety. Additionally, it contained the most accurate star charts of its time and allowed those who understood how to work the mathematical models to predict where the planets would be at a given time in the future. It was a truly brilliant work of scholarship, and it had been lost to the West until the late 11th century.

In 1085, after a six-month siege of the city by Alfonso IV, the king of Leon and Castile, Toledo agreed to surrender under terms that its population, property, liberty, and religious practices be guaranteed. So it was that the great works of antiquity, long unavailable to the West, once again came into the hands of European rulers and scholars. There was only one problem, however. None of the texts were written in the language of the emerging western intellectual movement-medieval Latin. They were all work that had either been translated from their original Greek into Arabic or written in that language originally-a language none of the conquerors would read. Herein enters the focal figure of our story, the primary bridge builder, Gerard of Cremona.

Born in northern Italy in 1114 CE, Gerard's early life is mostly lost to the mists of time, but it seems that sometime in his early life as a scholar, he became frustrated with the teachings of his professors or senior monastic brothers, especially in the area of astronomy. While he knew of Greek works, most notably the Almagest, that would allow him and other scholars to regain proficiency in understanding the motions of the heavens, but prior to the capture of Toledo, no copies of such works were available to the medieval academic community. Now, that lack had been remedied, or so Gerard thought. Traveling to Toledo in 1144, he was disappointed to find that he could read none of the bounty found in the library there.

A lesser scholar might have thrown up his hands in frustration and disgust. He might have balked at learning the language and customs of infidels, scorning the thought of living in a city so foreign, even alien, to him. But Gerard of Cremona was not that sort of person. He was not someone who would let such barriers keep him from learning the knowledge contained within the halls of Toledo's library and sharing that treasury with the scholars of Europe. Thus, it was that he spent the next 30 years of his life in Toledo, first learning the Arabic language and understanding Islamic culture and then beginning the arduous task of translating the works of antiquity into medieval Latin. In this endeavor he was not alone. Inspired by his example, a group of monastic scholars soon gathered to join him in his labors.

Over the next three decades, Gerard and his colleagues would translate over 85 works from the Classical world from Arabic. These included Aristotle's *Physics, On the Heavens and the World, and Posterior Analytics*, Galen's

On the Medical Arts, Euclid's *Elements*, al-Khwarizmi's *Algebra*, and, of course, Ptolemy's *Almagest* among many, many others. Finished around 1175 CE, Gerard's translation of the *Almagest* revolutionized astronomy in Europe and formed the foundation of most subsequent work in astronomy up to the time of Copernicus with the first printed edition of his translation being produced in 1515.

As a result of this effort, the Roman Catholic church could calculate the date Easter in advance for the first time in centuries, new methods of medical care would be applied, mathematics would move beyond simple arithmetic, and the motion of bodies both on the Earth and in the Heavens would be studied. In other words, the first seeds would be planted for the coming Renaissance and Scientific Revolution. It is hard to imagine that the most important work of the high Middle Ages, Thomas Aquinas' *Summa Theologica*, would have been possible without the foundation laid by the simple monk who decided to build a bridge between worlds: from the Classical to the Medieval mind, from Islamic al-Andalus to Christian Europe, and from faith to reason.

Artemis II Launch Windows

Launch of the Artemis mission requires a specific Earth-Moon alignment. There are currently five launch windows available between February 6th and 10th, each 120 minutes long: Feb. 6th at 7:41 p.m., Feb. 7th at 8:46 p.m., Feb. 8th at 9:20 p.m., Feb. 9th at 10:06 p.m., and Feb. 10th at 11:05 p.m. (All times MST).

The Space Launch Systems (SLS) rocket, with the Orion Crew Capsule, was rolled out to launch pad 39B at the Kennedy Space Center on January 17th. You can watch the launch pad live from the NASA feed here: https://www.youtube.com/watch?v=nrVnsO_rdew

The approximately 10-day mission will not land on the moon. It will carry NASA astronauts Reid Wiseman, Victor Glover, and Christina Koch, and the Canadian Space Agency astronaut Jeremy Hansen on a free-return trajectory around the Moon and back to Earth. Victor will be the first person of color, Christina the first woman, and Jeremy the first non-American to fly to the moon.

For Sale

Zane Landers has the following equipment for sale. If you are interested in the item, please contact him via email (zdlanders@gmail.com).

Celestron Firstscope 114 f/8 Newtonian reflector w/EQ-2 mount: Signed by Thomas Bopp, co-discoverer of Comet Hale-Bopp. 5x24 finder, decently sturdy equatorial mount with wooden legs. It is easy to add a motor drive for automatic tracking. Comes with a 1.25" 25mm Kellner eyepiece (36x). Very sharp optics. Asking $100 cash. It would make a great first telescope; I can make recommendations for additional eyepieces. The 5x24 is easy to swap out for a standard red dot sight ($20 on Amazon) which would probably be better.

About the Cover

Imager: Richard Lighthill
Target: IC 443 in Gemini (The Jellyfish Nebula)
Approximately 6 hours of integration of 180sec subs @ 200 gain
Camera: ZWOASI585MC Pro (cooled)
Scope: 60mm f/5 Askar FRA300 Pro Quintuplet APO Refractor
Mount: Celestron AVX
Taken during the middle of January, 2026
Stacked in Siril and post-processed in GIMP

HAC Calendar of Events (February - March 2026)

SU	MO	TU	WE	TH	FR	SA
Feb 1 **3:09 pm**	2 Groundhog Day	3	4	5	6 Donor Appreciation Night at Patterson 6:30 pm	7
8	9 **5:43 am**	10 Church group at Patterson 7 pm	11	12 Lincoln's Birthday	13 HAC Meeting 7 pm (1)	14 Solar Saturday 10 am to 12 pm Valentine's Day
15 Saturn/Neptune 0.9º apart Pluto/moon 0.9º apart	16 President's Day	17 **5:01 am**	18	19 Mercury (GEE)	20	21
22 Washington's Birthday	23	24 **5:28 am** Astro Night at Leman Academy 6:30 pm	25	26 Patterson Public Night 6:30 pm	27	28
March 1	2	3 **4:38 am**	4	5	6 HAC Meeting 7 pm (1)	7
8	9	10	11 **3:39 am**	12	13	14 Solar Saturday 10AM to 12pm
15	16	17	18 **7:23 pm**	19	20 Vernal equinox 8:46 am	21
22	23 Church group at Patterson 7 pm	24	25 **1:18 pm**	26 Patterson Public Night 7:00 pm	27	

All dates and times are local MST
Astronomy events listed are those visible in the Southwestern, USA

(1) HAC meeting location: Cochise College Downtown Center at 2600 E Wilcox Drive, Sierra Vista, AZ in Room A102

(GEE) – Greatest Eastern Elongation. A evening event, (GWE) - Greatest Western Elongation. A morning event

Join the HAC Astro forum to keep up to date with all the Huachuca Astronomy Club events
To join, send an email to: HACAstro+subscribe@groups.io