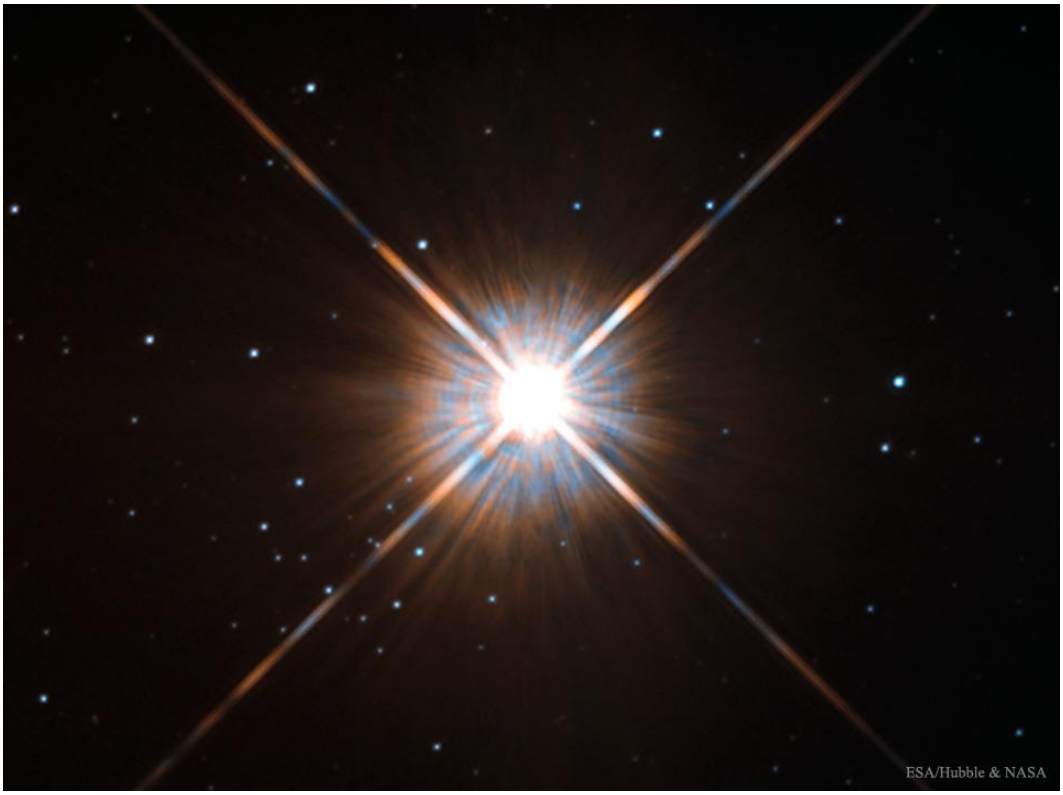
SkyWAAtch



Near Neighbor

Does the closest star to our Sun have planets? No one is sure -- but you can now follow frequent updates of a new search that is taking place during the first few months of this year. The European Southern Observatory's Pale Red Dot project began investigating slight changes in Proxima Centauri to see if they result from a planet -- possibly an Earth-sized planet. Although unlikely, were a modern civilization found living on a planet orbiting Proxima Centauri, its proximity makes it a reasonable possibility that humanity could communicate with them.

Credit: APOD

Image Credit: ESA/Hubble & NASA

In This Issue . . .

WAA February Lecture

"Current and Future Observations of Mars Using Ground Based Telescopes and Space Probes"
Friday February 5th, 7:30pm
Leinhard Lecture Hall,
Pace University, Pleasantville, NY

New observations of Mars are planned using current devices in new ways or using new devices. The MAVEN (Mars Atmosphere and Volatile Evolution) space probe is seeking to study the relationship between Hydrogen and Deuterium escape; MAVEN's observations are coordinated with NASA-IRTF observations using an infrared spectrograph (CSHELL). A new infrared spectrograph is being built for the IRTF. It will have a much larger bandwidth and will be able to detect many more molecular species simultaneous. A similar instrument (NOMAD – Nadir and Occultation for Mars Discovery) is part of the ExoMars space probe. Br. Novak will describe these projects along with plans for the observations.

Br. Novak holds a Ph.D. in Physics from Columbia University. He is a Professor of Physics at Iona College. Since 1996, he has been a collaborator with NASA's Astrobiology Group at the Goddard Space Flight Center. He has been on thirty observational runs using either the Keck II telescope or the NASA Infrared Telescope on Mauna Kea in Hawaii. He specializes in the study of Mars' atmosphere, and has also observed comets. Free and open to the public. Directions and Map.

Upcoming Lectures

Pace University, Pleasantville, NY
Our speaker for March 4th will be Al Nagler.

Starway to Heaven

Ward Pound Ridge Reservation,
Cross River, NY

There will be no Starway to Heaven observing date in February. The next scheduled monthly observing session is March 5, 2016.

New Members. . .

Alex Edwards - Mahwah
Erin Ubriaco - Ossining
Julia and Mina Golden - Chappaqua
Molly Wedding - Mohegan Lake

Renewing Members. . .

Harry S. Butcher, Jr. - Mahopac
John Higbee - Alexandria
Richard Grosbard - New York
Claudia & Kevin Parrington Family - Harrison
James Steck - Mahopac
Bob Quigley - Eastchester
Enzo Marino - Harrison
Robin Stuart - Valhalla
Jay Friedman - Katonah
Carlton Gebauer - Granite Springs
Gary Telfer - Scarborough
Tom & Lisa Cohn - Bedford Corners

Join WAA at NEAF, April 9-10th Rockland Community College, Suffern, NY

WAA will have a booth at the Northeast Astronomy Forum, to be held at Rockland Community College on Saturday, April 9th and Sunday, April 10th. This is the nation's premier astronomy show, with a vast diversity of exhibitors, vendors, equipment, lectures by leading astronomy figures and, weather permitting, the famous Solar Star Party.

We need volunteers to staff our booth. It's an opportunity to meet and chat with fellow club members and other astronomy enthusiasts, and to help recruit new members to the club. It also is a place where you can store your swag while attending lectures or other events. Last year 20 club members participated, we recruited new members and we made many new friends. Put NEAF in your calendar now.

WAA Apparel

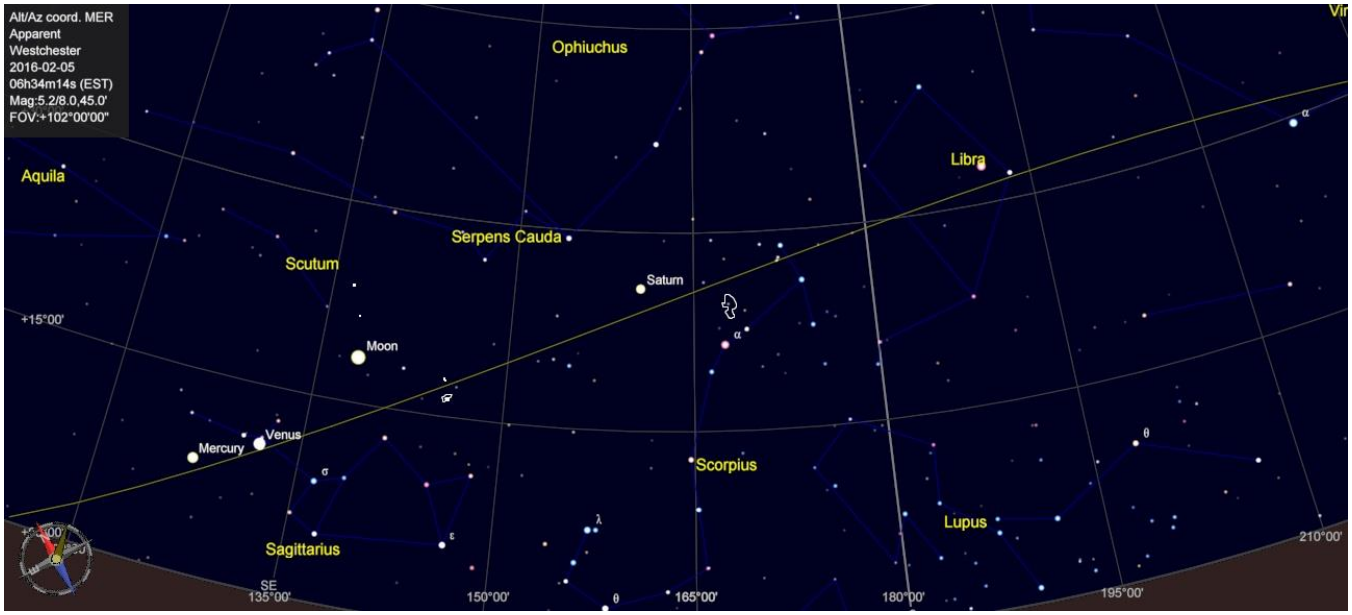
Charlie Gibson will be bringing WAA apparel for sale to WAA meetings. Items include:

- Hat ($15)
- Polos ($15)
- Tee shirts ($12)

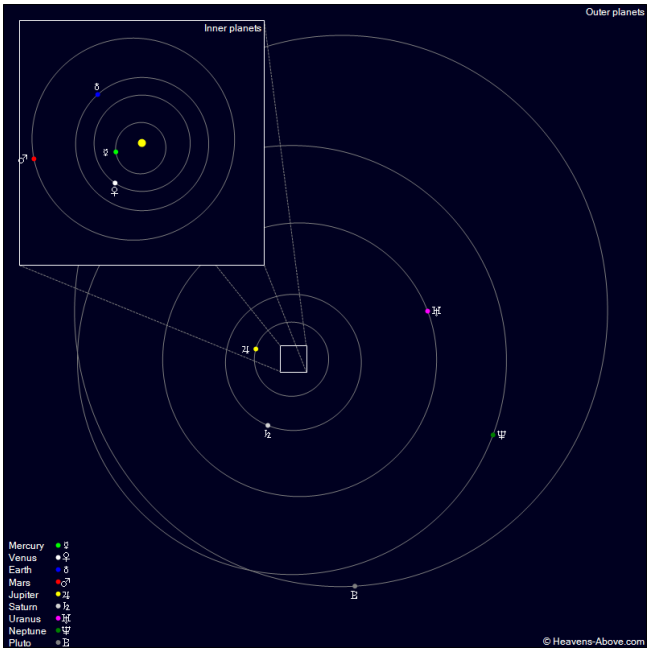
Call: 1-877-456-5778 (toll free) for announcements, weather cancellations, or questions. Also, don't forget to visit the WAA website.

Almanac
For February 2016 by Bob Kelly


Feb 8 Feb 15 Feb 22 Mar 1



February starts out with the five brightest planets, from the Earth's point of view, in our morning sky. It's not an alignment, but an array of planets spread across the pre-dawn sky.



Overhead' view of the planets from heavens-above.com

'Mercury continues to court Venus, closest together around the 13th, but they keep it on the down low, very low in the southeast. The low angle of Mercury and Venus to the horizon makes them hard to get amid the hills, trees and other obstructions on the horizon, but they are worth finding. It helps that Venus is so much brighter than Mercury, which makes them easier to find. Venus rises almost two hours before the Sun early in February, but doesn't get more than 16 degrees above the horizon, even at sunrise. Mercury reaches greatest elongation from the Sun on the 7th and hangs out for the rest of the month but is easier to see for folks in the Southern Hemisphere. The Moon points the way down to Venus and Mercury on the 5th and 6th—a good time to be a planetary paparazzi.

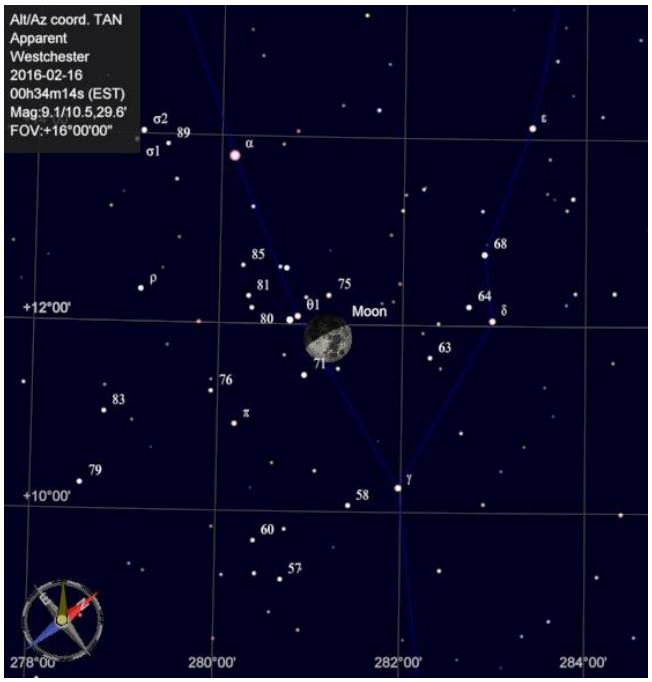
Next brightest, but at the other end of the planetary kick line, Jupiter is getting lower in the southwest in the morning sky, but rises earlier each evening – just after sunset by the end of the month. Two moon shadows play on the planet's cloud tops at one time for a few minutes on the 22nd, 26th and 29th.

Saturn, at magnitude +0.5, is to the upper right of Venus, in the stars of Libra. Saturn is the one with the nice hat – its rings are tilted 26 degrees open. To Saturn's left is Mars, reddish compared to yellowish Saturn.

Mars marks several milestones this month, passing Saturn in brightness to magnitude +0.3 and gaining the title of closest planet to Earth. Despite all this, Mars still looks shrimpy, at only 8 arc seconds wide, compared to 16 for Saturn and 43 for Jupiter. Larger telescopes normally would show the white gleam of

Mars' north polar cap, but it's the Martian north hemisphere's summer; so not much of a north polar cap is visible now.

Around midnight on the 15th/16th, the first quarter Moon bowls through the 1-2-4-7 pins of the V of the Hyades star cluster, taking out at least two third magnitude stars just after 12:30 ET.



The evening sky has no bright planets to call our attention, which is a shame, since you can't beat Orion standing tall with the Big Dog nipping at his heels. The casual, light pollution-hampered observer may not come back outside after dinner to take in the sublime Pleiades. But since you're reading this almanac, likely you bundle up and wait for your eyes to dark adapt and enjoy the starry scene - more than just the brightest stars! Let's be greedy and transport ourselves to a place where Orion the hunter strides directly overhead – that would be near the Equator. Not so cold there! See how equatorial Orion looks at http://skymaps.com/skymaps/tesme1602.pdf or using your favorite planetarium software.

Comet Catalina (C 2013 US10) is holding about magnitude +7 near Polaris in our skies. It is a tiny object, even in a telescope (so I've heard). Catalina will dim by three magnitudes this month as it speeds away, never to return.

The International Space Station is by far the brightest object other than the Moon in the evening skies through February 21st. Scott Kelly and Mikhail Kornienko return to earth after 342 days on the ISS on March 1st. Tiangong 1 from China, is smaller but still often easy to see at magnitude +1, in the evening sky through February 13th. Using heavens-above.com, I didn't see any dates when the ISS and Tiangong are in the sky at the same time (but feel free to check!)

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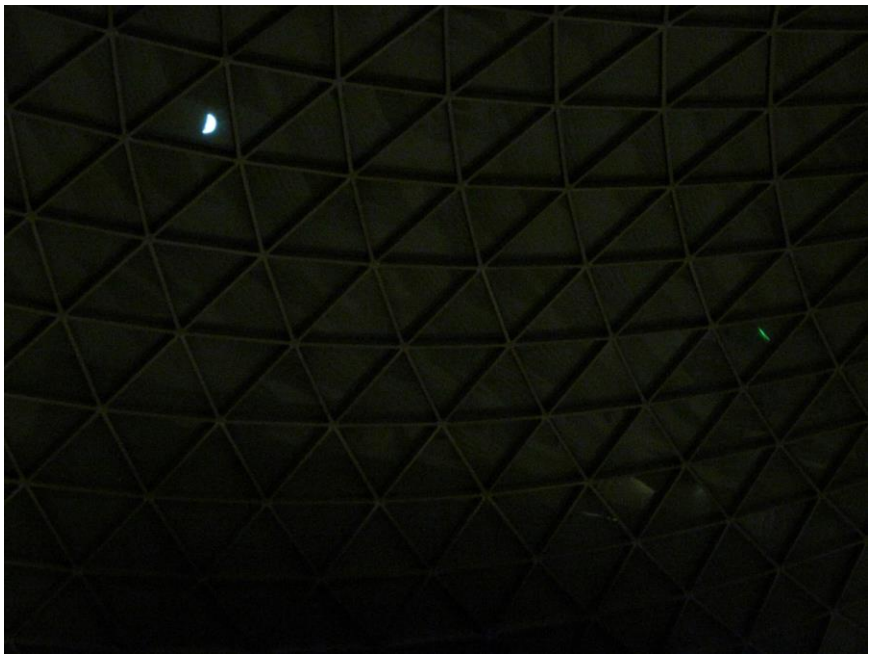
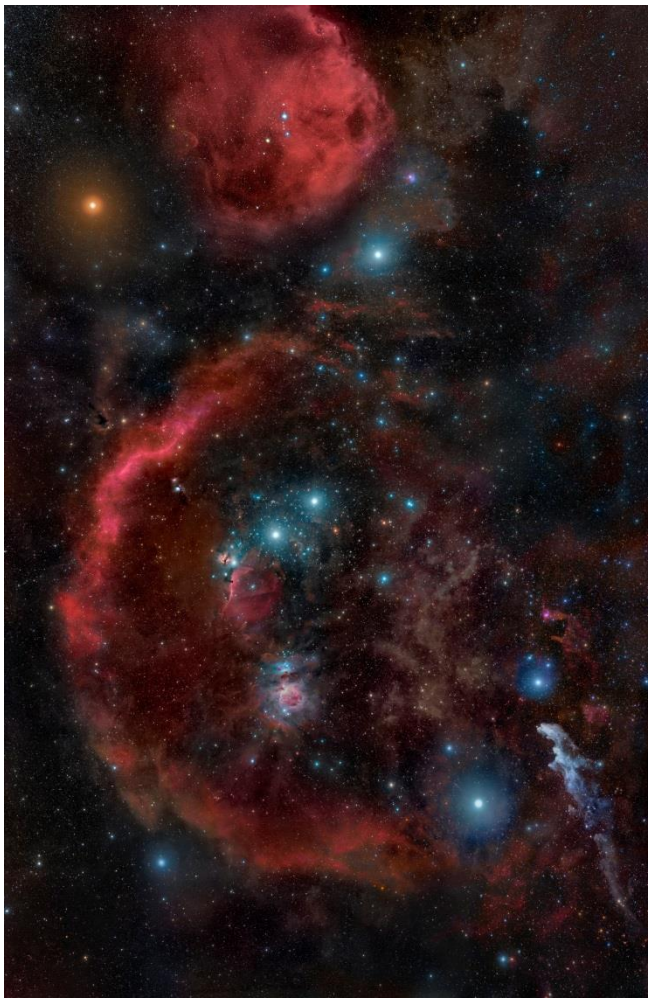


A London Moon

Courtesy of Larry Faltz is this image of a 6-day moon taken from beneath the dome of the British Museum in London on January 16, 2016. Notes Larry: Clear nights in January are a rarity in England.

Orion and His Nebula
Larry Faltz



Orion as magnificently imaged by Rogelio Bernal Andreo in 2010. The semicircular Barnard's Loop is seen on the left, with M42 within it. The exposure was 220 hours.

It's tempting to sit home during the cold winter months, leave the telescope in its case and find something warm to do. Standing still outdoors in frigid temperatures isn't the most enticing amateur astronomer experience to look forward to, but unless you're willing to don enough layers of clothing, step into warm boots, pull on the right kind of gloves (and take them off to set up your equipment) and minimize your skin exposure with a warm hat and scarf, you'll miss viewing the northern sky's most impressive deep sky object, the Great Nebula in Orion, Messier 42. As Robert Burnham, Jr. describes in his indispensable *Celestial Handbook* (1966),

> In a moderately large telescope its appearance is impressive beyond words, and draws exclamation of delight and astonishment from all who view it. The great glowing irregular cloud, shining by the gleaming light of the diamond-like stars entangled in it, makes a marvelous spectacle which is unequalled anywhere else in the sky.

Crisp winter nights with low humidity mean good transparency even in our light-polluted skies. Orion is a relatively southern constellation: Delta Orionis (Mintaka), the 2nd magnitude star on the right side of the belt, is essentially on the celestial equator. That means that Orion is never terribly high in the sky: M42 gets just 44 degrees above the horizon at our latitude: opposition is on December 14th. It's still above 40 degrees elevation when it crosses the meridian throughout February 2016 (8:45 pm on 2/1, 7:49 pm on 2/15, 6:54 pm on 2/29, which is still an hour after sunset), so it's well-positioned for evening observing. Its bright stars and distinctly anthropomorphic shape make it perhaps the most recognized of constellations, helped by the fact that you don't have to crane your neck to see it.

The ancients knew the constellation well. Visible from every inhabited part of the Earth, Orion has a rich history in myth and literature going back to the 5th Dynasty in ancient Egypt and to Babylonian sources. In Greek myth, Orion is a giant, handsome and somewhat arrogant hunter. There is no one story about his birth, life, loves or death: he seems to be a fungible character upon which ancient writers and storytellers embellished their plot lines. Among the most famous myths is one where he becomes the lover of Artemis, goddess of the hunt. She is tricked into killing him by her brother Apollo. At his death, he was placed in the heavens. Another myth has him killed by the sting of a scorpion sent by Gaia, the Earth-mother goddess, an act that may have animal rights overtones. In this scenario, Orion's celestial station is complemented by Zeus' setting of the scorpion on the opposite side of the sky so it can no longer threaten the hunter. Indeed Scorpius is opposite Orion on the celestial globe.

In a famous passage in Book 18 of Homer's *Iliad*, Hephaistos, armorer to the gods, makes a shield for Achilleus, embellishing it with a seeming infinitude of scenes, figures and stories. Among them is a map of the entire celestial sphere:

He made the earth upon it, and the sky, and the sea's water,
and the tireless sun, and the moon waxing into her fullness,
and on it all the constellations that festoon the heavens, the Pleiades, and the Hyades and the strength of Orion and the Bear, whom men give also the name of the Wagon,
who turns about in a fixed place and looks at Orion and she alone is never plunged in the wash of the Ocean.

(Translation by Richmond Lattimore)

In Homer's *Odyssey*, Odysseus meets Orion during a trip to the underworld:

I next caught sight of Orion, that huge hunter,
rounding up on the fields of asphodel those wild beasts
the man in life cut down on the lonely mountain-slopes,
brandishing in his hands the bronze-studded club
that time can never shatter.

(Translation by Donald Fagles)

It's no wonder that Orion is drawn in the sky with a raised club in his right hand and a shield (sometimes imagined as being made of a lion's skin) in his right, taking on Taurus, the charging bull. His dogs, Canis Major (with bright Sirius) and Minor, are at his feet.

The practical Hesiod features the constellation in *Works and Days*, and like the nearby Pleiades Orion is a marker of the course of the year, the bringer of winter with its storms and rough seas. In *Paradise Lost* Milton makes use of this metaphor, saying that Orion is "with fierce winds … armed."

In the Bible, the constellation is mentioned in Amos and twice in Job, first when Job muses on the powerlessness of man in the presence of God:

It is God who removes the mountains, they know not how, when He overturns them in His anger;
Who shakes the earth out of its place, and its pillars tremble;
Who commands the sun not to shine, and sets a seal upon the stars;
Who alone stretches out the heavens, and tramples down the waves of the sea;
Who makes the Bear, Orion and the Pleiades, and the chambers of the south;
Who does great things, unfathomable, and wondrous works without number.
Were He to pass by me, I would not see Him; were He to move past me, I would not perceive Him.
Were He to snatch away, who could restrain Him? Who could say to Him, 'What are You doing?'

(New American Bible, Job 9:5-12)

Later, God upbraids Job and Elihu for questioning him:

Have you tied cords to the Pleiades, or loosened the bonds of Orion?
Can you bring forth the Mazzaroth [the Zodiac] in their season, or guide the Bear with her children?
Do you know the ordinances of the heavens; can you put into effect their plan on the earth?

(New American Bible, Job 38:31-33)

The famous opening of Tennyson's poem "Locksley Hall" refers to "great Orion, sloping slowly to the west". Henry Wadsworth Longfellow wrote a mystical 75-line poem "The Occultation of Orion" in which the moon seems to violently attack the great hunter, but Orion is sufficiently south of the ecliptic that this isn't going to happen. The moon might just graze the tip of Orion's club in his outstretched right hand. He introduces the constellation thusly:

Sirius was rising in the east;
And, slow ascending one by one,
The kindling constellations shone.
Begirt with many a blazing star,
Stood the great giant Algebar
Orion, hunter of the beast!
His sword hung gleaming by his side,
And, on his arm, the lion's hide
Scattered across the midnight air
The golden radiance of its hair.

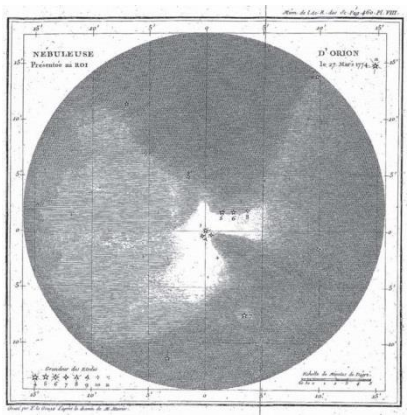
Algebar is an Anglicization of Al Jabbar, "The Strong One', another Arabic name for Alpha Orionis (Betelgeuse).


Orion in Al Sufi's *Book of Fixed Stars*

Although both Ptolemy and Al Sufi catalogued the stars of Orion, as naked-eye observers they missed the nebula. So did Galileo when he trained his telescope on it in early 1610. He did note in 1617 that Theta Orionis, in the middle of the belt, was actually a group of stars (he saw 3), which we now call the Trapezium, a name first used in 1931 by Robert Trumpler in recognition of the shape of the 4 brightest members of the cluster, but Galileo still didn't see the nebulosity. That discovery was made in November 1610 by the French astronomer

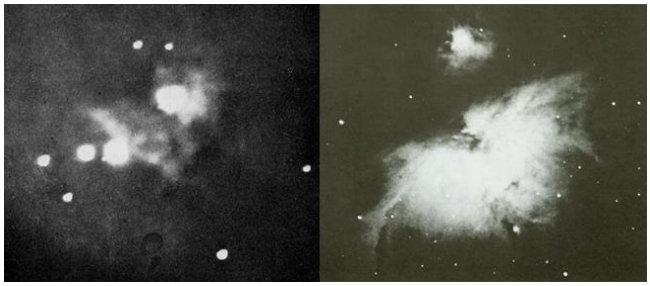
Nicolas-Claude Fabri de Peiresc, who described a cloud surrounding the star in the middle of the sword of "Orione," as he called it. This observation was not published, and it was left to Johann Baptist Cysat to describe the nebula in print, in a monograph on comets in 1619.

Messier first saw it in 1769, and his 1771 drawing clearly shows the Trapezium and the fan-like nebula. It was apparently Messier's description and drawing of the nebula that got William Herschel interested in deep sky observing.



Messier's drawing (1771)

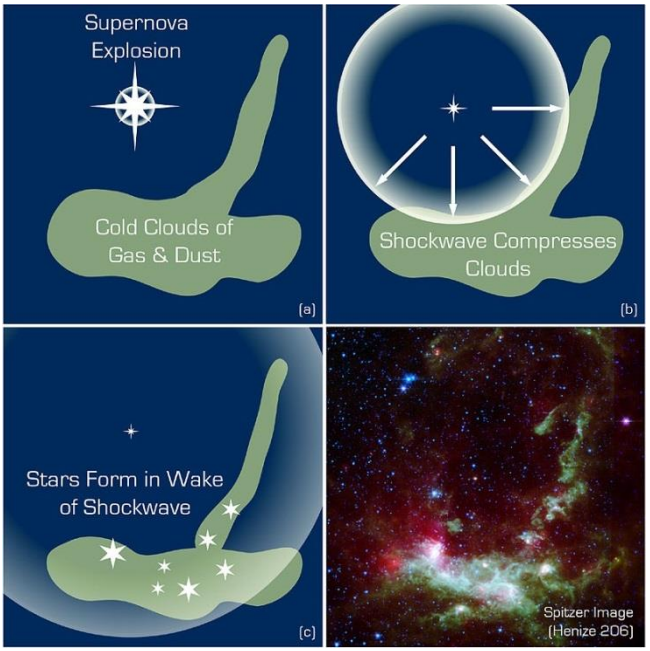
That the cloud was made of hot gas was confirmed in 1865 by William Huggins, using a visual spectrograph. Some 15 years later, Henry Draper made the first photographic image of the nebula, and just 3 years later A.A. Common made a wider-field image that shows both M42 and the adjacent M43.



Photos by H. Draper (1880) and A.A. Common (1883)

William Herschel made another one of his many inspired guesses about the cosmos when he described M42 as "the chaotic material of future suns." Clusters of hot, young stars (in addition to M42, other examples include the Eagle Nebula M16 and the Lagoon Nebula M8) illuminating surrounding gas are all sites of avid star formation. Significant variations in the radial velocity of different portions of the gas cloud can be demonstrated by analysis of Doppler shifts in the nebula's spectrum. The movement of gas can create areas of higher density, enhancing gravitational contraction, angular rotation and heating, subsequently leading to star formation.

Supernovas also play a critical role in star formation. Stars forming from condensed gas, if they are large enough, will burn through their fuel quickly, in millions not billions of years. When they explode as supernovas, shock waves compress and provide energy to the surrounding interstellar medium. These shock waves can start a new round of star formation. There are several hot, young stars outside the Orion nebula with large proper motions whose trajectories suggest that they originated within it but were thrown out by some enormous force. Among these stars are AE Aurigae, 53 Arietis and Mu Columbae. They appear to have been ejected from the nebula between 2 and 5 million years ago. It is likely that the expelling force was a supernova explosion. Tell-tale evidence for this event exists in the form of "Barnard's Loop", a gigantic arc of glowing gas that surrounds the entire constellation of Orion and is seen as a huge "C" on the image at the top of this article.



Supernovas compress cold gas, resulting in star formation. The infrared image is of Henize 206, a star-forming nebula in the Large Magellanic Cloud. (NASA/JPL)

Intense stellar winds from hot young stars create more shock waves that disturb and compress the gas cloud. Jets of particles from these young stars slam against the interstellar medium at speeds of several hundred kilometers per second, creating nebulous objects known as "Herbig-Haro objects". These are transient, with lifetimes of just a few thousand years.

Until recently, the evidence for recent star formation, while substantial, was indirect. Since the deployment

of the Hubble Space Telescope and the new generation of 8-10 meter class telescopes, nascent stars have been directly visualized. Stars still in the process of condensing and forming their solar systems can be seen in the infrared encased in dust. These objects are called "proplyds," more formally named "ionized protoplanetary disks." There are at least 180 in the Orion Nebula.

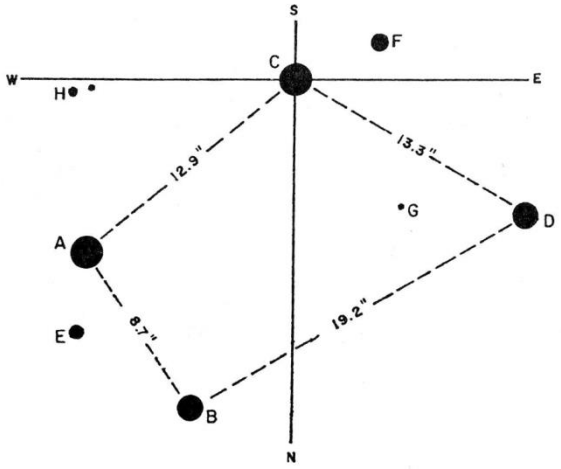
A collection of Orion Nebula proplyds (Hubble)

Burnham gives the composition of the nebula per cubic foot (a quaint choice of measure, now that we are in the metric era) as:

Hydrogen	25,000,000 atoms
Helium	2,500,000 atoms
Carbon	15,000 atoms
Oxygen	6,250 atoms
Nitrogen	5,000 atoms
Sulfur	900 atoms
Neon	250 atoms
Chlorine	50 atoms
Argon	38 atoms
Fluorine	3 atoms

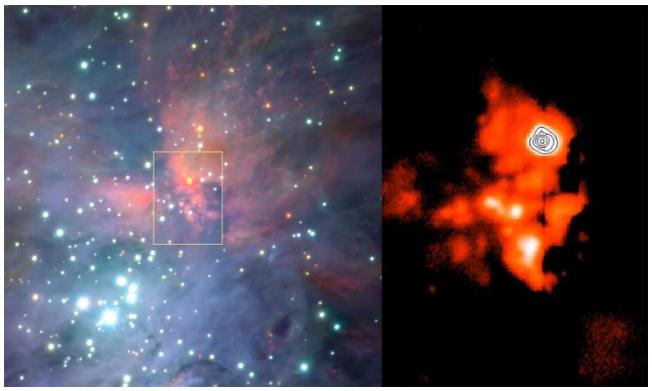
In a cubic foot of air at sea level there are about $1.52*10^{24}$ atoms, so the presence of $2.75*10^{7}$ atoms is a near perfect vacuum, measuring about 18 femtobars, which is about 1% of the record for a man-made vacuum but still more than 8 orders of magnitude greater than the matter content of ordinary interstellar space. That's still enough matter to seed a vast amount of star formation. There is enough material in the Orion nebula to form about 10,000 more stars.

The stars in the Trapezium (collectively Theta Orionis) are mere infants. They are hot (types O and B), young and large, each estimated to be 15-30 times the mass of the sun. The stars are between magnitude 5.4 and 6.7 but the group shines with an effective magnitude of 4.0, and they are easily resolvable in small instruments as four tiny, gem-like points of light sitting in a translucent cloud. There are at least 8 stars in the immediate area that are thought to be gravitationally bound and perhaps 300 other sibling stars brighter than 17th magnitude within 5 minutes of arc. Given the motions of these stars, it is possible that they are less than 300,000 years old, and the brightest stars in the Trapezium might be less than 10,000 years old.



Dimensions of the Trapezium (Burnham)

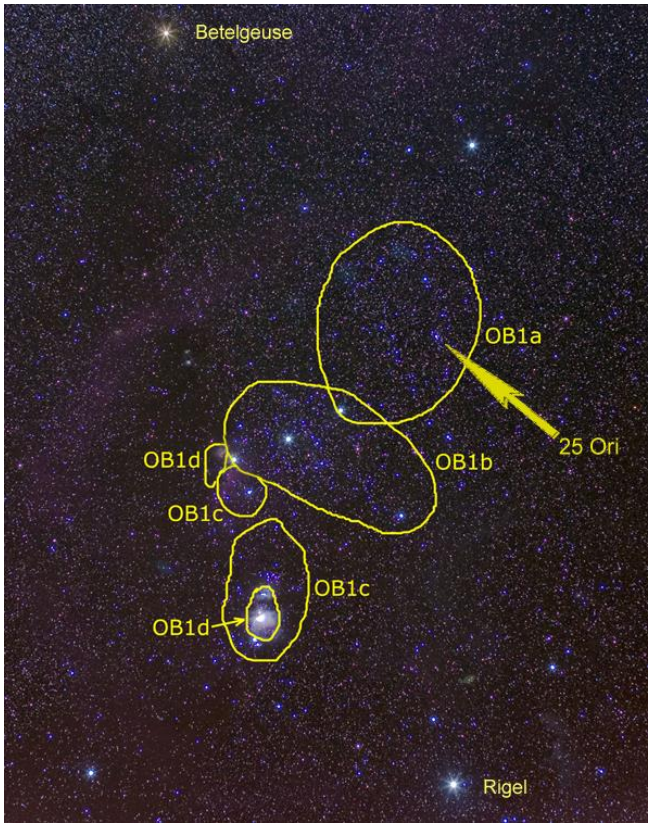
Close to the Trapezium is an area of dense dust surrounding several intense infrared sources, undoubtedly nascent stars, known as the BN/KL complex.



Images of the BN/KL complex: (L) near infrared (note the Trapezium in the lower left) and (R) mid-infrared, showing the point sources (ESA)

The Trapezium cluster is part of a larger association of young stars, a subcomponent of the "OB1 association," an active star-forming region within the central part of the Orion constellation, much larger than the nebula itself. There are dozens of young, hot stars of spectral class O and B (thus the name; remember the [sexist] mnemonic for star temperatures from hottest

to coolest: Oh Be A Fine Girl, Kiss Me). Also within the cluster are many low-mass stars, the runts of the litter, and many protostars. Star formation doesn't always make massive hot stars. Local areas of gas can condense into cool reddish class M and K stars and even brown dwarfs. It's the large O and B stars that provide radiation to excite and impel the nebula.

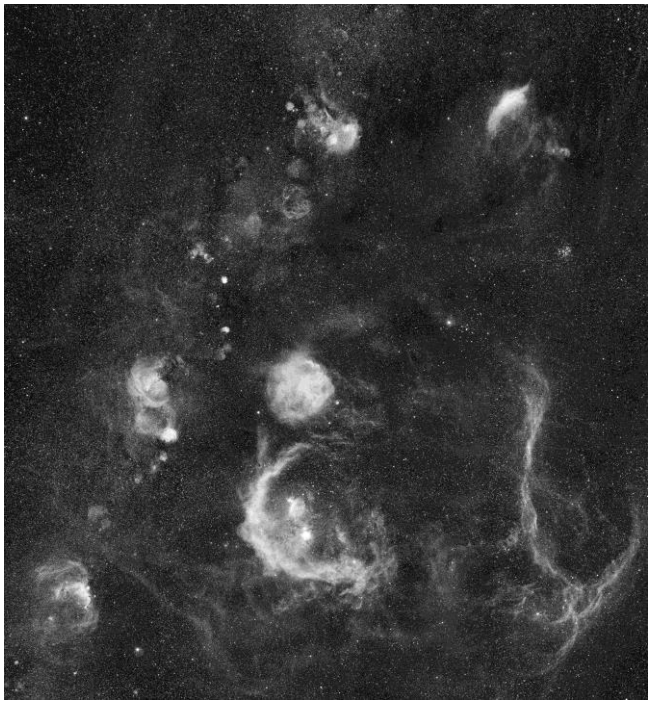


The Orion OB1 association and its subcomponents

Half a degree north of the M42/43 complex lies the Running Man Nebula, catalogued as three individual NGC objects (1973, 1975 and 1977). The figure of the "running man" is the dark area inside of the glowing gas. Even further north, just below Alnitak, the leftmost star of Orion's belt, is the emission nebula IC 434, containing within it the famous Horsehead Nebula, Barnard 33. Just west of Alnitak is NGC 2024, the Flame Nebula. This is an often-photographed part of the sky, but difficult to observe visually or image from our area because of its low surface brightness and competition from light pollution. John Paladini was able to capture this area from his driveway in Mahopac using an old 8" Celestron f/1.5 Schmidt camera that was modified with an imaging sensor in place of the film holder. The onion-shaped object towards the bottom of the frame is an imaging artefact, an internal reflection of magnitude 1.74 Alnitak.

All of these nebulas, stellar associations and even Barnard's Loop are part of the Orion Molecular Cloud Complex, which lies at a distance of about 1,500 light years from Earth. The complex is part of an even larger structure, the Orion-Eridanus Superbubble, a gigantic HII (ionized hydrogen) region that is still reeling from supernova explosions and is continuously heated by ultraviolet radiation from hot young stars.

John Paladini's Schmidt camera image of the Flame and Horsehead Nebulas from Mahopac



The full extent of the Orion-Eridanus Superbubble complex in hydrogen-alpha light The mosaic image shows an area of about 60 x 70 degrees! (Dennis di Cicco / Sean Walker, Sky & Telescope, April 2009).

Imaging bright M42 is fairly easy. It's listed as magnitude 4.0 and has high surface brightness, although it's

difficult to show the Trapezium and a lot of detail in the nebulosity at the same time since the bright nebula burns out the images of the stars. You have to choose between one and the other unless you have superior image processing skills and can combine frames taken with different exposures. Using a Mallincam video camera (½" sensor) on my 8" Celestron SCT, I imaged the central part of the nebula with a short exposure to show the Trapezium.

8" SCT/Mallincam image, showing the Trapezium

To show the larger extent of the nebula, I used an 80mm refractor, but the intense core is saturated. This image, just a 2-second frame, was actually first light for my Mallincam. It was taken from the Crossways baseball field in Scarsdale, not a particularly hospitable place for deep-sky imaging. The video camera does help cut through light pollution and in addition provides a "true color" image!

80 mm refractor/Mallincam image

The Mallincam's video sensor is high-sensitivity, but not really high resolution. John Paladini's color image with a proper CCD camera on an equatorially-mounted 80 mm refractor shows more detail in the nebula as well as better definition of the Running Man.

John Paladini's M42 with M43 just above and the Running Man nebula further above and to the right.

There are a gazillion high-quality amateur and professional images of M42 on the Internet, each with its own perspective on the subject. Every good image of the nebula is different, a unique work of art, depending on telescope, type of sensor, field size, field orientation, exposure, color mapping, computer processing and cropping. Imagers have become adept at bringing out the vast complexity of the nebular gas. Here are just 4 among the many fine ones. *Chacun à son gout!*

Clockwise from upper left: Alan Dyer, ESO La Silla, Dan (San Diego Astronomy Association), Bill Snyder

The Loneliest Galaxy In The Universe

By Ethan Siegel

Our greatest, largest-scale surveys of the universe have given us an unprecedented view of cosmic structure extending for tens of billions of light years. With the combined effects of normal matter, dark matter, dark energy, neutrinos and radiation all affecting how matter clumps, collapses and separates over time, the great cosmic web we see is in tremendous agreement with our best theories: the Big Bang and General Relativity. Yet this understanding was only possible because of the pioneering work of Edwin Hubble, who identified a large number of galaxies outside of our own, correctly measured their distance (following the work of Vesto Slipher's work measuring their redshifts), and discovered the expanding universe.

But what if the Milky Way weren't located in one of the "strands" of the great cosmic web, where galaxies are plentiful and ubiquitous in many different directions? What if, instead, we were located in one of the great "voids" separating the vast majority of galaxies? It would've taken telescopes and imaging technology far more advanced than Hubble had at his disposal to even detect a single galaxy beyond our own, much less dozens, hundreds or millions, like we have today. While the nearest galaxies to us are only a few million light years distant, there are voids so large that a galaxy located at the center of one might not see another for a hundred times that distance.

While we've readily learned about our place in the universe from observing what's around us, not everyone is as fortunate. In particular, the galaxy MCG+01-02-015 has not a single known galaxy around it for a hundred million light years in all directions. Were you to draw a sphere around the Milky Way with a radius of 100 million light years, we'd find hundreds of thousands of galaxies. But not MCG+01-02-015; it's the loneliest galaxy ever discovered. Our Milky Way, like most galaxies, has been built up by mergers and accretions of many other galaxies over billions of years, having acquired stars and gas from a slew of our former neighbors. But an isolated galaxy like this one has only the matter it was born with to call its own.

Edwin Hubble made his universe-changing discovery using telescope technology from 1917, yet he would have found absolutely zero other galaxies at all were we situated at MCG+01-02-015's location. The first visible galaxy wouldn't have shown up until we had 1960s-level technology, and who knows if we'd have continued looking? If we were such a lonely galaxy, would we have given up the search, and concluded that our galaxy encompassed all of existence? Or would we have continued peering deeper into the void, eventually discovering our unusual location in a vast, expanding universe? For the inhabitants of the loneliest galaxy, we can only hope that they didn't give up the search, and discovered the entire universe.

Image credit: ESA/Hubble & NASA and N. Gorin (STScI); Acknowledgement: Judy Schmidt, of the loneliest void galaxy in the known: MCG+01-02-015.

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Aristarchus

The rim of 40-km wide Aristarchus (lower left) rises over the darkness of the terminator when the moon is about 10.5 days old, in this case at about 8:30 pm on October 23, 2015. To the northeast is Prinz, the remains of a lava-flooded crater whose southern rim has been completely obliterated, and further in that direction is the Montes Harbinger, a group of isolated peaks. The largest craters in the upper right corner are Delisle (30 km) and Diophantus (18.5 km). Stellarvue SVR-105 triplet refractor, 2x Barlow giving 1470 mm focal length, QHY-5L-II monochrome camera, best 300 of 3000 frames. Seeing 4/10. Larchmont, NY

- - Larry Faltz