Skywatchers

Newsletter of the China Lake Astronomical Society

FEBRUARY 05, 2024 CLAS MEETING 7:30

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How Big is Space (And Other Mysteries of the Universe)

— *Ralph Paonessa*

The biggest – and smallest – dimensions in Outer Space and the Universe are hard to wrap your head around. We will explore the true size of the Solar System, our Milky Way Galaxy, and the vast distances and emptiness between all the galaxies in the Universe. And how it all used to be impossibly tiny.

On top of that, the Universe is expanding! We'll talk about what that means, how we know it's happening, and how big it really is. (And whether that expansion might make more room in your closets to store things in.)

Meetings and programs are open to the public, and are held at Maturango Museum on the first Monday of every month (or the following Monday for holidays).

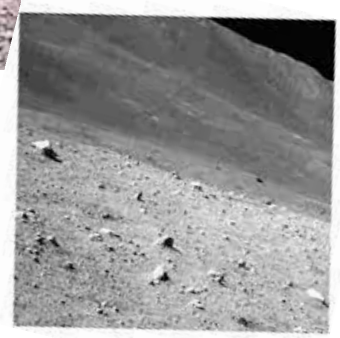
Monday, February 5, 2024 7:00 PM

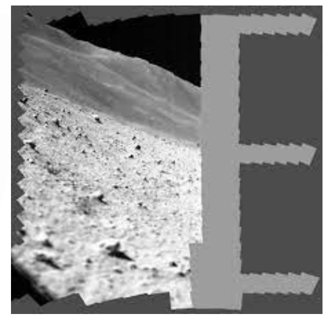
February Meeting & Program

Refreshments: 7:00 Announcements 7:30 Program 7:45

Japan's SLIM moon lander snaps final photos before going dormant during lunar night

The spacecraft will sleep through the deep cold of lunar night — and may or may not wake up afterward.





Mosaic images of the lunar surface captured by the Multiband Spectroscopic Camera (MBC) onboard Japan's SLIM moon lander immediately after its Jan. 19 touchdown (left) and after power was restored about 10 days later (right). As the direction of the sun changed from east to west, so did the shadows cast on the lunar surface. (Image credit: JAXA, Ritsumeikan University, University

Japan's historic SLIM moon lander has powered down ahead of a likely mission-ending cold lunar nighttime — but not before grabbing some final images and loads of science data. SLIM, short for "Smart Lander for Investigating Moon," nailed its precision touchdown on the rim of Shioli crater on Jan. 19, despite engine troubles that saw it land nose-down. As a result, the spacecraft's solar cells face westward and are unable to receive the expected levels of sunlight, initially cutting operations on the lunar surface very short. But SLIM triumphantly reawakened nearly 10 days after landing, as the sun finally shone on its panels.

The Japan Aerospace Exploration Agency (JAXA), which operates SLIM, has spent recent days scanning the nearby lunar surface with the spacecraft's Multi-Band Camera (MBC) to learn about its composition.

MBC is designed to scope out olivine and other minerals through analyzing the light signatures, or spectra, of reflected sunlight, according to the nonprofit Planetary Society.

JAXA's SLIM account on X, formerly Twitter, posted a final image taken by SLIM's navigation camera on Jan. 31 Japan time, while stating that the agency confirmed the spacecraft had entered a dormant state as expected.

The lunar rock "Aki Inu," imaged in near-infrared light by the Multiband Spectroscopic Camera instrument on Japan's SLIM moon lander after power was restored. "Aki Tainu" is 2.07 feet (63 centimeters) wide and lies 59 feet (18 meters) from SLIM. (Image credit: JAXA , Ritsumeikan University, University of Aizu)

JAXA will need to wait out the roughly 14.5-Earth-day-long lunar nighttime and then wait for favorable lighting and temperature conditions later in the next lunar daytime (which starts around Feb. 15) before SLIM can potentially be revived once more. For the probe to awake again, however, its electronics must hold up in the face of equatorial lunar nighttime temperatures of around minus 208 degrees Fahrenheit (minus 130 degrees Celsius).

But whether or not SLIM wakes up, the spacecraft has hit its full and extended mission goals by achieving a precision landing, deploying a pair of small rovers and demonstrating their interoperability, and obtaining a wealth of science data.

SLIM's X account also posted labeled images of targets of MBC's spectroscopic imaging, showing the various rocks and regolith that are being studied.
"Based on the large amount of data we have obtained, we are proceeding with analyses to identify rocks and estimate the chemical composition of minerals, which will help solve the mystery of the origin of the moon," a Google machine translation of a Feb. 1 JAXA statement read.

"We will announce scientific results as soon as they are obtained," the statement added.

"We proved that you can land wherever you want, rather than where you are able to," SLIM project manager Shinichiro Sakai said at the press conference, according to Reuters. "This will inspire more and more people, desirably Japanese missions, to try to land on unexplored places on the moon."

Source: Japan's SLIM moon lander snaps final pics before going dormant (photos) | Space

China Lake Astronomical Society

Membership or Renewal 2024

Name:____

Address:____

City, State, Zip:____

Phone:_________________________Email:____

Yearly Membership $ 25 (*due in January*) Family $ 40 Youth 18 & under $ 10.
Checks or Money Orders accepted ________________

Contact Roger Brower 760-446-0454 (email brower@iwvisp.com)

Make Checks or Money Orders Payable to China Lake Astronomical Society.(CLAS)

Roger Brower, Treasurer
China Lake Astronomical Society
P.O. Box 1783
Ridgecrest, CA 93556.

ASTRONOMY COLUMN

February EVENTS:
1. The next club meeting on February 5th in the Maturango Museum at 7:30 PM. The program this month will be a talk given by our president Ralph Paonessa on “The size of Space“.

Star parties:

No more star parties until March .

February CELESTIAL CALENDAR

1. Mercury is in the morning sky where it can be seen very low in the southeast before sunrise the first few days of the month.

2. Mars and Venus are also in the morning sky this month. On the 22nd Venus passes .6 degrees north of Mars. This event happens very low in the southeast about 45 minutes before sunrise.

3. Saturn appears low in the west after sunset the first of the month but is lost in the sun by the end of the second week.

4. Jupiter still puts on a fine show in the evening sky. It appears in the southwest at sunset and moves to the west before it sets at 12:30 AM on the first and 10:30 PM on the 29th.

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INFORMATION:

Please visit us at our website ChinaLakeAstro.org.

Why is the universe ripping itself apart? A new study shows dark energy may be more complicated than we thought

by Brad E Tucker, The Conversation

What is the universe made of? This question has driven astronomers for hundreds of years.
For the past quarter of a century, scientists have believed "normal" stuff like atoms and molecules that make up you, me, Earth, and nearly everything we can see only accounts for 5% of the universe. Another 25% is "dark matter", an unknown substance we can't see but which we can detect through how it affects normal matter via gravity.
The remaining 70% of the cosmos is made of "dark energy". Discovered in 1998, this is an unknown form of energy believed to be making the universe expand at an ever-increasing rate.
In a new study soon to be published in the *Astronomical Journal*, we have measured the properties of dark energy in more detail than ever before. Our results show it may be a hypothetical vacuum energy first proposed by Einstein—or it may be something stranger and more complicated that changes over time.

What is dark energy?

When Einstein developed the General Theory of Relativity over a century ago, he realized his equations showed the universe should either be expanding or shrinking. This seemed wrong to him, so he added a "cosmological constant"—a kind of energy inherent in empty space—to balance out the force of gravity and keep the universe static.
Later, when the work of Henrietta Swan Leavitt and Edwin Hubble showed the universe was indeed expanding, Einstein did away with the cosmological constant, calling it his "greatest mistake".
However, in 1998, two teams of researchers found the expansion of the universe was actually accelerating. This implies that something quite similar to Einstein's cosmological constant may exist after all—something we now call dark energy.

Since those initial measurements, we've been using supernovae and other probes to measure the nature of dark energy. Until now, these results have shown the density of dark energy in the universe appears to be constant.

This means the strength of dark energy remains the same, even as the universe grows—it doesn't seem to be spread more thinly as the universe gets bigger. We measure this with a number called w. Einstein's cosmological constant in effect set w to -1, and earlier observations have suggested this was about right.

Exploding stars as cosmic measuring sticks

How do we measure what is in the universe and how fast it is growing? We don't have enormous tape measures or giant scales, so instead we use "standard candles": objects in space whose brightness we know.Imagine it is night and you are standing on a long road with a few light poles. These poles all have the same light bulb, but the poles further away are fainter than the nearby ones.This is because light fades proportionately to distance. If we know the power of the bulb, and can measure how bright the bulb appears to be, we can calculate the distance to the light pole.

For astronomers, a common cosmic light bulb is a kind of exploding star called a Type Ia supernova. These are white dwarf stars which often suck in matter from a neighboring star and grow until they reach 1.44 times the mass of our Sun, at which point they explode.
By measuring how quickly the explosion fades, we can determine how bright it was and hence how far away from us.

The Dark Energy Survey

The Dark Energy Survey is the largest effort yet to measure dark energy. More than 400 scientists across multiple continents work together for nearly a decade to repeatedly observe parts of the southern sky.

Repeated observations let us look for changes, like new exploding stars. The more often you observe, the better you can measure these changes, and the larger the area you search, the more supernovae you can find.

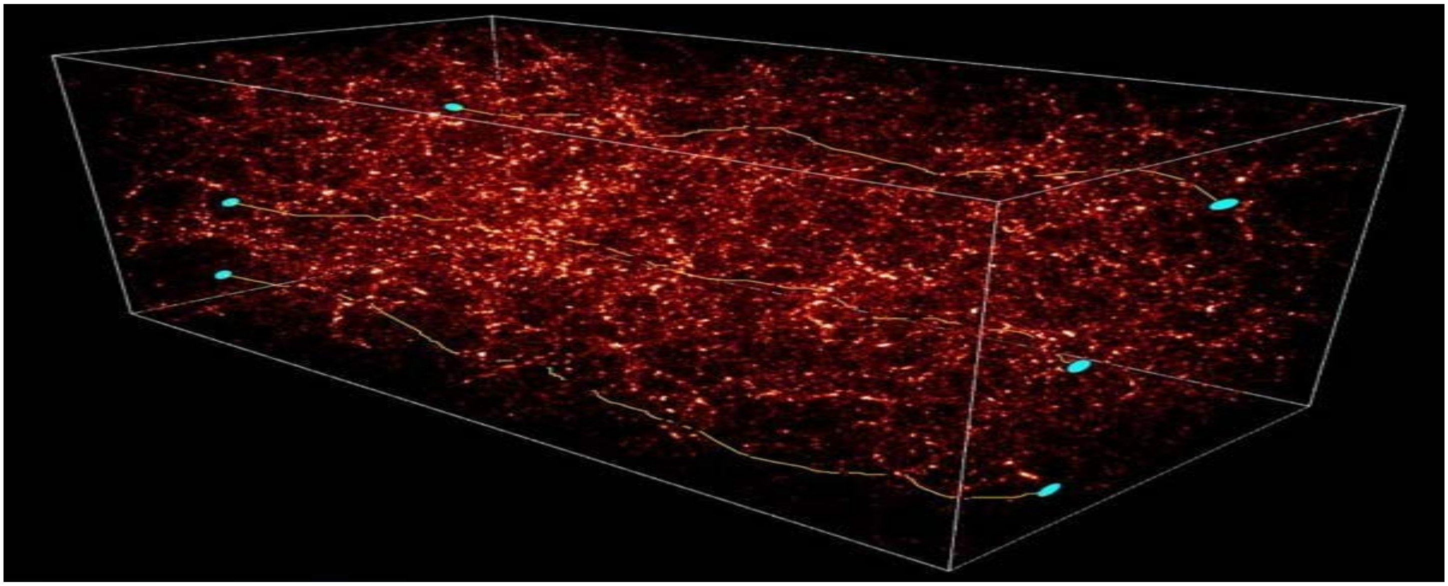
The first results indicating the existence of dark energy used only a couple of dozen supernovae. The latest results from the Dark Energy Survey use around 1,500 exploding stars, giving much greater precision. Using a specially built camera installed on the 4-meter Blanco Telescope at the Cerro-Tololo Inter-American Observatory in Chile, the survey found thousands of supernovae of different types. To work out which ones were Type Ia (the kind we need for measuring distances), we used the 4-meter Anglo Australian Telescope at Siding Spring Observatory in New South Wales.

The Anglo Australian Telescope took measurements which broke up the colors of light from the supernovae. This lets us see a "fingerprint" of the individual elements in the explosion.
Type Ia supernovae have some unique features, like containing no hydrogen and silicon. And with enough supernovae, machine learning allowed us to classify thousands of supernovae efficiently.

More complicated than the cosmological constant

Finally, after more than a decade of work and studying around 1,500 Type Ia supernovae, the Dark Energy Survey has produced a new best measurement of w. We found $w = -0.80 \pm 0.18$, so it's somewhere between –0.62 and –0.98.
This is a very interesting result. It is close to –1, but not quite exactly there. To be the cosmological constant, or the energy of empty space, it would need to be exactly –1. Where does this leave us? With the idea that a more complex model of dark energy may be needed, perhaps one in which this mysterious energy has changed over the life of the universe.

Source: Why is the universe ripping itself apart? A new study shows dark energy may be more complicated than we thought (phys.org)



Light from distant galaxies is distorted by foreground matter. This so-called weak lensing can be used to characterize dark energy. (Image credit: S. Colombi (IAP), CFHT Team)

FEBRUARY DAILY CELESTIAL CALENDAR

2	The Last Quarter Moon occurs at 3 P.M. PST
4	The Moon passes 0.6 deg north of Antares, 5 P.M. PST
7	The Moon passes 5 deg south of Venus, 11 A.M. PST
8	The Moon passes 4 deg south of Mars, 11 A.M. PST
8	Asteroid Vesta is stationary, 10:00 A.M. PST
9	New Moon occurs ar 2:59 P.M. PST
10	The Moon is at perigee(222,506 miles from Earth), 10:53 A.M. PST
10	The Moon passes 1.8 deg south of Saturn, 5:00 P.M. PST
11	The Moon passes 0.7 deg south of Neptune, 11:00 P.M. PST
15	The Moon passes 3 deg north of Jupiter, 12:00 A.M. PST
15	The Moon passes 3 deg north of Uranus, 6:00 P.M. PST
16	First Quarter Moon occurs at 7:01 A.M. PST
22	Venus passes 0.6 deg north of Mars, 8:00 A.M. PST
24	Full Moon occurs at 4:30 A.M. PST
25	The Moon is at apogee (252,470 miles from Earth), 6:59 A.M. PST
28	Mercury is in Superior Conjunction, 1:00 A.M. PST
28	Saturn is in conjunction with the Sun, 1:00 P.M. PST

2023/2024 New Moons

- February 9, 2024:
- March 10, 2024: .
- April 8, 2024:
- May 7, 2024
- June 6, 2024:
- July 5, 2024:
- August 4, 2024:
- September 2, 2024
- October 2, 2024

http://chinalakeastro.org/

Red Rock Spring Star Parties

2024 (*Tentative)*

- March 30th Saturday
- April 6th Saturday
- May 4th Saturday
- June 1st Saturday

Directions: Brown road star parties are held in the desert. Take south China lake Boulevard to 395. Cross 395 and go 2.3 miles on Brown road until you come to signs in cones pointing to the left. Take this dirt road .5 miles to the star party site.

Club Information

Monthly Skywatchers Newsletter.

Our newsletter is sent by email once a month to those who have subscribed. You do not have to be a member. Subscribe at a meeting or online at ChinaLakeAstro.org/subscribe

Annual Membership Dues

- Individual $25.00 per year.
- Family $ 40
- Youth 18 & under $10

Officers

PRESIDENT – Ralph Paonessa

VICE-PRESIDENT – Keith Weisz

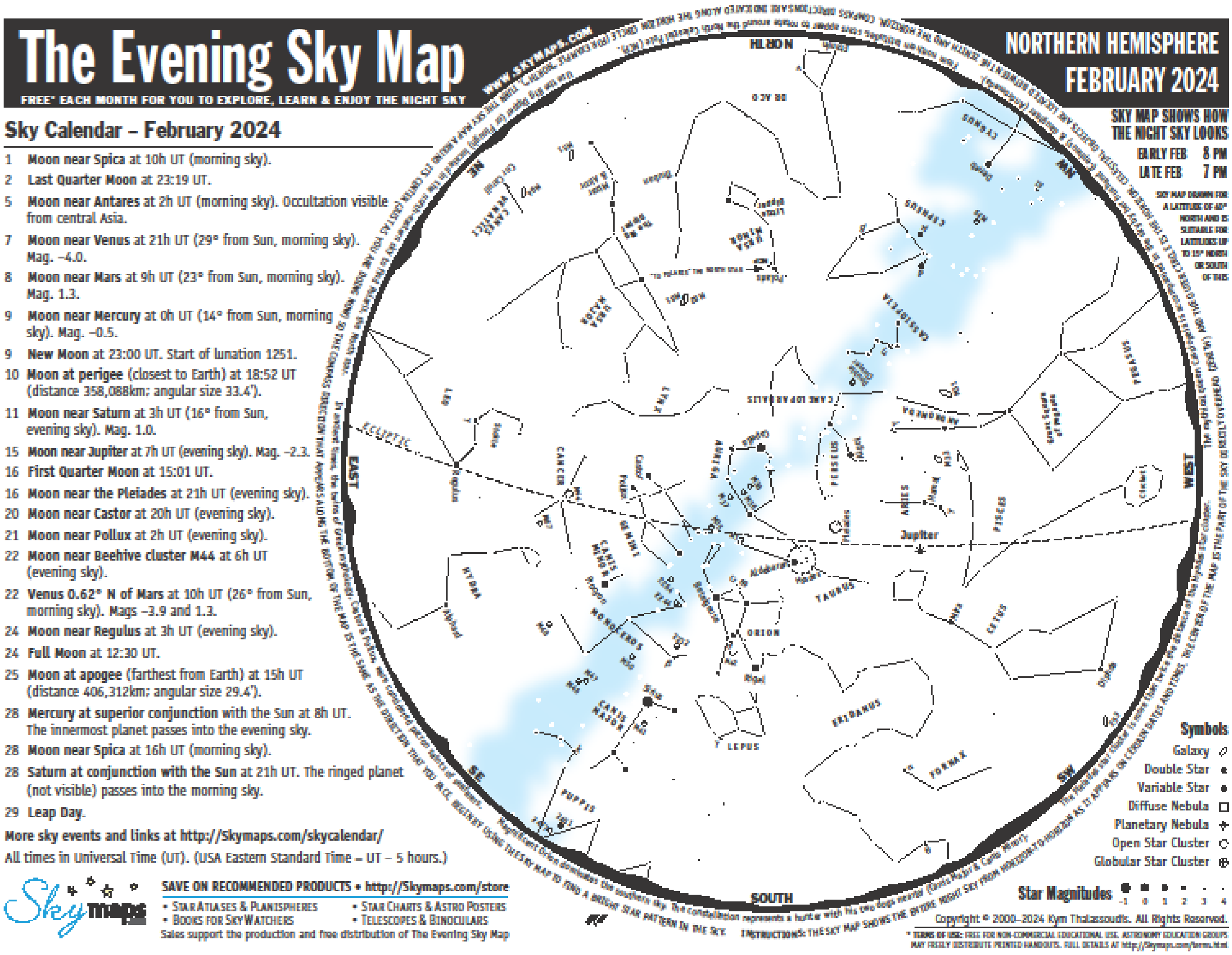
SECRETARY – Debbie Pio

TREASURER – Roger Brower

NEWSLETTER EDITOR – Ted Hodgkinson **Club Information**

Meetings of the China Lake Astronomical Society are held at the Maturango Museum 7:00 P.M. on the first Monday evening of each month, except when the first Monday is a holiday.

WESTERN AMATEUR ASTRONOMERS WEB SITE http://www.waa.av.org/



The Evening Sky Map

FREE* EACH MONTH FOR YOU TO EXPLORE, LEARN & ENJOY THE NIGHT SKY

NORTHERN HEMISPHERE
FEBRUARY 2024

SKY MAP SHOWS HOW THE NIGHT SKY LOOKS
EARLY FEB 8 PM
LATE FEB 7 PM

Sky Calendar – February 2024

1 **Moon near Spica** at 10h UT (morning sky).
2 **Last Quarter Moon** at 23:19 UT.
5 **Moon near Antares** at 2h UT (morning sky). Occultation visible from central Asia.
7 **Moon near Venus** at 21h UT (29° from Sun, morning sky). Mag. −4.0.
8 **Moon near Mars** at 9h UT (23° from Sun, morning sky). Mag. 1.3.
9 **Moon near Mercury** at 0h UT (14° from Sun, morning sky). Mag. −0.5.
9 **New Moon** at 23:00 UT. Start of lunation 1251.
10 **Moon at perigee** (closest to Earth) at 18:52 UT (distance 358,088km; angular size 33.4′).
11 **Moon near Saturn** at 3h UT (16° from Sun, evening sky). Mag. 1.0.
15 **Moon near Jupiter** at 7h UT (evening sky). Mag. −2.3.
16 **First Quarter Moon** at 15:01 UT.
16 **Moon near the Pleiades** at 21h UT (evening sky).
20 **Moon near Castor** at 20h UT (evening sky).
21 **Moon near Pollux** at 2h UT (evening sky).
22 **Moon near Beehive cluster M44** at 6h UT (evening sky).
22 **Venus 0.62° N of Mars** at 10h UT (26° from Sun, morning sky). Mags −3.9 and 1.3.
24 **Moon near Regulus** at 3h UT (evening sky).
24 **Full Moon** at 12:30 UT.
25 **Moon at apogee** (farthest from Earth) at 15h UT (distance 406,312km; angular size 29.4′).
28 **Mercury at superior conjunction** with the Sun at 8h UT. The innermost planet passes into the evening sky.
28 **Moon near Spica** at 16h UT (morning sky).
28 **Saturn at conjunction with the Sun** at 21h UT. The ringed planet (not visible) passes into the morning sky.
29 **Leap Day.**

More sky events and links at http://Skymaps.com/skycalendar/

All times in Universal Time (UT). (USA Eastern Standard Time = UT − 5 hours.)

CELESTIAL OBJECTS

NORTHERN HEMISPHERE FEBRUARY 2024

About the Celestial Objects

Listed on this page are several of the brighter, more interesting celestial objects visible in the evening sky this month (refer to the monthly sky map). The objects are grouped into three categories. Those that can be easily seen with the naked eye (that is, without optical aid), those easily seen with binoculars, and those requiring a telescope to be appreciated. **Note, all of the objects (except single stars) will appear more impressive when viewed through a telescope or very large binoculars.** They are grouped in this way to highlight objects that can be seen using the optical equipment that may be available to the star gazer.

Tips for Observing the Night Sky

When observing the night sky, and in particular deep-sky objects such as star clusters, nebulae, and galaxies, it's always best to observe from a dark location. Avoid direct light from street lights and other sources. If possible observe from a dark location away from the light pollution that surrounds many of today's large cities.

You will see more stars after your eyes adapt to the darkness—usually about 10 to 20 minutes after you go outside. Also, if you need to use a torch to view the sky map, cover the light bulb with red cellophane. This will preserve your dark vision.

Finally, even though the Moon is one of the most stunning objects to view through a telescope, its light is so bright that it brightens the sky and makes many of the fainter objects very difficult to see. So try to observe the evening sky on moonless nights around either New Moon or Last Quarter.

Astronomical Glossary

Conjunction – An alignment of two celestial bodies such that they present the least angular separation as viewed from Earth.

Constellation – A defined area of the sky containing a star pattern.

Diffuse Nebula – A cloud of gas illuminated by nearby stars.

Double Star – Two stars that appear close to each other in the sky; either linked by gravity so that they orbit each other (binary star) or lying at different distances from Earth (optical double). Apparent separation of stars is given in seconds of arc (").

Ecliptic – The path of the Sun's center on the celestial sphere as seen from Earth.

Elongation – The angular separation of two celestial bodies. For Mercury and Venus the greatest elongation occurs when they are at their most angular distance from the Sun as viewed from Earth.

Galaxy – A mass of up to several billion stars held together by gravity.

Globular Star Cluster – A ball-shaped group of several thousand old stars.

Light Year (ly) – The distance a beam of light travels at 300,000 km/sec in one year.

Magnitude – The brightness of a celestial object as it appears in the sky.

Open Star Cluster – A group of tens or hundreds of relatively young stars.

Opposition – When a celestial body is opposite the Sun in the sky.

Planetary Nebula – The remnants of a shell of gas blown off by a star.

Universal Time (UT) – A time system used by astronomers. Also known as Greenwich Mean Time. USA Eastern Standard Time (for example, New York) is 5 hours behind UT.

Variable Star – A star that changes brightness over a period of time.

Easily Seen with the Naked Eye

Capella	Aur	The 6th brightest star. Appears yellowish in color. Spectroscopic binary. Dist=42 ly.
Sirius	CMa	The brightest star in the sky. Also known as the "Dog Star". Dist=8.6 ly.
Procyon	CMi	Greek name meaning "before the dog" - rises before Sirius (northern latitudes). Dist=11.4 ly.
δ Cephei	Cep	Cepheid prototype. Mag varies between 3.5 & 4.4 over 5.366 days. Mag 6 companion.
Deneb	Cyg	Brightest star in Cygnus. One of the greatest known supergiants. Dist=3,000 ly.
Castor	Gem	Multiple star system with 6 components. 3 stars visible in telescope. Dist=52 ly.
Pollux	Gem	With Castor, the twin sons of Leda in classical mythology. Dist=34 ly.
Regulus	Leo	Brightest star in Leo. A blue-white star with at least 1 companion. Dist=77 ly.
Rigel	Ori	The brightest star in Orion. Blue supergiant star with mag 7 companion. Dist=770 ly.
Betelgeuse	Ori	One of the largest red supergiant stars known. Diameter=300 times that of Sun. Dist=430 ly.
Algol	Per	Famous eclipsing binary star. Magnitude varies between 2.1 & 3.4 over 2.867 days.
Pleiades	Tau	The Seven Sisters. Spectacular cluster. Many more stars visible in binoculars. Dist=380 ly.
Hyades	Tau	Large V-shaped star cluster. Binoculars reveal many more stars. Dist=152 ly.
Aldebaran	Tau	Brightest star in Taurus. It is not associated with the Hyades star cluster. Dist=65 ly.
Polaris	UMi	The North Pole Star. A telescope reveals an unrelated mag 8 companion star. Dist=433 ly.

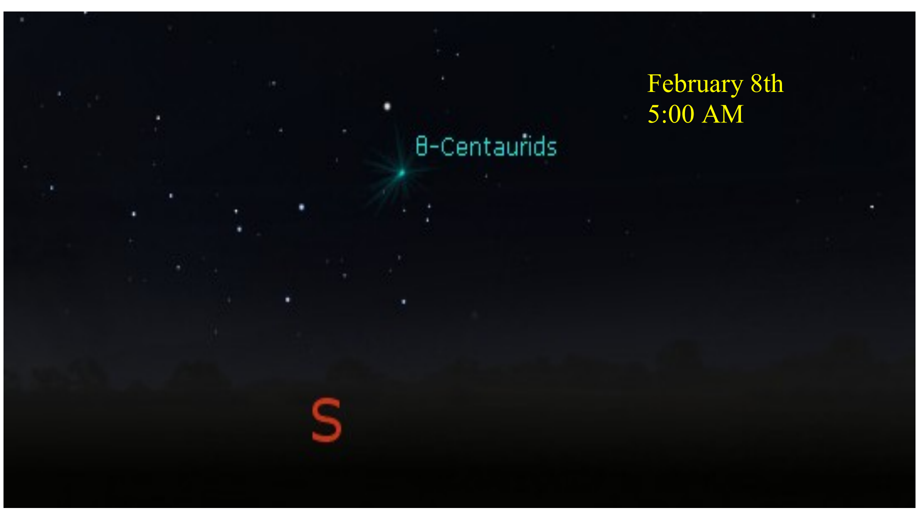
Easily Seen with Binoculars

M31	And	The Andromeda Galaxy. Most distant object visible to naked eye. Dist=2.5 million ly.
M38	Aur	Stars appear arranged in "pi" or cross shape. Dist=4,300 ly.
M36	Aur	About half size of M38. Located in rich Milky Way star field. Dist=4,100 ly.
M37	Aur	Very fine star cluster. Discovered by Messier in 1764. Dist=4,400 ly.
M44	Cnc	Praesepe or Beehive Cluster. Visible to the naked eye. Dist=590±20 ly.
M41	CMa	First recorded observation by Aristotle in 325 BC as "cloudy spot". Dist=2,300 ly.
μ Cephei	Cep	Herschel's Garnet Star. One of the reddest stars. Mag 3.4 to 5.1 over 730 days.
Mira	Cet	Famous long period variable star. Mag varies between 3.0 & 10.1 over 332 days.
M39	Cyg	May be visible to the naked eye under good conditions. Dist=900 ly.
M35	Gem	Fine open cluster located near foot of the twin Castor. Dist=2,800 ly.
M48	Hya	12+ stars in 7x binoculars. Triangular asterism near centre. Dist=1,990 ly.
γ Leporis	Lep	Visible with binoculars. Gold & white stars. Mags 3.6 & 6.2. Dist=30 ly. Sep=96.3".
2232	Mon	A large scattered star cluster of 20 stars. Dist=1,300 ly.
2244	Mon	Surrounded by the rather faint Rosette Nebula. Dist=5,540 ly.
M50	Mon	Visible with binoculars. Telescope reveals individual stars. Dist=3,000 ly.
Cr 69	Ori	Lambda Orionis Cluster. Dist=1,630 ly.
M42	Ori	The Great Orion Nebula. Spectacular bright nebula. Best in telescope. Dist=1,300 light years.
Double Cluster	Per	Double Cluster in Perseus. NGC 869 & 884. Excellent in binoculars. Dist=7,300 ly.
M47	Pup	Bright star cluster. 15+ stars in 7x binoculars. Dist=1,500 ly.
M46	Pup	Dist=5,400 ly. Contains planetary NGC 2438 (Mag 11, d=65") - not associated.
Mizar & Alcor	UMa	Good eyesight or binoculars reveals 2 stars. Not a binary. Mizar has a mag 4 companion.

Telescopic Objects

γ Andromedae	And	Attractive double star. Bright orange star with mag 5 blue companion. Sep=9.8".
γ Arietis	Ari	Impressive looking double blue-white star. Visible in a small telescope. Sep=7.8".
M67	Cnc	Contains 500+ stars mag 10 & fainter. One of the oldest clusters. Dist=2,350 ly.
M94	CVn	Compact nearly face-on spiral galaxy. Dist=15 million ly.
M51	CVn	Whirlpool Galaxy. First recognised to have spiral structure. Dist=25 million ly.
η Cassiopeiae	Cas	Yellow star mag 3.4 & orange star mag 7.5. Dist=19 ly. Orbit=480 years. Sep=12".
61 Cygni	Cyg	Attractive double star. Mags 5.2 & 6.1 orange dwarfs. Dist=11.4 ly. Sep=28.4".
θ Eridani	Eri	Striking blue-white double star. Mags 3.2 & 4.3. Visible in a small telescope. Sep=8.2".
γ Leonis	Leo	Superb pair of golden-yellow giant stars. Mags 2.2 & 3.5. Orbit=600 years. Sep=4.4".
β Monocerotis	Mon	Triple star. Mags 4.6, 5.0 & 5.4. Requires telescope to view arc-shape. Sep=7.3".
2264	Mon	Christmas Tree Cluster. Associated with the Cone Nebula. Dist=2,450 ly.
σ Orionis	Ori	Superb multiple star. 2 mag 7 stars one side, mag 9 star on other. Struve 761 triple in field.
k Puppis	Pup	Telescope easily shows two blue-white stars of almost equal brightness. Sep=9.9".
M1	Tau	Crab Nebula. Remnant from supernova which was visible in 1054. Dist=6,500 ly.
M33	Tri	Fine face-on spiral galaxy. Requires a large aperture telescope. Dist=2.3 million ly.
M81	UMa	Beautiful spiral galaxy visible with binoculars. Easy to see in a telescope.
M82	UMa	Close to M81 but much fainter and smaller.

SkyMaps



Beta Centaurids meteor shower radiates or was discovered in a location that is near the star Hadar from which it is named . Although radiant point is in Centaurus, the radiant point can move towards a different star or into another constellation than the one it is named after. The name is taken from the Bayer name for the star. Beta Centaurids meteor shower takes place between 2-Feb - 25 Feb with the peak on Feb 8th every year.