Skywatchers
Newsletter of the China Lake Astronomical Society

FEBRUARY 03RD, 2025 CLAS MEETING 7:30

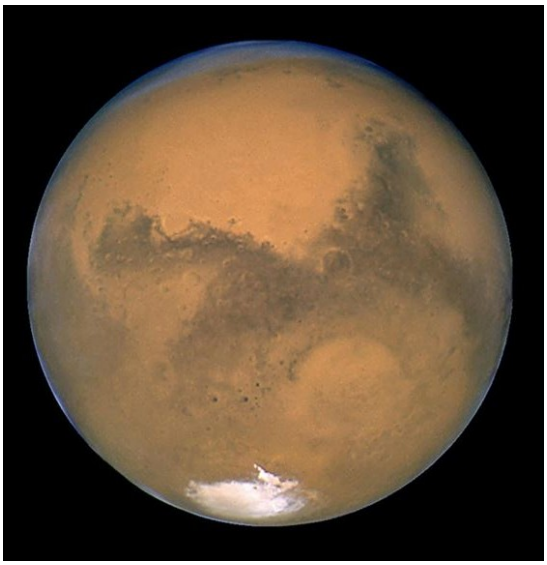
INSIDE THIS ISSUE:

Monday, February 03, 2025 7:00 PM

February 2025 Meeting & Program

Refreshments: 7:00 PM Announcements : 7:30

Program: 7:45



Program by Keith Weisz

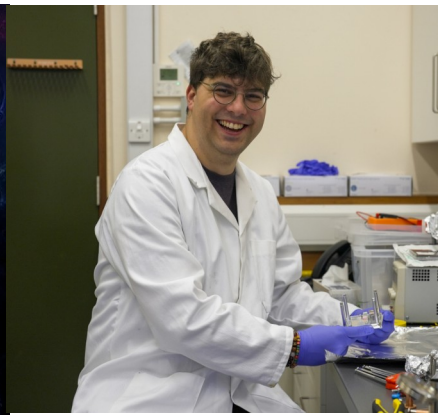
The Planet Mars

Location

Maturango Museum

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).

Scientists test space device to detect elusive dark matter



Scientists are working on an ambitious dark matter experiment in space in the hope it can unravel one of the universe's greatest mysteries.

For years, experts have been baffled by the puzzling force, which is invisible and yet makes up about 85% of all mass in our known cosmos.

Now a team from the University of Southampton have developed a concept that they claim could advance our understanding of dark matter.

The experts have begun testing a device that measures tiny signals by firing lasers through graphite sheets levitating in zero gravity.

Its mastermind physicist Tim Fuchs said it could be the first step to more space-based experiments that might detect it.

He added, "There are lots of theories as to what dark matter might be but no experiment on Earth has ever come close to detecting it.

"Dark matter remains one of the fundamental questions scientists are still trying to answer—it dictates the structure of our universe but is still undetectable.

"Our experiment is unlike anything attempted before: We'll be levitating graphite between magnets which, in zero gravity, are incredibly sensitive to small forces.

"If there is a sufficiently high density of dark matter, a dark 'wind' will softly push our levitated particles by an amount we can measure—detecting it for the first time ever."

Dark matter, which was first identified in the 1930s, does not emit, absorb or reflect light in any meaningful quantity, making it undetectable by telescopes.

However, scientists know it exists due to its gravitational effects on visible matter, said Fuchs.

"The movements of stars and galaxies within the universe can only be explained by the gravitational influence of dark matter," he added.

The experimental device will be blasted into space aboard a new satellite, which is being developed between Space South Central and the universities of Southampton, Portsmouth, and Surrey under the name Jovian-1.

Different options are being explored by the Jovian-1 team to launch the satellite early next year.

The Southampton dark matter device weighs just 1.5kg—and, once jettisoned, will fly around the Earth in low orbit for two years to conduct its tests.

Fuchs added, "There are theories that say the dark matter interaction rate may actually be so high that it cannot penetrate our atmosphere or the mountains under which detectors have been built.

"This might explain why many of the major Earth experiments that have been built to detect dark matter have not revealed any conclusive signals.

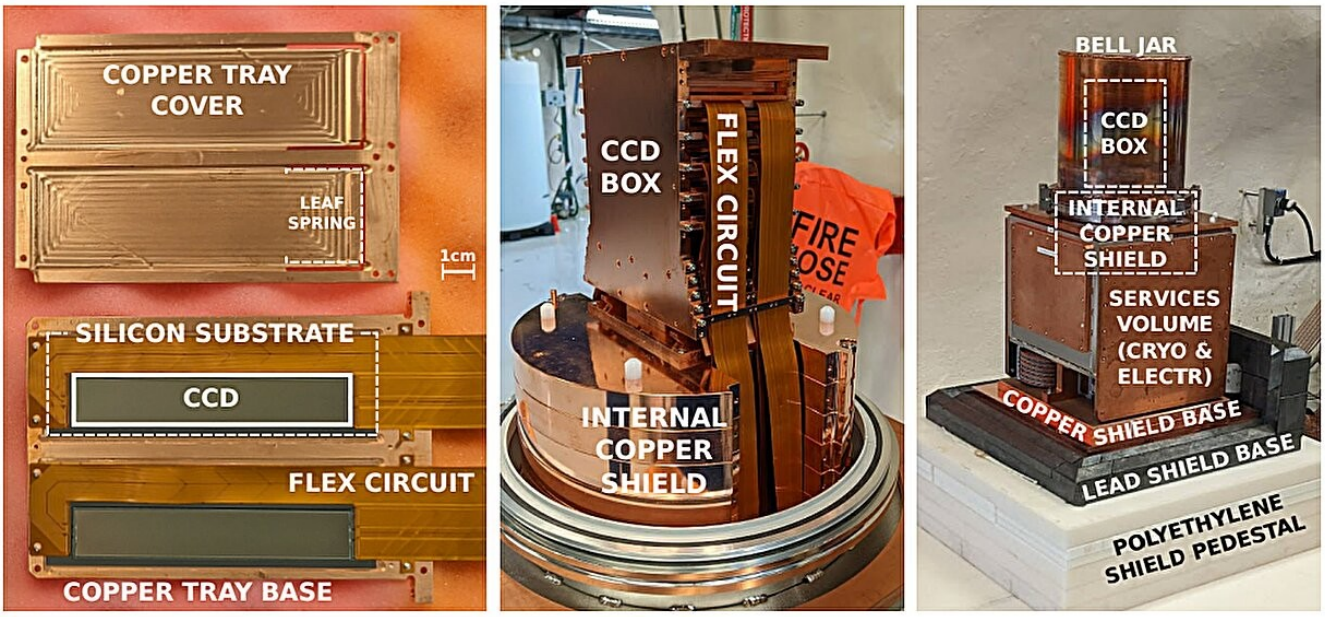
"Our mission is the first of its kind to use this levitating technology in space—and we hope it will serve as a proof of principle that we can detect dark matter above Earth."

Source:Scientists test space device to detect elusive dark matter

Published 1/31/2025

Provided by University of Southampton

Sub-GeV dark matter hunt: SENSEI collaboration reports first findings



Detecting dark matter particles and understanding their underlying physics is a long-standing research goal for many researchers worldwide. Dark matter searches have been aimed at detecting different possible signals that could be associated with the presence of these elusive particles or with their interaction with regular matter.

A promising technology for conducting dark matter searches is the SENSEI (Sub-Electron Noise Skipper-CCD experimental instrument) detector, a highly sensitive imaging sensor located at the SNOLAB research facility in Canada.

The research group analyzing data collected by this detector, dubbed the SENSEI collaboration, have published the results of their first search for sub-GeV dark matter at SNOLAB in the journal *Physical Review Letters*.

"The primary objective of our recent paper was to search for dark matter particle candidates with a mass below the proton, which we refer to as 'sub-GeV dark matter,' since the mass of the proton is about 1 GeV," Rouven Essig, co-author of the paper, told Phys.org.

"The results we presented came after several years of effort in which the SENSEI collaboration improved the sensitivity of their detectors to sub-GeV dark matter and reduced the impact of other types of events, which mimic dark matter events (i.e., 'backgrounds'). This is the first SENSEI study utilizing data collected at SNOLAB, one of the world's deepest laboratories, situated over 2 km underground in Sudbury, Canada." Bringing the SENSEI detector to the underground SNOLAB in Canada was a long-standing goal for Essig and his colleagues, as the collection of data in this location could allow them to advance their search for sub-GeV dark matter. Like other dark matter candidates, sub-GeV dark matter is believed to interact weakly with ordinary matter, which would make it incredibly difficult to detect.

"SENSEI uses ultrasensitive silicon 'Skipper Charge Coupled Devices' (Skipper CCDs), which allow us to search for dark matter particles that scatter off an electron in the silicon," said Kelly Stifter, co-author of the paper.

"Such a scatter would release only a small number of electrons (approximately 1-10) from the silicon atoms in one of the pixels in the Skipper CCD.

(when compared to an ordinary CCD) occurred in 2017 and allows us to measure precisely the number of electrons in each of the millions of pixels across the device. "

Via ultrasensitive Skipper CCDs, the SENSEI detector allows researchers to search for sub-GeV dark matter with high sensitivity. The detector's first experimental run at SNOLAB and the subsequent analysis of collected data allowed researchers to set unprecedented constraints on the interactions of this dark matter candidate with electrons and nuclei.

"We obtained the first dark matter search results with a Skipper-CCD in 2018, and several others over the next few years," explained Javier Tiffenberg, co-author of the paper.

"Notably, these experiments were run near the surface of the Earth, which is inundated with cosmic rays that can occasionally mimic events that look like dark matter. Our PRL paper presents our collaboration's first result obtained with an experiment that is being operated at SNOLAB, which is deep underground and well shielded."

The experimental run that gathered the data analyzed by the researchers as part of this recent study was performed over a 7-month period, spanning from 2022 to 2023.

To set new constraints on sub-GeV dark matter interacting with electrons and nuclei, the SENSEI collaboration specifically measured the number of events picked up by the detector that contained one or more electrons, which allowed them to set limits on the dark matter particles that could create these events.

"One of our goals for future work is to use more Skipper-CCDs so that we can detect more dark matter particles," said Sho Uemura, co-author of the paper. "We have now shown that we can operate an array of Skipper-CCDs and continue to improve their performance over our previous results with a single Skipper-CCD. Our understanding of background events, and our ability to remove them from the data, is keeping pace with the increased detector size."

The paper by the SENSEI collaboration could inform future efforts aimed at detecting dark matter, potentially leading to even more sensitive searches for sub-GeV dark matter particles.

The researchers are now planning to further enhance the sensitivity of the detector, which may contribute to the detection of these elusive particles or could allow them to set even more stringent constraints on their interactions with ordinary matter.

"We are confident that we can further reduce the backgrounds in our Skipper-CCDs, and we also plan to increase the number of Skipper-CCDs that we operate," said Ana Botti, co-author of the paper. "Both will improve the sensitivity of our detector to dark matter."

A key aspect of the research efforts by the SENSEI collaboration involves understanding how new high-sensitivity sensors are best operated, maximizing their potential for detecting dark matter-related signals. This is because detector effects (e.g., dark counts or spurious charges) produced without particles interacting, can often dominate the background signals collected while trying to pick up rare events, such as dark matter interactions,

"As Skipper CCDs are a new technology, there is no instruction manual for their use," added Botti. "Developing strategies to reduce these rates and mitigate their impact on the analysis has been crucial for the continuous improvement of SENSEI's results. We are also considering developing new technologies similar to the Skipper-CCD for light-dark matter detection to improve sensitivity further.

"It is worth mentioning that our work in SENSEI has positioned us at the forefront of this technology development, with applications that have extended beyond particle physics to fields such as astronomy and quantum imaging."

Source: Sub-GeV dark matter hunt: SENSEI collaboration reports first findings

More information: Prakruth Adari et al, First Direct-Detection Results on Sub-GeV Dark Matter Using the SENSEI Detector at SNOLAB, *Physical Review Letters* (2025). DOI: 10.1103/PhysRevLett.134.011804. On *arXiv*: DOI: 10.48550/arxiv.2312.13342

Comet Atlas and its Tails

Taken by Daniele Gasparri on January 26th from Atacama region, Chile

The Evening Sky Map

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

WWW.SKYMAPS.COM

NORTHERN HEMISPHERE
FEBRUARY 2025

Sky Calendar – February 2025

Follow us on Bluesky
skymaps.com/bsky/

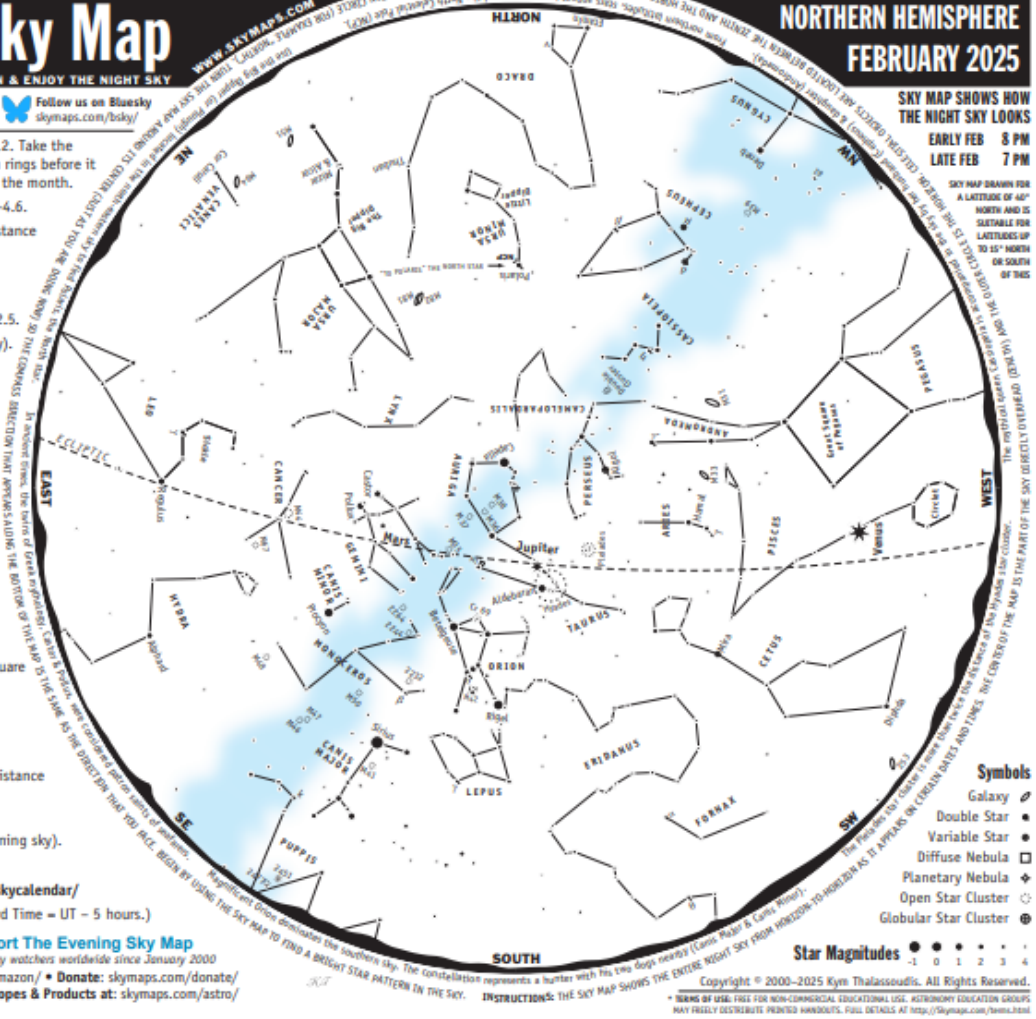
1 **Moon near Saturn** at 5h UT (evening sky). Mag. 1.2. Take the opportunity to view Saturn and its almost edge-on rings before it disappears into the evening twilight at the end of the month.
1 **Moon near Venus** at 23h UT (evening sky). Mag. −4.6.
2 **Moon at perigee** (closest to Earth) at 2:40 UT (distance 367,457km; angular size 32.5').
5 **First Quarter Moon** at 8:03 UT.
6 **Moon near the Pleiades** at 8h UT (evening sky).
7 **Moon near Jupiter** at 3h UT (evening sky). Mag. −2.5.
8 **Moon near M35 star cluster** at 16h UT (evening sky).
9 **Mercury at superior conjunction** with the Sun at 12h UT (not visible). The innermost planet passes into the evening sky.
9 **Moon near Mars** at 18h UT (evening sky). Mag. −0.8. Occultation visible from parts of Russia, China, eastern Canada and Greenland.
10 **Moon near Castor** at 0h UT (evening sky).
10 **Moon near Pollux** at 6h UT (evening sky).
10 **Mars at northernmost declination** (26.2°) at 16h UT (evening sky).
11 **Moon near Beehive cluster M44** at 8h UT (evening sky).
12 **Full Moon** at 13:53 UT.
13 **Moon near Regulus** at 3h UT (midnight sky).
14 **Venus shows greatest illuminated extent** (334 square arc seconds) at 22h UT.
16 **Venus at its brightest** at 9h UT (39.7° from Sun, evening sky). Mag. −4.63.
17 **Moon near Spica** at 13h UT (morning sky).
18 **Moon at apogee** (farthest from Earth) at 1h UT (distance 404,882km; angular size 29.5').
20 **Last Quarter Moon** at 17:33 UT.
21 **Moon near Antares** at 10h UT (83° from Sun, morning sky).
28 **New Moon** at 00:46 UT. Start of lunation 1264.

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

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

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

SKY MAP DRAWN FOR A LATITUDE OF 40° NORTH AND IS SUITABLE FOR LATITUDES UP TO 15° NORTH OR SOUTH OF THIS



Symbols

Galaxy
Double Star
Variable Star
Diffuse Nebula
Planetary Nebula
Open Star Cluster
Globular Star Cluster

Star Magnitudes −1 0 1 2 3 4

Skymaps

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Looking west just after sunset.
Venus at greatest brilliancy on February 14th at minus 4.9 magnitude

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.

CELESTIAL OBJECTS

NORTHERN HEMISPHERE FEBRUARY 2025

Sky maps.com

Easily Seen with the Naked Eye

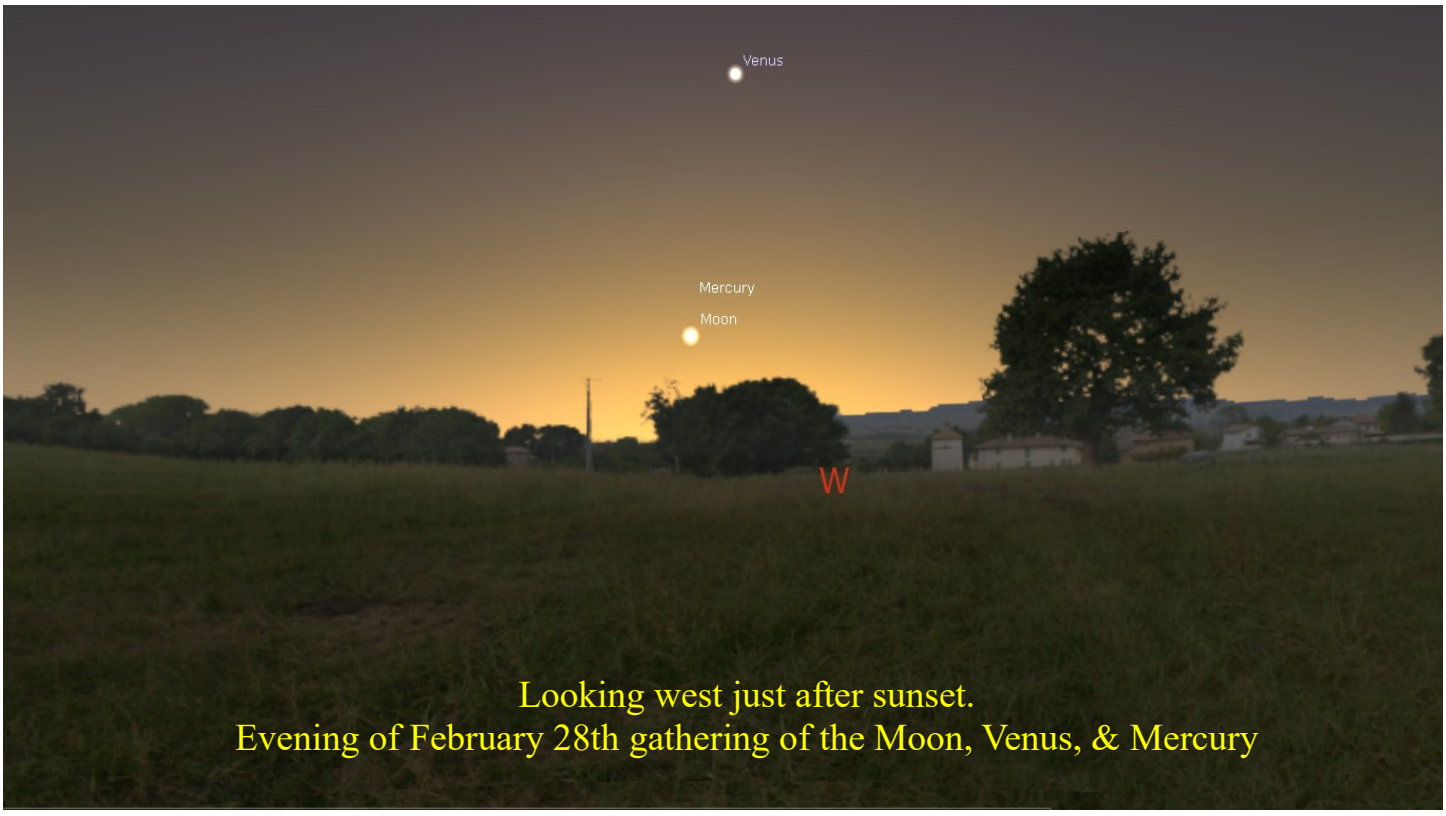
Capella	Aur	●	The 6th brightest star. Appears yellowish in color. Spectroscopic binary. Dist=42 ly.
Sirius	CMa	●	The brightest star in the sky. Also known as the "Dog Star". Dist=8.6 ly.
Procyon	CMi	●	Greek name meaning "before the dog" - rises before Sirius (northern latitudes). Dist=11.4 ly.
δ Cephei	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.



Looking west just after sunset.
Evening of February 28th gathering of the Moon, Venus, & Mercury

ASTRONOMY COLUMN

February EVENTS:

1. The next club meeting will be on February 3rd at the Maturango Museum. Open at 7:00 PM program at 7:30 PM.

Star parties:

No scheduled star parties until March.

February CELESTIAL CALENDAR

1. Mercury reaches superior conjunction on the 9th so will not be visible till the end of the month. The last week it will appear in the west near Saturn in the early evening.

2. Venus appears high in the western evening sky after sunset. Check out its crescent phase throughout the month.

3. Saturn appears low in the southwest then the west soon after sunset where it is joined by Mercury at the end of the month.

4. Jupiter appears in the south at dusk and moves westward until it sets after midnight.
5. Mars starts the evening in the east and moves to the northwest where it sets in the morning sky.

INFORMATION:

Please visit us at our website ChinaLakeAstro.org.

For more information, contact the China Lake Astronomical Society at 760-446-0454 or 760-384-8666.

Roger Brower

China Lake Astronomical Society
Membership or Renewal 2024

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Yearly Membership $ 25 (*due in January*) Family $ 40 Youth 18 & under $ 10.
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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.

February DAILY CELESTIAL CALENDAR

1 The Moon passes 2 deg south of Venus, 12 P.M. PST

1 The Moon passes 1.4 deg north of Neptune 3 P.M. PST

1 The Moon is at perigee (228,327 miles from Earth), 6:47 P.M. PST

,

3 Venus passes 4 deg north of Neptune, 12:00 Noon PST

4 Jupiter is stationary, 5 A.M PST

5 First Quarter Moon occurs at 12:00 Midnight PST

5 The Moon passes 5 deg north of Uranus, 1 P.M. PST

6 The Moon passes 5 deg north of Jupiter, 8 P.M. PST

9 Mercury is in superior conjunction, 4 A.M. PST

9 The Moon passes 0.8 deg north of Mars 12 Noon PST

12 Full Moon occurs at 5:53 A.M. PST

14 Dwarf planet Ceres is in conjunction with the Sun, 2 P.M. PST

14 Venus is at greatest brilliancy (magnitude –4.9) 3 P.M. PST

17 The Moon passes 0.3 deg south of Spica, 5 P.M. PST

17 The Moon is at apogee (251,582 miles from Earth) 5 P.M. PST

20 Last Quarter Moon occurs at 9:33 A.M. PST

21 The Moon passes 0.4 deg south of Antares, 1 A.M. PST

24 Mars is stationary, 2 P.M. PST

25 The Moon passes 1.0 deg south of Pluto, 2 A.M. PST

27 New Moon occurs at 4:45 P.M. PST

27 Venus is stationary, 7 P.M. PST

28 The Moon passes 0.4 deg south of Mercury, 8 P.M. PST

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2024 & 2025 New Moons

- Feb 27, 2025
- March 29, 2025
- April 27, 2025
- May 26, 2025
- June 25, 2025
- July 24, 2025
- August 22nd 2025
- September 21st 2025
- Oct 21st, 2025
- November 19th, 2025
- December 19th, 2025

Star Parties for Red Rock Ricardo Station

Brown Road Star Parties

Maturango Museum

March 08, 2025 7 PM

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

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VICE-PRESIDENT – Keith Weisz

SECRETARY – Vacant

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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.waastro.org/