Skywatchers
Newsletter of the China Lake Astronomical Society

Volume 59 No. 02 February 4, 2022

February 07, 2022 CLAS Meeting

Hybrid at Maturango Museum 7:30 PM

Keith Weisz our Vice President will present the KSTARS software application, as a planetarium software for casual virtual astronomy and as a tool for observation planning. Keith will also present how he integrated his observatory into KSTARS for automatic observation and image collection.

Description

KStars is free, open source, cross-platform Astronomy Software. It provides an accurate graphical simulation of the night sky, from any location on Earth, at any date and time. The display includes up to 100 million stars, 13,000 deep-sky objects,all 8 planets, the Sun and Moon, and thousands of comets, asteroids, supernovae, and satellites. For students and teachers, it supports adjustable simulation speeds in order to view phenomena that happen over long timescales, the KStars Astrocalculator to predict conjunctions, and many common astronomical calculations.
For the amateur astronomer, it provides an observation planner, a sky calendar tool, and an FOV editor to calculate field of view of equipment and display them. Find out interesting objects in the "What's up Tonight" tool, plot altitude vs. time graphs for any object, print high-quality sky charts, and gain access to lots of information and resources to help you explore the universe! Included with KStars is Ekos astrophotography suite, a complete astrophotography solution that can control all INDI devices including numerous telescopes, CCDs, DSLRs, focusers, filters, and a lot more. Ekos supports highly accurate tracking using online and offline astrometry solver, autofocus and autoguiding capabilities, and capture of single or multiple images using the powerful built in sequence manager.

In other news, Peter Wiley and I did another session debugging the Maturango Museum presentation system. We found a single point failure in a device called a "video stripper" (grow up, not that kind of stripper). The device is supposed to pass the computer video through and strip the audio off for feeding the public address system. After removing that device, computer video using a laptop and an iPad worked from the video port at the southwest corner. Also, using the Apple TV (that is what I used last month) lost it's pink tint and everything presents a clear image on the screen. The audio is now fed from the projector and the projector feeds the audio system.

As such, I will be at Maturango Museum before the meeting to ensure the Maturango Museum system is operational. After that, I will dash home and make the presentation from my desk at home and will attend the meeting and do the presentation using Zoom.

Keith

Ted Hodgkinson is inviting you to a scheduled Zoom meeting.

Topic: Title: "Armchair astronomy with KSTARS - mostly"
Time: Feb 07, 2022 07:30 PM Pacific Time (US and Canada)

Join Zoom Meeting
https://us02web.zoom.us/j/6727499334?pwd=VWhuVGZ3aFphL283THRKNUNoZ0RSZz09

Meeting ID: 672 749 9334
Passcode: 9V8FQM
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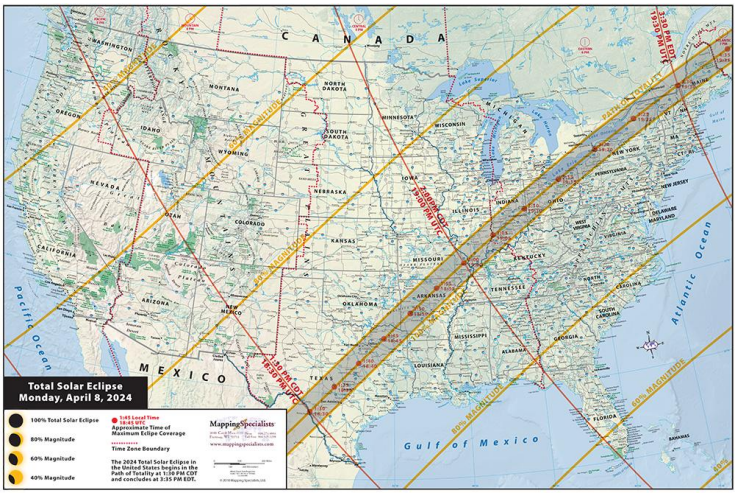
+1 312 626 6799 US (Chicago)
+1 646 876 9923 US (New York)
Meeting ID: 672 749 9334
Passcode: 562029
Find your local number: https://us02web.zoom.us/u/kzvHNprV6

Next Meeting March 07, 2022 Dr. Scott Cameron Topic: To be announced.

PLAN AHEAD!

In just a little over 2 years on April 08th, 2024 the United States will be one of the best places on Earth to see the Great Eclipse of 2024.



Where is NASA's James Webb Space Telescope? Here's how to follow its progress.

What's the massive observatory doing now? Here's how to find out.
Where Is Webb? NASA/Webb

SpaceX Falcon 9 rocket stage to crash into moon 1 month from today (March 04)

The rocket stage has been cruising through the Earth-moon system for seven years.

A SpaceX Falcon 9 rocket upper stage is poised to slam into the moon one month from today (Feb. 4).

In February 2015, the Falcon 9 launched the Deep Space Climate Observatory (DSCOVR), a joint mission between the U.S. National Oceanic and Atmospheric Administration (NOAA) and NASA.
The rocket carried DSCOVR toward the Earth-sun Lagrange Point 1 (L1), a gravitationally stable spot about 930,000 miles (1.5 million kilometers) from Earth. After getting there, the upper stage ended up pointing away from our home planet.

"This rendered a deorbit burn to dispose of it in our planet's atmosphere impractical, while the upper stage also lacked sufficient velocity to escape the Earth-moon system. Instead it was left in a chaotic sun-orbiting orbit near the two bodies," European Space Agency (ESA) officials wrote in a statement Wednesday (Feb. 2).
The upper stage's time in space is now almost up: It will hit the moon on March 4, observers have calculated.

Regulatory regime

Human-made objects have been intentionally steered into the moon before, starting as early as the 1950s. The practice was common during the Apollo program, with rocket upper stages even used to induce "moonquakes" for surface seismometers to pick up.
But the coming SpaceX moon crash is quite different, marking "the first time that a human-made debris item unintentionally reaches our natural satellite," ESA officials wrote. ("Debris item" does not include spacecraft that have crashed while trying to land on the moon, such as Israel's Beresheet probe in 2019.)
"The upcoming Falcon 9 lunar impact illustrates well the need for a comprehensive regulatory regime in space, not only for the economically crucial orbits around Earth but also applying to the moon," Holger Krag, head of ESA's Space Safety Program, said in the same statement.
"For international spacefarers, no clear guidelines exist at the moment to regulate the disposal at end of life for spacecraft or spent upper stages sent to Lagrange points," ESA officials wrote in the statement. "Potentially crashing into the moon or returning and burning up in Earth's atmosphere have so far been the most straightforward default options."

Credible forecasts

The Falcon 9 upper stage will strike the moon on March 4 at 7:25 a.m. EST (12:25 GMT) on the lunar far side near the equator, according to observers' calculations. That's just an estimate, albeit a precise one; followup observations should sharpen the accuracy of forecasts.

One such calculation comes from astrodynamics engineer Michael Thompson, of Advanced Space in Westminster, Colorado. He's generated a plot and a visual to show where the upper stage may crash.

Thompson built upon the work by Bill Gray of Project Pluto, who collects and analyzes observations of near-Earth objects. It was Gray who discovered the crash course of the SpaceX upper stage.

Project Pluto posts a subset of raw observations made by users around the world. Using these observations, Thompson performed his own orbit determination process in addition to the processes run by Gray.

Advanced Space generated predictions currently showing an impact west of the Sea of Tranquility, very similar to the prediction generated by Gray.
Impact will be near the lunar limb as viewed from Earth, according to these calculations. Most of the distribution lies slightly on the moon's far side. Based on current data, the impact is not expected to be near any NASA Apollo or Chinese lunar exploration sites.

Still uncertain

The impact may or may not be visible from Earth, Thompson noted.

The predicted impact zone is far away from the current location of China's Chang'e 4 lander-rover duo; it's much closer to the lunar limb than fully over on the far side.
Even given the large uncertainties in the attitude of the rocket body and the resulting uncertainties in the solar radiation pressure effects on it, an impact much closer to Chang'e 4 is unlikely, Thompson added.

The uncertainty will come down a good bit more once additional observations are made this month.

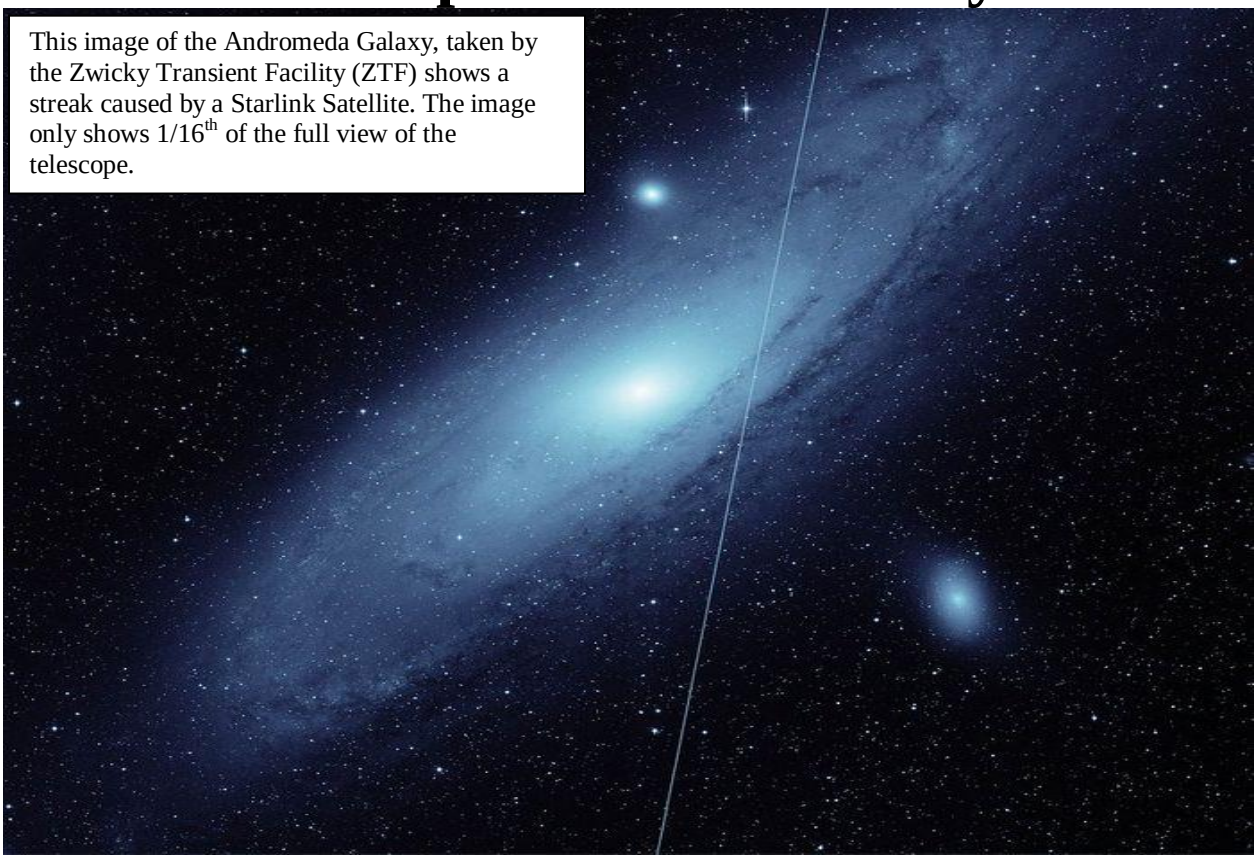
Of the full field of view of the telescope

"NASA's Lunar Reconnaissance Orbiter (LRO) will not be in a position to observe the impact as it happens," a NASA statement sent to Inside Outer Space explained.
"However, the mission team is assessing if observations can be made to any changes to the lunar environment associated with the impact and later identify the crater formed by the impact. This unique event presents an exciting research opportunity," the NASA statement added.

"Following the impact, the [LRO] mission can use its cameras to identify the impact site, comparing older images to images taken after the impact. The search for the impact crater will be challenging and might take weeks to months." Source: https://www.space.com/spacex-falcon-9-moon-crash-one-month-away

FEB 04, 2022 8:20 AM PST

SpaceX Starlink Satellites: An Astronomical Impact on Astronomy



This image of the Andromeda Galaxy, taken by the Zwicky Transient Facility (ZTF) shows a streak caused by a Starlink Satellite. The image only shows 1/16th of the full view of the telescope.

The spaceflight company SpaceX would like to provide low-cost internet to remote locations, uniting the entire world through a network of satellites. SpaceX CEO Elon Musk first announced this project, named Starlink, in January 2015, noting that they would like to have 42,000 satellites in their "megaconstellation." This sounds like a great idea in theory, but at what cost?
Starlink is problematic for a number of reasons. Have you ever seen a satellite streak across the night sky? You might begin to see more of these when you are stargazing. Another problem is the amount of debris that already exists in orbit around Earth. There are approximately 36,500 objects in orbit larger

than 10 cm, and when you look at the number of smaller debris (1 mm - 10 cm), the total rises to the hundreds of millions according to the European Space Agency. However, the biggest concerns have been expressed by astronomers, noting that these satellites will interfere with ground-based astronomical observations.

How? The Starlink satellites appear as streaks in astronomical images, and renders the data unusable.

In a recent study, Przemek Mróz and his team studied archival images from the Zwicky Transit Facility (ZTF) obtained between November 2019 and September 2021. The ZTF, funded by the National Science Foundation and operated by Caltech's Palomar Observatory, scans the entire night sky over the course of two days and aims to catalogue and quantify astronomical objects that change over time (e.g., supernovae, near-Earth asteroids). The images show an increase in the number of satellite streaks observed over time. Specifically, there were 5,301 satellite streaks in the images, and the percentage of images affected by these streaks has grown from 0.5% to almost 20% from 2019-2021, according to Dr. Mróz.

The Starlink satellites are currently the largest low-Earth orbit constellation, and their orbits have been well studied and characterized. The team found that the streaks were more prevalent in twilight observations – those taken at dusk or dawn. Unfortunately, these times are the most important to observe near-Earth asteroids that appear close to the sun in the sky. In the near future, the team expects that almost all images taken by the ZTF during twilight will contain at least one streak. To diminish the problems caused by the Starlink satellites, software can be developed to predict the locations of the satellites at any given time, thus helping astronomers to avoid scheduling observations when a satellite may be in the telescope's field of view.

After receiving feedback from the astronomical community, SpaceX altered the satellites by adding visors to block sunlight from reflecting off the spacecraft. The team studied their effectiveness and found they reduce satellite brightness by a factor of 5, but this still does not make the satellites dim enough to meet the standards outlined by the Satellite Constellations 1 (SATCON 1) workshop in 2020, sponsored by the National Optical-Infrared Astronomy Research Laboratory and the American Astronomical Society. The goal of this workshop was for astronomers, policymakers, and other experts to gather and discuss the impact of large satellite constellations on the astronomical community.

All ground-based observatories will be affected by Starlink. The most notable is the Vera C. Rubin Observatory, currently under construction in Chile. The Rubin Observatory will survey the sky nightly, and has been designed to be much more sensitive – the telescope can image much fainter objects than ZTF – thus, one could imagine that the images taken by this telescope could be much more negatively affected by satellite streaks.

Feb 04, 2022 Please Take the time to watch this You Tube Video

What Elon Musk's 42,000 Satellites Could Do To Earth - YouTube

Sources: Caltech.edu, Sky & Telescope Author: Kristina Punzi. PH.D.

PhD in Astrophysics

She is a stellar astrophysicist by training with a passion for formal and informal education and diversity and inclusion in STEM. She loves to take a humanistic approach to her work and firmly believes that all of humanity is united under one sky.

ASTRONOMY COLUMN

February Events:

1 *New Moon at 5:48 UT. Start of lunation 1226.*
3 *Moon near Jupiter at 1h UT (evening sky). Mag. −2.0.*
4 *Saturn at conjunction with the Sun at 19h UT. The ringed planet (not visible) passes into the morning sky.*
5 *Mars 0.2° from M22 (globular star cluster) at 9h UT (38° from Sun, morning sky). Mags. 1.4 and 5.2.*
7 *Moon near Uranus (82° from Sun, evening sky) at 21h UT. Occultation visible from Antarctica. Mag. +5.8.*

8 *First Quarter Moon at 13:51 UT. 9 Moon near the Pleiades at 12h UT (evening sky).*
9 *Venus at its brightest at 14h UT. Mag. −4.7.*
10 *Moon near Aldebaran at 7h UT (evening sky).*
11 *Moon at apogee (farthest from Earth) at 3h UT (distance 404,897 km; angular size 29.5').*
12 *Moon near M35 star cluster at 5h UT (evening sky).* ***12*** *Venus shows greatest illuminated extent (337 square arc seconds) at 22h UT. Mag. −4.6*
13 *Moon near Castor at 18h UT (evening sky).*
14 *Moon near Pollux at 0h UT (evening sky).*
15 *Moon near Beehive cluster M44 at 3h UT (evening sky).*
16 *Full Moon at 16:58 UT.* ***16*** *Mercury at greatest elongation west at 21h UT (26° from Sun, morning sky). Mag. 0.0.* ***16*** *Moon near Regulus at 22h UT (midnight sky).*
21 *Moon near Spica at 0h UT (morning sky).*
23 *Last Quarter Moon at 22:33 UT.*
24 *Moon near Antares at 8h UT (morning sky).*
26 *Moon at perigee (closest to Earth) at 22:39 UT (distance 367,789km; angular size 32.5').*
27 *Moon near Venus at 7h UT (47° from Sun, morning sky). Mag. −4.6.* ***27*** *Moon near Mars at 11h UT (44° from Sun, morning sky). Mag. 1.3.*
28 *near Mercury at 23h UT (24° from Sun, morning sky). Mag. −0.*

Join Zoom Meeting
:
https://us02web.zoom.us/j/6727499334?pwd=VWhuVGZ3aFphL283THRKNUNoZ0RSZz09

Evidence Hints at Ancient Life on Mars

Scientists have found a chemical signature that hints at ancient life on Mars. But other possible explanations remain.

NASA's Curiosity rover has collected and analyzed samples of Martian sediments, revealing a chemical signature that hints at ancient life on the Red Planet. These findings, published in the January 25th *Proceedings of the National Academy of Sciences*, are some of the best evidence yet for biological processes on Mars. Other mechanisms may account for the intriguing chemistry, however.

This mosaic, made from images taken by the Mast Camera aboard NASA's Curiosity rover, shows the landscape of the Stimson sandstone formation in Gale Crater. In this general location, Curiosity drilled the Edinburgh drill hole, a sample from which was enriched in carbon-12. *NASA / Caltech-JPL / MSSS*

THE DETAILS ARE IN THE CARBON

Since 2012 Curiosity has been exploring Gale Crater, an impact basin targeted because it hosted a river delta and a lake 3 billion years ago, when Mars had a far more hospitable climate. In the search for evidence of past life on Mars, the Curiosity team has subjected ancient deposits of waterborne sediments exposed by eons of weathering to a battery of tests that include *carbon isotope* analysis.

Two stable isotopes of carbon occur in nature: carbon-12 and carbon-13. 98.9% of Earth's carbon is carbon-12, which has 6 protons and 6 neutrons in its nucleus. Almost all remaining terrestrial carbon is the carbon-13 isotope, which has 7 neutrons. One in every trillion carbon atoms are a third, unstable isotope, carbon-14, which has 8 neutrons. Its radioactive half-life of 5,730 years is the basis of the dating method that archeologists use to determine the age of organic objects.

The relative quantities of carbon-12 and carbon-13 throughout the solar system are essentially the same as those in the primordial solar nebula, the cloud of gas and dust that condensed to form the Sun and its retinue of planets 4.6 billion years ago. On Earth, variations in the carbon isotope ratio arise here and there as a variety of geological and biological processes, known as the *carbon cycle*, exchange carbon between the atmosphere, rocks, soils, and bodies of water.

The lighter carbon-12 isotope, which forms weaker chemical bonds, undergoes chemical reactions at a slightly faster rate than carbon-13, so it's more likely to be incorporated into biological materials. As a result, biogenic carbon compounds contain comparatively less carbon-13 than do carbon compounds in the atmosphere or rocks.

CARBON . . . FROM LIFE?

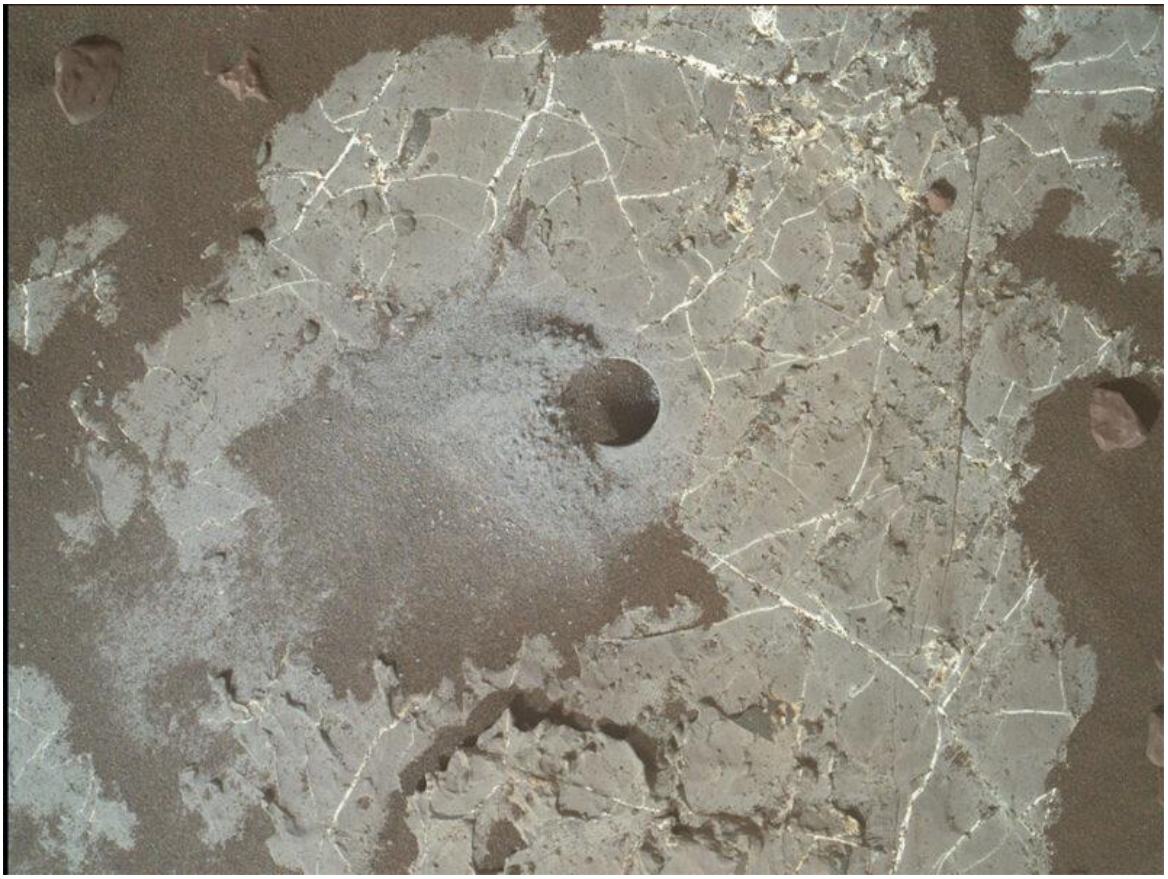
The Curiosity team, led by Christopher H. House (Penn State), found that several Gale Crater sediment samples have far less carbon-13 compared to carbon-12 than the carbon dioxide in the Martian atmosphere or the Martian meteorites that have landed on Earth.

Such extreme carbon-13 depletion also occurs on Earth in layered sedimentary formations known as *stromatolites*. These 2.7 billion year–old remains of some of the earliest life forms contain fossilized mats produced by microorganisms that consumed methane (CH_4).

At the present time, there are only tiny traces of methane in the Martian atmosphere, measured in parts per billion. But Curiosity and the Mars Express orbiter have detected several sudden spikes in methane concentrations, perhaps gas released from subsurface reservoirs that disappears rapidly.

Controversy surrounds the origin of Martian methane. Chemical reactions between water, carbon dioxide, and minerals like olivine may be responsible, but production by microbes remains an intriguing possibility.

To House, the extreme carbon-13 depletion has several possible explanations, including two chemical reactions not related to biology and one that could be related to microbial life. At this time, though, all three possibilities require further investigation.



This image shows another drill hole, called Highfield, made by NASA's Curiosity rover as it was collecting a sample on Vera Rubin Ridge in Gale Crater on Mars. Drill powder from this hole was enriched in carbon-12. *NASA / Caltech-JPL / MSSS*

ALTERNATIVE SCENARIOS

It's possible methane-consuming microbes on the planet's surface metabolized the methane and sequestered its carbon in sediments. But there's no "smoking gun" evidence (like fossilized microbial mats) to indicate that methane-consuming microbes were ever present on Mars, and solar ultraviolet radiation and wind-driven erosion are also capable of binding methane with Martian surface materials.

In fact, there may be ways to explain carbon-13 depleted sediments that don't involve methane at all. The investigators cautiously cite two alternative mechanisms.

As the solar system orbits the center of the Milky Way Galaxy every 230 million years, it passes through tenuous clouds of gas and dust containing material with different proportions of carbon-12 to carbon-13 than the primordial solar nebula. These encounters deposit minute amounts of material on Earth, but geochemists have detected traces of past passages. To concentrate in sedimentary layers on Mars, the Curiosity team envisions cosmic dust accumulating on the surface of glaciers until they melted, leaving layers of sediment with anomalous carbon isotope ratios. While this explanation is plausible, there's no evidence of past glaciers in Gale Crater.

A second way to reproduce the carbon isotope ratio may occur when ultraviolet radiation from the Sun converts carbon dioxide and water vapor in the Martian atmosphere into formaldehyde and other organic compounds. In the laboratory this transformation requires exotic catalysts, so it's by no means certain that it happens on Mars.

"[The paper] is impressive in the breadth of possibilities," says Michael Mumma (Goddard Space Flight Center), who was not involved in the study.

All three possibilities point to a Martian carbon cycle unlike anything on Earth today, but we'll need more data to determine which scenario is correct. Curiosity continues to collect and analyze samples in Gale Crater, and investigators are especially keen to use the rover's mass spectrometer on a future methane plume to see if its carbon isotope ratio indicates a biological origin. Source: Evidence Hints at Ancient Life on Mars - Sky & Telescope - Sky & Telescope (skyandtelescope.org)

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

A Note from your Editor

This newsletter is sent directly to 183 folks and available to many more that visit our website ChinaLakeAstro.org . There are so many interesting things that are of interest going on in the field and so many things "you may be doing" that we would love to hear about. Please consider writing an article and sending it my way so it can be added in. Photographs, field trips, book reviews, etc. Just about anything related to Astronomy, Space Science, or related fields. Use your imagination.

Hope to hear from you soon. Remember this is your Newsletter.

Keep looking up.

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

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Meetings of the China Lake Astronomical Society are held at the Maturango Museum at 7:30 p.m. on the first Monday evening of each month, except when the first Monday is a holiday.

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