NIGHTFALL

A PUBLICATION OF THE HUACHUCA ASTRONOMY CLUB

OCTOBER 2023

DR. AMY LOWITZ – SPEAKER AT THE OCTOBER HAC MEETING

Title: "Cosmology at the End of the Earth: Why and how we study the universe from the South Pole"

Summary: The Amundsen-Scott South Pole Research Station is home to four major telescopes and an atmospheric research observatory. In this lecture, we will look at what science is being done at the South Pole and why it's worth it to build these instruments in such a remote and inhospitable place.

Bio: Dr. Amy Lowitz received her bachelor of science degree from Brown University and her doctoral degree in physics from the University of Wisconsin - Madison. In 2016, she lived and worked for 11 months at the Amundsen-Scott South Pole station, an NSF-operated research base located at the geographic South Pole, in Antarctica. She worked on detector and readout hardware development for the South Pole Telescope at the University of Chicago from 2017-2020, and after a brief detour to industry, is now a scientist in the Astronomy Department at the University of Arizona, working on hardware development for the Event Horizon Telescope.

2024 BOARD CANDIDATES AND GENERAL ELECTION

BY MARK ORVEK

The election for our 2024 Board of Directors is coming soon. The election process is spelled out on the HAC Constitution and By-Law (refer to the link below). In this article, I refer to key sections regarding the election process.

From our By-Laws:

"**Article IV, Section V: GENERAL ELECTIONS** Candidates shall be nominated from the floor or by a Board of Director appointed nominating committee consisting of three members at either or both of the meetings immediately preceding the November annual business meeting. No more than one Member-at-Large Board member shall be a member of the nominating committee. It shall be the duty of the Nominating Committee to submit the names of a candidate for each Director and Officer to be elected under these Articles. Write-in candidates must accept their nomination in person or in writing before the vote is taken. Nominees' names shall be published in the Club Newsletter at least thirty days prior to the election meeting. Nominations for elective offices must be submitted prior to the publishing deadline to be officially included on the ballot; however, nominations for write-in candidates shall be accepted from the floor at the November meeting.

An official count of the votes shall be made for the record. Two neither non-candidate nor office holding members and the Secretary, known as the Teller Committee, shall count election Ballots. This is in lieu of a secret ballotThe two Club members, whom the President appoints to count the ballots in collaboration with the Secretary, shall open and count all absentee ballots for the relevant votes. Proxies are not allowed under any circumstances. In the case of officers, if no candidate receives a majority vote or there is a tie, another ballot will be handed out and balloting will continue until a candidate for each office has been elected by a majority vote."

From the Constitution:

"**Article IV, Section VI: GENERAL ELECTIONS:** The Board of Directors shall be elected at the annual business meeting in November by secret ballot for a term of one year. Absentee ballots will be accepted no later than the time of voting at the annual business meeting. In the event that the election ballot for the Board of Directors has no contested positions a simple show of hands shall be made to approve or disapprove the board as nominated. In the event that the elections are delayed, the incumbents shall continue to serve until their

successors are elected. The candidate for each office, or candidates for the election of Members-at-Large, receiving the majority vote for each office are to be declared the winner(s). A majority is one more than half of the votes cast. Newly elected members of the board shall take office on December 1st following their election at the November General Meeting."

The Nominating Committee (consisting of Karen Peitsmeyer, Mike Perron and myself) for the 2024 HAC Board is nominating the following candidates for the 2024 Board of Directors:

Board of Director positions to be voted (8 members in total):

- Officer Candidates:
  - President - Penny Brondum
  - Vice President - Jim Reese
  - Secretary - Katherine Zellerbach
  - Treasurer - Ted Forte
- Members-at-Large: (4 total)
  - Gary Grue
  - Vince Sempronio
  - Richard Lighthill
  - Mike Morrison

Nominations for write-in candidates from the floor will be accepted at the November 3rd general meeting. If there are additional nominees for any of the Officer positions or more than 4 nominees for Member-at-Large positions, we will follow the procedure stated in the Constitution (as noted above).

The official vote for the 2024 Board of Directors will take place at the November 3rd general member meeting.

If you have any questions, please contact me (Mark Orvek) by email: morvek@yahoo.com.

Oct. 11 – OSIRIS-REx Asteroid Bennu Sample Reveal Event

NASA will hold a news conference and media day when the first samples collected from the asteroid Bennu are revealed at NASA's OSIRIS-REx Curation Laboratory, at the agency's Johnson Space Center in Houston. Watch on https://www.nasa.gov/nasatv/ The News conference is scheduled for 8 a.m. MST

October 14 - Kartchner Star Party

View the partial solar eclipse: First Contact: 8:12 a.m. Mid Eclipse: 9:34 a.m. Last Contact: 11:05 a.m.

At 5pm in the in the Tenen–Tufts theater in the discovery center: Finding Other Earths a talk by Dr. Tyler Robinson.

Stargazing after dark.

The official hours of the party are from 8 a.m. until 11:30 a.m. and 4 p.m. to 9 p.m. HAC members arriving to set up telescopes for the star party are entitled to free admission to the park. The Bat Cave Café has very limited hours and limited choices. You should plan to bring your own food.

October Outreach

October 14, 8 a.m. to 11:30 a.m. "Eclipse Watch" at the Sierra Vista Library.

October 19, 6:30 p.m. start. Public Night at Patterson Observatory (We have 85 registered guests)

October 20, 6:30 p.m. to 8:30 p.m. we host 11th grade students from Veritas

October 26, 9 a.m. to 11 a.m. Elementary age special ed students at Patterson (Skills Group field trip)

October 27, 9 a.m. to 11 a.m. Middle and H.S. special ed students at Patterson (Skills Group field trip)

Watch HacAstro on Groups.io for new events.

2024 HAC Dues

Most HAC memberships expire in December. It's never too early to pay your 2024 annual dues. Dues are $25 Regular, $35 Family ($20 and $25 active duty military) $10 Student. If you joined HAC in 2023, your dues will be due on the anniversary of your joining and you will be asked to pay a pro-rated amount to adjust your membership to December to coincide with the calendar year.

HAC dues payment options

1. You can pay your dues in person by cash or check made out to Huachuca Astronomy Club. See the treasurer, Ted Forte, at a meeting or event.

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

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

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

5. If you have a Zelle account with your bank, you can make a dues payment by transferring funds to twforte@powerc.net

Initial Curation of NASA's OSIRIS-REx Sample

By Rachel Barry
NASA's Johnson Space Center, Houston

(Sent by Ted Forte)

The initial curation process for NASA's OSIRIS-REx sample of asteroid Bennu is moving slower than anticipated, but for the best reason: the sample runneth over. The abundance of material found when the science canister lid was removed earlier this week has meant that the process of disassembling the TAGSAM (Touch-and-Go Sample Acquisition Mechanism) head – which holds the bulk of material from the asteroid – is off to a methodical start.

NASA curation team members along with Lockheed Martin recovery specialists look on after the successful removal of the sample return canister lid. Credit: NASA/Robert Markowitz

After the collection event on Bennu three years ago, scientists expected they could find some asteroid material in the canister outside the TAGSAM head when they saw particles slowly escaping the head before it was stowed. However, the actual amount of dark particles coating the inside of the canister lid and base that surrounds the TAGSAM is even more than they'd anticipated.

"The very best 'problem' to have is that there is so much material, it's taking longer than we expected to collect it," said deputy OSIRIS-REx curation lead Christopher Snead of NASA's Johnson Space Center. "There's a lot of abundant material outside the TAGSAM head that's interesting in its own right. It's really spectacular to have all that material there."

The first sample collected from outside the TAGSAM head, on the avionics deck, is now in the hands of scientists who are performing a quick-look analysis, which will provide an initial understanding of the Bennu material and what we can expect to find when the bulk sample is revealed.

"We have all the microanalytical techniques that we can throw at this to really, really tear it apart, almost down to the atomic scale," said Lindsay Keller, OSIRIS-REx sample analysis team member from Johnson.

The quick-look research will utilize various instruments, including a scanning electron microscope (SEM), infrared measurements, and x-ray diffraction (XRD), to gain a better understanding of the sample.

The SEM will offer a chemical and morphological analysis, while the infrared measurements should provide information on whether the sample contains hydrated minerals and organic-rich particles. The x-ray diffraction is sensitive to the different minerals in a sample and will give an inventory of the minerals and perhaps an indication of their proportions.

"You've got really top-notch people and instruments and facilities that are going to be hitting these samples," Keller said.

This quick-look science is a tool that will offer more data to researchers as they approach the larger pieces of sample for follow-on analysis.

Over the coming weeks, the curation team will move the TAGSAM head into a different specialized glovebox where they will undertake the intricate process of disassembly to ultimately reveal the bulk sample within.

A Dark Sky-Friendly Home

By Janet de Acevedo Macdonald

Jeff Pregler, senior planner with the City of Sierra Vista, spoke at our September meeting on Sierra Vista lighting policies, recent additions, existing and future lights at City facilities, what it does to make its outdoor lighting more dark sky friendly, and how the public can provide input in shaping future lighting codes. The presentation was very interesting and frank. Not only did Mr. Pregler outline plans that had come to fruition, but he also spelled out myriad challenges faced due to differing city, county, and state lighting policy regulations.

During the Q&A portion of the meeting, the Tucson-based 501(c)(3) nonprofit organization DarkSky.org (formerly International Dark-Sky Association) was mentioned as an excellent resource for anyone interested in learning what they can do at home to protect our night skies for present and future generations.

DarkSky has an approved program that provides objective, third-party certification for products, designs, and completed projects that minimize glare, reduce light trespass, and don't pollute the night sky.

One valuable, hands-on resource it provides is its database of DarkSky-approved lighting products and companies, so you know which products to choose from to update your outdoor residential lighting.

Read more about these products and companies at this link:

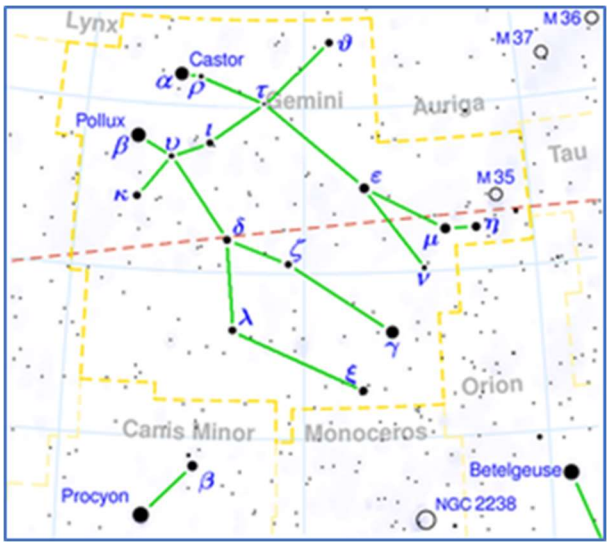
https://darksky.org/what-we-do/darksky-approved/products-companies/

President's Constellation Exploration (Oct 2023)

Last month I began an exploration of constellations based on this graphic which shows how to use stars in the big dipper to find four major constellations in the night sky. The intent is to explore one constellation a month. Last month was Ursa Minor so going clockwise this month is Gemini.

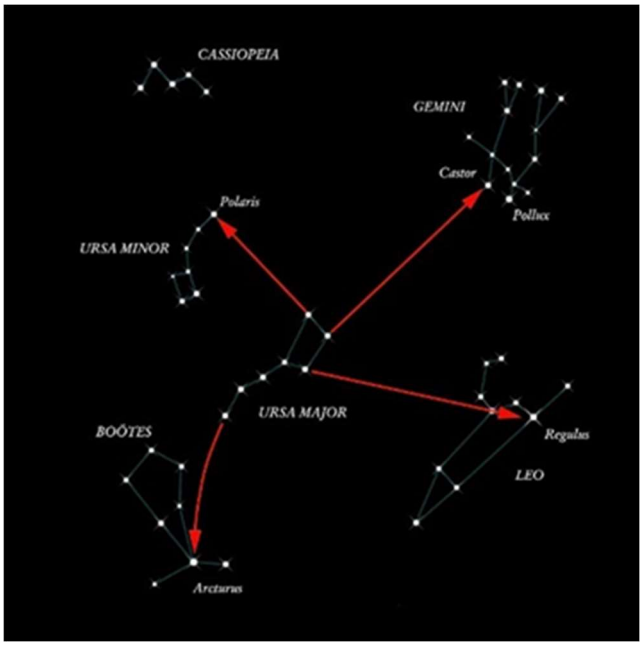
Gemini is one of the constellations of the zodiac and is located in the northern celestial hemisphere. It was one of the 48 constellations described by the 2nd century AD astronomer Ptolemy, and it remains one of the 88 modern constellations today. Its name is Latin for twins, and it is associated with the twins Castor and Pollux in Greek mythology.

The constellation Gemini as it can be seen with the unaided eye, with added connecting lines.



In classical antiquity, Cancer was the location of the Sun on the northern solstice (June 21). During the first century AD, axial precession shifted it into Gemini. In 1990, the location of the Sun at the northern solstice moved from Gemini into Taurus, where it will remain until the 27th century AD and then move into Aries. The Sun will move through Gemini from June 21 to July 20 from now through 2062.

Gemini is prominent in the winter skies of the northern Hemisphere and is visible the entire night in December–January. The easiest way to locate the constellation is to find its two brightest stars Castor and Pollux eastward from the familiar V-shaped asterism (the open cluster Hyades) of Taurus and the three stars of Orion's Belt (Alnitak, Alnilam, and Mintaka). Another way is to mentally draw a line from the Pleiades star cluster located in Taurus and the brightest star in Leo, Regulus. In doing so, an imaginary line that is relatively close to the ecliptic is drawn, a line which intersects Gemini roughly at the midpoint of the constellation, just below Castor and Pollux.



When the Moon moves through Gemini, its motion can easily be observed in a single night as it appears first west of Castor and Pollux, then aligns, and finally appears east of them.

In Babylonian astronomy, the stars Castor and Pollux were known as the Great Twins. The Twins were regarded as minor gods and were called Meshlamtaea and Lugalirra, meaning respectively 'The One who has arisen from the Underworld' and the 'Mighty King'. Both names can be understood as titles of Nergal, the major Babylonian god of plague and pestilence, who was king of the Underworld.

In Greek mythology, Gemini was associated with the myth of Castor and Pollux, the children of Leda. Pollux was the son of Zeus, who seduced Leda, while Castor was the son of Tyndareus, king of Sparta and Leda's husband. Castor and Pollux were also mythologically associated with St. Elmo's fire in their role as the protectors of sailors. When Castor died, because he was mortal, Pollux begged his father Zeus to give Castor immortality, and he did, by uniting them together in the heavens. In Chinese astronomy, the stars that correspond to Gemini are located in two areas: the White Tiger of the West (Xī Fāng Bái Hǔ) and the Vermillion Bird of the South (Nán Fāng Zhū Què).

The Gemini constellation contains 85 naked eye stars. The brightest star in Gemini is Pollux, and the second-brightest is Castor. Although the characters of myth are twins, the actual stars are physically very different from each other.

Gemini contains several deep sky objects: M35 (NGC 2168) is a large, elongated open cluster of magnitude -5, discovered in the year 1745 by Swiss astronomer Philippe Loys de Chéseaux. It has an area of approximately 0.2 square degrees, the same size as the full moon. The 200 stars of M35 are arranged in chains that curve throughout the cluster; it is 2800 light-years from Earth. Another open cluster in Gemini is NGC 2158, visible in large amateur telescopes and very rich, it is more than 12,000 light-years from Earth. NGC 2392 is a planetary nebula with an overall magnitude of

9.2, located 4,000 light-years from Earth. In a small amateur telescope, its 10th magnitude central star is visible, along with its blue-green elliptical disk. It is said to resemble the head of a person wearing a parka. The Medusa Nebula is another planetary nebula, some 1,500 light-years distant. Geminga is a neutron star approximately 550 light-years from Earth. Other objects include NGC 2129, NGC 2158, NGC 2266, NGC 2331, NGC 2355, and NGC 2355.

The Geminids is a bright meteor shower that peaks on December 13–14. It has a maximum rate of approximately 100 meteors per hour, making it one of the richest meteor showers.

The Epsilon Geminids peak between October 18 and October 29 and have only been recently confirmed. They overlap with the Orionids, which make the Epsilon Geminids difficult to detect visually. Epsilon Geminid meteors have a higher velocity than Orionids.

A bit of trivia, NASA named its two-person space capsule Project Gemini after the zodiac sign because the spacecraft could carry two astronauts. In astrology Gemini (♊)is the third astrological sign in the zodiac. Under the tropical zodiac, the sun transits this sign between about May 21 to June 21. It is a positive, mutable sign.

I hope you take this as a positive sign that you can change and learn things at any age as you explore our night sky. I hope you will enjoy finding Gemini and exploring more about our night skies.

The Bucket List – October 2023

by Vince Sempronio

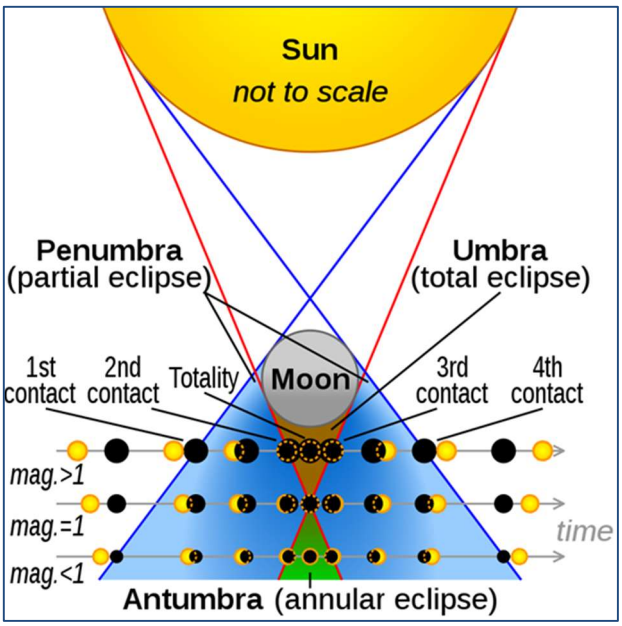
This column highlights interesting non-seasonal nighttime, and sometimes daytime sky events that the reader may not be aware of and may wish to observe. I'll cover one-off events that are special, rare, or uncommon.

ASTRONOMY TERM OF THE MONTH

Considering that we have an upcoming solar eclipse, it is a good opportunity to review some terms that are used in describing the progress of the Moon as it crosses the disc of the Sun. The upcoming solar eclipse on October 14th is an annular eclipse. This type of solar eclipse occurs when the apparent size of the Moon is smaller than the apparent size of the Sun. This means that no matter where you are, the Moon will not completely cover the Sun. The amount of the Sun that is covered by the Moon is called its magnitude, not to be confused with the term that describes how bright an object appears. The magnitude of an eclipse is measured in percentages. It is the ratio between the apparent size of the Moon to the apparent size of the Sun. If the magnitude is 100% or greater, then the eclipse is a total eclipse, and if less than 100%, then the eclipse is an annular eclipse. The magnitude of this October's solar eclipse is 95.2%. Depending on where you are along the path of this eclipse you will see either part of the Sun covered by the Moon (the eclipse is "partial" from your location), or you will see the entire disc of the Moon surrounded by a bright ring (annulus) of light from the Sun. When the edge of the Moon first contacts the edge of the Sun, this is referred to as First Contact. This is the instant that the eclipse begins at your specific location. Likewise, when the Moon finally fully passes across the surface of the Sun, at the exact moment when the last remnants of the edge of the Moon disappears, this is Fourth Contact. There are two additional contact points, but they only occur if you are in the path of totality, whether that is a total eclipse, or an annular eclipse. The path of totality is the path along the ground where the total phase of the eclipse is visible. If the eclipse is partial from your location, there isn't a Second or Third Contact event. Second Contact marks the beginning of the totality phase of a solar eclipse. This happens when the trailing edge of the moon is fully inside the ring of light (for an annular eclipse), or when the edge of the Sun disappears completely behind the Moon (total eclipse). Second Contact is spectacular for a total eclipse, whereas you can't even notice (without a telescope) when Second Contact occurs for an annular eclipse. Likewise, Third Contact announces the end of the totality for an eclipse. For an annular eclipse, the leading edge of the Moon will cut into the limb of the Sun. For a total eclipse, the brightness of the Sun will appear suddenly. The only remaining term we'll discuss is Maximum Coverage. This is the time, from your location where the maximum amount of the Moon is covering the Sun. For locations inside the path of totality, this is the central time of the eclipse. For those observing in the umbra, this time will vary, depending on where you are located. Figure 1 shows the various geometries of the types of solar eclipses.

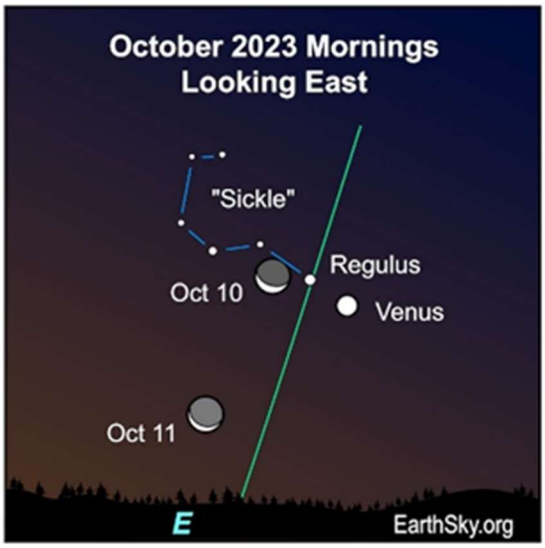
TRIVIA QUESTION OF THE MONTH

Some of us know about Pi day which is the 14th of March each year. For those of you not familiar with it, March is the third month and the 14th day, put them together you get 3.14. Ok, a stretch, but I didn't come up with it! So, I guess if you want to be technical, there should be a Pi date and time which would be on the 14th of March at 15 hours, 9 minutes, and 26.5 seconds. But I digress. This date is the birthday of a very famous theoretical physicist and is also the date that another theoretical physicist and cosmologist died. What are their names?



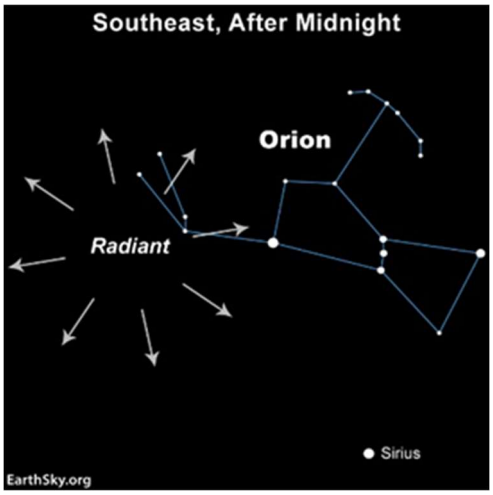
IN THE SKY

Look for the Moon near the star Regulus and the planet Venus before sunrise on the morning of October 10th. They will form a striking grouping in the East.



October 14th, 8:12am – New Moon and Annular Solar Eclipse. This is the only time when you can see a New Moon! This eclipse can only be considered a teaser or warmup compared to the April 2024 total eclipse but is an eclipse none the less. From the perspective of an occultation observer, this is referred to as a partial occultation of a star from the satellite of a planet. HAC will offer public viewing of the eclipse from Kartchner Caverns State Park. where 77% of the sun is covered, beginning at 8:12:57am local time. The maximum coverage is at 9:35:17am and finally the event ends at 11:06:59am. The image shows the Sun and Moon at maximum coverage. For those who wish to travel to the center line (NM is the closest), the Moon will cover 95% of the Sun.

The Orionid Meteor shower peaks this year around on the evening of October 22nd. The moon is at first quarter and will set around midnight, so if you are up late, look for the tell-tell signs of an Orionid meteor.



They are fast moving and sometimes leave a persistent tail. In dark skies you may see 10 20 an hour. Meteor showers are a good opportunity to try some wide field astrophotography. The best tools are a DSLR with a wide-angle lens and a camera tracking device. An EQ mount with a motor drive works well too! Who knows, if you are lucky you might catch a bright fireball.

NASA Night Sky Notes October 2023

This article is distributed by NASA Night Sky Network

The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.org to find local clubs, events, and more!

From Galileo to Clipper, Exploring Jupiter's Moons

By Vivian White

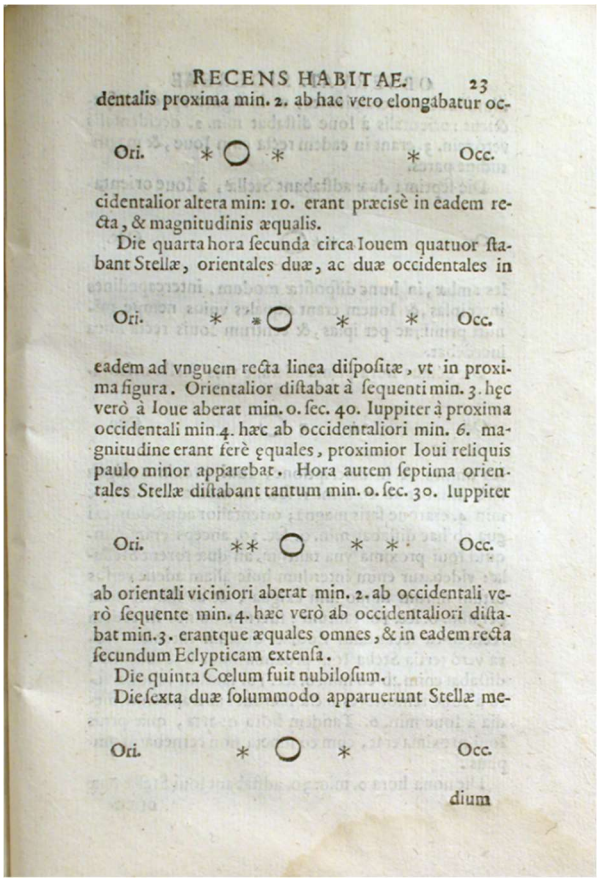
We, too, are made of wonders, of great
and ordinary loves, of small invisible worlds,
of a need to call out through the dark."

From *In Praise of Mystery: A Poem for Europa*
by Ada Limon

As autumn begins, if you're up late, you may notice a bright point of light rising in the east. Look a bit closer, with a pair of binoculars, and you'll notice it's not a star at all. While stars look point-like no matter how big your backyard telescope, this light appears as a circle under closer examination. Even more curious, you will likely see a line of smaller dots on one or both sides. Congratulations! You've rediscovered the king of the planets - majestic Jupiter - and its four largest moons.

Galileo famously chronicled the four moving dots near Jupiter and surmised that they were orbiting the distant world. While Jupiter has well over 80 discovered moons as of September 2023, these brightest four are called the "Galilean Moons" - Io, Europa, Ganymede, and Callisto. (Great mnemonics exist to remember these in order of distance from Jupiter, such as "I Eat Green Caterpillars") You can follow these like Galileo did, using stargazing apps or the handy image below. A favorite beginning observing challenge is to track the movement of the Galilean Moons over the course of many nights. Even within a few hours, you will notice them moving in relation to Jupiter, just as Galileo did.

Fast forward 414 years, and NASA will be sending a robotic mission to investigate the surface of one of these distant worlds. The Europa Clipper Mission is launching to the cold, icy moon in 2024, to begin orbiting in 2030. With its salty oceans covered by ice, Europa was chosen as an excellent location to continue the search for life outside of Earth. Clipper will be the largest spacecraft ever sent to another planet, designed to withstand Jupiter's punishing radiation. Once it arrives at Jupiter in 2030, NASA plans to do about 50 flybys of Europa, mapping almost the entire surface of this watery world.



RECENS HABITAE. 23

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Ori. * ○ * * Occ.

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Ori. * * ○ * * Occ.

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Ori. ** ○ * * Occ.

ab orientali viciniori aberat min. 2. ab occidentali verò sequente min. 4. hæc verò ab occidentaliori distabat min. 3. erantque æquales omnes, & in eadem recta secundum Eclypticam extensa.

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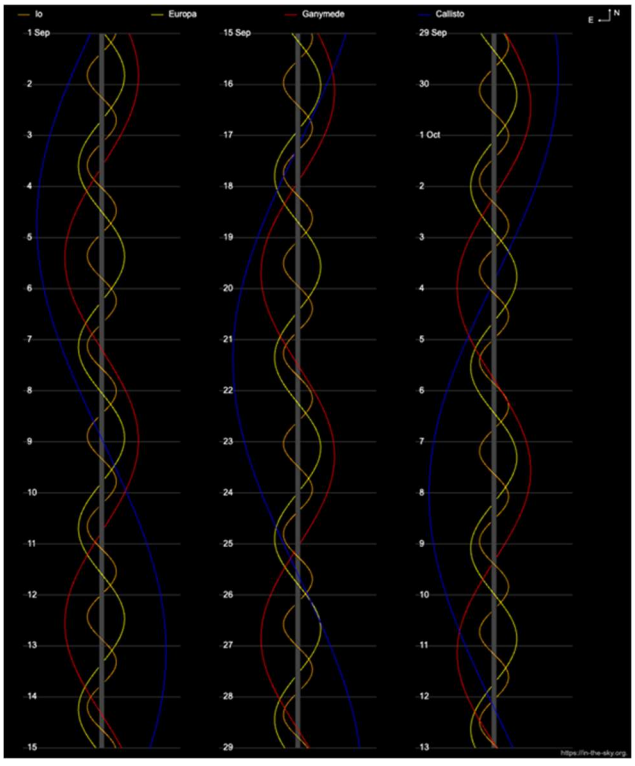
Die sexta duæ solummodo apparuerunt Stellæ me-

Ori. * ○ * Occ.

dium

Galileo's drawings of Jupiter and its Medicean Stars from Sidereus Nuncius. Image courtesy of the History of Science Collections, University of Oklahoma Libraries.



The position of the Galilean Moons of Jupiter in October 2023: https://in-the-sky.org/jupiter.php

What was once only dreamed of in the small telescope of Galileo, or in great works of fiction, NASA is turning our

wildest imagination into reality. One of the celebrated quotes from the classic 2010: Odyssey Two warns, “All these worlds are yours, except Europa. Attempt no landing there.” Science fiction fans can feel relieved knowing that writer Arthur C. Clarke gave his blessing for the Europa Clipper mission.

Join the Europa Message in a Bottle Campaign to send your name with the spacecraft, hear the rest of the poem by the US Poet Laureate, and learn more about the wonders of space travel with the Clipper Mission: https://europa.nasa.gov/participate

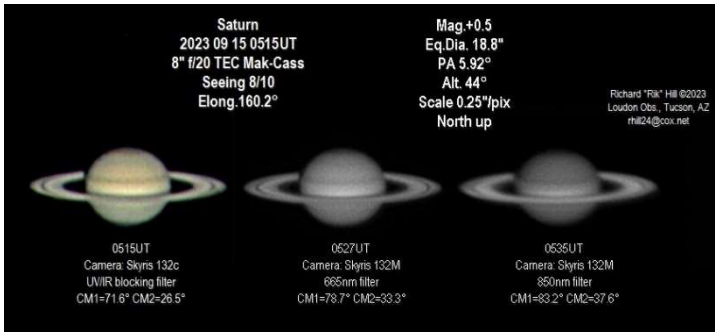
Watch a wonderful Clipper webinar with Dr. Cynthia Phillips, planetary geologist with the mission: https://www.youtube.com/live/RnnLJBLRBCA?feature=shared&t=269

Items For Sale ? Telescope Swap Meet

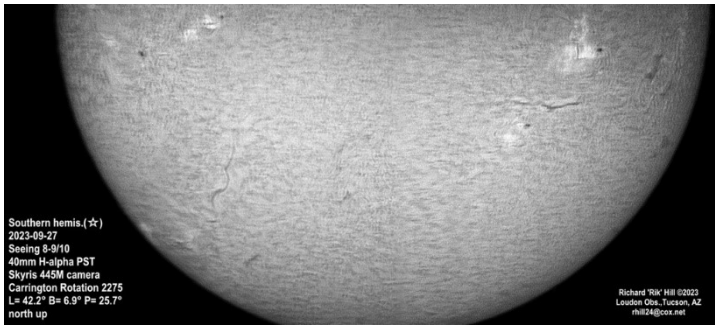
Mark your calendars. HAC will host a telescope swap meet at the Patterson Observatory on Saturday, November 18. Watch HacAstro on groups.io for details including a list of telescopes and other items.

This is a good time to clear you closets or prepare you r holiday wish list because many great telescope and astrophotography equipment will be for sale.

Pictures from HAC Astro

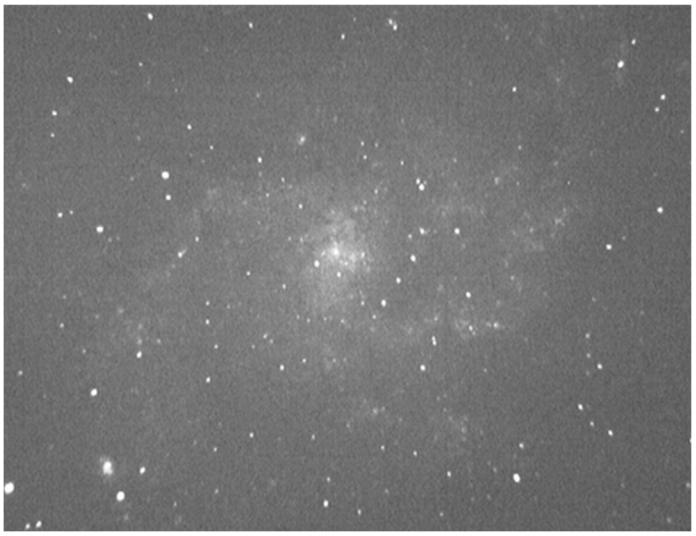


Saturn by Rik Hill



Sun in H Alpha by Rik Hill

M33 (Triangulum Galaxy) by Mark Orvek



M33 (Triangulum Galaxy) by Vince Sempronio

M27 Dumbbell Nebula by Richard Lighthill

M16 Eagle Nebula by Richard Lighthill

M17 Swan Nebula by Richard Lighthill

in Black and White

Milky Way North of Sagittarius by Richard Lighthill

Club Officers and Contacts

President: *Penny Brondum* ***Vice President:*** *Karen Madtes*

Secretary: *Katherine Zellerbach* ***Treasurer:*** *Ted Forte*

Past President: *David Roemer*

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HAC Oct Nov 2023 Calendar of Events

SU	MO	TU	WE	TH	FR	SA
1 OCT	**2**	**3**	**4**	**5**	**6** 6:48 AM **HAC Meeting Room A102 7PM**	**7**
8	**9** 	**10** Venus 6° from moon	**11**	**12**	**13**	**14** 10:55AM Kartchner Star Party. 8:00 AM S.V. Library eclipse watch Annular Eclipse
15	**16**	**17**	**18**	**19** Patterson Public Night 6:30PM	**20** Veritas 11th Grade at Patterson 6:30 PM	**21** 8:29 PM Orionid Meteors
22 Orionid Meteors	**23** Venus western elongation	**24**	**25**	**26** Skills Group elementary students 9-11 AM Patterson	**27** Skills Group Middle & HS students 9-11 AM Patterson	**28** 1:24 PM
29 Jupiter 3° from moon	**30**	**31** 	**Nov 1**	**2**	**3** **HAC Meeting Room A102 7PM** Jupiter opposition	**4**
5 1:37 AM Daylight Savings Time Ends	**6**	**7** Boy's Group at Patterson 7PM	**8**	**9** Venus 1° from moon	**10**	**11**  Solar Saturday 9AM
12	**13** 2:27 AM Uranus Opposition	**14**	**15**	**16**	**17** Leonid Meteors	**18** TELESCOPE SWAP MEET PATTERSON 9AM Leonid Meteors
19 Leonid Meteors	**20** 3:50 AM Saturn 3° from moon	**21**	**22** Senior Group at Patterson 6PM	**23** 	**24**	

All times local MST
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