Rochester Academy of Science

BULLETIN

"An organization of people in the Natural Sciences"

December 2022; Vol. 76, #10

President's Message

As you know, on Saturday, October 29th we held our 48th annual Fall Scientific Paper Session. We met at the Rochester Museum and Science Center. Usually, these are held at local colleges and universities, where there is in-house volunteer staff and robust infrastructure. In fact, next year's event will be at Rochester Institute of Technology. The RMSC proved a great facility and location. It was a pleasure to work with their small staff, but they could not play much role in running the event. That meant that RAS members had to step up again this year to fill the many positions an event like this requires – and they did!

The leading purpose of this society is and always has been to promote scientific study and research. We provide public outreach programs, and we have many opportunities to serve our members. However, I believe that our greatest contribution to the advancement of science is in nurturing young scientists and encouraging them to continue their careers in the sciences. The Scientific Paper Session is our flagship program in this area. For many students, this is their first time publicly presenting a poster or oral report on their research.

With the waning of the pandemic, we had a much larger attendance than last year, but saw that many students were still behind in in their research programs. We had far more than 200 people attend and could not keep track after we ran out of blank nametags. We had 54 posters and 27 oral presentations – more than last year. Attendees came from 21 Upstate New York schools – Alfred, Cornell, Hobart & William Smith, Houghton, Keuka, Le Moyne, Monroe Community College, St. John Fisher, Nazareth, Niagara, SUNY Brockport, SUNY Buffalo, VHS-Victor Central Schools, SUNY Environmental Science and Forestry, SUNY Geneseo, SUNY Oswego, Syracuse iSchool, UC Santa Cruz, University of Rochester, Wells College, and SUNY Buffalo State College.

You will see articles in the next few Bulletins highlighting a few of the research projects presented.

Besides the five to six oral slide show presentation sessions through the morning and the bustling poster session, our Life Sciences Section conducted tours of the RAS Herbarium for which the RMSC is the repository. These were oversubscribed but the additional folks wanting to see it were all accommodated.

The Anthropology, Astronomy, Fossil, and Life Sciences Sections each ran outreach display tables for attendees and for museum visitors. We also had a table with past issues of *Proceedings of the Rochester Academy of Science*, with issues going back to 1892. Rare issues were priced inexpensively, and students scooped up many copies given for free. With their normal weekend attendance in addition to all the people coming for the Paper Session, the museum was really hopping that Saturday.

After lunch, we reconvened in Bausch Auditorium where we had a warm welcome by RMSC President and CEO Hillary Olson who spoke briefly on the history of the RMSC and of RAS and how they intertwined. Dan Krisher introduced our keynote speaker Dr. Bryan Danforth of Cornell University for the Annual Larry King Memorial Lecture on *The Extraordinary Diversity of Solitary Bees*. This was well attended, and many seats were filled by the public and even by museum visitors taking advantage of the suddenly-presented opportunity.

The Extraordinary Diversity of Solitary Bees

Colletes latitarsis a specialist of tomatillo Image courtesy of nativebeeology.com

A video was made of Dr. Danforth's talk and is available on our private YouTube channel at https://youtu.be/DaPYNe_u-7Q. Sound quality is not great but suffices.

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Renew Your Membership

Unless you are a Life Member, note that your membership will expire on December 31, 2022. Please renew your membership at your earliest convenience. Use this link to renew. https://rasny.org/how-to-join

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2024 Eclipse Watch

On November 30th, 2022, it will be just **495** days until the total solar eclipse passes through Rochester on Monday, April 8, 2024. I noted last month that Rochester has its own **Eclipse Task Force**. This group hosted the American Astronomical Society's

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Presidents Message
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(AAS) Solar Eclipse Planning workshop on Friday and Saturday, October 21-22, 2022, at the Rochester Museum & Science Center (RMSC). Panels and breakout sessions addressed the practical strategies that community planners need to know to prepare. Thank you to RAS members David Bishop, Jim Seidwand, Bob Easterly, Don Chamberlin, and Mark Minarich for attending Saturday's session, and to Tony Golumbeck, Callie Brown, Bob Berch, Jackie Amigone, Jim Seidwand, Carol Latta, and Mark Minarich for representing RAS at Sunday's public session. You can learn more at https://rochestereclipse2024.org.

Official poster of the Rochester Eclipse Task Force

David Bishop reports that ASRAS is purchasing 1000 eclipse glasses and 1000 eclipse viewers to use in public outreach and that RMSC has ordered a million eclipse glasses. Expectations by the task force are that 1.5 million people will come to Rochester for this event.

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NASA's *Lucy* Spacecraft to Trojans

I have been keeping up with the Lucy probe since my August-September 2022 RAS Bulletin report and note now that the first loop was completed on October 16th, when Lucy looped the Earth at 220 miles altitude – lower than the International Space Station – one year after liftoff. This places Lucy on a new trajectory for its next two years, and then it will loop Earth again to get enough energy to reach targets in the main asteroid belt.

Lucy probe liftoff on Atlas V rocket from Cape Canaveral (NASA)

See lucy.swri.edu/ and en.wikipedia.org/wiki/Lucy_(spacecraft) for more information

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Thanks for all the help!

My thanks for helping at the RAS Paper Session to members Noveera Ahmed, Frank Bov, Jutta Dudley, Tony Golumbeck, Helen Haller, Santosh Kurinec, John Handley, Larry Hirsch, Dan Krisher, Logan Kusher, Theodore Lechman, Elizabeth Pixley, Michael Richmond, Linda Saalman, Alex Smith, Tim Tatakis, James Zollweg, Karen Wolf, and Kevin Zwiebel. Between them they covered poster frame set–up and take-down, moderating oral sessions, greeting and registration, food service monitoring, photography, outreach tables, and Herbarium tours. Wow!

Special thanks also to our RMSC hosts CEO Hillary Olson, and staff members Daniel Kalin, Jessica Paul, and Brandon Swain for all the effort they put into planning and organizing the event.

Michael Grenier, President RAS

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In Memoriam

Albert C. ("Bud") Smith, Jr.
1922 - October 7, 2022

We sadly note the passing of Albert C. Smith, Jr., RAS Fellow (1969).

After serving in the U.S. Navy in World War II, he finished his Bachelor's at Middlebury College and earned a doctorate in chemistry from Harvard in 1951. He spent his career at Eastman Kodak improving color film with multiple patents to his name. He joined the Academy in 1959. His fascination with the Arctic led him to research there in 1960, where he hand-drilled 120-foot ice cores and correlated the stratification to prove that the Ellesmere ice shelf is the source of many of the ice islands located in the Arctic. As Program Chairman and Chairman of the Mineral Section of our Academy, he fostered many of its programs.

Winter Solstice

December 21, 2022

Image Credit © Bodil Johansson/Thinkstock

Sunrise: 7:39 a.m.
Sunset: 4:38 p.m.

Events for December 2022

Not Meeting in December:

Mineral Section
Life Sciences/Herbarium
RAS Board of Directors
Anthropology Section

2 Fri: Astronomy Members Meeting

6:30 PM–10:00 PM at the Strasenburgh Planetarium, 663 East Ave, Rochester, NY 14607. Schedule: 5:30 p.m. – 6:30 p.m., setup. 6:30 – 7:30 p.m., potluck. 7:30 p.m. – 8:00 p.m., ASRAS meeting. 8:00 – 8:45 p.m., featured talk: Dr. Michael Richmond on "Can the James Webb Space Telescope tell us the distance to NGC 7320?" (bring your Thinking Cap and a calculator.. oh, wait there's one on your phone!). 8:45 p.m. 9:15 p.m., member Astro images. 9:15 p.m. – 10:15 p.m. JWST images and Highlights of 2022 in Astronomy by David Bishop. Contact: Mark Minarich at mminaric@rochester.rr.com

6 Tue: Fossil Section Meeting

7:30 p.m. Meeting will be held in the community meeting room at the NEQALS building, 1030 Jackson Rd., Webster 14580. It will also be broadcast on Zoom and is open to all RAS members and guests. The meeting will feature the return of our annual Show-n-Tell and Pizza party. The section will provide Pizza and drinks while members are asked to bring some of their choice fossil finds from the past couple of years. All attendees will leave the meeting with a Eurypterid fossil provided by the estate of longtime Section member Sam Ciurca. For meeting details and login info see the *FossiLetter* or contact Michael Grenier at paleo@frontier.com.

7 Wed: Astronomy Board Meeting

7:00 p.m. UR, Bausch & Lomb Hall, 4th floor Chart Room, room 408. Also Zoom meeting. ASRAS members are welcome. Contact: Mark Minarich at mminaric@rochester.rr.com.

18 Sun: Astronomy Open House

Open House: 12:00 p.m. - 4:00 p.m. Observatory tours and work parties. Members may bring guests. Farash Center for Observational Astronomy, 8355 County Road 14 Ionia, NY 14475. For weather related cancellations or changes contact Mark Minarich at mminaric@rochester.rr.com or see www.rochesterastronomy.org/calendar-of-events

23-24 Fri- Sat: Astronomy Member Observing

New moon deep sky member observing, starting at dusk till last person leaves. Farash Center for Observational Astronomy, 8355 County Road 14 Ionia, NY 14475. For last minute changes contact Mark Minarich at mminaric@rochester.rr.com

Featured Article

Jennifer L. Anstey, Ph.D., University of Rochester

Naked-Eye Astronomy, Precession, and the Bible.

In the first creation story of Genesis, it says "and God made the sun, the moon, and the stars, for days, and months, and years" (Genesis 1:14). This article introduces you to the basic ideas of naked-eye astronomy, what things look like to the person on the ground, watching the sky overhead. Let's see how we can go from obvious things like sunrise and sunset to much less obvious ideas like the precession of the equinoxes.

Let's say you commute to work on Horizon Street, which runs east-west, and that you're heading east in the morning. At the equinoxes, around March 20-21 and September 21-22, because you live in the northern hemisphere, you notice the sun directly ahead of you on Horizon, blazing right down the street. When you go home, it might as well be called Sunset Blvd, because the setting sun will be blinding you on those dates. You may notice that in summer, the sunrise is way over to your left, which is northeast, as you head east, and the farthest it goes is on June 20, the summer solstice, the longest day of the year. In winter, you may notice that around December 21, the sunrise is way over to your right, to the southeast, and that's the winter solstice, the shortest day of the year.

You may sometimes notice the full moon rising or setting in about the same places, or that the sun and the moon are at opposite sides of the sky at the full moon. The sun and the moon travel, or appear to travel, along a line in the sky called the ecliptic. Sometimes, when they match their tracks exactly, at the full moon or the new moon, there's an eclipse. Eclipses happen on the ecliptic. Although the lunar cycle takes approximately one month, sometimes there are two full moons in the same month. That is because lunar year is about 11 days shorter than a solar year, counting by lunar months, which usually begin at the new moon (when there seems to

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Naked-Eye Astronomy
(Continued from p.3)

be no moon at all or just the slimmest of crescents) rather than the full moon. Most cultures have used a lunar calendar to keep track of the months, since the moon is up there in the sky showing them, and most cultures have a way of adjusting the lunar calendar to make it synchronize with the solar year.

OK, that's the sun for days and the moon for months, but what about the stars for years? As you go east up Horizon Street very early in the morning, you may see some stars in front of you. The stars you see on the equinoxes, right in front of you, will be one of the zodiac constellations, lined up with the sun and the moon on the ecliptic. In the spring just before dawn you will see the constellation Pisces, the fish. Every day you would see the stars in about the same place, but a little bit different in height, as the year goes along. The stars make a progression as you watch them throughout the year, so that the constellation you would see before sunrise at midsummer is different than at the spring equinox, and so on. The next spring equinox, there they would be back at almost but not quite the same place at the same time.

Figure 1: https://en.wikipedia.org/wiki/Zodiac

A hundred years from now, your great-grandchildren would start to notice Aquarius, the water pourer, in the east at spring.

Figure 2: Aquarius – the Water Pourer [8]

Two thousand and some years ago, you would have seen Aries. So the stars and years are not about just short solar years, but really long years, 2,162 of the short ones.

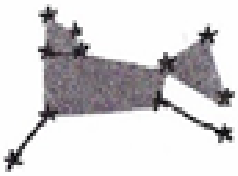

Figure 3: Aries, the Ram [9]

The change over thousands of years is called the precession of the equinoxes, because the constellation at the spring and fall equinoxes changes over time. It takes almost 72 years to move the fixed stars by 1 degree, almost 26,000 years to go the whole way around [1]. And yet, going by both numbers and language hints in mythology, nearly everyone in the world seems to have known about it and referred to it. Even in the Bible, you will often find the number 72, or rounded off to 70, given in verses that seem significant of time or authority, specifically the authority of God, seen written in the sky. The story of the Septuagint, the Greek version of the Hebrew scriptures, cites 72 translators that were all in sync.

If you think about it, the sky is one of the few things all humans have in common, and it seems that all humans have used the sky, not only to measure time but to measure direction. Before modern instruments, people managed to sail across the oceans and find their ports using celestial navigation, which meant going by the stars. Knowing exactly which constellation would be where, exactly when, could tell them both time and place.

Not only sailors but travelers on land used the stars for direction. The Big Dipper can point you to the north, as you know, and it also swings around overnight, like a hand on a mechanical clock, telling you what time it is. Using the sky practically and finding it significant in the realms of meaning seems to be inherent in humanity. The cave paintings in Europe record constellation patterns, and even dates, using a combination of zodiac constellations, signified by animal pictures, shown in a configuration that would have occurred at sunrise or sunset at a particular time [2].

Some would argue that there's little to no indication that the people of the Bible knew any astronomy, but we can see that on the rare occasions that stars or constellations are mentioned, they used the same words as neighboring Mesopotamian cultures used. You can find these words in Amos 5:26, where the prophet gives what seem to be two names of stars or planets, Jupiter and Saturn, which correspond to the names of Assyrian deities. Another theory supposes that these are two names in different languages for the same planet, Saturn. In Job 9:9 and 38:31, and in Amos 5:8, constellations are named, the Bear (Big Dipper), Orion, and the Pleiades.

Now while the Hebrews and the Greeks thought of the Dipper as a bear, the Mesopotamians and the Chinese saw it as a wagon. For South Pacific Islanders, for whom it lies on the northern horizon of the ocean, it's a whale (I saw this myself from latitude 21° south). The exact imagery and name of a constellation may differ, so that Aquarius was called GU.LA in MUL.APIN — the Sumerian star catalog, a goddess of healing, not so different from the refreshing idea of water pouring (see Figure 1). Aries was called the Hired Man or Field Hand by the Sumerians, and Rebecca first saw Isaac in the field, after a

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servant, a hired man, had arranged their marriage.

So, there's a continuity in the shift in the concepts over time and space, and I find it very interesting that these exact same concepts are reflected in Bible stories.

I have found that there were some indications that attention had indeed been paid to astronomy and that some of the Bible stories were written in a way to help people remember significant numbers. You may recall the story of Rebecca at the well, how she drew and poured water for Abraham's servant, his companions, and all their camels. That's a lot of water. Rebecca married Isaac, who would have been a human sacrifice, if a ram had not been miraculously shown to Abraham just as he raised the knife. Rebecca gave birth to twins when Isaac was 60 years old (Genesis 25:26). If you look at the ring of animals that is the zodiac (see Figure 1), you'll see it's arranged in 30° intervals, the 12 constellations making up a 360° circle. Aquarius, the water pourer, like Rebecca, is 60° away from Aries the ram, like Isaac, and Aries is 60° away from Gemini, the twins.

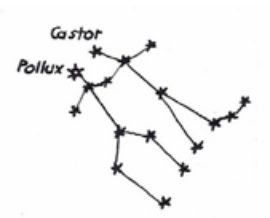

Figure 4: Gemini – the Twins [10]

A Jewish tradition dates certain key events by astronomical symmetry, again by the important 60°, saying that on the day of creation and again when Abraham was born, the visible planets including the sun and moon were arranged symmetrically at 60° intervals, all of them at arm's length, as it were [3].

This story of Rebecca, who married Isaac, and who had twins (see Figure 1) when her husband was 60, can be seen as a memory aid to the way the zodiac moves through the sky nightly and annually. The precession of the equinoxes indicates that on the vast repeat cycle, the clock runs slow, so that succeeding age-long constellations run backwards to the regular east-to-west motion of the sky. That's why the next spring equinox constellation after Pisces will be Aquarius, and not Aries.

Now, in the Roman world, there was a certain amount of awareness about the changing spring horizon, from Aries to Pisces. The poet Virgil said it was the dawning of a great new age, and that the age hero (the person bringing it all about) was of course the emperor Augustus [4]. Christians took over this imagery, using the sign of the fish, Pisces, to indicate themselves, before adopting the cross as their main symbol. In the second century CE a Jewish rebel called himself Bar Kokhba, literally the "son of the star". Pisces was the constellation that related closely to Israel [5].

The astrological side of astronomy looks for indicators of good times and bad. Since God was thought to live above the heavens, what appeared in the sky was seen as direct or indirect communication from above. In general, conjunctions and especially multiple conjunctions were deemed very significant, as though the gods the planets were named for were meeting, conferring, and no doubt plotting some sort of calamity for someone, or uniting to confirm some new world order.

There were two invisible massings of the planets in the years just after Jesus died; we know that people could calculate and measure such things at that time, as shown by the Antikythera device, and that St. Paul was an educated man who could hold his own with the intellectuals of Greece. In his Letter to the Colossians he refers to the importance of invisible things (Col 1:16). In early August, 35 CE (soon after Jesus is supposed to have died), between Virgo and Leo, the first mass conjunction occurred, above the constellation Crater, which has a chalice shape. Jesus had challenged his disciples to drink from his cup, and asked that the cup be taken from him (Matt 20:22, 26:39). The conjunction was in place on the Hebrew calendar's Av 9, which commemorated the destruction of Solomon's temple, and Jesus had been accused of predicting the downfall of Herod's temple. Such a planet massing at that time and in that place in the sky could have been seen as an invisible confirmation that God's will had been and would be done.

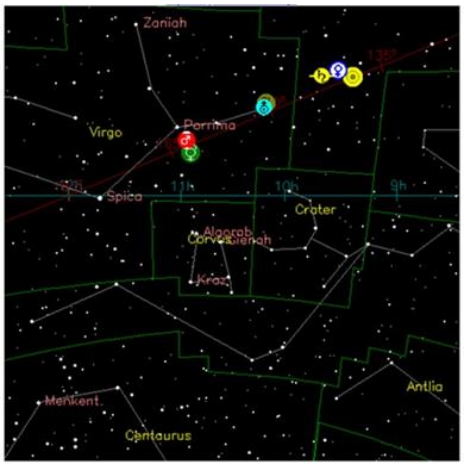

Figure 5: Massing of planets on August 14, 35 CE. [11]

The second planetary massing occurred in Paul's years of active ministry, in March, 53 CE, which was the Fast of Esther and the Feast of Purim. The planets convened in Pisces and Aquarius, emphasizing the Jewish connection with Pisces, and the triple conjunction of Saturn and Jupiter in 6 BCE in Pisces, which for some doubtless "rung in" the new age of Pisces.

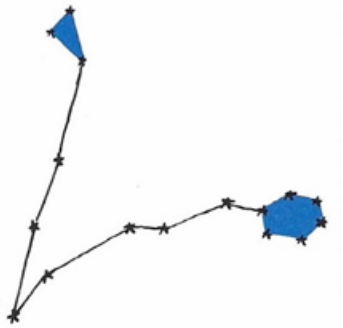

Figure 5a: Pisces [8] p.58

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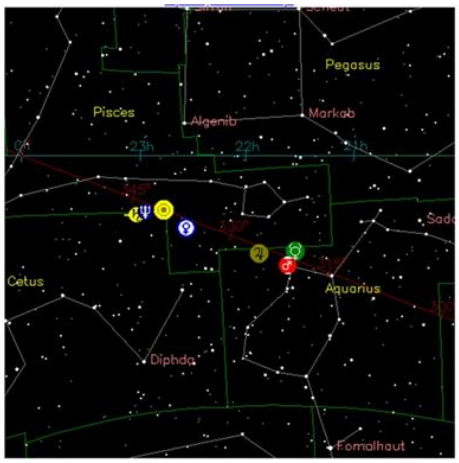

Figure 6: Massing of planets on March 2, 53 CE. [10]

Paul and other Christians might well have taken this "secret" validation of their point of view, confirming that indeed a new golden age was coming, and it was theirs. The other planets, named for the old gods, were gathered by and outshone by the sun, which symbolized Christ himself.

One symbolic number you find often in the Bible is 40, which is used to mean a generation, or long enough, as well as the actual number. The planets Jupiter and Saturn meet in conjunction along the plane of the ecliptic every 20 years, so it seems that the significance of 40, which doubles that 20, is astronomical. Why otherwise would you use such an unnaturally large number to indicate a generation? The cycle of these conjunctions is a total of about 800 years, a number given twice in Genesis 5 as the age a patriarch lived after begetting a son, once for Adam and once for Jared. When the numbers of their age, at either their begetting the next generation or at commencing a mission, are added up, the total is 1656, a number that is related to precession, as are 40, 60 and 72. The base-60 arithmetic system of Sumer was essentially a precession-related system.

Although ancient people dated events by the year of a king's reign or some notable disaster, such as "two years before the earthquake" (Amos 1:1), they also used astronomy to date occasions even more precisely. The regular conjunctions of Jupiter and Saturn seem to be referred to by the prophet Amos, specifically in September 761BCE, when the planets named for the son and father gods appeared to follow Venus from Leo to Virgo. In Amos 2:7 it says "A man and his father walk toward the young woman." Anyone looking up in the night sky in late September of that year could have seen it illustrated (see Figure 7).

Amos also parallels the large geographic borders referred to often in the Bible (from the border of Egypt to the Euphrates is a common one) with the area covered by the sky. "If a man escapes from a lion he will run into a bear; if he comes into a house and leans his hand on the wall he may be bitten by a snake," (5:19).

Figure 7: View towards horizon from Jerusalem, September 29, 761 BCE., Saturn ♄ and Jupiter ♃ are close to each other and to Venus ♀; they

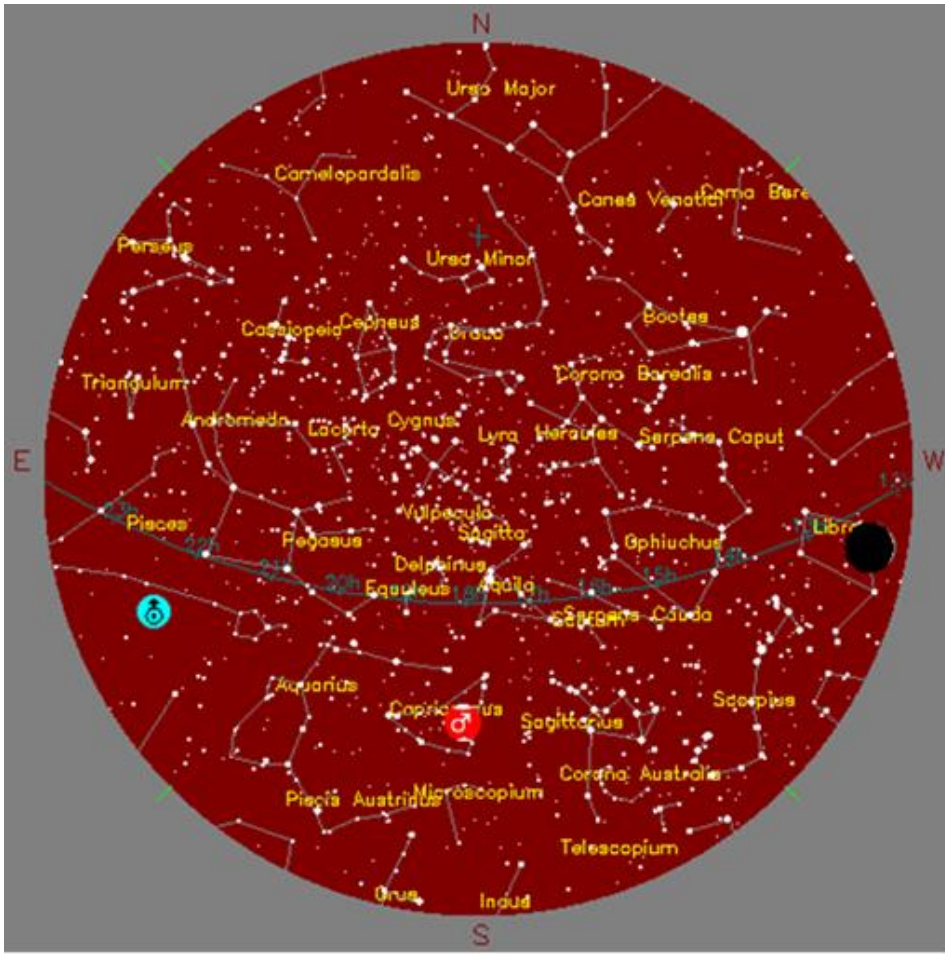

Figure 8: September 20, 761 BCE, new moon on equinox (more or less). Mars ♂ in Capricorn, in the "Underworld" below the plane of the ecliptic at the New Moon (the black circle on the right of the image near the W). Corona Australis, a bowl-shaped constellation, is situated just below Sagittarius (to the right of Mars) in the figure are all relatively near Crater, to their right. Mercury ☿ is below, near the label of Virgo. [11]

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Naked-Eye Astronomy
(Continued from p.6)

There's a straight line north from Leo (the Lion), specifically its bright star Regulus, to Ursa Major (the Great Bear), the two stars of the cup nearest the handle. One of Amos' visions was of God holding a plumb bob (7:7), a device used to establish vertical, suggesting that straight astronomical line. At dawn on the spring equinox, you would have seen Aries in the east and in the west the two ends of Serpens with Hercules between them. Isaiah 11:8 spells this out explicitly, echoing the myth of baby Hercules fighting serpents in his crib. In mythological metaphor, the earth is said to have four pillars or corners, so each of the directions could well be associated with a wall. The prophet made reference to the sky with its well-known features, to remind his audience of the setting of current events. He's aware of the known world from north to south and east to west, on ground and in the sky.

Since God was thought to live above the heavens, what appeared in the sky was seen as direct or indirect communication from above. The prophets specified what kind of bad times were happening, blaming it partly on the fact that the astronomical indicators had changed, so the stars of good fortune weren't properly aligned any more. People who rely on auspicious days to press their luck can be terribly anxious to hang on to them. The efforts of the Incas to turn the stars back, to regain their assurance of the mandate of heaven, as the Chinese call it, led them to all sorts of extreme actions, even before the Spanish came [6]. Amos' second notable vision is of a basket of summer fruit (8:1). You may have noticed in Figure 7 that it was near a constellation we call Crater, which looks like a chalice. At the autumn equinox of 761 BCE, in the evening, on the opposite (west) side of the sky, the planet Mars was near the constellation Corona Australus (see Figure 8 on page 6). I don't know, but either of those constellations could have reasonably been called the basket. The fruit basket seems (as it is still among observant Jews) to have been specific to the Feast of Booths, an autumn festival in which casual shelters are built, their roofs so incomplete that attendees can see the stars through them [7]. Amos's imagery suggests that festival.

In Joshua 4:20, we are told that the people entering Canaan brought from the Jordan River valley twelve stones which they set up as a memorial of the event. Similar standing-stones marked the shrines at Bethel and Gilgal, as reminders of the time and place of important occurrences. Amos seems to suggest that the old alignments, or what they signified aren't working any more, when he says, "Daughter Israel is falling, unable to continue standing up, abandoned on her clay, no one setting her up;" "Do not inquire of the baetyl-stone oracle (at Bethel), and don't go into the circles (at Gilgal), pass over Beer-Sheba because the circles are exposed and uncovered, and the baetyl is false" (5:2, 5:5). (5:2, 5:5, my translation). Stones like the heel-stone at Stonehenge still work just fine, after thousands of years, because they mark the sun's year. But stones set up to say a certain fixed star rose on the glory of so-and-so, won't be accurate for long, due to the effects of precession —if indeed anyone remembers what it was for. Once the mandate of heaven is gone, you can't get it back.

The big symbolic number is 7, the number of planets, including the sun and moon, that the average person can see in the sky. They all seem to follow the same path in the sky, the ecliptic, so they are spoken of as dwelling in houses (that means sighted in a constellation) sometimes. When Amos in 9:6 says God "builds his upper chambers in the heavens" that's a reference to the zodiac "houses," the 30-degree increments of the ecliptic circle. Likewise, when Paul in several of his letters speaks of thrones (a throne is a seat of authority, like a county seat), powers, and dominions, he's talking about the zodiac as well as drawing a parallel with earthly hierarchies. In China, the deities were so identified with the sky that Heaven became a euphemism for God. In the Bible, where the people were surrounded by those who identified the planets with their gods and agreed that astronomical order indicated the divine plan for humanity, care was taken to remind readers that God was even higher and vaster than what could be seen. Even if you prefer to leave God out of the picture, the naked-eye view is impressive enough to arouse interest, if not respect and awe.

References

[1] For a discussion of precession numbers see Campbell, Joseph, The Masks of God: Oriental Mythology, Penguin Books, New York, 1962, pp. 115-121

[2] Sweatman, Martin, *Prehistory Decoded*, Troubador Publishing Ltd, Matador, Kibworth Beauchamp UK, 2019, pp. 186-190

[3] Cohen, Ariel, "The Changes in Calendars in the Ancient World as a Tool to Teach the Development of Astronomy," *Journal of Astronomy & Earth Sciences Education*, 5 (1), 2018, 67-84

[4] H. Mattingly, 'Virgil's Golden Age: Sixth Aeneid and Fourth Eclogue', *CR* 48 (1934) 161–165.

[5] Kidger, Mark, The Star of Bethlehem, Princeton University Press, 1999: 188

[6] Sullivan, William, *The Secret of the Incas: Myth, Astronomy, and the War against Time*. Three Rivers Press, New York, 1996

[7] *Jewish Encyclopedia* (1906, 2002): Tabernacles, Etrog

(Continued on p.8)

Naked-Eye Astronomy
(Continued from p.6)

[8] image from H. A. Rey, *The Stars: A New Way to See Them*, Boston: Houghton Mifflin Harcourt,1982, p. 56

[9] image from H. A. Rey, *The Stars: A New Way to See Them*, Boston: Houghton Mifflin Harcourt,1982, p.42

[10] image from H. A. Rey, *The Stars: A New Way to See Them*, Boston: Houghton Mifflin Harcourt,1982, p.44

[11] *Image generated by* fourmilab.ch/cgi-bin/Yourtel

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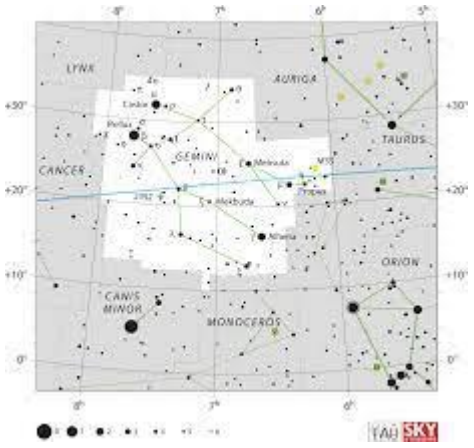
Geminid Meteor Showers

Peak December 13-14, 2022 around the constellation of Gemini.
Parent Object: Asteroid 3200 Phaethon.



ROCHESTER AREA RESEARCH IN REVIEW

Scientists convert wastepaper into battery parts for smartphones and electric vehicles, November 23, 2022, Cornell University.

Gene mutation leading to autism found to overstimulate brain cells, November 21, 2022, SUNY Upstate Medical Center in Syracuse, N.Y.

Using monsoons of the past to predict climate conditions of the future: A team of researchers used ancient climate data to predict how the summer monsoon may change in the North American southwest, November 10, 2022, Syracuse University.

Study analyzing often-overlooked racial/ethnic groups provides a new understanding of pain disparities in the U.S.: Racial/ethnic disparities in pain prevalence are much greater than previously thought, November 9, 2022, University at Buffalo.

How network pruning can skew deep learning models. November 2, 2022, Syracuse University.

Antarctic summer thaw starts earlier, ends later than previously believed: Seasonal thaw begins nearly a month earlier, lasts two-months longer than previously believed, October 31, 2022, Colgate University.

Certain type of stroke on the rise, with higher rates among Black people, October 27, 2022, SUNY Upstate Medical University in Syracuse, N.Y.

Conservative state policies generally associated with higher mortality, study finds, October 25, 2022, Syracuse University.

Keeping electricity affordable on wireless charging highways, October 20, 2022, Cornell University.

Future emissions from 'country of permafrost' significant, must be factored into global climate targets, October 17, 2022, Colgate University.

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