**Rochester Academy of Science**

# BULLETIN

*"An organization of people in the Natural Sciences"*

*May 2023; Vol. 77, #5*

## President's Message

### President's 2022 Annual Report

It was gratifying to see us return to live meetings, as soon as we did, with most sections achieving this by February last year. The sections embraced hybrid meetings, broadcasting them over Zoom, enabling our own distant members to attend as well as members of other societies across the North East, Mid-Atlantic, and Midwest —with which we have been partnering to share speakers. This also enables the meetings to be recorded, with our Astronomy, Fossil, and Mineral sections each now having a library of lectures which our members can access through our RAS website.

In March last year, after months of development, RAS launched an entirely new website, replacing our severely obsolete original site. This has worked exceedingly well and with much new content. ASRAS is in the process now of migrating its website to the RAS platform, with substantial savings, and thus putting all of RAS on one digital site.

For the first time since 1984, we held the 48th Annual RAS Scientific Paper Session at the Rochester Museum & Science Center. Without the staff and resources that we usually draw upon at the colleges and universities, RAS members had to step in to run all aspects of this program and did so successfully. We had over 200 attendees from 21 different colleges as well as many from RAS and had 85 research projects presented.

Our "promote scientific study and research mission" is largely met through our sections' "citizen science" programs. It was good to see these return as robust as ever this past year. Members had a wealth of opportunities available in 2022. All sections had regularly scheduled meetings, usually with note-worthy topical lectures. ASRAS offered both scheduled and open observing of the universe at the Marian & Max Farash Center for Observational Astronomy, the RocheStar Fest, and special events such as Lunar Eclipse viewing. The Fossil section conducted seven collecting and stratigraphy field trips to various sites. The Mineral section sponsored the 49th Annual Rochester Mineral Symposium, which we founded in 1973, and Life Sciences held regular Herbarium workshops. Our world-class, internationally known Herbarium has over 30,000 preserved specimens from NY State housed at the Rochester Museum & Science Center.

We also have a "disseminate scientific knowledge" mission and we meet that through outreach and public science programming. In 2022, ASRAS hosted many public open house events and scout astronomy campouts at the Farash Center and operating the RMSC telescope on Saturday nights with 60 to 200 visitors coming each time. Several sections participated in educational outreach programs at the ADK Expo in June and at the RMSC in December. The Anthropology section had another educational outreach event at the RMSC in October for Archeology Day and also had a public excavation event at the Frost Town archeological site at Cummings Nature Center (see top of page 7).

For our RAS Annual Scientific Paper Session, the museum was open to the public with hundreds of visitors. Many of these visited the poster session and took advantage of our outreach opportunities. These included our public lecture, Herbarium tours for attendees, the outreach tables set up by all five sections plus tables for our publications and an Apollo mission guidance computer logic chip from RIT. Dr. Brian Danforth, our Larry King Memorial Lecture speaker, and an expert from Cornell on solitary bees, nearly filled the 100-seat auditorium with both session attendees and public. Also, our public spring lecture last April, in conjunction with last year's annual meeting, featured Dr. John O'Shea of the University of Michigan with a fascinating talk on "*Central Oregon obsidian from a submerged early Holocene archaeological site beneath Lake Huron*."

Our student grants committee reviewed numerous applications at the end of the year and made a record ten research grants to undergraduates for $5750. Many of these will continue to be featured in the RAS Bulletin.

How do you keep up with all this? Please read the monthly RAS Bulletin sent to all members! We saw continuous improvement in the Bulletin again this past year. We published 10 monthly issues, doubling up summer months. Each had 8 pages of original content, mostly scientific articles written by members, friends, and student researchers. Remember that the section newsletters—which are great—do not have all the news that you need. Read the Bulletin!

Our success is due to the tireless efforts of scores of leaders and volunteers within the Academy and its sections.

*(President's message continued p.2)*

*(Continued from p.1)*

I am very grateful to all those who have had a hand in our 2022 success. This also includes all our members who take such an active interest in our events and programs.

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## RAS Outreach at Peep Show

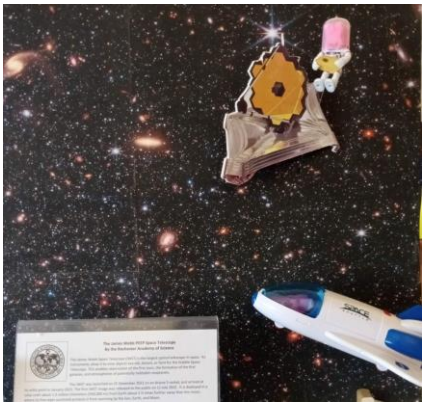
Yes, you read that right.

The 8th Annual Greater Rochester Marshmallow Peep Art Show, aka "The Peep Show," was held on March 25th and 26th, and the RAS was represented with a three-dimensional display representing the James Webb PEEP Telescope.

Over 2500 visitors came through and dozens of RAS flyers we distributed to those who stopped to look at this.

The educational sign read, "The James Webb Space Telescope (JWST) is the largest optical telescope in space. Its instruments allow it to view objects too old, distant, or faint for the Hubble Space Telescope. This enables observation of the first stars, the formation of the first galaxies, and atmospheres of potentially habitable exoplanets.

"The JWST was launched on 25 December 2021 on an Ariane 5 rocket and arrived at its orbit point in January 2022. The first JWST image was released to the public on 11 July 2022. It is deployed in a solar orbit about 1.5 million kilometers (930,000 mi) from Earth (about 2 ½ times further away than the moon) where its five-layer sunshield protects it from warming by the Sun, Earth, and Moon.



*RAS Peep Show Display(Photo credit: Jutta Dudley)*

"JWST's primary mirror consists of 18 hexagonal mirror segments made of gold-plated beryllium, which creates a 6.5-meter-diameter (21 feet) mirror, compared with Hubble's 2.4 m (7 feet 10 inches). This gives JWST a light-collecting area about six times that of Hubble.

"The background is a field of stars of the Wolf-Lundmark-Melotte dwarf galaxy taken by JWST on November 9, 2022. In the background are several further away galaxies. At around 3 million light-years from Earth, this dwarf galaxy is one of the most remote members of the local galaxy group that contains our galaxy. This demonstrates the JWST's remarkable ability to resolve faint stars outside the Milky Way.

"Since JWST's Christmas 2021 launch, engineers have detected more than 20 micro-meteoroid impacts to the telescope; only one that hit in May 2022 was large enough to noticeably hurt the observatory. Eventually, the JWST will be hit by one large enough to cause severe damage. ***Will we be able to send a mission to replace a damaged mirror hex?***"

For participating, the RAS will receive a check to put towards our student grants program.

To see our display and others, http://www.rochesterpeepshow.com/.

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## 2024 Eclipse Watch

On May 1st, 2022, it will be less than one year, just **343** days, until the total solar eclipse passes through Rochester on Monday, April 8, 2024. The eclipse will occur at about 3:20PM.

On April 6, 2023, the RMSC held a "One-Year Out" press conference, and ASRAS was a part of it**.** RMSC announced all the preparations made to date, trotted out local politicians and celebrities to talk about how important this is for Rochester with the expected huge influx of eclipse tourists, and unveiled the new eclipse glasses design using a pair of giant eclipse glasses (see image below). I am adding to the tourist influx, having invited relatives from out-of-town and reserving rooms. To celebrate in style, I have laid up a case of Heron Hill Winery Eclipse White wine.

*The prop sunglasses were made with actual lens elements and work to screen the sun. (Photo Credit: RMSC)*

See more at https://rochestereclipse2024.org/the-rmsc-marks-one-year-out-to-total-solar-eclipse/. Another good local website to visit for information is that of WROC-TV Channel 8 (CBS). https://www.rochesterfirst.com/weather/weather-blog/what-to-know-about-the-total-solar-eclipse-happening-in-rochester-one-year-from-today/.

***Michael Grenier, RAS President***

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# *Events for May 2023*

**2 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. Our speaker is Dr. Jennifer Olori, biological sciences Associate Professor at SUNY Oswego. Topic: *The Origins of the Modern Amphibian Groups,* including a review of the frog and salamander fossil record. All RAS members and visitors are welcome. For details, see the RAS May *FossiLetter* or contact Michael Grenier at paleo@frontier.com.

**3 Wed: Astronomy Board Meeting**
7:00 p.m. Farash Center in Ionia. ASRAS members are welcome. Contact: Anthony Golumbeck at semp@use.startmail.com.

**5 Fri: Astronomy Members Meeting**
7:30 p.m. – 10:00 p.m. Education building at the Ionia Farash Observatory site. Speaker: David Bishop. Topic: *Astronomy Year In Review*. Contact: Anthony Golumbeck at semp@use.startmail.com.

**6 Sat: Fossil Section Field Trip to the Gulf at Lockport**
This trip will visit several sites in the Lockport area exposing the Silurian Rochester Shale Formation. The fossils—primarily brachiopods and bryozoan with trilobites, corals, cystoids, and others—can be found lying loose on the hillside. For details, see the RAS April *FossiLetter* or contact Dan Krisher at (585)698.3147 or DLKFossil@gmail.com .

**7 Sun: Astronomy Open House**
Open House: 12:00 p.m. - 3:00 p.m. Observatory tours and work parties. Members may bring guests. Come out and learn to use some of the equipment available at the Farash Center! Farash Center for Observational Astronomy, 8355 County Road 14, Ionia, NY 14475. For weather related cancellations or changes contact site manager Roger McDonough at rdmcdogz@aol.com.

**14 Sun: Life Sciences - Nature Walk - Durand Eastman Park**
2:00 - 4:00 p.m. The Life Sciences section will hold a Nature Walk at the Durand Eastman Park Arboretum. This will be a guided tour by a Monroe County Cornell Cooperative Extension master gardener who will discuss the history of the park's development, unique plants, and trees. This is a public event. You must register at https://pub.cce.cornell.edu/event_registration/main/events_landing.cfm?event=DurandTours2022-2_226. Also, call or write Michael Grenier at (585) 671-8738 or mgrenier@frontiernet.net. Refreshments after the walk. Meet at the kiosk on Zoo Rd. (off Lakeshore) next to the park maintenance center. This park is similar to F.L. Olmsted's Highland, Maplewood, Seneca, and Genesee Valley Parks—with rolling terrain and scenic vistas integrated natural water elements.

**17 Wed: RAS Board Meeting**
7:00 p.m. – 9:00 p.m. at Landmark Society Warner Castle. Zoom option available. For details, contact Michael Grenier at mgrenier@frontiernet.net.

**20 Sat: Astronomy Members Observing:** Dusk till? Weather permitting. Watch ASRAS emails for details.

**20 Sat: Life Sciences - Herbarium Workshop**
10:00 a.m. – 2:00 p.m. The Life Sciences section will hold a workshop at the RAS Herbarium, located in the basement of the Rochester Museum and Science Center (RMSC). We will be working on sorting herbarium specimens into separate species folders. You may bring a lunch or buy lunch at the Cafe. At RMSC go to the front desk to meet other participants. If you plan to attend, please send RSVP or any inquiries to Elizabeth Pixley, herbarium curator, at eypixley@gmail.com, or call (585) 334-0977.

**23 Tue: Mineral Section Meeting**
7:00 p.m. Meeting in person only at the NEQALS building, 1030 Jackson Rd. in Webster. Join us for a social gathering and a talk by member Dr. Howard Heitner about fluorescence, its history, mechanism, and application. There will be minerals to enjoy viewing under U-V light. Contact: Jutta Dudley, juttasd@aol.com.

**24 Wed: Astronomy Forum**
7:30 p.m. Speaker: Tony Golumbeck. Topic: TBD. Contact: Carol Latta at cosmos@rochester.rr.com

**27 Sat: Fossil Section Field Trip to Road Cuts Near Waverly, NY.** A series of road cuts near Waverly, NY exposes Upper Devonian strata of the Frasnian West Falls Group containing fauna of brachiopods, bivalves, and rare Upper Devonian rugose corals. For details, see the RAS April *FossiLetter* or contact Dan Krisher at (585)698.3147 or DLKFossil@gmail.com.

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*The yellow magnolia in the center-right background is a cross between Magnolia accuminata and M. denudata. (Photo taken at the Durand Eastman Park arboretum by Michael Grenier on April 26, 2023)*

## Featured Article

### *Cosmological Compromise*

Jennifer Anstey, Ph.D.

*From an astronomical POV, while retaining all the religious and mythological goodies, but with an audience of astronomers in mind, who need to be reminded of how central astronomy is to human culture.*

The one thing all humans have always had in common is skygazing and finding patterns in the sky. Socrates understood the word for humanity, *anthropos* in Greek, to mean those who look up at what they have seen (Plato, *Cratylus*, 399c). We stand up tall and see far out around us and above us, and we strive to make sense of what we see. We see a face in the blotches on the moon's surface, and some see a rabbit there. All humans are pretty good at looking for and finding patterns in what they see. Knowledge of those patterns is handed down through the generations, as when you teach your child or grandchild how to find and use the Big Dipper to locate other constellations and stars, or to keep time. The constellations are products of our imagination, yet they've been consistently described and identified in various cultures over time. We still use the ones codified in ancient Babylon, as edited by the Greeks. Other cultures drew the lines differently, but consistently.

Human ingenuity doesn't stop with drawing imaginary lines between the stars in the sky. There is the systematic layout of the seven planets (which includes the sun and the moon) that featured for historic astronomers, shown in Figure 1. This late medieval or early modern diagram demonstrates the moon (Luna) closest to the earth in the center, with Mercury (Mercurii) and Venus (Veneris) next, and the Sun (Solis) about as far distant as Mars (Martis). Jupiter (Jovis) and Saturn (Saturni) are the farthest out, with the fixed stars farther still. Their relative brightness is indicated in the lower half of the diagram.


*Figure 1. Petri Apiani cosmographia (1539). (Wikimedia Commons.)*

Nowadays, we can imagine ourselves seeing things from outside the solar system! From an earth-centric point of view however, Figure 1 shows how planet order was systematized, as the sun, moon and planets traveled along the ecliptic path marked by the zodiac constellations. For the earth-based naked eye astronomer, the heavens appear to circle above us, turning on the axis of the poles. So far, so good, it's what it looks like from here. But then, as various people present their models of the cosmos, it starts to get odd.

You may have read in mythology stories about the underworld, as in Homer, Hesiod, or Plato, with a system of rivers like the Styx and localities like Tartarus. There are also stories about the heavens, which reflect both straightforward astronomical observations and some weird ideas that don't match anything anyone has ever seen. Why the difference? As an astronomer of the casual kind, I wish the symbolism matched up and built upon observation. Certainly, the idea of the world tree and the axis sort of go together, they're both incredibly tall and connect the vast above and the vast below, but where does the idea of the earth having corners come from? When you start looking into it, you'll find a lot of consistency all over the world, all apparently based on the same basic design, that isn't quite what you would expect. An internet search for ancient cosmology will yield many images of cosmological schemes, such as those on http://whale.to/c/ancient_cosmology.html, which also demonstrates the worldwide nature of this imagery.

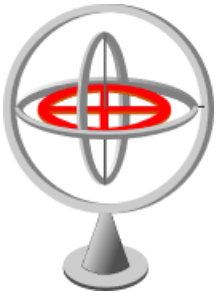

*Figure 2. Gyroscope image. (https://www.goodfreephotos.com)*

As shown in the simple outline of a gyroscope, Figure 2, the basic cosmological model we find from antiquity consists of a flat, pancake-shaped earth, surrounded by a circular river (the red circle with cross-bars, with the gray rim around it). The pancake is often divided into four quarters, aligned to the cardinal directions, and at the center of the pancake is the axis, pointing straight up and down. Various sources elaborate on this model, describing the axis as a great tree, a twisting vine, or a ladder, that in any case connects the upper hemisphere of the heavens and the earth and the lower hemisphere of the underworld. Encompassing the pancake is a hemisphere or set of nesting hemispheres in which the heavens, including the planets, sun, and moon

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are said to reside, depending on the complexity of the model.

In legends and myths, we hear about the four corners of the earth, the idea of the inhabited earth as a plane instead of a ball, and the numerous heavens above, as opposed to a variously complicated underworld, all surrounded by a big snake sometimes, or waters or oceans that no one has ever encountered physically.

Your average, basic human knows that the physical world is not like this. The earth does not have corners, and if you live near a big body of water, as most people have over time, you can see the subtle curvature of the earth on the horizon. Any sensible person living on the land knows there is no place in which the earth touches the sky, not even the highest mountain. And though the basic human may find some places special and even holy, they know for sure that there isn't actually a big tree or ladder going from that place straight up into another world, even though their hymns and stories say there is. Herodotus, who seems pretty gullible in some respects, complained that the river Ocean, that supposedly circled the entire world, seemed far-fetched to him (*The Histories*, Book II.24-5). And yet, from nearly every culture, all over the world, we have reports of this gyroscope-style model of the cosmos, complete with surrounding snake or river. Why?

Basic humans have practical knowledge of their particular environment to ensure their survival. But basic humans also have their impractical imagination working on them full-time. We see patterns that are actually there. A stick insect looks like a stick to you and me, and to the critter that would like to prey upon it, so there's some objective reality. We also see patterns that are merely suggestions, as when someone once upon a time showed us the Big Dipper and we saw the imaginary lines for ourselves. Or think of the eager response to the apparent face on Mars, from some early photos.

Humans have a sense of an external others perspective, even when there may not be an objective other person nearby. For example, you may have heard the little voice inside your head called the observing ego, the one that says "no!" when you're about to try something very risky. We have the ability to take an imaginary stance outside of ourselves — to be a bit objective — as for example, when we imagine ourselves outside the solar system, somewhere no one has actually been. Many people have spiritual experiences, in which they sense a different kind of other person speaking to them or conveying feelings. Among indigenous peoples there are usually well-known rituals and devices designed to enhance the ability of the gifted to be closely in touch with these spirits. And it is shamans or priests who have said that the gyroscope-style model of the cosmos is what the world looks like from the spirits' point of view [1]. So, your basic human is dealing with two sets of knowledge, one practical, physical-experience-based, time-tested and provable. But the other is in another realm, like that of the imagination, experienced on levels that defy experimentation, unlike the well-known physical world. It too, by report, is consistent over time and place. So, your basic human has a foot in both worlds and tries to make the two worlds cohere. The oldest maps found from the Middle East seem to be drawn on the gyroscope model, trying to make actual cities and countries conform to the spirit-revealed cosmos. Elaborate symbolic systems, such as those that relate planets to metals and gods, suggest references made by the spirits suggesting connections between apparently unconnected entities.

Book 10 of *The Republic* contains Socrates' version of the gyroscope-style model. Socrates' underworld contains a complicated river system (as found in *Phaedo* 109-114), and consistent with limestone cave and river formations, while his heavens are a set of nested spheres, each housing a planet, until the outermost layer, in which the fixed stars are located (see Figure 1). Socrates' "gyroscope" would thus have at least eight circling rings or layers instead of three (see Figure 2). Socrates also mentions the colors of the planets and their various degrees of radiance. However, Socrates describes the planet Jupiter as being white, whereas any of us can testify that it's on the orange end of things. This was not a misprint. Socrates was continuing a tradition that came straight from Babylonia, which said that Jupiter was white. The Babylonian color assignments seem to reflect a parallel system that attributes a color and a metal to each planet/god— iron for Saturn, copper for Venus, and so forth. So here we have a symbolic color, white, assigned to Jupiter, when it's not that color at all. The ancient commentator Proclus assures us that sometimes Plato tells us things that are contrary to the way they can be observed; rather than take these assertions at face value, they have to do with traditional symbolism [2]. Once again, I suspect the spirits of being the sources of the apparent misinformation. Plato told us what Socrates said, and Socrates told his listeners what his particular spirit had told him.

| | Celestial Body | Greece (ER) Color | Meso-potamian Color | Greece Radiance |
|---|---|---|---|---|
| 1 | Fixed Stars | | | |
| 2 | Saturn | yellow | black | shining |
| 3 | Jupiter | white | white | beaming |
| 4 | Mars | red | red | fiery |
| 5 | Sun | yellow | yellow | |
| 6 | Venus | white | green/blue | light-bearing |
| 7 | Mercury | yellow | Black/brown | glistening |
| 8 | Moon | | | borrowed light |

*Table 1. Compiled from various sources, including Martijn, "Colourful Planets." [2]*

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*(Continued from p.5)*

Those in contact with these spirits assure us that the spirits are powerful, knowledgeable, and tricky to work with. Socrates calls them "knowing and wise" (*Cratylus* 398b). It's worth our while to try to contact them because the spirits are, on occasion, willing to share the special knowledge and power they have. Typically, a spirit-contacting person, a shaman, would seek to know a healing remedy for an illness. The shaman takes a drug made from a complicated recipe to contact the spirits, who will reveal that recipe and others to the shaman, thus there is a circular or at least back and forth process of information sharing [3]. It's one way to account for people learning the complicated procedures needed to, for example, process cassava roots into something edible. But the spirits also convey cosmological knowledge, the gyroscope model, where to find the ladder or the tree, and how to climb it, or where the entrance to the underworld is, and how to return safely with the buried treasure. These spirits have access to information we normally don't have.

We feel the need to know. A persistent strain in religious cults is the idea that (usually astronomical) secrets are held by initiates, and they induce those wanting to know to pay the price of initiation, and demand ongoing loyalty from them in exchange [4]. You may be more comfortable thinking, with Jung, that there aren't really any secrets, but most of us suspect there are [5]. We're sure things must connect and have meaning and not merely be by chance.

Socrates' story or myth of Er (in Book 10 of *The Republic*), tells of a man apparently dead, who goes on a tour of the afterlife, where he is shown a schematic view of the heavens, the system of nesting spheres of the seven planets together with their respective colors and widths. Er's story is very similar to the Jewish legend of Enoch. On his birthday, Enoch too was taken up to the heavenly realms where he was shown the cosmos, all seven levels of it in detail, and like Er, was told to take notes and report back to earth-dwellers when he returned [6]. The Roman era story of Apuleius features a vision of Isis that imagines the goddess as the cosmos, her dress embroidered with the same yellow, red and white of the planet colors, and her outer robe black, covered with stars. Another description of Isis describes her in seven layers of robes, each representing one of those seven planets. In fact, Isis may represent the axis, the essential upright connector between the pancake and the highest sphere, that symbolizes the conscious, upright human, looking at both worlds at once, perpendicular to the plane of the earth [7]. All humans have been stargazers. Before GPS, a close knowledge of the sky was necessary for navigation, and all timekeeping was based on observations of the sun, moon and stars. And almost all humans have found meaning and placed their mythology according to the starry sky [8].

Some people, like Socrates, who have access to the spirits, have consistently described the gyroscope model of the cosmos. Intense concentration is another way of accessing unforeseen realms of knowledge. Stan Tenen, a physicist by training, devoted decades of intense study to the sequence of letters found in the first chapter of Genesis. Since he didn't know the Hebrew language, he was unable to form the words the letter sequence is usually broken into. He found that the letters occurred in patterns that described complex three-dimensional forms, such as the torus, the tetrahedron, and the reciprocal spiral. His continuing study resulted in a form very similar to the spirits' cosmological model, with a woven axis, the surrounding shell form, and the flat central plane [9]. Maybe there is something underlying our physical observations of reality as we perceive it, some kind of schematic that contains some of the answers, if not the answer itself. Enlightenment beckons, from different directions.

We have, as humans, the ability to make a cosmological compromise, to see and understand our world as both the factual, physical one that's relatively easy to measure, and the other world that's more than imaginary, but not quite tangible. As humans, it seems that we are able to live with a foot in both those worlds, to find our balance, and bring them into accord.

**References**

[1] Narby, Jeremy, *The Cosmic Serpent* (New York: Penguin, 1999)

[2] Martijn, Marije, "Colourful Planets: The Reception of an Astronomical Detail in the Myth of Er," *Mnemosyne* 75 (2022): 145-168, https://brill.com/view/journals/mnem/75/1/article-p145_9.xml

[3] Narby, *The Cosmic Serpent*

[4] Hayden, Brian, *The Power of Ritual in Prehistory: Secret Societies and Origins of Social Complexity* (New York: Cambridge University Press, 2018) p. 45-6

[5] Jung, C. G., *Civilization in Transition*, 2nd Ed., (Princeton: Princeton University Press, 1970), p. 468

[6] Ginzberg, Louis, *The Legends of the Jews* (Philadelphia: The Jewish Publication Society of America, 1909, 1937) vol. 1, p. 135-137

[7] Martijn, "Colourful Planets"

[8] de Santillana, Giorgio and Hertha von Dechend, *Hamlet's Mill: An Essay on Myth and the Frame of Time*, (Boston: Gambit, 1969)

[9] Tenen, Stan, *The Alphabet that Changed the World: How Genesis Preserves a Science of Consciousness in Geometry and Gesture* (Berkeley: North Atlantic Books, 2011) and http://www.meru.org

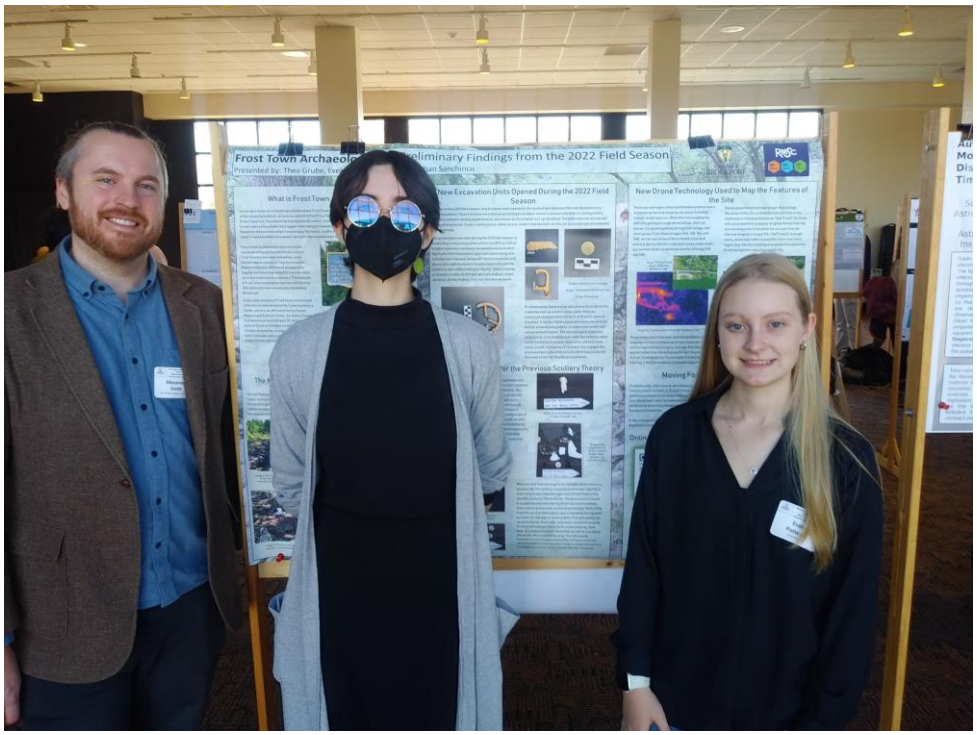
**RAS 2022 Fall Poster Paper Session**

Thea Grube, Evelyn Patterson, Sebastian Sanchirico, and Alexander J. Smith, Ph.D. SUNY Brockport.

*Frost Town Archaeology: Preliminary Results From the 2022 Field Season.*

**Abstract**

Frost Town Archaeology is a project dedicated to the excavation and better understanding of an abandoned 19th-century Euro-American mill town, now known as Frost Town, located on what is now the Cumming Nature Center in South Bristol, NY. Since 2019, Frost Town has undergone not only changes in physicality but also in our interpretations as well. Over the summer, new theories arose about the Hall Residence site through continued excavation, and brand-new explorative excavations have been started at a nearby structure (jokingly referred to as the "Hell trench"), as well as at what we believe to be a sawmill near the Gulick road site. In 2019 the prevailing theory was that the last possible use of the area next to the Hall Residence site was a scullery. However, our most recent theory, based on excavations conducted throughout the 2022 field season, is that it may be a refuse area.




*Dr. Alex Smith (left) with students at the October 29, 2022, RAS Paper Session at the Rochester Museum and Science Center.*

The numerous material remains and evidence of archaeological features in several of our new trenches are encouraging for our goal of continuing to pursue uncovering the past. The 2022 field school also had a much larger number of students than the 2019 field dig. Thanks to the ACLS Sustaining Public Engagement NEH Grant we were awarded; we were not only able to conduct more intensive excavations at multiple sites but also lead two separate groups of children's camps in exploratory public archaeology. This exploratory public archaeology consisted of having the kids join us in digging the trenches, lecturing the kids about the history of Frost Town, and having archaeology-related tours of the RMSC. We look forward to continuing excavations, incorporating more public engagement, and educating the public about Frost Town Archaeology.

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## RAS Member Photos

*Figure 1: Planet Venus showing dispersion. Taken Dec 31 2021, just before last inferior conjunction. (Photo Credit: Douglas Kostyk)*

*Figure 2: Solar observatory photo of the Sun taken at noon on same day as figure 3. (Photo Credit: Douglas Kostyk)*

*Figure 3: Sunrise "Green Flash" dispersive reflection from atmosphere, taken 6:24 am April 16, 2023. (Photo Credit: Douglas Kostyk)*

## Announcement of the 2022-2023 Undergraduate Student Research Grant Awards

This year, we had eighteen proposals, requesting over $12,000. Our mission was to award only significant grants rather than small, partial awards. The maximum amount of the grant is $750. The RAS Grants Committee awarded a total of $5750 for ten research projects. The maximum awards were $700 so that we could fund as many proposals as possible.

First place: full funding plus $50 to the student.

**Gabriella Orfanides, Rochester Institute of Technology**. Heat Shock Proteins as a Physiological Stress Metric of Migrating Songbirds. Award: $700. Sponsor: Susan Smith Pagano, Ph.D.

**Amaya Bechler, Cornell University**. Characterizing variation in gut microbiome composition and diet from breeding through molt in the migratory black-throated blue warbler. Award: (full funding) $500. Sponsor: Sara Kaiser, Ph.D.

**Charly Campanella, St. John Fisher University**. Investigating the role of TET2 in human erythropoiesis using CRISPR/Cas9. Award: $400. Sponsor: Zachary Murphy, Ph.D.

**Derek Emrich, Rochester Institute of Technology**. Development and optimization of a parallel poly(A) duplex-based poly(rA)-tailed mRNA purification method. Award: $600. Sponsor: Mike Gleghorn, Ph.D.

**Samantha Geis, Cornell University**. Uncovering neuronal populations associated with aggressive behavior in *Danionella dracula*. Award: $400.00. Sponsor: Andrew Bass, Ph.D.

**Adam Graziano, SUNY Brockport**. Quantifying the presence of the allelopathic compound, emodin in local samples of *Fallopia japonica* and its effect on the growth of native plants. Award: $600. Sponsor: Kathryn Amatangelo, Ph.D.

**Aidan Lynch, Rochester Institute of Technology**. X-Ray Crystallography of the Nudix Hydrolase Rv2985, a Potential Antibiotic Target in *Mycobacterium tuberculosis*. Award: $700. Sponsor: Suzanne O'Handley, Ph.D. & Michael Gleghorn, Ph.D.

**Isabelle Pilo, Rochester Institute of Technology**. Inhibiting the Interaction Between Peptidoglycan-Associated Lipoprotein and TolB Proteins. Award: $600. Sponsor: Lea Vacca Michel, Ph.D.

**Braeden Thomson, Cornell University**. Oxidative costs and constraints of territory quality on reproductive effort in male black-throated blue warblers. Award: $700. Sponsor: Sara Kaiser, Ph.D.

**Noor Zamamiri, Syracuse University**. β-Glucosidase Expression in Poplar. Award: $500. Sponsor: Heather Coleman, Ph.D.

All the money for the grants this year was from the Undergraduate Student Research Grants Fund. Congratulations to all undergraduate researchers from the RAS student grants committee, William Hallahan, Ph.D. coordinator, and the entire RAS board of directors.

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