ASTRO BEAT

October/November 2023

Figure 1: Celebrating a successful annular eclipse: (from left to right) Geovanni Somoza, Kendra Base, Jeremy Lewan, Andrea John (Eclipse Ambassadors), Shanil Virani and Tony Smith (ASP Staff).

Public Engagement in Nevada for October's Annular Solar Eclipse

By Tony Smith and Shanil Virani
(Astronomical Society of the Pacific)

Astronomical Society of the Pacific (ASP) staff were invited to join the Exploratorium, San Francisco's hands-on science center, in Ely, Nevada for the October 14, 2023 annular solar eclipse. The Exploratorium has a long history of providing live streams of eclipses for NASA, and Ely was chosen as their backup site with the primary being in the Valley of the Gods in SE Utah. The ASP was represented by us, co-authors Tony Smith and Shanil Virani, who were asked to provide public engagement during the eclipse while the Exploratorium folks worked on their live stream. Four of our Eclipse Ambassadors were also invited to participate. See Figure 1.

Eclipse Ambassadors are volunteers from communities across the U.S. who have a passion for astronomy and sharing what they know with their communities. The Eclipse Ambassador Off the Path program, funded by a grant from NASA, partners college undergraduate students with amateur astronomers and trains them to share the excitement of NASA solar science with their communities. Engagement events that Eclipse Ambassadors plan and host prepare community members to enjoy the science and wonder of two solar eclipses that criss-cross the USA, first of which was the "Ring of Fire" annular eclipse that occurred on October 14, and second of which is the total eclipse coming up April 8, 2024.

Figure 2: Tony welcomes audience members of a public show to the portable planetarium.

Tony's Reflections on Community Outreach in Ely

Knowing we'd be in Ely for a few days before the eclipse and that a few thousand people were expected to come to the town of about 4,000 residents, we thought about how to engage the community before the eclipse. I have previously used a mobile, inflatable planetarium from Digitalis Education Solutions, so I reached out to them to ask if they would be willing to loan us one of their systems to take to Ely. They generously agreed so I contacted the City of Ely who arranged for us to set up on Thursday evening, October 12th to do public shows about the eclipse in the Bristlecone Convention Center (see Fig. 2). Tickets to the six 20-minute shows sold out very quickly. While we did not charge anything for the planetarium use, the City of Ely, which handled the ticketing, took donations to benefit their annual civic festivals, such as their Independence Day fireworks show.

We invited Eclipse Ambassadors from across the country to apply to join us in Ely. We selected Andrea John, undergraduate in meteorology, and Jeremy Lewan, broadcast meteorologist, from New Jersey and Kendra Base, undergraduate in astrophysics, and Geovanni Somoza of the Planetary Society and Griffith Observatory, from Los Angeles. They were joined by us, new ASP staff members Tony and Shanil.

Each show had 25 people in the five-meter inflatable dome, and I showed a simulation of the eclipse as it would be seen from Ely. Next, we observed the position of the Moon day by day from Third Quarter a week before through the eclipse, and then for another

Figure 3: (above) Pictured left to right: Geovanni Somoza, Mayor Nathan Robertson, Tony Smith, Kendra Base. (right) Lieutenant Governor Stavros Anthony and Tony Smith.

month until the November New Moon. The audiences shared observations that they could see how less of the Moon was illuminated each day as it got closer to the Sun, then "grew" through the waxing phases, "shrank" again through waning, and then on the November New Moon could see that the Moon was below the Sun in the sky, not in front of it as it was during the October New Moon and annular eclipse. This helped them understand why we see the Moon go through phases and why we don't get an eclipse every New Moon.

Notable attendees of the evening public planetarium shows were the Mayor of Ely, Nathan Robertson, and the Lieutenant Governor of Nevada, Stavros Anthony

Figure 4: Set up at Learning Bridge Public Charter School, we were getting K-1 students ready to go into the planetarium.

(see Fig. 3). Most attendees came with their families, and each audience had children, parents, and grandparents. All were very enthusiastic about the planetarium.

On Friday morning, October 13th, we set up the planetarium at Learning Bridge Public Charter School. Ron Hipschman of the Exploratorium did presentations for the 6th, 7th, and 8th grade classes. The Kindergarteners and 1st graders, 2nd and 3rd, and 4th and 5th grade classes rotated through the planetarium that morning (see Fig. 4). They experienced the same presentation as the public shows the night before. A

Figure 5: The diesel locomotive for the night train, to see the dark skies outside of town.
It was clear from all of our public engagements that folks in Ely were very excited about the upcoming eclipse!

few students had attended the public shows and spoiled the punchline of several of my jokes! After the planetarium show the students (a) explored stations where they learned about the size of the solar system, (b) observed the Sun with a Sunspotter, disco ball projections, and eclipse viewer glasses, and (c) used ASP's yardstick eclipse scale model of the Earth-Moon system to make their own eclipse shadows.

In addition to the planetarium shows and school visits, ASP staff and Eclipse Ambassadors joined an evening train ride both Thursday 10/12 and Friday 10/13. We rode the train from the Nevada Northern Railway Museum to dark skies outside of town (see Fig. 5). Along the way we talked with our fellow passengers about the eclipse and did some stargazing from the open-air flat car.

Figure 6: 200 Eclipse participants, ASP staff member Shanil Virani and Eclipse Ambassador Geovanni Somoza, rode the Eclipse train an hour out of East Ely into the foothills of the Steptoe Mountains to observe the annular eclipse.

Shanil's Experience on the Eclipse Train (with Geovanni Somoza)

While up to 5,000 people were anticipated to arrive at the small, mountain community of Ely, NV, the town did a fantastic job at creating a series of 8 events across the region where visitors could participate in viewing the eclipse. One of these events was an "Eclipse Train" for 200 participants where they rode an early 20th century steam locomotive operated

Figure 7: (above) Image of the Moon eclipsing the Sun seen in projecting using a Sunspotter.

Figure 8: (center) ASP Staff member Shanil Virani holding up a disco ball and using it to project "mini-eclipses" onto the side of the train.

Figure 9: (right) In lieu of a covered wall, eclipse train participants used themselves to cast a shadow on the ground, and used their silhouette to create a unique eclipse keepsake as they saw mini-eclipses projected onto their shadow.

by the Nevada Northern Railway Museum. Eclipse Ambassador Geo Somoza and I (Shanil) joined these eclipse enthusiasts for a unique Eclipse trip (see Fig. 6).

Departing at 7:15a Saturday morning, our coal-powered train pulled out of the East Ely train station and departed for an hour-long journey into the foothills of the majestic Steptoe Valley. We arrived at a remote area that would be our location for the next hour to witness annularity.

Upon arriving, Geo and I set up a Sunspotter (see Fig. 7) and a Mirror Ball to provide alternative ways of observing the eclipse. A Mirror Ball (or Disco Ball) are collections of pinhead mirrors, each of which are the reflective equivalent of a pinhole camera aperture. With a covered wall, it provides a unique way to observe the eclipse. Unfortunately, we had no wall to project onto so we had to quickly improvise! Instead, participants took turns casting a shadow onto the ground which provided the silhouette for the Mirror Ball projections (see Fig. 8).

In addition to sharing and interpreting what was going on as first contact began (the start of the eclipse), we shared different cultural responses from various people

Figure 10: Los Angeles-based Eclipse Ambassador, Geovanni Somoza, takes a moment to capture a photograph of the Eclipse using a solar film to protect his phone camera.

Figure 11: Spectacular image of annularity captured by Geovanni Somoza using the early 20th century steam locomotive in the foreground to frame his image.

Figure 12: The end of the annular eclipse was bittersweet. We were happy that our unique Eclipse trip was successful with perfect weather, but it also meant our journey was coming to an end. Eclipse Ambassador Geovanni Somoza and ASP staff member Shanil Virani take a moment to take an image of a memory that will last a lifetime.

Figure 13: Image of annular eclipse taken by Shanil Virani.

around the world to witnessing an eclipse. We also distributed eclipse glasses and helped participants to understand the cosmic dance they were witnessing using demonstration teaching materials we brought. However, all of this was a prelude to the real show – maximum annularity at 9:29 am!

Maximum annularity was like the clock striking midnight on New Year's Eve! That moment will forever be engraved in my mind as I heard shrieks of joy, of laughter, happiness, and applause as the Sun fully encircled the Moon. As an astronomer who understands the underlying celestial mechanics that gives rise to an eclipse, my reaction to seeing the lunar disk in silhouette against the Sun truly caught me off guard. I remember yelling "There it is!" when I could see sunlight wrap around the entire disk of the Moon! As the cosmic dance proceeded, I remember that a cool Ely, Nevada morning became even cooler as ~90% of the solar disk was now covered! In just a few minutes, the Moon was now slipping away from the Sun and one of nature's majestic events was over. At that moment, I understood how umbraphiles (those who chase shadows) are made.

Tony's Experience at the Railway Museum

We arrived at the Northern Nevada Railway Museum at about 7am on the morning of the eclipse. We got nervous as the clouds seemed to be developing but began our set up. The road in front of the museum was closed so the Exploratorium could set up their telescopes and live streaming equipment. Tables were set up at either end where we acted as a "wall of public engagement" to allow the Exploratorium crew to work undisturbed, and to talk with the public who came to the Railway Museum to experience the eclipse. We had a Sunspotter solar telescope, safe solar viewing glasses to pass out, several of ASP's yardstick eclipse models, and various items to use as pinhole viewers including an 8" disco ball (see Fig. 14). Several of the Exploratorium's education staff were with us as well. Jeremy Lewan, one of our Eclipse Ambassadors is a broadcast meteorologist and appeared on the live stream to do a segment in Spanish. The eclipse also happened to fall on his 24th birthday!

Figure 14: (a) Tony Smith demonstrating the use of a disco/mirror ball to project images of the eclipse. (b) Tony at the Nevada Northern Railway Museum set up to engage the public. The Exploratorium live stream broadcast trucks are in the background.

A few hundred people came to the Railway Museum to experience the eclipse and you could feel the excitement in the chilly morning air. The clouds went away right as first contact occurred, building the anticipation. About 15 minutes before annularity, I

Figure 15: Small gaps between tree leaves create pinhole projectors and images of the eclipse are visible on the ground.

noticed the lighting change. It is hard to describe but it just didn't look right. Shadows began to blur at the edges and as the moments of annularity approached you could feel the temperature drop. A cheer erupted from the crowd as the Ring of Fire fully encircled the Moon as if the team we were all rooting for scored on a miraculous play. I wanted to capture the moment with my camera but made sure to also put it down and be fully present, experiencing the eclipse with all of my senses. I was captivated both by the incredible phenomenon of the annular eclipse, and also by the reaction of everyone near me. One of the coolest visuals was seeing the eclipse projected on the ground through a small tree near our table. Hundreds of little eclipses danced around as the breeze rustled the tree. See Figure 15.

As the eclipse moved through its final stages the crowd started to disperse. Folks still came by our table and we talked about what we all just experienced. Everyone loved getting to make their own eclipse with the yardstick eclipse model and seemed to have a better understanding and appreciation for it after what we had all just experienced. For the rest of the day everyone seemed to be steeped in euphoria, still processing the awesome phenomenon we had all witnessed. As an informal educator, I'm all about making people more curious about the world around them. I wonder how many sparks of curiosity were lit that day, and how many will grow into a burning desire to learn more about our amazing universe.

Figure 16: Tony Smith (left) and Shanil Virani (right) in Ely, NV

About the Authors

Tony Smith is an Astronomy Educator for Online Learning at ASP supporting online workshops through the Learn@ASP platform. He graduated from Oregon State University with a degree in General Science Pre-Education. An internship at the Oregon Museum of Science and Industry (OMSI) set him down the path as an informal science educator he's been on for the past 10+ years. Tony currently lives in Pullman, Washington, working remotely for the ASP and also presents a few shows a month at the Washington State University Planetarium and volunteers at the Palouse Discovery Science Center. He can often be found on his bike, in running shoes or hiking boots, finding ways to be outside with his young children.

Shanil Virani, who also joined the ASP in 2023, is an award-winning astronomer and co-author of Daughter of the Stars, an astrophotography coffee-table book highlighting light pollution and what we lose when we lose the night. He is also the host of a weekly podcast entitled "Our Island Universe" that looks at all things space -- how what goes on "up there" affects our life "down here". Prior to attending graduate school at Yale University, he spent 5+ years as part of the Science Operations Team at the Chandra X-ray Observatory. After grad school, Shanil pivoted to teaching and science education as he was a faculty member and Planetarium Director at James Madison University and then later at Morehead State University.

AstroBeat

Number 191 · October/November 2023
Publisher: Astronomical Society of the Pacific
Editor: Greg Schultz
Designer: David Barker

The Astronomical Society of the Pacific increases the understanding and appreciation of astronomy by engaging scientists, educators, enthusiasts, and the public to advance science and science literacy.

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