

Two comets dive toward the Sun (hidden behind an opaque occulter), as seen on January 17, 2021, by the LASCO C3 coronagraph onboard the ESA/NASA SOHO spacecraft.

SOHO-4119
(comet)

SOHO-4120
(comet)



THE LOWELL OBSERVER

Issue 131 | 2024 no. 1

Shrouded in Daylight

By Dr. Qicheng Zhang, Percival Lowell Fellow

In the astronomical community, and especially here in the dark sky city of Flagstaff, we are often acutely aware of the impact artificial lighting can have on our view of the night sky, drowning out the Milky Way and all but the brightest few stars from most urban areas. On the other side of Earth, meanwhile, is the Sun, whose life-giving rays dwarf the intensity of the most brightly lit cities at night. Its brilliance, in fact, poses a major operational hazard to most astronomical telescopes, preventing them from pointing too closely in its direction.

Unsurprisingly, most astronomers do not observe this near-Sun region of sky. After all, as the Earth orbits the Sun, anything far out in the distance behind the Sun will

eventually drift back out into night skies a few months later. Not so, however, for objects in physical proximity to the Sun, which remain concealed in daylight year-round—with one exception. Every eighteen months or so, the Moon hides the Sun from a narrow strip of Earth in a total solar eclipse, as will occur for a slice of North America on April 8. During these brief events, the tenuous solar corona famously makes its grand appearance against the darkened sky. Less known, however, are the sometimes equally spectacular comets that can simultaneously emerge into view.

CONTINUED ON PAGE 11

IN THIS ISSUE

- Jeff Hall Dark Sky Challenge 3
- Lisa Actor Moves Toward Retirement 4
- Digital Preservation 5
- Pluto Arizona's Official State Planet 6
- Staff Profile: Ben Hardesty 7
- Historic Images Coming Online 8
- For the Kids - Native American Designs 9
- Thanks for your 2023 Support 10

Comet 12P/Pons-Brooks: Not that Devilish!

By Dr. Teddy Kareta, Postdoctoral Researcher

If you read about space news regularly, you have almost certainly seen headlines in the past few months decrying, announcing, or warning of the arrival of the "Devil Comet." While there is nothing particularly evil or dangerous about the inbound Halley-Type Comet 12P/Pons-Brooks, you might be surprised to

hear just how much interest, excitement, and new questions that the arrival of this comet has generated among comet scientists—it really is the comet of the moment.

CONTINUED ON PAGE 11



EXECUTIVE DIRECTOR'S UPDATE



By Dr. Jeff Hall

We have seen much change in the past few decades at Lowell Observatory, from construction and commissioning of the Lowell Discovery Telescope to the opening of the Marley Foundation Astronomy Discovery Center (ADC).

It is now time for me to note one more change, one that many people know already: at the opening of the ADC this November, I will hand the executive director baton to my successor and retire from the observatory.

I've been in my present role for fourteen years, and that is more than long enough. I feel an increasing need to make a change for the remainder of my career, and I believe it is necessary for eyes other than mine to be at the helm as the observatory defines and implements its scientific and technical aspirations for the 10-20 years ahead.

As this issue of the *Observer* arrives in your mailbox, the search committee for my successor is already hard at work winnowing applications down to a short list. Finalist visits will occur in early summer, with selection shortly thereafter and onboarding in the fall leading up to the ADC opening.

Lowell Observatory is what it is due to the excellence and dedication of our staff, volunteers, Advisory Board, Trustee, and all our supporters who give so much of their time, talent, and treasure to enable us to continue our mission. It has been my honor to work with all of you. May the night skies above you be always clear and dark, and may the wind ever be in your sails. •

TRUSTEE'S UPDATE



By W. Lowell Putnam

I am a little unhappy to be writing this column for this issue. We are seeing the departure of Lisa Actor after 10 years here at Lowell and I want to thank her and acknowledge our gratitude that she is willing to stay available to Leslie Currie for the balance of this year of transition. We are also starting the search for a new Executive Director as Jeff Hall steps down at the end of 2024 after 14 years as the head of Lowell Observatory.

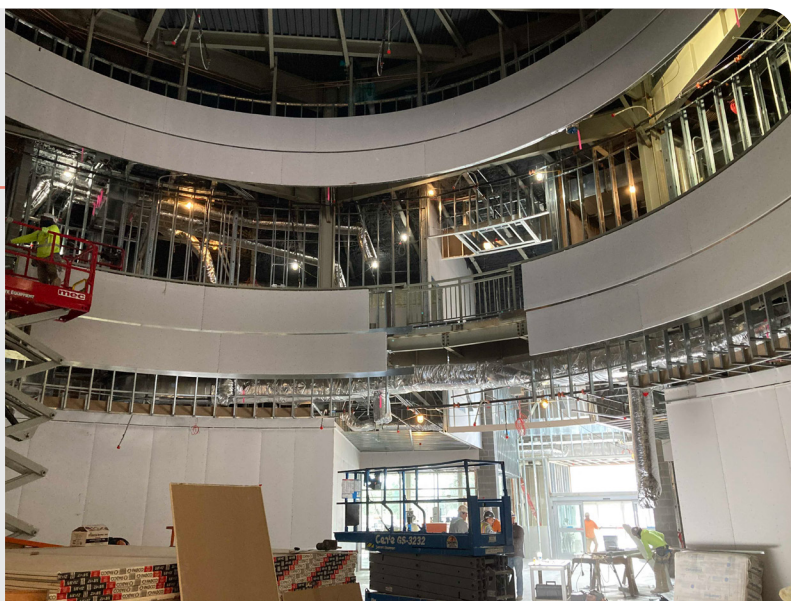
As you can see looking through the rest of this issue, our science research remains strong and there is lots of effort leading up to the opening of the Marley Foundation Astronomy Discovery Center this fall. As I have walked through the new building take shape, it is clear that it will be an incredible facility, allowing us to educate and inspire hundreds of thousands of visitors annually. The ability to present Lowell research as part of the visitor experience will help showcase the exhibits and assure visitors that they are at a place where discoveries continue to happen.

As the saying goes, the only true constant is change. I look forward to everything that is happening and to the opportunity to grow the institution further. My thanks to all of you who help make that happen. •

ADC Update

By Dave Sawyer, Technical Project Manager

As the winter season set in this year, the work to close up the building and make it weathertight was completed and this allowed attention to focus on the interior of the building. The interior walls have all been framed, power and data distributed to the rooms, insulation applied, railings installed, and wall board is currently going up in earnest. The building's electrical, mechanical, and plumbing systems are largely complete and the service utilities—water, electric, and gas—are being connected and the systems are beginning to be turned on. In the Universe Theater, the steel support structures for the giant LED screens are installed and the components of the LED screens themselves have been delivered and will begin to be assembled this spring. As we look forward to completion of the building construction this summer, the fabrication of the exhibits and production



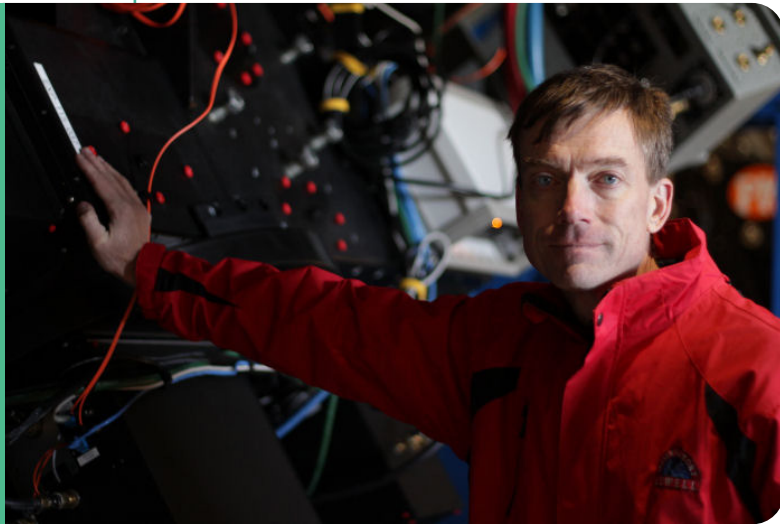
Framing is complete and wall board is being installed in the Origins Gallery.

of theater shows are well underway in preparation for fitting out the facility and ramping up training and rehearsals as we move into fall.

ANNOUNCING THE JEFF HALL DARK SKY CHALLENGE

By Sherry Shaffer, Senior Philanthropy Manager

An anonymous donor has pledged \$1 million to challenge members and friends to contribute to the Jeff Hall Dark Sky Challenge (JHDSC) as part of the \$7 million Marley Foundation Astronomy Discovery Center (ADC) endowment drive.



Dr. Jeffrey Hall has championed dark sky initiatives throughout his career.

Dr. Jeffrey Hall has spent nearly 32 years at Lowell Observatory, with 14 of those as our executive director. His leadership has been a guiding force behind the observatory's success, most recently in the planning and construction of the ADC. In honor of Jeff's remarkable legacy, the Dark Sky Lighting and Dark Sky Exhibits within the ADC will bear his name. This tribute is especially fitting as Jeff has been a staunch advocate for preserving dark skies, not only in Flagstaff but also in encouraging other cities to adopt best practices.

With the help of many generous donors, we successfully raised the funds for the ADC's construction. Our focus now shifts to establishing a \$7 million endowment to keep the facility and its programming at the same high quality. This endowment will ensure the sustainable operation of the facility, sparing us from the need to increase admission costs for maintenance and upgrades.

We are delighted to share that, thanks to the support of friends, Lowell Observatory Advisory Board members, and

Lowell Observatory Foundation Board members, we have already secured \$335,000 towards our \$1 million goal. The \$1 million challenge runs until July 31, providing an opportunity for everyone to contribute before the ADC's Grand Opening in November.

A unique aspect of the JHDSC is the acceptance of planned/estate gifts toward the challenge. By participating in this challenge, you are not only honoring Jeff's legacy but also contributing to Lowell's enduring future.

To acknowledge all these extraordinary gifts, a special place on the donor wall will list the contributors to the challenge. The JHDSC has multiple contribution levels, each representing a celestial milestone in our cosmic journey:

Constellation	\$1,000 - \$10,999
Planetary	\$11,000 - \$25,999
Star Cluster	\$26,000 - \$50,999
Nebula	\$51,000 - \$75,999
Galactic	\$76,000 - \$100,999
Big Bang	\$101,000+

Join us in celebrating Jeff Hall's legacy and safeguarding Lowell's future through the Jeff Hall Dark Sky Challenge. For more information or to make your donation, pledge, or estate gift, please contact Sherry Shaffer, Senior Philanthropy Manager, at sshaffer@lowell.edu or (928) 714-7777.

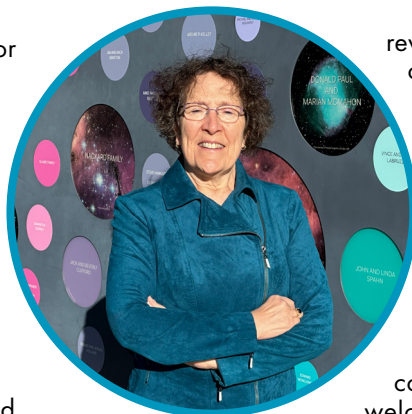
Let's come together to make the JHDSC a resounding success and ensure that Lowell Observatory continues to inspire for generations to come. •

Lisa Actor Moves Toward Retirement

By Kevin Schindler, Historian & Public Information Officer

In 1928, Lowell Observatory found itself in dire need of someone to lead a renewed search for a new planet. Succeeding in this search would go a long way toward reestablishing the observatory as an important center for astronomical pursuits. Leadership found that person in Clyde Tombaugh, who was profoundly suited for the task at hand and found success where few others would have. Nearly nine decades later, the observatory again found itself in dire need of help, this time for a fundraiser to lead the effort to find the millions of dollars necessary to keep the observatory operating in a sustainable manner. And again, the observatory struck gold and found someone profoundly suited for the task. Those familiar with the observatory know this person is biologist-turned-fundraiser Lisa Actor. As Lisa is nearing retirement nine years and \$100 million later, it is safe to say she found success.

As Lisa is nearing retirement nine years and \$100 million later, it is safe to say she found success.



Lisa Actor was not always a fundraiser, and she never gave much thought to working at an observatory, though she held a lifelong fascination with the night sky. After earning a biology degree from the University of the South, she got a commission and was the only female officer on an NOAA ship doing hydrographic surveying. She later worked at the National Marine Mammal Laboratory in Seattle before becoming interested in non-profit work and fundraising. Her first real fundraising job was as director of a public-school foundation in Washington State. From there she transitioned to Westminster College, where she worked for nearly 20 years.

At Westminster, Lisa was on track to become a vice president but eventually burned out and needed a change. The timing of the need for a new challenge was exquisite, as just then Lowell Observatory was searching for its new philanthropy leader.

Lisa remembers, "This job posting hit my email from a headhunter and it said Lowell Observatory was looking for someone who grew up with a telescope in their back yard. Well, I hadn't grown up with a telescope in the back yard, but I always loved the night sky." Observatory leadership was as thrilled to bring on Lisa as she was to accept the offer.

Lisa began working at Lowell in March 2015, and she had a tall order in front of her: to lead the charge in raising \$30 million. To fail would mean the very real possibility of the observatory closing within a decade. To raise the money, she needed to significantly enlarge the fundraising team.

When she arrived, she was the fourth person in the department. Nine years later, the team now numbers 10, with staff specializing in major gifts, foundation grants, planned giving, annual fund, and membership. And in that

time, they have raised more than \$100 million, much of that at the challenging height of COVID.

"Lisa brought a new level of professionalism to our development efforts and helped all of us at the observatory understand the important role philanthropy plays in allowing us to achieve our mission," says Sole Trustee Lowell Putnam. "She is a genuine and highly ethical person, attributes that fit in so well in our culture."

The most obvious result of Lisa's trailblazing career at Lowell is the revolution of the visitor experience with construction of the Giovale Open Deck Observatory (opened in 2019) and the Marley Foundation Astronomy Discovery Center. The latter opens this November, when Lisa will already be in the throes of partial retirement; while she will soon be leaving her full-time position at Lowell, she will continue part-time through the end of the year. She will also work on her own, under the guise of her new company (Lisa Actor Consulting) and welcome a new grandson to the family.

Lisa may not be as physically present at Lowell, but her contributions will be felt for generations to come.

"Lisa is a fundraiser par excellence, approaching philanthropy with sincerity and heart", says Executive Director Jeff Hall. "It's been a joy working with her, and I'm tremendously proud of what she has accomplished for Lowell. She will forever be a part of Mars Hill." •



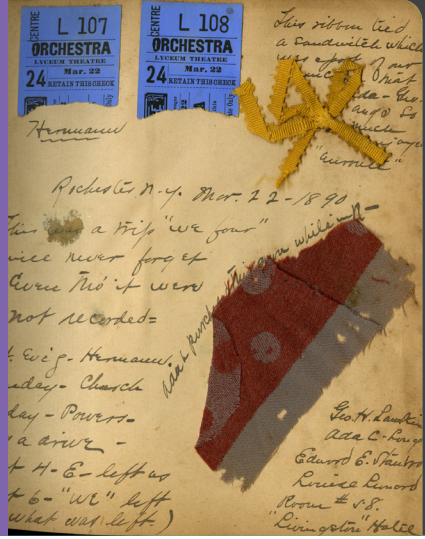
ADC Grand Opening Events

Save the Date!

We are planning for the Grand Opening of the Marley Foundation Astronomy Discovery Center! Mark your calendars for a week of celebrations this coming November.

November 8 & 9: ADC Donor Celebrations
November 10 – 12: Lowell Member Preview Days
November 13 – 15: Soft Opening for the Public
November 16: Ribbon Cutting and Grand Opening

Watch for more details in future *Lowell Observers*.



Treasures from the Archives

By Lauren Amundson, Librarian & Archivist

One of our favorite treasures is a collection of three scrapbooks that belonged to Wrexie Louise Leonard, Percival Lowell's personal secretary. They date from 1877 to 1907 and contain poems, photographs, cartoons, newspaper clippings, announcements, and mementos from Leonard's personal life. All three scrapbooks are digitized and available to view at <https://bit.ly/48yMomx>.

This page from March 22, 1890, includes two ticket stubs from an orchestra concert, a ribbon that was used to wrap a sandwich, and a piece of fabric.

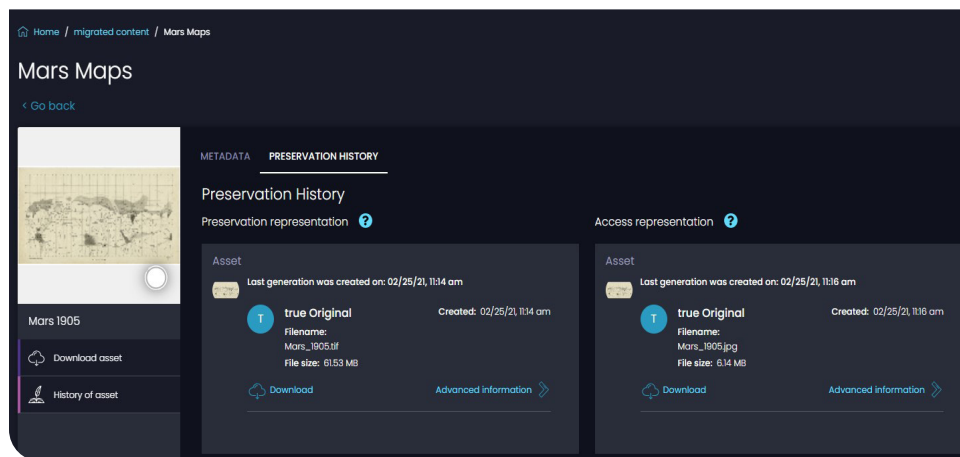
DIGITAL PRESERVATION

By Lauren Amundson, Librarian & Archivist

Archivists are trained professionals who collect, preserve, and provide access to records of enduring value. They work with paper documents, photographs, maps, films, audiovisual materials, and electronic records. While each category presents its own unique preservation and access challenges, electronic records can be especially tricky. Obscure file types, outdated equipment and media (floppy disks, anyone?), and the deterioration of data quality over time, or "bit rot," are all problems archivists encounter in the day-to-day preservation of electronic records.

In 2020, when we were working remotely due to the COVID-19 pandemic, we started thinking seriously about our approach to digital preservation. Most of our existing collections are paper-based, but we anticipate that future donations and transfers to the archives will consist partially or entirely of digital records. This includes born-digital materials and the products of digitization projects.

We researched various options and found Preservica, a cloud-based, hosted software platform that provides long-term digital preservation solutions to archives, museums, libraries, historical societies, colleges, and universities. It allows institutions to safeguard and manage their digital assets to ensure they will be accessible twenty, fifty, or even one-hundred years from now. Its workflow allows us to easily ingest, preserve, access, and share content without the worry of complicated procedures or reliance on our IT department. Preservica follows the best practices of the National Digital Stewardship Alliance's Levels of Digital Preservation.



Preservica provides a single point of access for us to securely ingest the content, preserve it using standards such as checksums (a tool used to check data for errors), build hierarchical collections, restrict certain materials, and provide access both internally and externally. More than 1900 unique file formats can be uploaded and preserved, so a file that may not be accessible on someone's computer will be accessible in Preservica. We take it for granted that the file formats we use today will still be readable in the future, but changes in technology and/or media failures could wipe out an entire collection.

As we receive more digital records, we want to be viewed as a trusted repository that can provide the necessary storage and safety for individuals seeking to donate their collections. For example, when astronomer Dr. Wes Lockwood donated his papers to the archives, part of the collection consisted of CDs and a hard drive containing 51,000 files/30 gigabytes of data. We've been ingesting the files into Preservica and adding descriptive metadata such as names, dates, and subjects. We also successfully uploaded a file format that is commonly used in astronomy, called FITS (Flexible Image Transport System).

We are excited to use Preservica to continue our mission of preservation and access in the digital age! •

LAWMAKER PUSHES TO DESIGNATE PLUTO AS ARIZONA'S OFFICIAL STATE PLANET

By Kevin Schindler, Historian & PIO

The rattlesnake is Arizona's official state reptile, petrified wood is the state fossil, and the bola tie the state neckwear. Now, if Arizona lawmaker Justin Wilmeth gets his way, Arizona will become the first state to boast an official planet: Pluto.



After the January 31 House Government Committee, Representative Justin Wilmeth invited Sedona-based children's book author Diane Phelps and three Lowell staff members to his office. Shown here giving the "Pluto Salute" in Wilmeth's office are, left to right: Dr. Stephen Levine, Kevin Schindler, Phelps, Senator Wilmeth, and Dr. Amanda Bosh.

Wilmeth, a Republican State Representative for District 15, introduced the bill into the House on January 17. Last April he was part of a legislative delegation that toured the construction site of Lowell Observatory's 40,000-square-foot Marley Foundation Astronomy Discovery Center, set to open this coming November. During the visit, he was reminded of Clyde Tombaugh's discovery of Pluto at the observatory in 1930.

Jump ahead to early 2024. "I was sitting around with one of my staffers one day who is from Flagstaff,

named Kelsey," explains Wilmeth. "And I said I want to have a little fun this year." Soon, the discussion triggered a lightbulb to go off in Wilmeth's head, and the idea of naming Pluto the official State Planet formed.

Wilmeth quickly wrote a bill, which reads simply, "Pluto is the Official State Planet." He introduced it to the House on January 17 and, after being passed by the House Rules and Government committees, went up for vote in front of the entire House on February 19. After Wilmeth read a proclamation honoring Pluto, the House discussed the bill and voted to pass it, 52-0.

Wilmeth acknowledged that the bill is not necessarily as weighty as others but is nevertheless important. "We're defenders and purveyors of our state history and this happened here," he explains. "When little kids hear about this, they will fall in love with Pluto and think, 'If that happened here, we can do anything in this state.'"

Lowell Observatory's Clyde Tombaugh, then 24 years old, discovered Pluto in 1930. Its planetary status has long been debated, but Wilmeth points out, "That's not really the point of this bill. It's to honor our state heritage, our state history, and our strong astronomy background that we have."

Lowell Observatory Chief Operating Officer Dr. Amanda Bosh, whose early days as an astronomer included participation on the team that discovered Pluto's atmosphere in 1988, testified at a House Government Committee meeting on January 31. She pointed out that the benefits of the bill extend beyond inspiration and community pride. "Adopting Pluto as our state planet would signify the importance of state optics, photonics and astronomy, an industry that stretches from Tucson through Phoenix all the way up to Flagstaff," she says, "and brings in \$4.3 billion annually to the state as noted by the Arizona Technology Council."

After the February 19 House vote, the bill moved to the Senate, where it was introduced on February 22 and assigned to the Senate Finance and Rules committees for deliberation. It was then approved by the full Senate and, as this newsletter went to press, awaiting Governor Katie Hobbs final approval and signing into law. This could happen by early spring, adding Pluto to the list of officially recognized emblems of Arizona. •



Following the successful February 19 House vote on the Pluto bill, Kevin Schindler joined Representative Justin Wilmeth on the House floor. Schindler holds the proclamation honoring Pluto that Wilmeth read during the House session, and Wilmeth displays a Pluto poster designed by Lowell Creative Specialist Alex Elbert.

Star Stuff: Season 3

By Madison Mooney, Content Marketing Specialist

STAR STUFF

A LOWELL OBSERVATORY PODCAST

Star Stuff: A Space Poddity, by Lowell Observatory, is a 45-minute podcast recorded on Mars Hill that aims to make astronomical science and space exploration fun and accessible to wide audiences using humor, facts, and casual banter. Various members of Lowell's superstar

staff meet to discuss astronomy, planetary science, and space exploration via news articles, movie reviews, audience questions, pop culture discussions, and guest speakers. Season 3 episodes will soon appear on Lowell Observatory's YouTube page.

Host Cody Half-Moon and Lowell Astronomer Dr. Joe Llama in an episode from season 2.

HOW COMMON IS LIFE ON OTHER PLANETS?



Listen now at lowell.edu/starstuff

Members-Only Facebook Page

By Emma Wood, Membership Assistant

The Lowell Observatory Member Community Facebook group is a space where members can meet and discuss topics of shared interest, as well as stay up to date on astronomical events. Every week members can expect to receive a Sky Report on the next week's astronomical events, courtesy of Stellar Vista Observatory. On top of that, members regularly share interesting articles, stories, beautiful pieces of astrophotography, astronomy memes, and more. Join now to become an engaged part of the Lowell Observatory Member Community!

facebook.com/groups/lowellobservatorymembers

Ben Hardesty Instrument Scientist

By Madison Mooney,
Content Marketing Specialist

STAFF
PROFILE



Ben Hardesty began work at the Lowell Discovery Telescope in 2010 as an engineering technician while working towards an undergraduate degree at Northern Arizona University (NAU), later becoming a mechanical engineer. He left LDT in 2018, after completing his education at NAU. He then relocated to Bozeman, Montana for about three years, working in R&D engineering optical access cryogenic instrumentation. He returned to Lowell in 2021, briefly working as an opto-mechanical engineer at the Navy Precision Optical Interferometer (NPOI) before accepting his current role of instrument scientist in 2022.



As an instrument scientist, Ben is responsible for the design and maintenance of existing and new instrumentation at all of Lowell's research facilities. Currently, he has been working on designing a (very large) custom filter wheel to integrate the 4K SOPHIA imaging instrument at the Peggy and Eric Johnson 1-meter telescope at Lowell's Anderson Mesa Station.

"I enjoy being able to take a design challenge from concept, to CAD, to lab testing, to installation with our very knowledgeable and skilled tech team," says Ben. "Having 'hands-on' experience with our incredible suite of instrumentation and telescopes is very rewarding!"

Ben enjoys camping and exploring outside, wood working, metal working, and 3D printing. He has two dogs named Rico and Sophie.

Historic Images Coming Online!

By Rachel Edelstein, Annual Giving Officer

Thanks to the generosity of 180 donors, Lauren Amundson and Stacey Christen in the Archives will recruit, train, and supervise a college intern this year. They will focus on providing access to more than 9,000 digital images in the online catalog ArchivEra.

The goal is to complete the project by December 2024. Members, donors, and the public will be able to access a trove of historic images dating back to the 1880s.

We are grateful for loyal supporters who provided the help needed to get the historic images online. They are accessible at library.lowell.edu.



"Percival Lowell observing at the Clark Telescope, 1897" is one of the many historic images that is easy to access online through ArchivEra.

William H. D. Goddard Postdoctoral Endowment

The Lowell Observatory Foundation is pleased to announce the creation of the William H. D. Goddard Postdoctoral Endowment. This endowment will provide funding for postdoctoral fellows to pursue research at Lowell Observatory. It was created by Mr. Goddard's wife of 52 years, Katharine Wright Goddard, and her family. Bill was a partner and Operating Manager of Brown & Ives Land Company LLC in Providence, Rhode Island, until his death in 2020. He was a longtime member of the Lowell Observatory Advisory Board and served on the Investment Committee.

Dr William H.D. Goddard



AAS Review

A dozen members of the Lowell team traveled to New Orleans in January to attend the annual winter meeting of the American Astronomical Society. They presented talks and posters and staffed the observatory's information booth on the exhibit hall. Lowell attendees included Drs. Jeff Hall, Christoph Keller, Lisa Prato, Stephen Levine, Gerard van Belle, and Taylor Kutra, and Cody Half-Moon, Catie Blazek, Haylee Archer, Peter Knowlton, Jacob Hyden, and Kevin Schindler.



Member Meteor Madness!

Lowell Observatory invites our members to join us for Member Meteor Madness on Tuesday, May 7, 2024, from 10 p.m. to midnight. Witness the peak of the Eta Aquarid meteor shower through the telescopes of the Giovale Open Deck Observatory and historic Clark Telescope. Don't miss this celestial experience—see you there!

Native American Designs

There are different types of asteroids with diverse orbits, shapes and composition. This is similar for Native American designs. They represent several meanings, have certain colors associated with them and are for multiple cultural events during different seasons. In the Navajo culture the four sacred mountains represent elements and their colors. They are turquoise, black jet, white shell and yellow abalone. The mountains also represent the cardinal directions and tie into special stories shared amongst families.

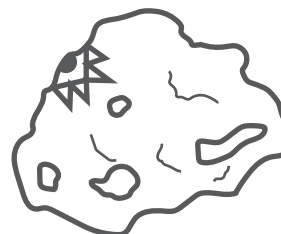
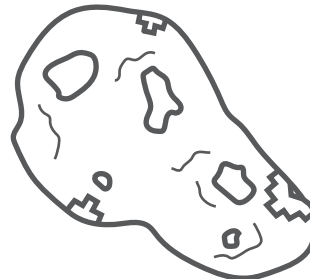
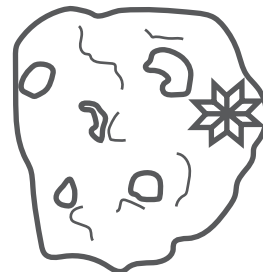
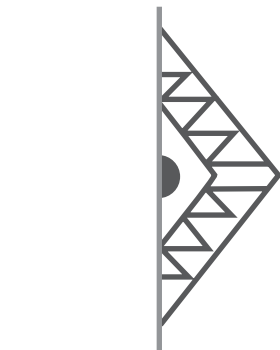
Words that describe asteroids in Navajo:

Frozen – *sik' az (sih-cuhz)*

Metal-like – *beesh nahalin (behsh na-hah-lin)* in reference for metallic

Boulder – *tsétsoh (ts'eh'-tsoh)* meaning Large (*tsoh*) Rock (*tsé*)

Complete the designs below and finding their matching asteroid:



THANKS FOR YOUR 2023 SUPPORT!

By Lisa Actor, Chief Philanthropy Officer

Lowell Observatory supporters came through again in 2023, helping us surpass our annual appeal goals, raising Lowell member numbers above pre-pandemic levels, and completing fundraising for the Marley Foundation Astronomy Discovery Center (ADC).

ADC Fundraising Goal Met!

In August of 2022 we received the gut-punching news that pandemic-related cost escalation had increased the price of the ADC by a whopping 36% or \$14 million. The only way to bring costs down was to scale back our vision for the facility, which caused considerable pain for the Lowell planning team. We made plans to cut essential elements of the ADC—including the exhibits for an entire gallery—if we could not raise the extra funds. Thanks to our loyal supporters, we did not have to cut exhibits or anything else.

In December 2022, we received an ADC fundraising challenge. If we could raise \$1 million by April 15, 2023, an anonymous donor would contribute a matching \$1 million to help us close the cost escalation gap. Lowell supporters responded and we met the goal by April 10, 2023. Our wonderful ADC lead donors committed another \$7.5 million. The State of Arizona came through in May of 2023 with a promise of \$5.6 million to help us finish the project without cutting any amenities. We are now completing the ADC just as we had envisioned it—fabulous!

Excellent Year for Seasonal Appeals!

Your support throughout 2023 helped us train elementary school teachers to teach science for our Orbits summer camps. You helped us create the software needed to remotely operate our research telescopes. You helped us upload our historic documents and images, so they are available for the public to access. Finally, you provided funding to help us recover from a snowy start to 2023 when we had to close our visitor center for days at a time due to record-setting snow. By the end of 2023, 459 of you had supported our appeals. Thank you!

Lowell Members Return!

By the end of 2023 Lowell member numbers had grown to 3,471 – 100 more than we had at the end of 2019! In addition, many of you increased your membership gifts in 2023, lifting our membership income over the \$400,000 mark for the first time. Thank you!

Your Loyalty Makes a Difference!

Loyal donors to the Directors Opportunity Network (DON) and the Slipper Society underwrote new initiatives in science and outreach last year. And we added members to the Percival Lowell Society, those loyal supporters who have chosen to include Lowell in their estate plans.

In 2024, Lowell Observatory will celebrate its 130th anniversary. Our history, science research, and STEM education programs make Lowell Observatory a favorite destination for visitors. We keep pushing the envelope because of you. We appreciate your continued support for this special place. Thank you! •



Percival Lowell Society members visit the ADC rooftop during a hard hat tour. October 2023.

Supporter Feedback

Compiled by Heather Craig, Marketing Operations Specialist

Excellent facility with super helpful staff and nice gift shop. Clark Telescope and observatory is a "must see" for astronomy buffs.

Yelp

Google Review

This place is awesome. We went on a partly cloudy night and we're able to see everything. Got to look through several telescopes and see some incredible stuff. Learned a ton about space and some of the history of how things were discovered. Would recommend going at night!

The term “comet” typically refers to any sub planetary object displaying a fuzzy coma and/or tail indicative of ongoing mass loss. Classically, these objects are considered to be blocks of ice and rock that become active as they approach the Sun when solar heating sublimates their ice, driving dust and gas into space to form the comas and tails we see from Earth. Comets closer to the Sun experience more vigorous heating, so tend to be brighter and more active than comets farther away. The most extreme cases of sungrazing comets pass just above (“graze”) the surface of the Sun where heating is so intense that both ice and rock alike vaporize, yielding behavior that uniquely reflects these comets’ interior structure and composition, and thus the early solar system environment in which both they and the planets formed.

Several of these comets have been so brilliant they appeared plainly visible beside the midday Sun, but far more hide behind the bright blue sky, unseen. Historically, the fleeting minutes of daytime darkness during total solar eclipses provided the only views of these fainter comets. A clearer picture of what’s lurking in broad daylight began to emerge in recent decades with the advent of spaceborne coronagraphs—devices creating artificial solar eclipses to provide a continuous view of the corona and near-Sun sky outside the brief windows afforded by eclipses, all from the darkness of space. Aided by citizen scientists, these coronagraphs have now uncovered more than five thousand of these daytime comets—surpassing the combined tally of all known nighttime comets.

As prolific as they are for comet discovery, these coronagraphs are still first and foremost heliophysics tools optimized to observe and monitor the solar corona. Their resolution and sensitivity are comparable to that of modern phone cameras, and if not for their near-Sun observation capability, would be outclassed by even

modest backyard telescopes. To better characterize these comets—to determine what they are made of and where they are from—I therefore work not only with these coronagraphs, but also track down these same comets away from the Sun with nighttime telescopes, to establish direct comparisons with the many observations of ordinary, nighttime comets. I am most excited, however, to now be developing dedicated instruments specifically targeting these near-Sun comets in daylight, which provide a realistic avenue to directly address the physical limitations of solar coronagraphs. Here, the sky—even a brightly sunlit one—is no limit. •



Field testing experimental daylight imaging hardware atop the Orange Cliffs overlooking Canyonlands National Park during the October 14, 2023, annular solar eclipse.

COMET 12P/PONS-BROOKS | CONTINUED FROM PAGE 1

Pons-Brooks has a 71-year-long orbit—the last time Pons-Brooks was observed was the middle of the 1950s. Comets on such long orbits need to be “recovered,” meaning that scientists search the part of the sky where they expect the comet to show up and cross their fingers. As comets orbit the Sun and throw off gas and dust, their orbits are constantly changing slightly—we call this “non-gravitational acceleration.” It is the part of their long-term evolution we have a much harder time predicting. Recovering comets is clearly as much about luck and intuition as it is about doing your math right and working long nights. On June 20, 1953, Dr. Elizabeth Roemer, whose photographic plates are in Lowell’s archives,

recovered the comet half a degree away from where it was supposed to be. Sixty-seven years later, minus half a work week, Dr. Quanzhi Ye (University of Maryland/Boston University) and colleagues recovered Pons-Brooks on June 17, 2020 using the Lowell Discovery Telescope (LDT). These observations revealed that Pons-Brook’s nucleus—the solid body at the center of the comet’s atmosphere—was much larger than that of a typical comet.

On July 20, 2023, the comet underwent an extremely large outburst—it brightened by a factor of a hundred in a few hours! I was on vacation at the time—the lovely beaches of Cape Cod could not stop me from checking my work email—and I felt like I had missed the opportunity to observe something really interesting. Then it happened again in October. And again in November and January. Pons-Brooks keeps undergoing outbursts, some as large as the original event from July and some a little smaller. Comet scientists do not have a clear single idea for how such energetic events can happen on comets generally, let alone several times in just a few months. The aftermath of the July event is visible in the first image attached to this article, and another comet displaying a similar two-pronged or devil-horn appearance is visible in the second.

The comet will likely be bright enough to see with your

A different comet, 174P/Echeclus, showing a similar morphology to Pons-Brooks. The two-pronged shape is probably related to their sizes, as gas expanding in an outburst gets blocked by their larger-than-average nuclei. Credit: Teddy Kareta et al., 2019.

CONTINUED ON PAGE 12

naked eye around the start of April of this year—right around the same time as the total solar eclipse. If the comet has another one of its outbursts around that time, it really could be spectacularly bright. That said, predicting how bright comets will be is a famously foolish effort.

Understanding comets on orbits long enough that an individual human might only see them once or twice is a generational effort. We will build off the progress made in the 1950s this go-around, and hopefully the comet scientists of the 2090s will do even better. •

Front cover image: This September 2023 image of Pons-Brooks shows both the debris from the months-earlier July outburst as a faint two-pronged structure and dust from ongoing normal cometary activity. Credit: Teddy Kareta/Lowell Discovery Telescope.

Recent Publications

Moskovitz, N., Thomas, C., Pravec, P., et al., 2024, PSJ, 5, 35, Photometry of the Didymos System across the DART Impact Apparition

Glein, C., **Grundy, W.**, Lunine, J., et al., 2024, Icarus, 412, 115999, Moderate D/H ratios in methane ice on Eris and Makemake as evidence of hydrothermal or metamorphic processes in their interiors: Geochemical analysis

Dr. Stephen Levine has created a listing of research utilizing the 4.3-meter Lowell Discovery Telescope. It is based on the Astrophysics Data System (ADS) and is updated regularly: www2.lowell.edu/users/tac/bio/dct_ref_pubs_et al.html

Dr. Levine has also put together a list of work by Lowell Observatory staff: www2.lowell.edu/users/tac/bio/Lowell_Annuals.html

Find us on Social Media

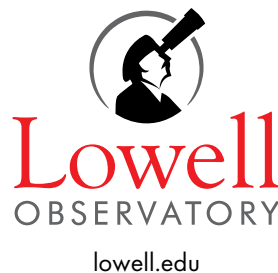
 facebook.com/lowellobservatory

 [@lowellobs](https://twitter.com/lowellobs)

 [@lowellobservatory](https://instagram.com/lowellobservatory)

 lowell.edu/youtube

 [@lowellobservatory](https://tiktok.com/@lowellobservatory)



The Lowell Observer is published quarterly by Lowell Observatory
1400 W Mars Hill Road, Flagstaff, AZ 86001

For comments about the newsletter, contact

Historian/PIO Kevin Schindler: kevin@lowell.edu | 928.233.3210 | Layout and Design by Sarah Gilbert
Contents Copyright 2024 by Lowell Observatory ISSN 1054-0059

