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ACTIVE SMALL BODIES IN THE SOLAR SYSTEM By Dr. Teddy Kareta, Postdoctoral Associa

The planets of our solar system grew larger by accreting the bodies smaller than them that wandered too close. The smaller bodies that survived without being swallowed up by Jupiter or Neptune, the remnant planetesimals, formed around the same time as the bigger bodies and should thus record information about that time when the planets were forming. If we could understand how these leftovers have changed since the time of their formation, we could "roll back the clock" and

Postdoctoral Associate

understand something about why the solar system looks the way it does today.

My research primarily focuses on the active small bodies of the solar system - the comets, asteroids, and centaurs which are shedding material, sometimes forming tails and atmospheres. I want to address that big picture research question of how they've changed since they formed by observing how they are

CONTINUED ON PAGE 11

IN THIS ISSUE

Dr. Hunter's Retirement from NAAOP LDT by the Numbers New Astrophotography Program Staff Profile: Dr. Ellsworth-Bowers Internship Results in Online Exhibit Eclipse Over Texas: Live from Waco For the Kids: Constellations **Slipher Society Loves Science**



Lowell Observatory Names First Percival Lowell Fellow

By Kevin Schindler, Historian/PIO

This year, Lowell Observatory introduced the Percival Lowell Postdoctoral Fellowship to support early-career scientists who wish to pursue independent research in astronomy, planetary science, instrumentation, and related fields. The observatory plans to appoint one new Percival Lowell Fellow each year.

Arizona State University's Tyler Richey-Yowell is the inaugural fellow and began her tenure in September.

The Percival Lowell Postdoctoral Fellowship consists of a four-year

CONTINUED ON PAGE 11

EXECUTIVE DIRECTOR'S UPDATE



I'm writing this on a chilly day that feels like fall in Flagstaff. January, when we briefly closed our outreach programs once again as the Omicron wave blew through, seems like yesterday; and now the year is running to its conclusion and

we are at work on next year's budget and our financial projections. The outlook is the usual set of two-sided coins.

We have had phenomenal success with fundraising for the Astronomy Discovery Center, but this year we have encountered appalling increases in materials and construction costs. It's making everyone feel like Sisyphus, but it's also thrilling to see the building taking shape and on track for a 2024 opening. We will continue to apply every ounce of effort and will to see that the ADC fulfills its vision as fully as did the Lowell Discovery Telescope.

We weathered the pandemic well, thanks in part to the Percival Lowell Trust, which gives us a crucial financial cushion during troubled times. But the 2022 upheavals abroad and domestic double-whammy of high inflation and a sagging stock market have rendered the outlook complicated and uncertain.

But this is one of the themes we want to convey in the Astronomy Discovery Center: uncertainty is ever the order of the day. We live in a universe governed by bizarre principles of uncertainty and unknowability, and our research constantly presents us with surprises and challenges to long-held ideas. We'd love to have a clearcut path forward, but it's not how the universe works; it's not how knowledge works; and it's not how non-profits work. Let us not fear but embrace and—dare I say, even enjoy the unfamiliar and uncertain, being nimble in adapting and in charting the always-murky way forward. We shall continue to do so, thanks to our excellent team and to all of you who support and invest in our mission. •

TRUSTEE'S UPDATE



It is All a Matter of Perspective

This past August a group of Lowell supporters and staff, including me, were visiting the Pic du Midi Observatory, located high (about 9,500 feet) on the French side of the Pyrenes. Built a little more than

a decade before Lowell Observatory, it is accessed now by cable car, instead of on foot and with mules when first founded. The observatory primarily focusses on solar observing and is also a popular tourist destination. The original dome has now been converted to a planetarium. Before the program began, the staff member talked about the observatory's history and specifically how the former telescope, in 1909, was used to discredit the concept of life on Mars. Unaware of the background of most of the audience, he proudly proclaimed, "We killed the Martians!" After the program I went up and introduced myself and told him that our founder gave "birth" to the Martians they had "killed". We enjoyed a good laugh and he asked for our autographs on the Lowell Observatory booklet we gave him.

Percival's theories on Mars were incorrect, but the work done to challenge them required other scientists and institutions to rise to the occasion, and society benefited from the resulting research. "Pure research" requires a constant give and take as we work towards a better understanding of the universe and our place in it. Percival may have been wrong about Mars, but his passion to learn more and push the boundaries of our knowledge still serve as the base of our mission, and our continued growth and success.

Thank you for your support and being part of that effort. •

ADC Construction Update

By Dave Sawyer, Technical Project Manager

It has been just about a year since we started the excavation for the ADC and the building is currently taking shape. The exterior masonry walls for the northern hemisphere of the building are complete and many of the interior block walls are, too. Underground utilities have been installed and floor slabs have been poured. The central steel tower that will support the upper levels of the facility, and defines the main hub "Origins Gallery", has been erected. Outside the building, waterproofing and drainage are being done in preparation for backfilling the foundation and completing earthwork before winter sets in.





Dr. Deidre Hunter's Retirement from NAAOP

By Hannah Rounds, Corporate and Foundation Philanthropy Manager

Many readers will have heard of Lowell Observatory's Native American Astronomy Outreach Program (NAAOP). Lowell Astronomer Dr. Deidre Hunter recently announced her retirement from the program after serving as its leader for 25 years. In her words, she sees the change as "getting out of the way of the young people who have all the new ideas and energy to carry them out."

The program Hunter began in 1996 with fellow astronomer Dr. Amanda Bosh has flourished, picking up invaluable partners along the way: Navajo and Hopi tribal elders, principals, teachers, Lowell astronomers and educators, Northern Arizona University graduate students, postdocs, professional STEM role models, and many donors. Under Hunter's leadership, the program created inspiring STEM experiences for more than 116 teachers and 3,400 students.

From the beginning, the road has not been easy. Hunter recalled, "I remember our first classroom visit to several of an 8th grade teacher's classes in Shiprock, New Mexico. I was very nervous when we started and totally exhausted when we finished. I have never understood how teachers do that all day every day."

Hunter's last year with the program came with the pandemic and all its challenges. However, she and her team packed and mailed hundreds of lesson packets and logged countless Zoom hours to connect with students.

Hunter has entrusted the program to Education Manager Todd Gonzales and Multicultural Outreach Supervisor Alethia Little. They have been involved with the program for six and 11 years, respectively, and will carry on Hunter's spirit of sensitivity, responsiveness, and dedication.

(Above): In 2015, the American Astronomical Society awarded its Education Prize to Dr. Deidre Hunter (left) for her leadership of NAAOP.

Big Red Carries Grand Marshall in Parade

By Kevin Schindler, Historian/PIO

Apollo 17 astronaut/former US Senator (New Mexico) Harrison Schmitt served as the grand marshal in Flagstaff's July 4 parade. Schmitt and his wife, Teresa, rode in Big Red, Percival Lowell's 1911 Stevens-Duryea automobile. The driving team consisted of Jake Tiegs and Frank Cornelius, and Kevin Schindler carried the "Grand Marshal" banner with Jennifer Schaber of Discover Flagstaff. Thanks to the Lowell Observatory Historic Car Repair Team for getting Big Red in top working order.

Big Red passes by the historic Weatherford Hotel during Flagstaff's July 4 parade. Note Lowell Observatory's 24inch Clark dome in background. | Credit: Rich Bohner



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You can support Lowell Observatory by using the smile.amazon.com link when making your purchases and we will receive donations from Amazon.

Here's how it works:

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- Enter "Lowell Observatory" as your charity

Amazon will donate 0.5% of your eligible purchases to Lowell. We receive quarterly distributions which totaled almost \$1,000 last year.

THE LOWELL DISCOVERY TELESCOPE BY THE NUMBERS

By Kevin Schindler, Historian/PIO

Throughout 2022, Lowell Observatory has celebrated the 10th anniversary of first light for the Lowell Discovery Telescope (LDT). It was on April 3, 2012 that scientists and engineers first used the fully assembled telescope to image the sky. As part of this recognition, here is a look at the LDT by the numbers. Well, ten numbers: one for each year of LDT operation.

The height, in feet, of the LDT's metal dome, which measures 62 feet in diameter.

The number of devices called 20 actuators that are spread around the bottom of the LDT's primary mirror. These are attached to sensors and hold, support, and control the shape of the primary mirror.

6,700

The weight, in pounds, of the LDT's primary mirror, which measures 4.3 meters (just over 14 feet) in diameter and 10 centimeters (nearly 4 Watch our LDT 10th anniversary series: inches) thick. Why doesn't this extremely thin mirror bend under its own weight? See 120 above. By the way, the telescope's secondary mirror measures 1.4 meters (a bit more than $4\frac{1}{2}$ feet) in diameter and weighs 500 pounds.

The cost, in 53,000,000

dollars, of building the

lowell.edu/youtube

LDT and associated facility. The telescope was originally called the Discovery Channel Telescope, in honor of the instrument's naming sponsor, Discovery Communications. The name Discovery is still included in the current name, to both continue honoring Discovery Communications and also as a nod to the discoveries being made with the telescope.



The number of miles (driving) from Flagstaff City Hall to the Lowell Discovery Telescope.

The number of instruments that the LDT's instrument cube can hold at one time, allowing for use of all the instruments, making the LDT one of the most versatile telescopes in the world. As former Lowell Observatory Director Dr. Bob Millis said, the LDT is the "Swiss Army Knife" of telescopes.

> The elevation, 1,740 in feet, of the terrain on which the LDT facility sits.

> > The current number of published

290

1()()

professional research papers using LDT data. The number has actually surpassed this, and the papers have been authored by scientists from around the world.

The number of megapixels in the massive CCD of the Large Monolithic imager, which is the LDT's workhorse camera. In fact, this is the largest CCD that can be made with current manufacturing techniques. CCD stands for charged-coupled device; such mechanisms are used for high-quality image sensing in digital cameras and video recorders.

The average thickness, in nanometers, of the aluminum coating on the primary mirror. This is 1,000 times thinner than typical

0.1-millimeter-thick copy paper! 100 is also the number of Earth-sized planets scientists plan to discover by using the LDT in conjunction with a powerful instrument built by Yale University called the EXtreme PREcision Spectrometer (EXPRES).

Star Stuff Podcast

By Madison Mooney, Content Marketing Specialist

Lowell Observatory is proud to present Star Stuff: A Space Poddity! This 45-minute podcast first aired in January of 2022 with the aim of making 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 with special guests to discuss astronomy, planetary science, space exploration, and more. This podcast is available to listen to on major audio platforms, including Spotify, Amazon Music, Stitcher, and Apple Podcasts.



New Astrophotography Program by Curtis Dankof, Public Program Supervisor

Percival Lowell first allowed guests on Mars Hill to view through the Clark Telescope in 1896, a tradition we keep to this day.

Over the years, we have expanded upon this by adding more telescopes to provide dazzling views of the universe. Even with these amazing telescopes there is a limiting factor as to what we can observe: the human eye. Through the incredibly generous donations of Eric etc.) Once the second set of exposures is under way, we take the guests through the processing of the first set of images. We use a wonderful program called Pixinsight for all the processing, and maybe a little Photoshop to make

and Peggy Johnson, we have developed an astrophotography program to help overcome this limitation and to provide guests with a brand-new experience.

This exclusive program is geared toward guests with a budding interest in astrophotography, or just those who simply want to take amazing images of deep sky objects and learn how it is done. Guests can book a private twohour astrophotography session utilizing the



This image of the Southern Pinwheel Galaxy (M83) was captured with the GODO's 17-inch Planewave Telescope.

things look extra pretty. Depending on the objects chosen, we may process the second object with them during the program, or just continue taking images until the end of the program.

These programs are generally held on Tuesday nights when we are not open to the public. During any downtime in the imaging or processing, our guests have access to all the GODO telescopes. They are sent home with the images we made together as well as all the original data for any potential practice they may want in the future.

17-inch Planewave at the GODO. During the session, our educators lead them through the entire process of taking images, stacking them, and producing beautifully detailed, full-color images. We generally image one brighter object first (usually a star cluster) and then begin taking exposures of a fainter object (galaxy, nebula, We demonstrated this program for the Advisory Board in June and offered it to members during the summer. With the approach of fall, it opened to all who want to book it and experience the wonders of the night sky in a never-beforeseen way at Lowell Observatory. •

Lowell Partners with Meteor Crater on Asteroid Day

by Kevin Schindler, Historian/PIO

On June 30, Lowell Observatory and Meteor Crater hosted a one-day public event centered around asteroids and their impact on Earth. Daytime programming took place at Meteor Crater and evening activities happened at Lowell. Programming included scientific presentations, facilities tours, food trucks, local beer, science demonstrations, and night-sky telescope viewing. The event was one of many independently organized activities around the world supported by the United Nationssanctioned program called Asteroid Day. Founded in 2014, Asteroid Day raises public awareness about asteroids and their risks and features events generally taking place on June 30—the date, in 1908, of the largest recorded



asteroid impact on Earth. •

Flagstaff Mayor Paul Deasy and Coconino County Supervisor Jeronimo Vasquez went to Lowell Observatory, and Winslow Mayor

Roberta "Birdie" Cano appeared at Meteor Crater, to proclaim "Asteroid Day" as an officially recognized day in both Flagstaff and Winslow, respectively. Standing here in front of a meteorite in the Meteor Crater Visitor Center are (left to right) Lowell Observatory's Kevin Schindler and Dr. Christoph Keller, Roberta Cano, and Meteor Crater's Matt Kent. Credit: Richard Bohner

Dr. Tim Ellsworth-Bowers

by Madison Mooney, Content Marketing Specialist



Dr. Tim Ellsworth-Bowers became the Lowell Discovery Telescope (LDT)'s first Support Astronomer in August of 2020. Tim completed his undergraduate studies in physics and science education

at the University of Arizona in 2003, after which he taught science at Flagstaff High School for three years. He earned a PhD in astronomy from the University of Colorado, Boulder in 2014.

Tim's responsibilities as support astronomer include developing and maintaining documentation for observers, providing new-user observing support, organizing operational engineering tasks to maintain and improve telescope performance, and communicating with the various onsite and remote

teams operating, maintaining, and using the telescope. He also facilitates communications between Lowell Observatory and the partner institutions that use the LDT for research, which include Boston University, the University of Maryland, the University of Toledo, Yale University, and Northern Arizona University.



Tim says that becoming a support astronomer at the LDT is a dream come true, as pursuing a career in astronomy has always been his goal. His main area of research lies in the interaction between star formation and galactic environments at spiral-arm scales within our Milky Way Galaxy.

Reader's Digest Recognizes Lowell as Arizona's Most Historic Landmark By Kevin Schindler, Historian/PIO

Arizona boasts a wide variety of historic landmarks spread across the state. But the most important of all of them, according to *Reader's Digest*, is Lowell Observatory. The recognition is part of an online Reader's Digest story identifying the most important historic landmarks for each state (rd.com/list/most-historic-landmark-everystate/). The Lowell entry reads, "For an out-of-this-world experience, check out Lowell Observatory, the spot where Pluto was first discovered in 1930. Now one of "The World's 100 Most Important Places," according to *Time* Magazine, it's open for tours and nightly stargazing. When it's your turn at the telescope, here are iconic constellations to look for in the sky (rd.com/list/iconicconstellation-pictures/). Trust us, you'll be seeing stars."



Members-only Facebook Group

In early May, the Membership Office was pleased to announce a new members-only Facebook group. This is a place where members can meet and discuss things of shared interest, as well as stay up to date on events. At the time of writing, topics have included telescope

operation, the May lunar eclipse, and a shared article from astrobiology.com. Join now to become an engaged part of the Lowell Member Community! To join the group visit:

facebook.com/groups/lowellobservatorymembers

INTFRNSHIP **RESULTS IN NEW** PLUTO ONLINE EXHIBIT

By Melissa Valenzuela, Archives Assistant



In the spring of 2021, I took a public history course at Northern Arizona University (NAU), where my instructor encouraged our class to apply for internships that would prepare us for life outside of the classroom.

One of the programs he mentioned was the opportunity to build a digital exhibit at Lowell Observatory. We had taken a virtual tour of the archives at Lowell a few months prior and I experienced what its archivist Lauren Amundson describes as "Archives Awe" when she showed us a telegram from a twelve-year-old girl named Venetia Burney who was the first person to suggest that Lowell name its newly discovered planet "Pluto." I applied in March of that year, and a little over a month later I was chosen to be Lauren's intern and create a digital exhibit about Pluto.

The project was funded by the NAU/NASA Space Grant, a partnership that funds undergraduate research in science and related fields. I felt extremely grateful for the opportunity to represent the humanities in a primarily science-based program, and even more grateful that I'd been given Pluto as my muse. I began in August of 2021 by digging through the Pluto collection of old newspapers, letters, photographs, and writings from Percival Lowell himself. I had never been in a physical archive before, but it soon became my favorite place and I never got over the excitement of being surrounded by history.

When the time came to interpret the artifacts I'd been working with, I was much better at remembering dates and important figures than any of the science (though I have since developed a fun new party trick of being able to locate Pluto on a glass plate). This is where experts like Will Grundy and Kevin Schindler came to my rescue, and I greatly appreciate their guidance. With their help, I was able to cover the story of Pluto from the initial search that began in 1905, to the New Horizons mission in 2015. My mentor Lauren was also a great resource to bounce my ideas off, and her encouragement kept me going every step of the way.

I completed the exhibit in April of 2022 after eight months of diligent research and meticulously arranging my selected items. On April 23rd, I published the exhibit to the main library website and presented it to fellow researchers at the Space Grant Symposium in Tucson, Arizona. The response was overwhelmingly positive, and several of my peers approached me afterwards to share their newfound interest in the role that museums and archives play in preserving scientific knowledge. My internship was a rewarding experience and I look forward to designing more exhibits at Lowell soon.

> The exhibit may be viewed at: collectionslowellobservatory.omeka.net/ exhibits/show/pluto/the-story-of-pluto

Flagstaff Astronomy Symposium

By Dr. Phil Massey, Astronomer

On April 13, Lowell Observatory hosted the Flagstaff Astronomy Symposium

(FAS), featuring 27 speakers from Lowell, Northern Arizona University (NAU), the U.S. Geological Survey, and the U.S. Naval Observatory. Organized by Lowell astronomer Dr. Phil Massey and NAU planetary scientist Dr. David Trilling, the FAS was started in 2015 as an annual event. It guickly moved to a biannual event due to the overwhelming response.

The symposium is an opportunity for Flagstaff astronomers and planetary scientists to share their work with each other, and to meet fellow researchers that they may not know. As usual, there was strong participation from early-career scientists (students and postdocs), as well as faculty and research staff. Due to the pandemic, the March 2020 FAS had to be canceled, and the symposium has been on hold since then. For many of us in the 60-person audience, it was the first in-person conference we have attended since the pandemic began.

As usual, the presentations consisted of five-minute talks, and covered such diverse topics as wandering black holes, giant stars, Martian water-ice clouds, the colors



Lowell Observatory Postdoctoral Fellow Dr. Teddy Kareta presents some of his recent research on "gateway centaurs," a type of asteroid. | Credit: Hannah Zigo.

of asteroids, massive stars, and Arabian skies. Support by Mattie Harrington, Hailey Osborn, Curtis Dankof, Dave Shuck, C.J. von Buchwald-Wright, and Scott Do are aratefully acknowledged. The next FAS will be held this fall, if the creek don't rise.

Eclipse Over Texas: Live From Waco to Celebrate April 8, 2024 Total Solar Eclipse

By Kevin Schindler, Historian/PIO

On April 8, 2024, a total solar eclipse will be visible from a narrow path running from Mexico to Canada. Texas will be an ideal viewing spot, and Lowell Observatory is teaming with The City of Waco, Baylor University, and Discovery on a public event, Eclipse Over Texas 2024: Live from Waco. This will include an onsite celebration at Baylor University's McLane Stadium in Waco, as well as virtual programming that people around the world may view.

Eclipse Over Texas 2024: Live from Waco will consist of a full day of presentations by astronomers and educators, interactive activities, and telescope viewing. Discovery will broadcast the event on their linear and digital networks. All of this will center around the eclipse: the Sun will begin to be eclipsed at 12:20pm CDT. The Sun's surface will gradually be covered until totality sets in at 1:38pm CDT. This will last for four minutes and 11 seconds, at which point the Sun will begin its gradual move out of the Moon's shadow.

Waco sits in the middle of the path of totality. This, combined with typically excellent weather in April, as well as easy accessibility, makes Waco an ideal location for an eclipse event.

For information, see eclipseovertexas2024.com.



For the Kids

CONSTELLATIONS



Can you find the constellations below in the image above? Use a pen and trace out each constellation.



Words to Know:

Constellation(s) - Groupings of stars that form shapes or patterns of imaginary objects, animals, or people in the sky named from long ago. There are 88 total.

Asterism - A group of stars forming a known patterns as part of a constellation. Like the Dipper!

Bonus:

There is an asterism in the summer sky called the "Summer Triangle." Can you find it?

SLIPHER SOCIETY MEMBERS ARE PASSIONATE ABOUT SCIENCE By Sherry Shaffer, Philanthropy Manager

Raising money for something as big as the Kemper and Ethel Marley Foundation Astronomy Discovery Center (ADC) can distract from other needs. Two years ago, a donor reminded us that while the ADC is very exciting, some members would prefer to focus on the science at Lowell Observatory.

Scientists must apply for grants to fund their projects. Awards aren't a sure thing and don't always fund the entire project. So, our scientists may not have the resources they need to start a new line of inquiry, finish off a project, or disseminate the results. We formed the Slipher Society for donors who wish to direct their gifts exclusively to research, giving Lowell's scientists the freedom to pursue fresh ideas and wrap up projects.

Slipher Society members visit Lowell facilities at Anderson Mesa.



Jon Petrescu, a charter member of the Slipher Society, explained why he joined:

"COVID 19 was my initial motivation for joining the Slipher Society in August 2020. If I recall correctly, the invitation to join the Slipher Society stated that, due to COVID, travel was much reduced and fewer organizations were renting time at the observatory telescopes. The Slipher Society was a method of raising funding to help Lowell's astronomers continue with projects and research, and to acquire necessary materials.

"I have been an on-again, off-again amateur astronomer since I got my first telescope when I was 13. Sometime after moving to Sedona, I was excited to hear that Lowell had openings for docents. I volunteered and became a oncea-week docent for a couple of years. I got to meet and talk to several of the staff and experience some of the research that Lowell astronomers were doing. It was innovative, cutting edge, and exciting, especially with the new Lowell Discovery Telescope and ongoing work with the NPOI. During COVID, I wanted this to continue. So I joined."

Thanks to members like Jon, the Slipher Society has contributed to 15 projects since its inception, resulting in everything from published papers and necessary equipment, to data needed to acquire a large NSF grant.

Find more information about the Slipher Society at **lowell.edu/slipher-society** or contact Sherry Shaffer at **sshaffer@lowell.edu** or (928) 714-7777.

Supporter Feedback Compiled by Heather Craig, Marketing Operations Specialist

Trip Advisor

We had a great time especially checking out the binary stars in the Leo constellation using the Clark Telescope. We also enjoyed the constellations tour. We loved this place! All the staff operating the telescopes were knowledgeable and informative! Would definitely go back!

Google Review

Google Review

This was an incredible experience. It's a must see for science geeks! The staff was so friendly. Very knowledgeable and passionate about astronomy. We even got a tour of the constellations and got to look through a number of telescopes.

ACTIVE SMALL BODIES IN THE SOLAR SYSTEM | CONTINUED FROM PAGE 1

changing now. It's become clear in the past decade or two that many populations of objects formerly thought to be more-or-less unchanged since they formed about four-and-a-half billion years ago actually have changed quite a bit – from some asteroids occasionally tossing off dust and gas to some centaurs becoming so active they almost fall apart (centaurs are small bodies on orbits that cross those of the giant planets – they're like a mix of the comets of the inner solar system and the trans-Neptunian objects like Pluto.) If you want to use the small bodies of the modern solar system to learn something about the early solar system, you've got to account for what ways they've been altered since!

I mostly use telescopes here on the ground to make observations at visible and near-infrared (a little redder than your eye can see) to try to understand what these objects are made of (composition) and whether they are currently losing mass and how much (activity), and I couple these observations with computer simulations to assess how their orbits are changing (dynamics) to get a full picture of these objects. This combination of studying their composition, their activity, and their dynamics has proven to be a very effective tool in understanding why they have their modern properties.

Recently, I have been focusing on the active centaurs. They're too far away from the Sun for them to be powered by the sublimation of water ice (the direct transition from solid ice to vapor) which is what makes comets in the inner solar system shed dust from their surfaces. I've been taking visible images and near-infrared spectroscopy of these objects with the Lowell Discovery Telescope. I want to understand what makes these fascinating objects tick, and I've made some great progress in the half year I've been at Lowell! I've been comparing my observations of active



(Above): In July 2022, Kareta gave an invited talk, about active centaurs, at the 44th meeting of the Committee for Space Research (COSPAR) in Athens, Greece.

(Front Cover): This image, taken with the Lowell Discovery Telescope's Large Monolithic Imager, shows the active Centaur 29P/Schwassmann-Wachmann 1 during a marked increase in activity, called an outburst, in November 2021. Note that this doesn't look like a regular comet (where's the tail?!), but that's because this image was taken right after the outburst happened. The tail thus didn't have time to form yet.

centaurs in similar orbits and it seems like most of them are behaving really similarly – the same processes that cause huge objects like 29P/Schwassmann-Wachmann 1 to toss off a ton of dust might be working on objects one-sixtieth it's width. This means that studying the big-andbright objects can be used to make inferences about the smaller objects which, while more numerous, are harder to observe. •

PERCIVAL LOWELL FELLOW | CONTINUED FROM PAGE 1

appointment, during which fellows have access to the full range of resources at Lowell Observatory, including the 4.3-meter Lowell Discovery Telescope, the Navy Precision Optical Interferometer, several 1-meter class telescopes, the Astrophysical Materials Lab at Northern Arizona University, and a full suite of instrumentation and engineering resources.

"The Percival Lowell Postdoctoral Fellowship allows Lowell Observatory to attract the brightest young minds on a continuous basis," said Dr. Christoph Keller, Director of Science at Lowell Observatory. "By offering four-year positions with substantial research funds and ample access to cutting-edge instrumentation on our own telescopes, we can successfully compete with the most prestigious postdoc positions." Lowell Observatory's Native American Astronomy Outreach Program, as well as its new Kemper and Ethel Marley Foundation Astronomy Discovery Center—set to open in 2024—will offer additional opportunities for fellows who wish to develop their science communication skills as part of the observatory's education and public outreach mission.

Richey-Yowell, who studies K-type stars (dwarf stars that are a little smaller than our Sun) to determine if they can host habitable planets, has a long connection with Lowell Observatory. As an undergraduate at Dickinson College in Carlisle, Pennsylvania, she used Lowell's 31-inch NURO Telescope for research several times. She later enrolled at Arizona State University for graduate studies so she could

CONTINUED ON PAGE 12

PERCIVAL LOWELL FELLOW | CONTINUED FROM PAGE 11

work with former Lowell astronomer Dr. Evgenya Shkolnik, who leads a team examining star-planet interactions and ended up serving as Richey-Yowell's PhD advisor.

A member of Shkolnik's team, Dr. Joe Llama, is a current Lowell astronomer and alerted Richey-Yowell to the Percival Lowell Postdoctoral Fellowship. Richey-Yowell jumped at the chance to apply. She said, "I decided to apply because I've always wanted to work at Lowell Observatory, and I really love what Lowell stands for. I'm someone who is passionate about my research, and Lowell is passionate about research. I also really enjoy community outreach. I think being able to share science is important, and that's a key thing that Lowell does. Being able to match Lowell with my personal priorities is the main reason I applied and accepted."

Richey-Yowell earn her PhD in May. She plans to continue her study of K-type stars and try to clarify an unexpected aspect of their behavior. She explained, "We're finding that K-type stars remain active much longer than we thought they would. This means they may not be ideal hosts for planets with life, as previously thought. For my fellowship, I'm going to try and learn more about K-type stars to see if this is the case." Keller is excited by Richey-Yowell's fellowship vision and noted its fit with that of Lowell Observatory. He said, "Tyler proposed a research plan that is an excellent complement to our existing scientific endeavors. Combined with her excellent prospects for scientific breakthroughs, there was no doubt that she should be the first Percival Lowell Fellow." •

(Front Cover): Tyler Richey-Yowell at the Mauna Kea Observatories, with the two Keck telescopes and the NASA Infrared Telescope Facility (IRTF) in the background.

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