

Most of the Senegal team members are shown here with the President of Senegal (center, in white), the US Ambassador (next to the President on the right), Marc Buie (SWRI, director of the project, next to the President on the left), Adrianna Ocampo (NASA representative, next to the Ambassador), Larry Wasserman (four rows back, fourth from the right).



## Chasing Shadows in Senegal

By Larry Wasserman, Astronomer

On January 1, 2019 the New Horizons spacecraft will fly by a small Kuiper belt object (KBO) provisionally named 2014 MU69. This object was discovered using the Hubble Space Telescope during an intensive search for objects that New Horizons could reach after its flyby of Pluto in July of 2015. Last year I participated in two expeditions to observe occultations of stars by this object. The first one of these expeditions, which involved sending about 25 telescopes—each with two observers to Argentina and South Africa—was unsuccessful because the predicted location was slightly in error. The second, which involved sending all the telescopes and observers to Comodoro Rivadavia in southern Argentina, was successful. We determined that 2014 MU69 either has a very elongated shape or is possibly a binary object. It is about 10-15 miles across.

This year NASA again asked us to look for potential occultations by this object. I did a search for such events in the European Space Agency's GAIA star catalog—a catalog of about a billion stars each with extremely accurate positions—and turned up only one

possible event. The candidate ground track crossed Colombia, Venezuela, the Atlantic Ocean, Senegal, Mali, Mauritania, and Libya on the night of August 3, 2018. NASA and the New Horizons team decided to attempt this event and put Marc Buie in charge. Marc is currently at SWRI but spent many years at Lowell. He has a long history with Pluto, KBOs, and New Horizons. This time, NASA wanted, in part, to use the occultation process in reverse. If you know the position of the star extremely accurately (which you do from the GAIA catalog), then you can use the observation of an occultation to refine the position of the occulting object and help target the spacecraft.

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## Satellite-based Telescope to Explore Nearby Stars

In 2021, a spacecraft approximately the size of a cereal box will carry a small telescope into Earth orbit.

See page 4 for more!



## DIRECTOR'S UPDATE

By Jeffrey Hall

The groundbreaking of the Giovale Open Deck Observatory, described by Trustee Lowell Putnam in his adjacent column, came at the end of a full week of planning and review meetings with our consultants and with many members of our staff. We did a thorough review of pretty much everything: our campus master plan, the GODO, the planned Astronomy Discovery Center and its marquee elements (a rooftop amphitheater, an ultra-wide-screen indoor theater, and innovative exhibits), a campus-wide dark-sky lighting plan, and a proactive effort to ensure our new facilities go “above and beyond” for guests with disabilities.

A full week of all-day meetings is always a bit

enerivating, but at the same time, by Friday I felt incredibly excited and energized. The vision for the outreach side of our strategic plan is to be “the finest astronomy education destination in the Americas.” We are sparing no expense to meet that lofty target; as just one example, the GODO telescope suite is so high-quality that it has attracted interest from both professional and advanced amateur astronomers for research use after regular public hours.

I, Mr. Putnam, the assembled staff, and our consultants all wrapped up the week feeling that if we get this right, we will have created something that will literally (and I’m not misusing that word) be a world-renowned beacon of astronomy education and science appreciation. That is something singularly exciting to be part of.

We will keep all of you posted as things move along!




## TRUSTEE'S UPDATE

By W. Lowell Putnam

I am just back from the groundbreaking of the Giovale Open Deck Observatory (GODO). In my remarks at that event I spoke of the gathering to celebrate the re-opening of Lawrence Lowell (“Pluto”) Telescope in early June. The June event celebrated the 110 years of science research and discoveries that have advanced our understanding of Pluto and the outer Solar System. There are few institutions in the world that have that long term view, and support, of science, but Percival believed in that approach, and established a culture of support that continues to this day.

The GODO groundbreaking represents

our “other side”, the belief by Percival that research is even more effective if we can share it with others in a way that excites them and makes them “co-discoverers”. This message and approach is clearly resonating with people. The number of people coming up Mars Hill to visit has grown by 50% in the past 4 years. The GODO is the first step in a series of expansions of the campus to allow us to provide “co-discovery” experiences to our general public guests with the best facilities for astronomical viewing. The goal in all of this is to allow our educators to be even more effective in engaging with folks and sharing the joy of astronomy.

We continue to invest in our scientists and the infrastructure they need, as you will read in this issue. With the GODO groundbreaking of the GODO we are working to make Lowell Observatory the finest astronomical destination in the world. 

## Cool Stars Conference in Boston



Jeff Hall, Gerard van Belle, Joe Llama, and Catherine Clark represented Lowell Observatory at Cool Stars 20.

My name is Catherine Clark, and I am a second year PhD student in astronomy and planetary science at Northern Arizona University. I also work as a graduate research assistant at Lowell Observatory under the supervision of Dr. Gerard van Belle. In my opinion, one of the best parts of being in academia is being able to attend conferences, and recently I was able to attend my first conference as a graduate student. Drs. Jeffrey Hall, Gerard van Belle, Joe Llama, and I traveled to Boston for the Cool Stars meeting, a conference covering low-mass stars, solar physics, and exoplanets.

At the conference, Dr. van Belle and I presented our poster, titled “The POKEMON Speckle Survey of Nearby M-Dwarfs”, and described how we are utilizing speckle imaging to refine the M dwarf multiplicity rate. In general, it was a terrific opportunity to learn more about low-mass stars, to meet prominent scientists in the field, and to introduce my science to a number of astronomers. I can’t wait to attend other conferences during my time as a graduate student!





Screenshot of Kevin Schindler talking about Flagstaff's lunar heritage, including the use of the 24-inch Clark Telescope to create Moon maps.

## New Visiting Scientists Program

By Michael West, Deputy Director for Science

The observatory has implemented a new Visiting Scientists Program with the goal of creating a vibrant scientific atmosphere on Mars Hill, enhancing the observatory's connection to the wider astronomical community and stimulating new scientific collaborations as well as strengthening existing ones. The Visiting Scientists Program complements the existing colloquium series by providing support for longer visits. The Observatory welcomes visits by PhD scientists whose expertise and research excellence in astronomy, astrophysics, planetary science, or related fields will enrich the scientific environment here. Visit lengths can vary from a minimum of two weeks to a maximum of three months. Currently, the observatory has resources to host the equivalent of one Visiting Scientist per month on average. More information can be found at <https://lowell.edu/research/research-resources/visiting-scientists-program/>

Cable television network C-Span produces a show, Cities Tours, that features historic and literary sites in select communities. This past July, Flagstaff was showcased and Lowell Observatory hosted a live event at which Flagstaff Mayor Coral Evans, Lowell's Michael West, and other community leaders spoke. Film crews then interviewed local historians and

writers to create several stories that aired in September. Lowell's Kevin Schindler and astronomy historian Bill Sheehan spoke about early Pluto research while Schindler also discussed Flagstaff's role in preparing for the Apollo missions to the Moon. These stories may be viewed at <https://www.c-span.org/series/?citiesTour&city=198>

## GODO Construction Progress

By David Sawyer, Technical Project Manager

Summer was a flurry of construction activity as we prepared for building the Giovale Open Deck Observatory (GODO) and adjacent wash house this fall. Much of the work completed this summer involved the underground utilities for distribution of water pipes, electrical service, network conduits, and gas lines—all needed to support the new facilities. The new driveway to access the trustee's residence is graded and ready for pavement. The relocated water tank and pump house, which are also accessible via the new driveway, have been erected and are undergoing testing and certification.

In the meantime, building plans for the GODO and wash house have been completed and submitted to the City of Flagstaff for permitting. We are on track to begin GODO construction early this fall.

Looking north along the new driveway to the Trustee's Residence with the new pump house and water tank visible in the background.



## Satellite-based Telescope to Explore Nearby Stars

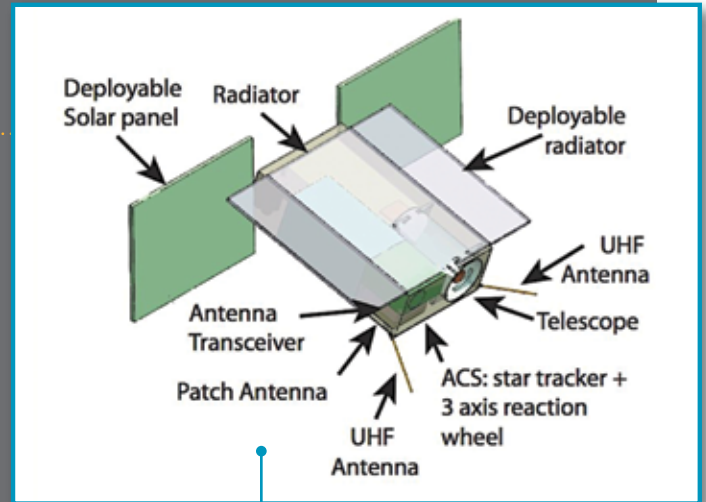
By Joe Llama, Astronomer

In 2021, a spacecraft approximately the size of a cereal box, known as a CubeSat, will carry a small telescope into Earth orbit to monitor the flares and star spots of low-mass stars to determine their potential to host habitable planets.

CubeSats are small satellites that are built in standard units of 10 cm<sup>3</sup> cubes, with a mass < 2 kg per cube. They are launched as secondary payloads on a launch vehicle. Their standardized form, combined with off-the-shelf commercial components such as spacecraft enclosure, electronics power, and communication systems ensure low-cost. This subset of small satellite has been growing in popularity since the launch of the CubeSat in June 2003 with more than 800 having been launched as of April 2018. The heavy burden for time on large space telescopes like Hubble, the ability to observe sources for weeks

or months at a time, and the ability to observe wavelengths not accessible from the ground make CubeSats an exciting platform for astronomy.

I am part of a science team for one of the first CubeSats for astronomy. The Star-Planet Activity Research CubeSat, or SPARCS for short, is led by former Lowell astronomer Dr. Evgenya Shkolnik out of Arizona State University. SPARCS will be the first mission to provide the time-dependent flux and evolution of low-mass star ultraviolet (UV) radiation, proving that compelling astrophysics can be achieved with a 6U CubeSat. As part of the science team, I will analyze the SPARCS data to measure the UV flare frequencies and intensities.



SPARCS is a 6U CubeSat built by Arizona State University along with scientists from the University of Washington, the University of Arizona, Lowell Observatory, the Southwest Research Institute and NASA's Jet Propulsion Laboratory.

Check back for more mission updates as we approach the 2021 launch-date!



Mars Hill is an ideal location for viewing all sorts of sky wonders, from distant planets, stars, galaxies, and nebulae, to nearby atmospheric phenomena such as lightning. Astronomer Dr. Joe Llama captured this dramatic picture during the height of the monsoons in Flagstaff on July 19, 2018



# DISPATCHES FROM THE UNIVERSE

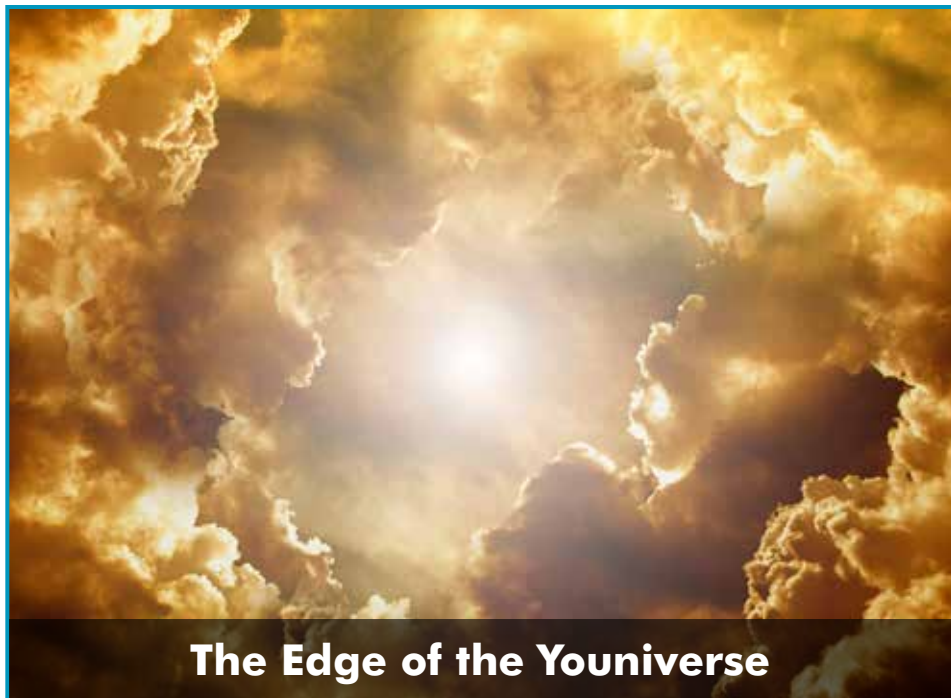
By Michael West,  
Deputy Director for Science

On August 12, NASA's Parker Solar Probe blasted off on its historic mission to "touch" the Sun by plunging through its scorching atmosphere. So, it might surprise you to learn that you live inside the Sun. Our star is an enormous ball of glowing gas whose apparent surface is an illusion. Although most of the Sun's mass is contained within the luminous sphere we see, some spills much farther out. At Earth's distance from the Sun, a teacup full of space contains about a thousand atoms of solar gas.

Astronomers aren't actually sure where the Sun ends. NASA's two Voyager spacecraft, launched in 1977, have detected tenuous traces of the Sun's gas beyond the orbit of Pluto. Farther out, this gas eventually travels to mix with that of neighboring stars, making it hard to know where one star ends and another begins.

Boundaries are fuzzy elsewhere in the cosmos, too. Earth's atmosphere doesn't end abruptly at an altitude of a hundred miles or even a thousand miles, it just gets thinner as you go higher. Likewise, there's no clear edge to our home galaxy, the Milky Way—stars simply become rarer in its outer regions.

Our lives lack sharp edges too. Our bodies are in a constant state of flux as we



## The Edge of the Youniverse

swap atoms at an astonishing rate with the world around us. With each breath, we inhale atoms that become part of us and exhale others that once were. The same for the food we eat and drink. We don't own our atoms, we borrow them as they scurry in and out of us on their way to somewhere else. The great poet Walt Whitman got it right when he said, "For every atom belonging to me as good belongs to you."

And it gets hazier. Most of the cells in our bodies aren't even ours; they're freeloading bacteria that outnumber our own human cells ten to one. Genes from unknown ancestors shape our personalities and our odds of dying from one disease or another. The air we breathe holds the first breaths and dying gasps of everyone who ever lived. Our knowledge is taken on faith from others, our thoughts expressed in

words we didn't invent. How much of me is mine?

Here in America, where individualism is woven into our cultural fabric, we tend to think of ourselves as distinct entities. But maybe there's a deeper truth in the realization that each of us is a small fragment of an interconnected whole. Like the Sun, we're temporary collections of matter and energy with no clear boundaries. Diffused through space and time, we overlap with everyone and everything. Perhaps the inventor and visionary Buckminster Fuller summarized this ambiguity best: "I live on Earth at present, and I don't know what I am. I know that I am not a category. I am not a thing — a noun. I seem to be a verb, an evolutionary process—an integral function of the universe." ☺



### Michael West Joins IAU Commission

Michael West has been elected to the International Astronomical Union's (IAU) commission, Communicating Astronomy with the Public. The IAU is the largest organization of professional astronomers in the world, with more than 12,000 members in nearly 100 countries. The commission's mission is to explore new ways of communicating astronomy with the public and to facilitate sharing of ideas and best practices. Its philosophy is "it is the responsibility of every astronomer to play a role in explaining the interest and value of science to our fellow citizens."



**Lawrence Lowell (Pluto Discovery) Telescope  
Grand Opening – March 10, 2018**

Cutting the ribbon to officially reopen the dome (left to right): Frank Edmondson, Margaret Edmondson Olson, Flagstaff Mayor Coral Evans, Lowell Director Jeff Hall, Lowell supporter Sam Storch. Edmondson and Olson are the children of onetime Lowell astronomer Frank Edmondson and his wife, Margaret.



Lowell Director Jeff Hall and Flagstaff Mayor Coral Evans in front of the telescope.

Astronomer Will Grundy and Historian Kevin Schindler sign copies of their new book, *Pluto and Lowell Observatory: A History of Discovery at Flagstaff.*



Retail Supervisor Kimberly Tackitt sells Lowell Observatory books.

Guests enjoy new exhibits on the ground floor of the dome.







**Lawrence Lowell (Pluto Discovery) Telescope and Dome Dedication for Advisory Board – June 8, 2018**

Two classic cars frame the ceremony: Percival Lowell’s 1911 Stevens-Duryea (“Big Red”) and New Horizons Principal Investigator Alan Stern’s 2006 Nissan 350Z (“Little Red”), which Stern donated to Lowell Observatory in 2017 for a fundraiser. Advisory Board member Mike Beckage won the auction for the car and now owns it.



Standing in front of a new plaque honoring Jim Christy’s 1978 discovery of Charon (left to right): Naval Observatory Flagstaff Station (NOFS) Director Paul Shankland, Jim Christy, Lowell Director Jeff Hall, Lowell Sole Trustee W. Lowell Putnam, and Charlene Christy.



Historian Kevin Schindler talks with Edith and David Lowell, with Alden Tombaugh and Annette Tombaugh Sitze in the background.



Clyde Tombaugh family members stand in front of the telescope (left to right): Cheryllee Tombaugh (daughter-in-law), Alden Tombaugh (son), Annette Tombaugh Sitze (daughter), Ellen Bell (granddaughter), and Annette Tombaugh Sitze.



Led by New Horizons Principal Investigator/Lowell Advisory Board member Alan Stern, ceremony participants give a Pluto Salute.





Prototype tracking telescope nicknamed "Bright Eyes."

## Tracking Telescopes and the Forgotten Legacy of Clyde Tombaugh at White Sands Missile Range

By Bill Godby, Archaeologist, White Sands Missile Range

The legacy of Clyde Tombaugh is synonymous with the discovery of Pluto and his work at Lowell. Many know that he left Lowell to work at White Sands Proving Ground (WSPG), New Mexico, now known as White Sands Missile Range. Very few may be aware that his later contributions were just as noteworthy and in fact, led a revolution in optical missile tracking.

The story begins with James Edson, Clyde's brother-in-law. In the 1930s, the pair had been acquainted through the Lowell Syzygy Club, a social club of astronomy students. After serving in the Army Air Artillery, Edson went on to pursue his PhD in Physics at Johns Hopkins. At that time, he was employed at Aberdeen's Ballistic Research Laboratories (BRL) while working on his dissertation research on rocket development. Clyde had discovered Pluto, met and married

Patsy (Edson's sister), obtained his master's degree and was rotating teaching with his observing at Lowell. As World War II was winding down, a series of events began to unfold, reconnecting Edson and Tombaugh.

At the end of the war, Special Mission V-2 resulted in the capture and transport of one-hundred German Vengeance 2 weapons (V-2 rockets) to WSPG, and "recruiting" German scientists and engineers, known as the Paperclippers, to teach personnel how to assemble and launch them. The first successful firing took place at WSPG on May 10, 1946. Involved early on with the American V-2 project, Edson introduced the first detailed proposal to use the rocket for upper atmospheric research and identified the need for further study of jet flame behavior while the missile was in flight. However, Edson recognized the need for improved long-range imagery than what was obtained

through the use of existing trajectory-collecting instruments by the Germans known as Askania cinetheodolites.

In the summer of 1946, Edson showed up in Flagstaff on a mission to recruit Clyde to join him on a visit to WSPG to witness a V-2 launch and more. Edson was anxious to try out a prototype tracking telescope he had pieced together at BRL. It included two refractors (a 5-inch and a 6-inch) mounted on a 45-mm gun mount, with an Eyemo 35-mm movie camera mounted on the larger refractor. A pair of Japanese binoculars, obtained by Edson while overseas, were used for sighting. Also installed was an observer's seat (see picture). This first tracking telescope was called "Little Bright Eyes". Edson had his prototype delivered to WSPG and sat Clyde down in the observer seat to witness a firing of the V-2 and see the telescope in action. Edson knew two things; 1) that Clyde was THE person to make this telescope work as he imagined and 2) that the data collected from it would be the game changer for both observing rocket behavior phenomena and for how that data was collected.

Clyde was hooked and enthusiastically saw the potential of this device to capture data like never before. Soon thereafter, he left Flagstaff and was recruited as Chief of Optical Measurements at WSPG, leading a paradigm shift in data collection with the integration of tracking telescopes as an essential component of the instrumentation arsenal at WSPG. 🍷

[Continued in next Observer](#)





By Mattie Harrington, Executive Assistant

Lowell Observatory salutes longtime supporters Mike and Karen Kitt for their volunteer time and their generous gifts. Amateur astronomers, Mike and Karen have spent many hours gazing up at the stars and pondering the cosmos. Mike first visited Lowell in the 1960's and immediately fell in love with Mars Hill. In 2005, the couple began volunteering at Lowell in the old library

located in the Hendricks Center for Planetary Science. In 2013, Karen started cataloging and organizing Carl Lampland's correspondence. She found Lampland's work fascinating. He was hired by Percival Lowell and worked directly with him on his research.

Meanwhile, Mike explored the Slipper Building attic and basement, sorting and organizing historical materials. One such

Mike and Karen Kitt stand in front of the Putnam Collection Center's library, named in their honor for their financial support of the facility's construction

find for Mike were the notes of the last observing session of Percival Lowell, dated November 11, 1916—the day before he died.

The Kitts have committed their time, talent, and treasure to Lowell Observatory for more than a decade because they believe in the observatory's mission and they feel a part of the "Lowell family". They both played a significant role in the opening of the Putnam Collection Center, the building which will ultimately hold a large percentage of Lowell's historical documents and artifacts, from Percival Lowell's letters to photographic plates of Pluto. As part of their love for the observatory, the Kitts initiated the Historic Preservation Fund through the Lowell Observatory Foundation. Income from this fund will preserve the collections at Lowell Observatory. If you share the Kitts' interest in Lowell's history, they welcome you to give to the Preservation Fund, too. Contact Lisa Actor at (928) 255-5047 or [lactor@lowell.edu](mailto:lactor@lowell.edu). ☺

## Flagstaff's Lunar Legacy



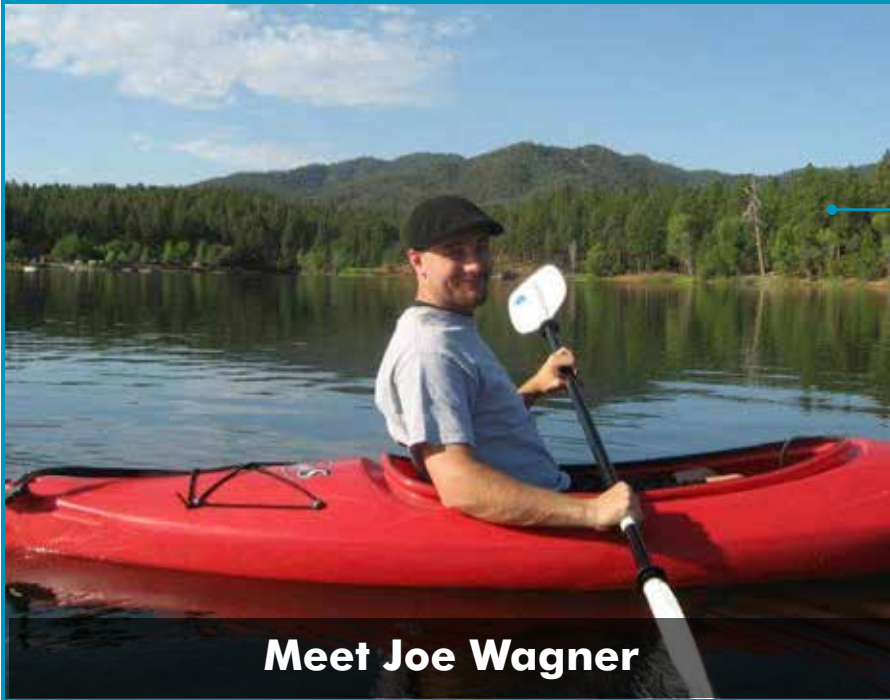
Celebrating Flagstaff's Scientific Role in the Apollo Moon Missions

Lowell is heavily involved in "Flagstaff AZ Lunar Legacy", a celebration of the 50th anniversary of the Apollo missions to the Moon. It kicked off on July 20, 2018 and continues through the end of 2019. It celebrates Flagstaff's crucial contributions—lunar mapping, astronaut training, instrument design and testing—in preparing for those missions. More than 100 activities are planned around the community. Information is available at <https://www.flagstaffarizona.org/lunarlegacy/>

For Lowell's part, we have created exhibits in the Putnam Collection Center as well as online and will also offer a special program/grounds tour and Neil Armstrong video/display.

## Put Your Name on GODO

One of the unique features of the Giovale Open Deck Observatory (GODO) will be quotes about astronomy and science, as well as famous scientific equations. These are now available for purchase, with resulting funds going to support the facility construction. Donor names will be listed with the associated quotes and equations, which will be etched on tiles of steel and mounted on the rail around the perimeter of the GODO. For more information see <https://lowell.edu/donate/godo-quotes/> or contact Mica Gratton at (928) 255-0229 or [mica@lowell.edu](mailto:mica@lowell.edu).



## Meet Joe Wagner

By Joe Wagner

I have lived in Flagstaff since the late 1990s. I love role-playing games, hockey, and being outdoors fishing, camping, Frisbee golfing, or stargazing. I completed my studies in accounting and political science at the University of Arizona and will become a Certified Public Accountant in 2019. Prior to my career in accounting I had various roles around the community working as a grocery manager, coffee and tea barista, pita builder, smoothie shop manager, and social researcher for Northern Arizona University.

Since graduating I have specialized in not-for-profit finance: working as a consultant for governments in Arizona (primarily schools on the Navajo Nation), serving as a fiscal manager for Flagstaff Medical Center, and eventually overseeing finance for the newly established Northern Arizona Healthcare Foundation. I believe space is the future for humankind and consider the opportunity to support such exploration at Lowell Observatory a dream job. 🌌

Like many Lowell staff members, Joe Wagner is an outdoor enthusiast. He is shown here kayaking at Lynx Lake in Prescott.

## Sign Up to Receive Digital Observer

In an effort to be economically and environmentally friendly, we are offering the option of receiving *The Lowell Observer* digitally, rather than in printed form. If you are of the mindset of Douglas Adams, who said, "Lovers of print are simply confusing the plate for the food" and you would like to opt for the digital version, contact Shannon Gonzales at [sgonzales@lowell.edu](mailto:sgonzales@lowell.edu). If you align more with Susan Hill, who said, "I love the feel of paper. The sound it makes when I turn a page. I love the beauty of print on paper, the patterns, the shapes, the fonts," simply do nothing and you will continue receiving the printed version.



## Recent Publications

Keep up with our astronomers' research by reading their recent publications. Below is just one example of their work. See our website for more.

**Neugent, Kathryn F.; Massey, Philip;** Morrell, Nidia I.; Skiff, Brian; Georgy, Cyril. A Runaway Yellow Supergiant Star in the Small Magellanic Cloud. *The Astronomical Journal*, Volume 155, Issue 5, article id. 207, 7 pp.

Image: Neugent/Massey/Lowell Obs./NSF

See our website: [www.lowell.edu/research/recent-publications](http://www.lowell.edu/research/recent-publications) for more publications

## Astronomy Comedy

by Jury Judge

What are you observing?

Earth. I'm feeling a little homesick.





FRONT PAGE STORY  
continued from page 1

So plans were made to send three telescopes and six observers to Colombia and 21 telescopes and about 40 observers to Senegal. I don't know the details of the Colombia group but in Senegal, both the U.S. Embassy and the Senegal government became deeply involved in this project. The president of Senegal saw this as an opportunity to improve and develop science education in Senegal. He set up a news conference with all of the observers in attendance at the presidential palace. A local Senegalese scientist was assigned to join each telescope team. Ours was a geologist and a professor at the University in Thies.

We spent the first two nights practicing with the telescopes at our hotel south of Dakar. Then, each team was assigned a location on the ground for the actual event such that we set up a "picket fence" of telescopes a few times wider than the size

of our target object. Each team was provided a truck and a local driver and those teams with sites in the northern part of the fence moved to a hotel in Louga (about 100 miles north of Dakar) while those with sites in the southern part of the fence moved to a hotel in Thies (about 20 miles north of Dakar). The next two nights were a dress rehearsal night at our assigned location and then the actual event night. I was at the most northern site that we used—about 30 miles north of Louga. Although it didn't seem really necessary, the government insisted that each team take two local policemen (with guns) along to each site.

At the time of this being written, data analysis is still underway. No results are yet available although I note that the three teams in Colombia were rained out and several of those in Senegal had some or a lot of clouds. ☹



Most of the telescopes used in Senegal and Colombia were 16" Skywatcher instruments, as shown here. Each telescope is shipped in four packing cases. A medium-sized shipping container was required to hold all the cases.



### Research Observing on Mars Hill

By Gerard van Belle, Astronomer

While Mars Hill is today a mecca for the general public to telescopically observe the night sky (and soon to be greatly expanded with construction of GODO), professional observing continues from the site as well, with the Titan Monitoring (TiMo) instrument. TiMo is a 20-inch PlaneWave telescope, recently upgraded with a new PlaneWave L-500 mount, and currently

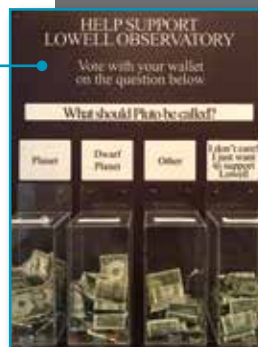
Standing in front of TiMo are (left to right): Michael Mommert, Gerard van Belle and Michael Collins

sports a near-infrared (NIR) Princeton Instruments NIRvana640 imager, generously sponsored by long-time Lowell Advisory Board member Bob Ayres. This camera uniquely positions the facility as one well-suited for NIR observations of bright objects; typically such advanced instrumentation is only available—at a steep premium—on larger telescopes.

The TiMo team consists of Michael Collins, Michael Mommert and me, with contributions from Lowell adjunct Kaspar von Braun. The project was begun by former Lowell astronomer Henry Roe, who graciously passed along the infrastructure to the team upon his departure. We are aiming to upgrade the instrument package over the next year for simultaneous visible and NIR observing, and full robotic observatory operations. ☹

The Pluto donation box is located adjacent to the admissions desk in the Steele Visitor Center.

### Pluto Donation Box



In 2006 the International Astronomical Union (IAU) reclassified Pluto as a dwarf planet. This resulted in a spectrum of reactions—some positive, others negative—and controversy that continues to this

day. Lowell's visitor experience has benefited from this drama not only by increased publicity but also financially; after the reclassification, we built a new donation box that allowed guests to "vote with their wallets" on what Pluto should be called. Donations tripled over those seen with the previous donation box, and a dozen years later, guests still enjoy voting. "Planet" far dominates the votes, followed, in order, by "I Don't Care, I Just Want to Support Lowell", "Dwarf Planet" and "Other". We've collected thousands of dollars that we can reinvest in our education efforts.



**RECURRING EVENTS**

**LOCKS Preschool** | **OCT 20** (*The Planets in our Solar System: Dwarf Planets*) | **DEC 1 and DEC 15** (*Space Travels: Europa and Titan*)

**Meet an Astronomer** | **OCT 20** | **NOV 10, 17, 24** | **DEC 1, 8, 15**, | 8 – 10 p.m.

**OCTOBER**

**FRI 19 | Orionid Meteor Shower**  
(7:00 – 9:00 p.m) *Learn about the best times to view the meteor shower, and the science behind it.*

**NOVEMBER**

**MON 12 | Veterans Day**  
(10:00 a.m. – 10:00 p.m) *All veterans and their immediate family members receive free admission for the day.*

**FRI 16 | Taurid and Leonid Meteor Showers**  
(7:00 – 9:00 p.m) *Learn about the best times to view the meteor shower, and the science behind it.*

**DECEMBER**

**FRI 19 | Geminid Meteor Shower**  
(7:00 – 9:00 p.m) *Learn about the best times to view the meteor shower, and the science behind it.*

**For more special event information visit:**  
[www.lowell.edu/outreach/special-events](http://www.lowell.edu/outreach/special-events)



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