

THE

LOWELL OBSERVER

ISSUE 117 WINTER 2019

THE QUARTERLY NEWSLETTER OF LOWELL OBSERVATORY

CELEBRATING 125 YEARS

IN THIS ISSUE

- 2 Director's Update
- 2 Trustee's Update
- 3 Lights, Cameras...Norway



- 4 Introducing Kyler Kuehn
- 5 Dispatches from the Universe
- 6 Giovale Open Deck Observatory Pictures



- 8 Charles Simonyi Headlines Lowell42
- 9 Giovale Open Deck Observatory Bathroom Exhibits
- 10 Staff Highlight - Mary DeMuth
- 12 Upcoming Events



Superfast Star Found Leaving the Milky Way at Four Million Miles Per Hour

By Michael West, Deputy Director for Science and Kevin Schindler, Historian

Astronomers have discovered one of the fastest moving stars ever, and it appears to have been flung out of our galaxy by the supermassive black hole that lurks in the heart of the Milky Way. Lowell Observatory's own Deputy Director for Technology, Kyler Kuehn, is one of the discoverers.

The star, named S5-HVS1, is traveling at a speed of nearly four million miles per hour. Tracing its orbit back in time, astronomers conclude that it must have passed near the center of the Milky Way, home to our galaxy's supermassive black hole. The black hole's intense gravity flung the star with such force that it will eventually escape our galaxy,

destined to wander the dark void between galaxies.

What actually happened is a little more complicated. The escaping star was probably once a member of a binary star system—two stars that dance around each other, locked in a gravitational embrace. When the pair wandered too close to the black hole, one of the stars 'changed partners' and began to orbit the black hole instead. The jilted and now partner-less star was then tossed out of the galaxy by the black hole, who is clearly a bully.

The discovery of S5-HVS1 was made by Sergey Koposov from Carnegie Mellon

continued on page 11

2I/Borisov, an Interstellar Comet

By Kevin Schindler, Historian

This past fall, amateur astronomer Gennadiy Borisov was scanning the skies on the Crimean Peninsula when he detected a new comet that quickly caught the attention of scientists around the world, including here in northern Arizona. Comet discoveries aren't that unusual but this particular one stood out because astronomers realized it doesn't belong to our solar system family, but instead was

a visitor from another system. This marked only the second "interstellar" comet (a comet originating outside of our solar system) discovered to date.

Borisov discovered the comet on August 30 and scientists soon realized it was moving much faster than typical comets orbiting our Sun. Even more arresting was its eccentricity—

continued on page 11





DIRECTOR'S UPDATE

By Jeffrey Hall

Time, as the old proverb goes, flies when you are having fun, and I find myself amazed at how 2019 has flown by. It seems just the blink of an eye ago that we were having a glass of champagne to toast not only New Year's Day of 2019 but the New Horizons flyby that evening of the Kuiper Belt object MU69, now officially bearing the resonant name Arrokoth, the Powhatan/Algonquian word for "sky."

Since then, we and our partners from Yale University have commissioned the Extreme Precision Spectrograph at our Discovery Channel Telescope, which is delivering spectacularly high-precision spectra of not only Sun-like stars but now the Sun itself. My

duties as director don't leave me a lot of time for my own research these days, but this is science near and dear to my heart, as the stellar data that will accrue as part of EXPRES's search for Earth-like planets are a natural extension of the 27-year Stellar-Spectrograph program that originally brought me to Lowell.

We've also raised the bulk of the funds for what is now named the Kemper and Ethel Marley Astronomy Discovery Center, and we've brought the Giovale Open Deck Observatory into full operation. Outreach is an integral part of Lowell's mission, and I'm thrilled to be elevating our ability to reach

and inspire so many lives with the wonders of the Universe.

I'm sure that 2020 will fly by just as quickly, and I look forward to seeing where we are in a year, and to sharing the news with you. Thanks for being part of the Lowell community as we move forward. 🍷



TRUSTEE'S UPDATE

By W. Lowell Putnam

There are very few institutions that reach 125 years, whose mission is as relevant today as when founded and that are as vibrant and active as Lowell Observatory. For all that to be true it means that every year along the way there were people who pushed the organization to do more and be more. I want to thank all of those who have contributed so much time, talent and treasure in the past and thank all of you who are continuing to do so now. It is your efforts that are making the observatory successful and growing as it starts its next 125 years!

My best wishes to you for the holidays and a great 2020! 🍷

Summer Camps

By Todd Gonzales, Master Teacher

Lowell Observatory's Summer Camps have reached their eighth successful year. Recently the summer camp has worked with Northern Arizona University's College of Education to build a summer course where pre-service teachers get experience working with science curriculum in an informal setting. This year we worked with eight NAU students, seven certified teachers, and five high-school-aged counselors in training (CIT). It has become clear the camps over the years serve more than just the close to 200 students that enroll every year. The certified teachers receive a robust folder of science curriculum and seat hours that can be used to recertify in the future. The CITs are mostly returning students that have aged out of the camp program but still want to be a part of the developing family culture of Lowell summer camp. Next year Lowell Observatory will begin to see its first cohort of former campers now old enough to work tours with the public program at Lowell.

Lowell Observatory's Middle School campers helping each other out on the Jill Allen Challenge Course. | Credit: Barbara Sherman



Participants in Lowell's trip to Norway enjoy a chilly but colorful auroral display.



Lights, Cameras...Norway

By Stephen Riggs, Development Manager

The Vikings of old called it norðrljós. Our term for it now is aurora borealis or just northern lights. In October of this year Lowell Observatory astronomer Dr. Joe Llama and Development Manager Stephen Riggs traveled with a group of Lowell supporters to the northern regions of Norway to find and photograph the elusive lights. They succeeded at both. In addition to hosts Joe and Stephen and trip guide Maria Roser Bonet, the travelers included Michael Beckage, Pam and Charlie Ross, Ken and Chris Dahl, Thomas Naber, William Hamilton, Robert

Filler, David Actor, Katharine Graham, and Janice Holt. The tour started in Oslo, then quickly moved above the Arctic Circle to Svolvær, Tromsø, and Alta, Norway. While the lights, in varying intensities, were encountered on several nights, those seen in Svolvær were truly spectacular.

North Norway is considered one of the best places on Earth to see aurora borealis, although finding the lights is never a sure thing—weather and luck play their roles. The Lowell group was lucky—and, oh, the photographs... 📷

Carl Lampland Exhibit

By Lauren Amundson,
Librarian and Archivist

On May 11, 2019, we opened The Lampland Diaries exhibit in the Putnam Collection Center. Carl O. Lampland worked his entire career as an astronomer at Lowell Observatory (1902-1951), and he kept a daily diary of his research, the weather, and current events. The exhibit highlights his diaries, logbooks, equipment, and astronomical images. In addition to the physical display, we created a digital collection and exhibit showcasing letters, photographs, manuscripts, and forty-three of his diaries. View them online at collectionslowellobservatory.omeka.net/exhibits

The Lampland Diaries exhibit will be on display in the Putnam Collection Center lobby into 2020.



Andy Odell Plate Glass

By Kevin Schindler, Historian

The Slipper Building reading room now is a little brighter, thanks to a plate glass from the estate of Andy Odell, who passed away this past May. An Emeritus Associate Professor of Physics and Astronomy at Northern Arizona University, Odell for years was a familiar face around Lowell. He was involved with a number of research projects here through the years and also volunteered in the Public Program at nights, setting up portable telescopes and sharing his passion for the night sky with visitors from around the world.



Kyler Kuehn at the (mostly clouded out) solar eclipse in Sydney, Australia in 2014

Introducing Kyler Kuehn

By Kyler Kuehn, Deputy Director for Technology

I have served as the Deputy Director for Technology since April, when my family and I relocated from Sydney, Australia. Previously, I worked at the Australian Astronomical Observatory (AAO) as an Instrument Scientist and Project Manager, focusing particularly on building and testing astronomical instruments that used AAO's novel "Starbug" fiber-positioning technology. Starbugs use co-axial piezo-ceramic tubes that flex and bend when a current is applied to them, allowing them to "walk" across a surface—in this case, a glass plate at the focal plane of a telescope. Once the Starbugs are positioned properly (to within about 5 microns), the optical fiber at the Starbug's center can be accurately pointed at an object in the sky, such as a star or galaxy. One of the most interesting features of Starbugs is that a whole "army" of them can be positioned independently, allowing for "massively multiplexed" instruments that can observe hundreds (or even thousands) of targets with a single exposure.

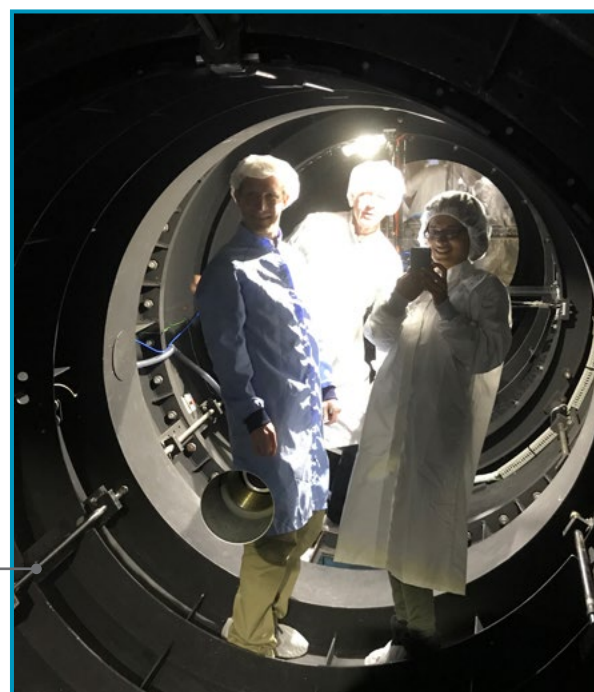
Prior to my time in Australia, I was a postdoctoral researcher in the Center for Cosmology and AstroParticle Physics at The Ohio State University, and then a postdoctoral appointee in the High Energy Physics Division at Argonne National Laboratory. During that time, I helped to design and build the Dark Energy Camera, which has been operating on the

Blanco 4-meter telescope at Cerro Tololo Interamerican Observatory since 2012. In 2018, the Dark Energy Camera completed observations for the Dark Energy Survey, which is expected to provide the most precise measurements to date of the expansion rate of the universe (as well as the rate that expansion has changed over cosmic history). Along the way, I have helped the Dark Energy Survey collaboration to produce an enormous amount of unexpected science, including the discovery of dozens of new dwarf galaxies—satellites of our own Milky Way galaxy—and stellar streams—long bands of stars that used to be dwarf galaxies or globular clusters but have been torn apart by the Milky Way's gravity. These discoveries are particularly helpful for our understanding of galaxy formation, and over the last several years I have been fortunate enough to perform spectroscopic follow-up observations of many of these

dwarf galaxies and stellar streams with the 4-meter Anglo-Australian Telescope, located about six hours outside of Sydney in rural New South Wales. I am now looking to expand observations of these celestial objects by using new telescopes—including Lowell's own Discovery Channel Telescope!

In addition to pursuing my own research interests, I'm looking forward to leading Lowell's technology group in the development of the next generation of DCT instruments, with more and better observing capabilities than have been delivered during the first half-decade of DCT's operation. Since my arrival in Flagstaff, I've also helped the technology group contribute to the expansion of the Mars Hill campus by leading the preliminary design for a new Technical Services Building—a facility where all of our new instrumentation can be built, tested, and maintained. I've also been very excited to support Lowell's public education and outreach efforts, especially with all of the new and exciting telescopes available at the Giovale Open Deck Observatory. For more information on S5-HVS1, you can read the results of the original research here:

doi.org/10.1093/mnras/stz3081



Kyler Kuehn (left) and colleagues reflected in the primary mirror of the UK Schmidt Telescope at Siding Spring Observatory. Yes, they are standing *inside* the telescope!

DISPATCHES FROM THE UNIVERSE

The Colors of the Night

By Michael West, Deputy Director for Science

Stars come in a rainbow of colors. "If you look carefully, you'll see that some stars are lemony yellow, others have pink, green or blue forget-me-not glows," wrote Vincent van Gogh. A star's color reveals its temperature; blue stars are hottest, and red ones are coolest. Yet their different tints are, in a sense, only skin deep—inside they're all made of the same stuff.

Benjamin Banneker loved the stars in all their many hues. Born in 1731 near Baltimore, he was a free black man in an era when most African Americans were still slaves. A self-taught astronomer and mathematician, Banneker published an almanac in 1791 with the predicted times of sunrise and sunset, tides, and the nightly positions of the stars and planets.


That same year, Banneker wrote a letter to Thomas Jefferson, the man who would eventually become the third president of the United States. Jefferson had authored the Declaration of Independence with its assertion that "all men are created equal," with inalienable rights to "life, liberty and the pursuit of happiness." Yet Jefferson himself owned hundreds of slaves.

"I freely and cheerfully acknowledge that I am of the African race, and in that color which is natural to them of the deepest dye," Banneker began his letter. He went on to denounce Jefferson's hypocrisy, accusing him of "detaining by fraud and violence so numerous a part of my brethren, under groaning captivity and cruel oppression."



To prove that blacks were as capable intellectually as whites, Banneker sent Jefferson a copy of his almanac. He implored the future president to recognize that people of all races are equal and to set an example by freeing his slaves. Jefferson replied, "Nobody wishes more than I do, to see such proofs as you exhibit, that nature has given to our black brethren talents equal to those of the other colors of men." But he took no action to free his slaves. After Banneker's death in 1806, Jefferson wrote disparagingly of him, suggesting that he could not have done the calculations for his almanac without help from his white friend and neighbor, Joseph Ellicott.

Nearly two centuries after Banneker's death, Martin Luther King, Jr. was arrested in 1963 for organizing a peaceful protest

against racism in Birmingham, Alabama. In a letter written from his jail cell, King said, "Let us all hope that the dark clouds of racial prejudice will soon pass away... and in some not too distant tomorrow the radiant stars of love and brotherhood will shine over our great nation with all their scintillating beauty." It's a sentiment that Benjamin Banneker, astronomer and abolitionist, would have understood well. 



Deputy Director for Science Michael West



Giovale Open Deck Observatory Dedication

Top left: The colorful GODO donor wall.

Top right: Jeff Hall (right) joins Charlie and Pam Ross on the plaza named in their honor.

Middle left: Bob and Diane Filler sitting on the bench named after them.

Middle center: Kelly Glawe checks out the supersized planisphere.

Middle right: Sue and Bill Ahearn address the GODO dedication crowd.

Bottom: Jeff Hall introduces the new telescope observing plaza.





Giovale Open Deck Observatory Grand Opening

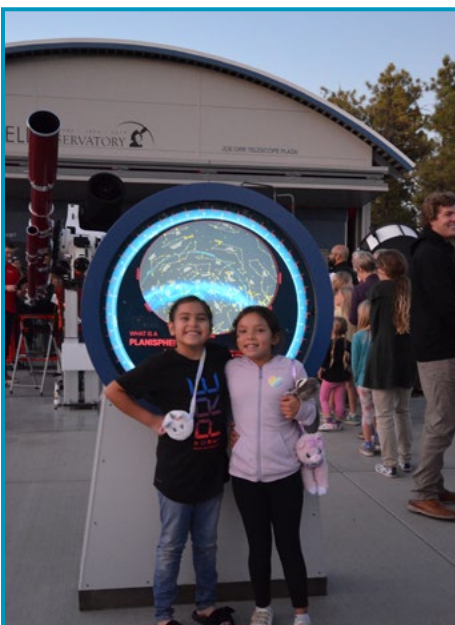
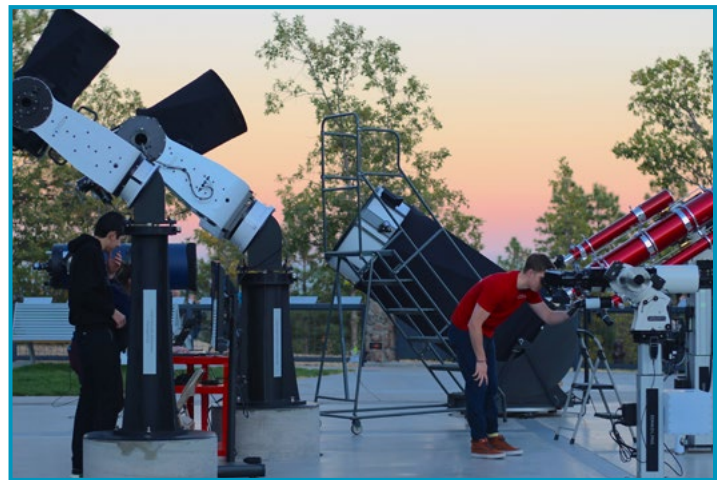
Top: During the GODO ribbon-cutting ceremony, John and Ginger Giovale wield the scissors as Flagstaff City Council members Regina Salas and Charlie Odegaard hold on.

Middle left: Allison Bair gazes through the striking 8-inch Moonraker refracting telescope.

Middle Right: GODO telescopes ready for an evening of viewing.

Bottom left: Two young guests pose in front of the planisphere.

Bottom right: A lovely evening for viewing the night sky.





Dr. Charles Simonyi during preparation for his first flight in space.

Charles Simonyi Headlines Lowell42

By Todd Gonzales, Master Teacher

The November Lowell42 was a night to remember as Dr. Charles Simonyi engaged the crowd with his experience training for and going to the International Space Station. Simonyi is a former Microsoft software architect who is known for his work developing the first editions of the Microsoft Office Suite. He later became the

world's fifth space tourist and twice flew to the International Space Station.

Simonyi shared with the packed lecture hall what it took to train as a civilian to prepare for a visit to the space station. It was clear during his talk that the training is not easy and requires a lot more than a routine physical examination. The talk was streamed live on Lowell Observatory's YouTube channel.

Simonyi brought his family along with him to Lowell and they were most excited about looking through the telescopes at the new Giovale Open Deck Observatory. Clear skies prevailed before the talk and Simonyi saw his daughter experience the cosmos in Lowell style. Simonyi's hope for the future is to see more of the world's youth take interest in going to space and

he believes space tourism will soon be more accessible and affordable.

Simonyi's talk closed a year full of astronauts with Flagstaff Unified School District's Skype call to the space station in March and Apollo moonwalker General Charlie Duke's presentation for the Flagstaff Festival of Science last September.

Kicking off the new year of Lowell42 lectures, Lowell's Deputy Director for Marketing and Communications Dr. Danielle Adams will dazzle audiences with a look into Arabian astronomy and explain how Arabian culture is still a solid foundation for how we know the skies. March will bring a talk that will tackle ethics in the age of genetics with former Lowell staffer Kelsey Banister. September will bring an encore performance of Director Dr. Jeffery Hall's musical connection to the universe.

Lowell42 has been running for nearly three years as a unique lecture series that connects the humanities to the sciences. The number "42" is a nod to Douglass Adams' novel, *The Hitchhiker's Guide to the Galaxy*. In the novel, a computer ("Deep Thought") was built to solve the ultimate question: "What is the meaning of life, the universe, and everything?" After a long 7.5 million years, the computer came up with the answer of "42." Luckily for fans of Lowell42, we only have to wait every other month for an engaging lecture. As Lowell42 progresses, it becomes easier to find speakers who want to share their connections to "Life, the Universe, and Everything." The Lowell42 series has seen various topics from religion, music, and consciousness. The idea is that these Lowell42 topics do not necessarily come with easy answers or explanations. Instead the lectures serve mainly to engage our thoughts as human beings trying to understand the universe we share. 🌌



Mars Hill expansion south of the visitor parking lot, including a new storage warehouse, fleet vehicle parking lot, visitor overflow parking lot, and new loop road exiting the visitor lot to the right.

Mars Hill Master Plan Expansion Continues

By Dave Sawyer, Technical Projects Manager

Following the successful completion and grand opening of the Giovale Open Deck Observatory, we continue the Mars Hill campus expansion efforts on several fronts. South of the visitor parking lot, a new warehouse and fleet vehicle parking lot is now in use for the growing needs of the Lowell staff. In combination with these new staff facilities, other improvements are being made to address the growing number of visitors. Next to the warehouse, at the future site of a new Technology Center, a temporary overflow parking lot has

been completed. In addition, a new "loop" road links the visitor parking lot to Mars Hill Road to improve traffic flow and safety, and provide additional visitor parking. The new road will initially provide a one-way loop through the visitor parking lot and, in a few years, it will provide the main entrance to the next phase of the campus expansion—the Kemper and Ethel Marley Foundation Astronomy Discovery Center!

Interior of the men's Giovale Open Deck Observatory restroom, featuring Mars-themed graphics and information.



The Advantages of Giving Appreciated Stock

By Stephen Riggs, Development Manager

Gifts of stock are a smart way to maximize the effectiveness of your charitable giving. You may find that you can make a larger contribution to Lowell Observatory by giving stock—particularly stock which has appreciated in value—than you can by giving cash. A gift of stock offers you a number of advantages. Your gift is the full market value of the securities and you may deduct this amount from your taxable income for federal income tax purposes, as long as the stock has been held for at least one year. Moreover, you do not have to pay capital-gains tax on the increased value of the securities, as you would if you sold them and donated cash. The market has been doing well, on average, for the past few months. This may be a good time to consider supporting Lowell Observatory with a gift of stock.

For more information about gifts of stock as well as instructions for transferring securities to Lowell Observatory, contact Stephen Riggs at (928) 255-0186 or sriggs@lowell.edu.

Giovale Open Deck Observatory Bathroom Exhibits

By Lowell Observatory Staff

Everyone loves bathroom humor, especially scientists. A small group of Lowell scientists and staff had themselves in stitches last summer imagining space-themed exhibits for the new Giovale Open Deck Observatory (GODO) restrooms.

"The rings of Uranus were discovered here!"

"Watch out for black holes!"

Deputy Director for Marketing and Communications Dr. Danielle Adams suggested such bathroom humor would find its way around the planet faster than the speed of light via social media. Lowell Director Dr. Jeff Hall said, "Science and mathematics can seem abstract and intimidating to some. We want all our guests to feel at ease and enjoy themselves as they absorb all the fascinating ideas we'll present to them, and humor is a great way to do that."

When we brought up our ideas with GODO restroom donors Bill and Susan Ahearn they laughed and took it a step further. Why not have a Venus theme for the women's restroom and a Mars theme for the men's? So that's what we did. The bathroom exhibits, including an anti-gravity toilet, were installed in November. The women's restroom features an expansive graphic of Venus with factoids such as

"Venus would not be a pleasant place to visit. Temperatures are hot enough to melt lead, and the atmosphere is so thick that it would crush you. As if that were not enough, it rains sulfuric acid and smells like rotten eggs."

The men's Mars-themed restroom includes a call to action: "In H.G. Wells's sci-fi classic, *The War of the Worlds*, invading Martians are killed by earthly germs for which they had no immunity. But we are not at war with Mars, so be sure to wash your hands before you leave."

"Scientists are not superhuman; they are human like everyone else," adds Deputy Director for Outreach and Education Samantha Gorney. "We want our visitors to know that astronomers have a sense of humor and are approachable here at Lowell." ☺

Mary DeMuth with moonwalker Neil Armstrong during his 2012 visit to Flagstaff to help dedicate Lowell's Discovery Channel Telescope.



STAFF HIGHLIGHT

Celebrating Mary DeMuth

By Kevin Schindler, Historian

Guests to Lowell Observatory regularly comment on the congeniality and dedication of our employees, and perhaps no staffer better exhibits these qualities than Volunteer Coordinator Mary DeMuth, who is retiring at the end of 2019.

Like several Lowell employees, Mary began working here as a volunteer. In 2001 she began assisting then-librarian Antoinette Beiser with cataloging astronomy photographs. She fit in quite nicely at Lowell and within a few months, Robin Melena hired her to work part-time helping with administrative duties. I soon brought Mary into the Public Program and she began giving tours and crewing the gift shop. She was well organized and detail-oriented and soon took over the Public Program's scheduling duties. She later helped manage the observatory's volunteer program and in 2010 was designated as Lowell's first full-time volunteer coordinator, a post she has held since.

In all her duties, Mary has been friendly, positive, and a great face of

Lowell. She's always willing to pitch in to help others; besides her regular job duties, she has also organized supplies for several Navajo-Hopi Astronomy Outreach teacher workshops, proofread hundreds of documents, edited *The Lowell Observer*, written a daily astronomy factoid called StarTales, answered public queries about Lowell, served on the Safety Committee, and even played on the Lowell Infrared Sox city softball team.

Mary has now come full circle. As she winds down her full-time work at Lowell, she again is reporting to Robin Melena. She is also leaving quite a legacy, not the least of which is her daughter Lauren Amundson. When Mary worked as a volunteer in the archives, her enthusiasm for the work inspired Lauren to go into that field, and today she is Lowell's Librarian/Archivist.

In honor of Mary's dedicated service to Lowell, asteroid 25867 DeMuth has been named in her honor. 🍷

What Our Guests Are Saying

Compiled by Heather Craig, Marketing Specialist

"Amazing experience to see and learn about the beauty of the galaxies, stars and planets. Knowledgeable, entertaining and interactive staff, great especially with kids." – 5 Stars

Google Review, October 2019

Trip Advisor Review, October 2019

"Very informative, spacious, educational, very helpful staff and guides. If you have a few hours...give this place a look. Well worth it" – 5 Stars

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.

Hunter, Deidre A.; Elmegreen, Bruce G.; Berger, Clara L. H I Clouds in LITTLE THINGS Dwarf Irregular Galaxies. *The Astronomical Journal*, Volume 157, Issue 6, article id. 241, 16 pp.

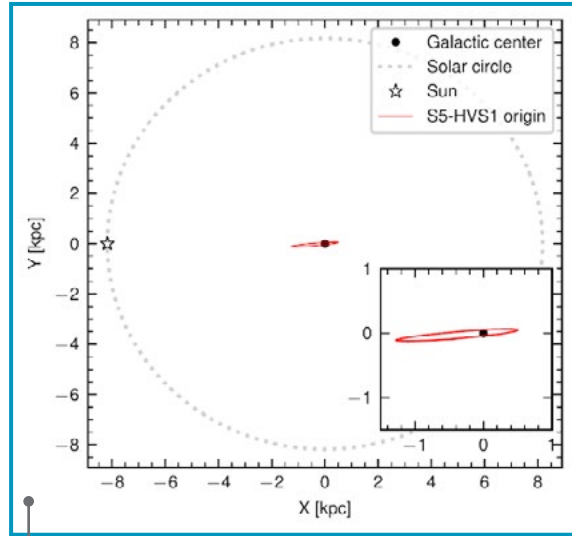
See our website lowell.edu/research/recent-publications for more publications

Annual Fund Giving

Annual Fund gifts impact projects and programs at Lowell Observatory throughout the year. Starting in 2020, Annual Fund appeals will focus seasonally on the following priorities:

Spring – Educational Programs | Summer – Research | Fall – Library/Archives | Winter - Greatest Needs

At any time, donors can earmark gifts to a program of their choice. Questions regarding the Annual Fund can be directed to Rachel Edelstein at redelstein@lowell.edu or (928) 255-0229.



The location of the star on the sky and the direction of its motion. The star is flying away from the galactic center, from which it was ejected five million years ago.

The precise orbit of S5-HVS1 allows scientists to determine where in the galaxy the star originates. The red elongated contour shows the region in the Milky Way disk where (with high probability) the star originated. This region is exactly where the center of the galaxy and Sagittarius A*, the supermassive black hole, is located (shown by a black circle). This shows, with high confidence, that the star was ejected by the black hole. The location of the Sun is also indicated by a black star.

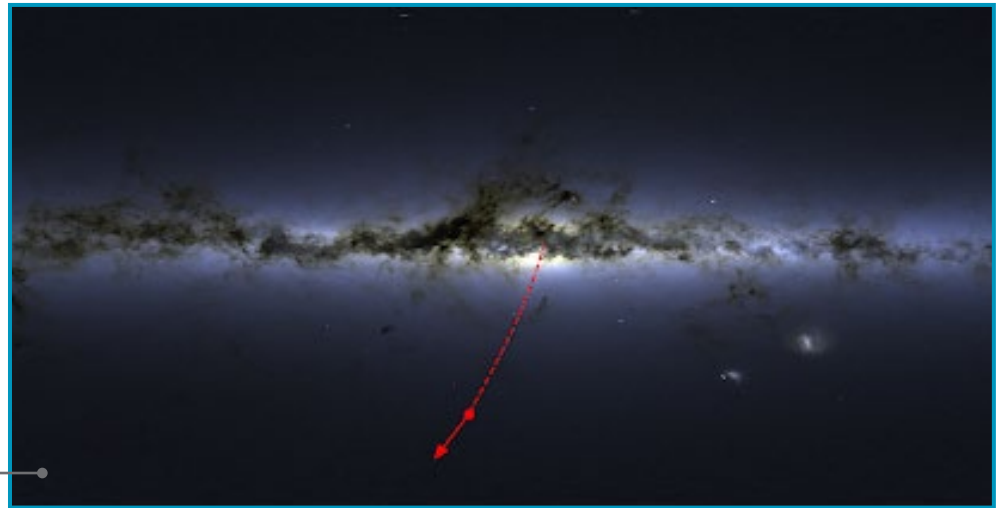
Credits: Sergey Koposov

SUPERFAST STAR FOUND LEAVING THE MILKY WAY
continued from page 1

University as part of the Southern Stellar Stream Spectroscopic Survey (S5). Located in the constellation of Grus—the Crane—S5-HVS1 was found to be moving ten times faster than most stars in the Milky Way.

Kuehn, a member of the S5 executive committee, said, “I am so excited this fast-moving star was discovered by S5. While the main science goal of S5 is to probe the stellar streams—disrupting dwarf galaxies and globular clusters—we dedicated spare resources of the instrument to searching for interesting targets in the Milky Way, and voila, we found something amazing for ‘free.’ With our future observations, hopefully we will find even more!”

FRONT COVER IMAGE: An artist’s impression of S5-HVS1’s ejection by Sagittarius A*, the black hole at the center of the galaxy. The black hole and the captured binary partner to S5-HVS1 are seen far away in the left corner of the picture, while S5-HVS1 is in the foreground, speeding away from them | Credit: James Josephides (Swinburne Astronomy Productions)



2I/BORISOV, AN INTERSTELLAR COMET
continued from page 1

essentially a measure of how much its orbit is squished. The eccentricities of solar system objects can range from 0 (this would be a perfect circle; no objects actually exhibit this) to 1. Anything greater than 1 means a so-called hyperbolic orbit, and by definition that object can’t be orbiting the Sun. Earth’s eccentricity is 0.1067, Pluto’s is 0.2488, and that of perhaps the best-known comet, Halley, is 0.967. This new object exhibits a staggering eccentricity of 3.3, meaning it is interstellar. Astronomers thus christened the object 2I/Borisov, with the “2I” indicating this was the second (2) interstellar (I) comet discovered.

The first interstellar comet-like body was discovered in 2017. Dubbed ‘Oumuamua, it has an eccentricity of 1.2. Unfortunately, it was already on its way out of our solar system when discovered and

astronomers didn’t get much of a chance to study it before it disappeared from view.

2I/Borisov, on the other hand, is on its way into our solar system and made its closest approach to the Sun on December 7, when it came within twice the distance between the Sun and Earth. Astronomers will be able to view it for a year or so, giving them ample opportunity to characterize it. This effort is already well underway in Flagstaff, where astronomers have observed it with the Discovery Channel Telescope and other Lowell instruments. Lowell post-doctoral fellow Maxime Devogèle has obtained spectra of the comet, James Bauer of the University of Maryland has imaged it, and his colleague Matthew Knight has analyzed some of the resulting data and found that cyanogen gas—commonly found in the fingerprint of comets—is present in 2I/Borisov. These and other scientists are now looking for other elements typical of comets.

With further study, astronomers will be able to characterize 2I/Borisov and

see how similar its chemistry and other properties are to comets within our solar system. Perhaps even more exciting is the story that 2I/Borisov can tell about its parent solar system. Comets are celestial time capsules. They are some of the oldest bodies found in a solar system and thus can reveal a lot about the chemical composition and structure of that system when it first formed. This comet may thus allow scientists to compare our solar system to that of 2I/Borisov and begin to see just how unique our system is. As we go to press, Schleicher reports that very recent observations by him and other astronomers revealed ammonia and carbon, with the bulk composition surprisingly similar to comets in our own solar system. Stay tuned!

FRONT COVER IMAGE: 2I/Borisov, imaged with the Hubble Space telescope | Credit: NASA, ESA, David Jewitt/UCLA

THE LOWELL OBSERVER

UPCOMING SPECIAL EVENTS

OPEN YEAR-ROUND

Monday - Saturday | 10:00am - 10:00pm

Sunday | 10:00am - 5:00pm

FRIDAY NIGHTS | Cosmic Questions | 8 - 10 p.m.

SATURDAY NIGHTS | Meet an Astronomer | 8 - 10 p.m.

Subject to astronomer availability

LOCKs PRESCHOOL | JAN 4 & 18 Newton's 2nd Law | FEB 1 & 15

Distance Between Stars | MAR 7 & 21 Mass | 10:30 a.m. - Noon

For more special event information visit:

lowell.edu/visit/special-events



**Celebrate the 90th anniversary of
Pluto's discovery on Mars Hill**

- Return of the blink comparator
- Special Pluto brew from Mother Road Brewery
- Talk by New Horizons Principal Investigator Alan Stern

Plus much more!

2.15.2020 AND 2.18.2020

Find us on Social Media!

Facebook.com/LowellObservatory

Twitter: @LowellObs

Instagram: @LowellObservatory

lowell.edu



The Lowell Observer is published quarterly by
Lowell Observatory, 1400 W Mars Hill Road, Flagstaff, AZ 86001
For comments about the newsletter, contact
Historian Kevin Schindler: kevin@lowell.edu | 928.233.3210
Layout and Design by Sarah Gilbert
Contents Copyright 2019 by Lowell Observatory ISSN 1054-0059



Eco-friendly printing by

