

THE

# LOWELL OBSERVER

EXPANDING OUR UNIVERSE

The quarterly newsletter of Lowell Observatory

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Winter 2013

## Pointing the Way for Exoplanet Search

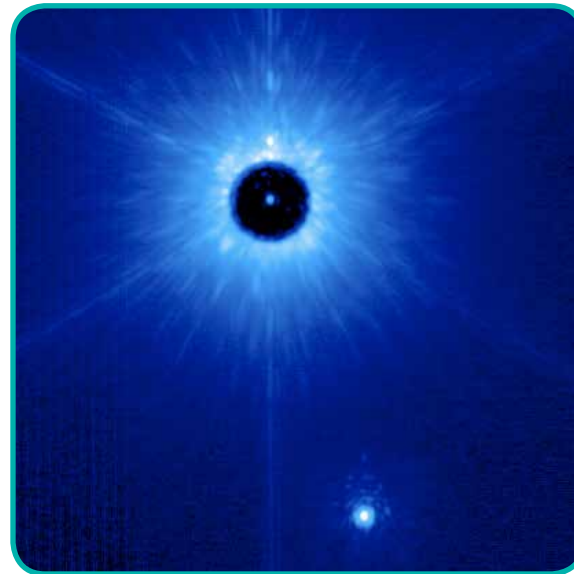
by Tom Vitron

**T**hough the search for exoplanets, or planets around other stars, is showing researchers that planets are abundant in our galaxy, it helps a great deal to have directions when searching for as-of-yet undiscovered exoplanets.

Lowell astronomer Evgenya Shkolnik and her collaborators have written such a set of directions, if you will.

In their paper, recently published in *The Astrophysical Journal*, the researchers examined new and existing data from stars and brown dwarfs (often called “failed stars”) that are less than 300 million years old, as determined from strong X-ray emission readings. In all, the authors identified 144 young targets for exoplanet searches, with 20 very strong candidates, according to Dr. Shkolnik. This candidate list is being searched for planets with Gemini’s NICI Planet-Finding Campaign and the Planets Around Low-Mass Stars survey, led by astronomer Michael Liu and graduate student Brendan Bowler, respectively, both at the Institute for Astronomy, University of Hawai’i.

By looking for markers in spectroscopic data and measuring the motions of the stars, Shkolnik and her



This infrared image was taken at 1.6 microns with the Keck 2 telescope on Mauna Kea. The star is seen here behind a partly transparent coronagraph mask to help bring out faint companions. The mask attenuates the light from the primary by roughly a factor of 1000. The young brown-dwarf companion in this image has a mass of about 32 Jupiter masses. The physical separation here is about 120 AU. Also, the primary star was identified as a young star for the first time by Dr. Shkolnik. Image Credit: B. Bowler/IFA

For more information about this research, visit our blog at [www.lowell.edu/news/](http://www.lowell.edu/news/)

collaborators were able to carefully examine the age of each star. Since low-mass stars are small and dim, they are good candidates for directly imaging planets around them. And young stars make it even easier since the young planet is still hot and bright. Plus, knowing the planetary system’s age allows for the characterization of the planet itself beyond the initial detection.

The authors sifted through data of about 8,700 stars within 100 light years of the Sun to find these candidates. The spectra were collected using two Hawaiian Mauna Kea telescopes (Keck and the Canada-France-Hawaii telescopes), and distances to the stars were measured by Guillem Anglada-Escude (Universität Göttingen) using the du Pont Telescope in Chile, operated by the Carnegie Institution for Science.

“Since low-mass stars are the most common type of star in our galaxy,

most planets probably reside in these environments,” says Mr. Bowler. “Finding young versions of these stars to search for planets is fundamental to understanding the galactic census of exoplanets.”

“These young stars help point the way. And if the Jupiter-mass planets are there, we will find them,” notes Dr. Shkolnik.

In this search, planet hunters are happy to have directions but they know the landscape of our understanding is subject to change. ☺

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## Director's Update

by Jeffrey Hall

**W**ell, just like that we've arrived at the end of 2012. The deputy directors and I have spent the past several weeks looking ahead to the 2013 budget and operations plan — as well as farther downstream to prepare for the operational challenges the newly-completed Discovery Channel Telescope (DCT) will present, but it's also a good time to look back and see how we've done over the past 12 months. Thanks to our excellent and dedicated staff, we have much to be proud of.

First on the list is of course first light for the Discovery Channel Telescope. Bill DeGross and the engineering crew, Ted Dunham and the instrument group, and Stephen Levine went full bore to meet the mid-year first light deadline, and they got there with flying colors. Subsequently, the instrument group has completed the National Science Foundation-funded Large Monolithic Imager (LMI), and the DCT commissioning team (along with LMI Principal Investigator Phil Massey) has already obtained spectacular images from the new camera. We are also very pleased to welcome the University of Toledo as a formal, long-term partner in the DCT, joining

our colleagues from Boston University and the University of Maryland.

We celebrated first light with a gala masterminded by Chuck Wendt, and for very good reason, people are still raving about it. It was a magnificent evening. We could not have known at the time that the riveting speech given by Neil Armstrong would be his last public appearance, but we now feel especially honored by Mr. Armstrong's participation, and I hope that giving him a chance to look through the DCT the day after the Gala was as fun for him as it was for us.

In the face of increasing pressure on federal support of research, our astronomers have maintained a steady stream of grants and have won new ones, as well as winning selection of Lowell and Flagstaff to host a major and prestigious conference on stellar astronomy in June 2014. A large grant won by Northern Arizona University (NAU) astronomer David Trilling will provide access to NAU at our currently dormant 24" telescope at Anderson Mesa, increasing the interaction and collaboration between Lowell and our local university. We've also hosted some excellent conferences, tirelessly coordinated by Deidre Hunter.

Kevin Schindler and our outreach team have welcomed more than 80,000 people through the

doors of the Steele Visitor Center this year — a very strong showing in a time of cautious discretionary spending. Thanks to Tom Vitron, the publication you're holding is looking better than ever. Our foray into summer camps for kids set a gold standard for that kind of program in Flagstaff. Antoinette Beiser is spearheading the fundraising for the new Collections Center and is well past \$2 million in cash and pledges. The Science Endowment Fund — which I view as a vital part of our future research support, ultimately intended to lessen somewhat the soft money exposure and burden on the scientific staff — now has \$8 million in pledged testamentary gifts, a sum for which I am very grateful.

Underpinning all this activity is a campus that works well. Cash flow has continued to proceed steadily and efficiently thanks to Kay McConagha and her staff, and Dave Shuck and Jim Gorney have kept the campus looking nice — as does our Trustee Bill Putnam, whose stone walls provide a dose of Yankee charm here in the high desert, and whose new memorial grove overlooking Flagstaff is a lovely place to unwind. And Bill's dog Lena remains as faithful as ever in guarding the cars in the parking lot.

Not bad for one year, I'd say. It wasn't without its bumps and stresses,

but one would hardly expect otherwise for a place undergoing our kind of growth. On behalf of all of us, I'd like to extend an end-of-year thank-you to our Friends, Advisory Board, benefactors, and all those in the community and beyond who have supported our mission. Best wishes to all of you over the holidays and in the new year, and we look forward to keeping you up to date on all the good things in store for 2013. ☺



## DCT TOURS TO BEGIN

Monthly public visits to the Discovery Channel Telescope (DCT) will begin in January. Features include a van ride to the site, a box lunch, an hour tour of the facility with an expert educator, and a souvenir photo of you next to the DCT. For more information about reservations, contact Leslie Wells at [lwells@lowell.edu](mailto:lwells@lowell.edu) or (928) 233-3278.

## Cool Stars 18

by Tom Vitron



Artist's impression of a young low-mass star, that is undergoing contraction and accretion as it evolves towards becoming a middle-aged main sequence star.

(Source: coolstars17.net)

One of the largest and most prestigious astronomy conferences is coming to Flagstaff in 2014.

Lowell Observatory and its hometown, Flagstaff, Arizona, were recently selected to host the next "Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun", also known as Cool Stars. This biennial conference began in Cambridge, Massachusetts, in 1980, and is now held at locales around the world.

Cool Stars 18 will take place at the High Country Conference Center, June 8-14, 2014. More than 400 astronomers from around the world are expected to be in attendance.


"This is a major feather in Flagstaff's cap," says the Observatory's director,

Dr. Jeffrey Hall. "From modest beginnings, Cool Stars has grown to become one of the more substantial astronomical conferences, with international renown that attracts the world's top researchers in the field. We're delighted to have them here for a week sharing all the latest discoveries and enjoying everything Flagstaff and northern Arizona have to offer."

Cool Stars gathers worldwide experts in low-mass stars, solar physics and exoplanets, creating a stimulating cross-disciplinary exchange environment in these fields. Cool Star meetings have a long tradition of presenting cutting-edge science, as shown by outstanding results such as the discovery of the first extrasolar planet, or exoplanet, and the first confirmed brown dwarf, which were both announced at Cool Stars 9 in Florence, Italy in 1995. Lowell astronomer Gerard van Belle is chairing Lowell's Cool Stars effort. "It is a real honor to have been competitively selected to host this prestigious meeting series," Dr. van Belle said. "It says a lot about how Lowell is viewed with high esteem in the world astronomy community."

Since 1993, Cool Stars hosts have alternated across the Atlantic; previous Cool Stars venues include

Athens, GA; Barcelona, Spain; Boulder, CO (2 times); Cambridge, MA (4 times); Florence, Italy; Hamburg, Germany; Pasadena, CA; Santa Fe, NM; Seattle, WA (2 times); St. Andrews, Scotland; Tenerife, Spain; and Tucson, AZ.

Cool Stars 17 (CS17) was held this year in Barcelona, Spain. Dr. Mercedes López-Morales, the chairwoman of CS17, noted, "The selection committee in Barcelona was thrilled by Lowell's proposal to organize Cool Stars 18 in Flagstaff. The combination of science and location were just perfect." 

### V.M. Slipher Podcast

Reporter Diane Hope produced a 21-minute podcast during the "Origins of the Expanding Universe: 1912-1932" conference held in Flagstaff in September, 2012. Listen to leading voices celebrate the centennial of Lowell legend V.M. Slipher's first evidence of the expanding universe, and the related work of other luminaries. The podcast was funded by a generous gift from Sue Durling. Simply go to [www.lowell.edu/collectionscenter.php](http://www.lowell.edu/collectionscenter.php) and click the link in the right-hand column.



### LMI Sees First Light

The Large Monolithic Imager (LMI), a camera built at Lowell Observatory and funded by the National Science Foundation (NSF), recently took a set of first-light images on Lowell's 4.3 meter Discovery Channel Telescope (DCT). At the heart of the LMI is the largest charge-coupled device (CCD) that can be built using current fabrication techniques and the first of its kind to be made by the firm e2v. The 36-megapixel CCD's active surface is 3.7 inches on a side. The LMI's ability to provide much more accurate measurements of

the faint light around galaxies separates it from cameras that use a mosaic of CCDs to produce images.

The first-light image (left) is of NGC 891, an edge-on spiral galaxy about 30 million light-years away in the constellation Andromeda. The image was obtained by Lowell's Phil Massey (LMI Principal Investigator), Ted Dunham, and Mike Sweaton, and then turned into a beautiful color composite by Kathryn Neugent. The exposure consisted of 10x1 min (B), 5x1 min (V), and 6x1 min (R), all unguided. See the Winter 2010 Observer for more about the LMI.

# End-of-Year Appeal

by Chuck Wendt

A telegram was sent from the cosmopolitan eastern city of Boston to a backwoods lumber town in the Arizona Territory more than a century ago. "Site probably Flagstaff (stop) Prospect for best seeing (stop) Report climate... compared with Tucson." The telegram was sent on April 10, 1894 by Percival Lowell to Andrew Douglass. Lowell Observatory was effectively founded on that day and, over the next 118 years, the Observatory has been a leader in astronomical research and education.

The discovery of Pluto, evidence of an expanding universe, mapping the Moon for the Apollo missions, and other endeavors have provided a rich foundation for future explorations. Times have changed and our ability to produce quality research and education relies more heavily on support from our friends in the community.

Two major fundraising projects are underway. A new Library/Collections Center is planned for Mars Hill. This building will be the first new structure built on the Mars Hill Campus in the last 17 years, at a cost of \$2.5 million plus a \$1.5 million building endowment. We are pleased to announce that \$2.2 million has been raised and/or committed.


Federal budget issues have put future NASA and NSF grants in question. While Lowell scientists have a highly successful track record of obtaining research grants, it has become apparent that we need an endowment for scientific research that would allow scientists the opportunity to continue research if grant money isn't available. Our goal is to raise \$10 million to endow a research program. To date we have commitments for \$8 million. Good news but we still have a ways to go.

Lowell Observatory, being a not-for-profit entity, has become the "gold standard" for innovation and efficiency with our new Discovery Channel Telescope that is completed and being commissioned. The \$53 million project, built with no taxpayer money, was completed under budget and ahead of schedule. The power of

philanthropy played a major role in the telescope's success.

The support we receive from people like you is what distinguishes us from being a good research institution to being an exceptional place of learning and discovery. As you can see, we are enthused with the desire to build upon the past. Our future holds great promise. All we need is your support.

Please consider a year-end tax deductible contribution today. With your gift we will be able to maintain an environment in which our astronomers are free to add to our understanding of the universe and our place in it, and where we can quickly share discoveries with you.

Thank you again for what you do for us and, in advance, for your continued support. *To make a charitable donation to the Observatory, please contact Antoinette Beiser at (928) 233-3216 or e-mail [asb@lowell.edu](mailto:asb@lowell.edu).* 

- Read a digital version of the 2011 Annual Report at [www.lowell.edu/about.php](http://www.lowell.edu/about.php) and click the link in the right-hand column.
- Visit our new device-friendly mobile site at [m.lowell.edu](http://m.lowell.edu)



## "A New Perspective on Mars: The Red Planet in 3D"

This fall, an engaging offering opened in the Steele Visitor Center's exhibit hall. The German Aerospace Center's "A New Perspective on Mars: The Red Planet in 3D" features 3D images and short films created using images taken by the European Space Agency's Mars Express satellite, which has been orbiting the Red Planet for nearly a decade. Lowell's Rotunda Museum hosted an earlier and smaller version of this exhibit in 2008. Many new, incredibly detailed images — and a much larger space — have helped make this exhibit a hit since its first day back on Mars Hill. The exhibit runs until January 13th.

(Image Credit: NASA, edited by Joe Jaeger)

## Educators Recognized

Two Lowell educators recently received Robert Noyce Teacher Scholarships. Todd Gonzales is an undergraduate fellow while Sone Sithonnorath is a post-baccalaureate fellow. Both study at Northern Arizona University. Supported by the National Science Foundation, the program offers \$15,000 each to

talented undergraduate science, technology, engineering and math (STEM) majors and post-baccalaureate students holding STEM degrees to help them earn a teaching credential and commit to teach in high-need school districts. Congratulations Todd and Sone!



# Archiving the William A. Baum Collection

Story and photos by Lauren Amundson



Left: The Baum Collection as archived by Samantha (pictured).

Right: The collection in its previous storage space in the Slipper Building attic.

In December of 2011, the Center for History of Physics at the American Institute of Physics awarded the Lowell Observatory Archives a \$9,600 grant to process the papers of former Lowell Observatory employee Dr. William A. Baum. Baum was the director of the Planetary Research Center (PRC – now called the Hendricks Center for Planetary Studies) from 1965 to 1991. In addition to overseeing the operations of the PRC and coordinating the International Planetary Patrol Program, Baum was actively involved with the 1975 Viking mission to Mars, the Carnegie Image Tube Committee, and the Hubble Space Telescope. He retired from Lowell in 1991 and moved to Seattle with his wife, Ester. He passed away on June 10, 2012 (see page 7).

For many years after Baum's retirement, his papers were stored in the attic of the Observatory's Slipper Building, where they sat uncatalogued and unavailable to researchers. In the spring of 2012, Lowell hired Samantha Thompson to process the collection. She had previous archives experience working at the Smithsonian National Air and Space Museum, where she became familiar with Baum's work on image tubes. Samantha began by moving the boxes from the attic to the library and

re-housing the contents in acid-free folders and boxes. In addition to papers, she came across maps, charts, slides, photographs, reel-to-reel tapes, lantern slides, and glass plates. Major areas of focus in the collection are the Planetary Research Center, International Planetary Patrol, Large Space Telescope (later the Hubble Space Telescope), Carnegie Image Tube Committee, 1975 Viking mission to Mars, Space Shuttle, and NASA.

After re-housing the materials, Samantha entered information about the collection into the Lowell Archives online database, which is searchable on

the Web. This information consists of box and folder numbers, folder titles, dates, and subjects. A finding guide for the collection will be made available through Arizona Archives Online, and selected materials will be digitized for inclusion in the Arizona Memory Project. The papers will be housed in the Chalet on the Lowell campus until completion of the new Collections Center.

The Baum Collection is a significant addition to the Lowell Archives and is now available for use by researchers and historians. A big "thank you" to Samantha for all her hard work! ☺

## Volunteer of the Year: Jill Allen

A former schoolteacher, Jill inspires all those she encounters. As a docent, her infinite energy and insatiable appetite for educating visitors is unparalleled. Featured in the 2010 Annual Report, Jill and her enthusiasm are best encapsulated in the following quote from that article: "As the hour of solar viewing comes to an end, Jill answers a child's eager



Jill (red shirt) educates visitors about the Sun. questions about the composition of the Sun. She leaves the girl with one last thought that is sure to linger in her curious young mind for a long time. "We are all made of star stuff!" Jill exclaims after explaining the critical role that stars play in the formation of elements. "Doesn't that just tickle your brain!"

# Walking in Howard's Footsteps

by Tom Vitron



Left: Howard cutting the ribbon, with daughter Sharyn (far left), wife Maddy (in beige), and son Steve (in pink).  
Top: A child investigates one of the Walk's signs.  
Bottom: Lowell Trustee Bill Putnam at the dedication.  
Photo Credit: Craig Younger/City of Chandler

If you're a fan of our Pluto Walk – the scale model of the Solar System along the path to the Pluto Discovery Telescope – you need to come see our new Galaxy and Universe Walks. And the next time you're in the Phoenix area, there's now another "walk" to take. In July, a new self-guided astronomical walk opened in Chandler, Arizona, and it has very special meaning...

Every stargazing fanatic has a tale of how they came to be passionate about the celestial sky. For Lowell docent Howard Israel, the "ah ha!" moment came nearly 20 years ago after an unforgettable encounter on the deck of a cruise ship in the South Pacific. Howard happened upon a navigator closely looking at the stars above. Once the navigator explained that he was verifying the ship's position using the stars, Howard realized he had stumbled upon a new passion. To pursue this hobby, Howard joined the East Valley Astronomy Club, became a docent at Lowell (along with his wife Maddy), worked with the International Dark-Sky Association, gave on-board lectures for every major cruise line, and taught astronomy classes at the Environmental Education Center at Veterans Oasis Park in Chandler.

In honor of Howard (who died in August after battling lung cancer) and his passion


for astronomy, a new self-guided walk opened at Veterans Oasis Park in July. The Chandler Solar System Walk is along the 2,500-foot-long path around the park's lake. The Walk includes a series of monuments and signs representing the Sun, eight planets, asteroid belt, dwarf planets, and comets. Signs are placed at distances relative to the scale of the Solar System. Each foot on the walk equates to 1.5 million miles. In comparison, on the 300-foot-long Pluto Walk, every inch represents 1 million miles. For example, the distance between Earth and the Sun along Howard's Walk is 62 feet, representing the actual 93 million miles, while that distance is 93 inches on the Pluto Walk. The Chandler Walk also includes information about ancient cultures and their relationship with the night sky. Howard's family and friends raised the money for the project, with collaboration from the city's Recreation and Parks divisions and the East Valley Astronomy Club.

"Can you imagine having something being dedicated to you while you're still alive?" Howard told the *Arizona Republic* in July. "That's pretty cool, I would say. I even helped design the

thing. I've been intimately involved in writing the copy for the signs, designing the handout brochures. I was actively involved in this thing. It was like doing it for somebody else."

Sharyn Younger, Howard's daughter, told the *Republic* that she believes aiding with the Walk's design helped her father deal with his illness.

"Sometimes, I wonder what he would be doing with his time if he wasn't hounding us with, 'Hey, did you think about this? Did you think about that? I've been doing some research,'" Younger said. "This has really kept him occupied and very engaged. It's something for him to really look forward to and to strive to be able to make. It has worked out on any number of levels."

Celebrate Howard's legacy by taking a free tour of the Walk, which you can do anytime from 6 a.m. to 10:30 p.m. daily. Veterans Oasis Park is on the northeast corner of Chandler Heights and Lindsay roads. For information, call (480) 782-2887 or visit [www.chandlersolarsystemwalk.com](http://www.chandlersolarsystemwalk.com) or [www.chandleraz.gov/veterans-oasis](http://www.chandleraz.gov/veterans-oasis). 

## In Memoriam



### William A. Baum (1924-2012)

William Alvin Baum, who directed the Planetary Research Center (PRC) at Lowell Observatory from 1965 to 1991, died June 10, 2012, in Seattle. He was 88 and Professor Emeritus at the University of Washington's Department of Astronomy. A concert in his honor by the Oceana String Quartet took place Sept. 12 in Seattle. Baum was a versatile astronomer who helped Richard Tousey obtain the first ultraviolet spectrum of the Sun, developed the first photoelectric photometers for the Mt. Wilson and Palomar Observatories, worked with J. D. McGee in London on early solid-state imaging devices, headed the PRC to monitor Mars (and other planets) and plan the first spacecraft (Viking Mission) to it, and helped plan and use the Hubble Space Telescope. He is survived by his wife of 50 years, Ester.



### Albert G. Wilson (1918-2012)

Former Lowell Observatory Director Albert G. Wilson died at his home in Sebastopol, CA on August 27, 2012. He was 94. An astronomer, observatory director, and discoverer of comets, galaxies and supernovae during a long career as a scientist, Wilson also supervised the National Geographic Society-Palomar Observatory Sky Survey, and was the founding co-editor of *Icarus*. His discoveries included four dwarf galaxies in the Local Group, several supernovae, a comet, and at least five asteroids. His main interest, however, was theoretical cosmology, especially the idea of discretization. Wilson served as Director of Lowell from November 1954 to January 1957, having succeeded legend V.M. Slipher at that post.



### Howard Israel (1934-2012)

An avid amateur astronomer, Howard was a docent at Lowell for more than five years. He died August 31, 2012 in Phoenix. He is survived by his wife, Madeline, as well as three children and five grandchildren. His son, Steve, is the U.S. Representative for New York's 2nd Congressional District. See article on page 6 for more.



### Neil Armstrong (1930-2012)

Former astronaut, test pilot, college professor, Mr. Armstrong – the first human to set foot on the Moon and the special guest speaker at the First Light Gala – died August 25, 2012. Armstrong is survived by his second wife, Carol, and by two sons. See Gala feature from Fall 2012 Observer.

*The American Astronomical Society contributed to Wilson and Baum text.*

This exquisite 3D ornament of the Clark Telescope was recently unveiled at the Starry Skies Shop, Lowell's remodeled science store. It is the fifth in a series of ornaments depicting special places in the



region that the Flagstaff branch of American Association of University Women (AAUW) has sold to raise funds for college scholarships for local Flagstaff women.

### ARRIVALS/PROMOTIONS

Samantha Christensen,  
Education Coordinator  
Samantha Thompson,  
Curator of Exhibitions

### DEPARTURES

Caryn Fitch,  
Anderson Mesa Site Manager  
Lauren Hill,  
Media Intern

**2012-2013 PUBLIC PROGRAM  
 WINTER SPECIAL EVENTS**

**A New Perspective on Mars: The Red Planet in 3D:**

Exhibit open until January 13 (regular open hours)

**Upcoming Flagstaff Nights:** Wednesdays 1/2 and 2/6

**Second Friday Science Nights:** Fridays 1/11 and 2/8

**Upcoming Star Fests:** Sundays 1/20 and 2/17

**School's Out & Kids are Free Days:** Mondays 1/21 and 2/18

**DECEMBER**

**Regular Public Hours:**

M/W/F/Sat noon - 9:30 p.m.

T/TH/Sun noon - 5:00 p.m.

**17, 19, 22**

**Star of Bethlehem and Mayan Calendar**

(7:00 p.m. - 9:30 p.m.) – At 7:00 p.m. we will discuss the astronomical interpretation of the Star of Bethlehem. At 8:00 p.m. we'll share the facts about the 2012 Mayan Calendar. December 21, 2012 marks the end-date of the Mayan long-count calendar. We will wade through the doomsday fables and discuss the scientific facts surrounding this date. In addition to these presentations, view breathtaking celestial objects through telescopes and enjoy exciting multimedia programs.

**FRI 21**

**Winter Solstice**

(6:00 p.m. - 9:30 p.m.) – Join Lowell Observatory for the longest night of the year, winter solstice. At 6:00, 7:00, 8:00 and 9:00 p.m. see a simple demonstration showing why our night is so long tonight.

**26 – 31**

**Winter Holiday Celebration**

(9:00 a.m. - 9:30 p.m.) – Lowell Observatory will extend our open daytime hours and offer indoor programs and building tours. Throughout the day and evening see a presentation of science experiments you can do on your own kitchen counter or dinner table. Use fruit to make fireballs and a common kitchen appliance to measure the speed of light! After dark, we will set up numerous telescopes for viewing celestial objects. Note: we will close at 5:00 p.m. on the 31st.

**JANUARY &  
 FEBRUARY**

**Regular Public Hours:**

M/W/F/Sat noon - 9:30 p.m.

T/TH/Sun noon - 5:00 p.m.



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