MROI Monthly Inquirer

INSIDE: A look at the MROI's closest neighbor, Langmuir Laboratory.

August 2020

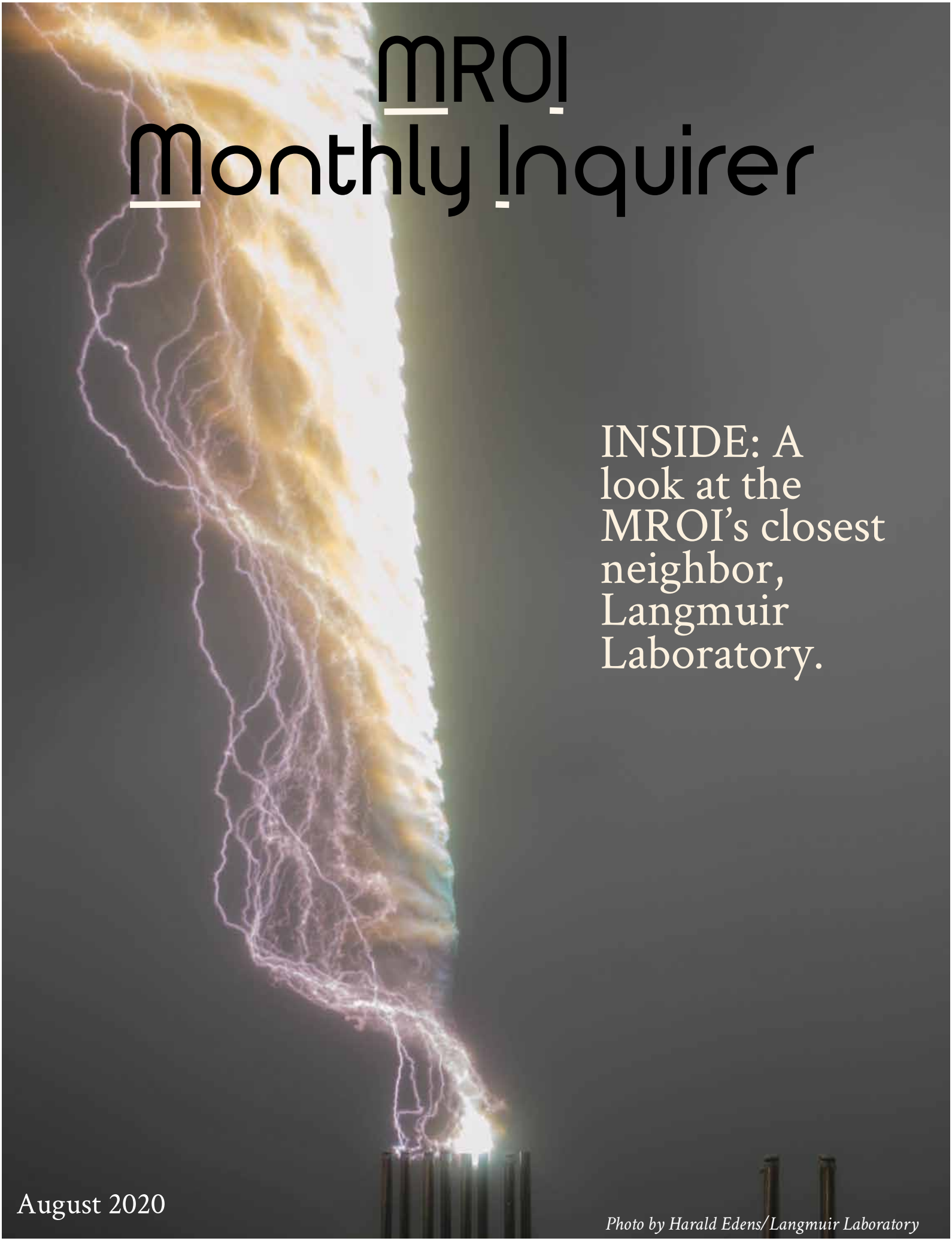


Photo by Harald Edens/Langmuir Laboratory

The MROI is excited to announce the creation of the AstroDaily! A daily blog website where you can find information on happenings at the MROI, current events in the world of astronomy, tips and tricks on viewing the night sky, and much much more! Content is being added every day at [http://astrodaily.mro.nmt.edu/!](http://astrodaily.mro.nmt.edu/)

Want to be the first to know all the news and updates coming out of the MROI with early access to our monthly e-newsletter? Want our exclusive yearly newsletter mailed straight to your door? How about a private dinner and tour at the Observatory for you and seven of your friends? Or maybe you'd just like to support the advancement of science and astronomy in your community?

Do all of this and more by joining the Friends of the MRO. Go to our website to find out more: http://www.mro.nmt.edu/support-mro/

Stay up to date with all of MROI's monthly newsletters at http://www.mro.nmt.edu/news/newsletter/.

Click the links below to access new content being uploaded across all our platforms!

The MROI team would like to give a heartfelt congratulations to our lead Opto-Mechanical engineer, Andres Olivares, for completing the intensive and worthwhile process of naturalization to become a US citizen! Congratulations, Andres!

Comet NEOWISE: A Rare and Unexpected Sight

Shelbi Etscorn

In a year where the hits seem to keep coming, the universe seems to have not only cut us a break but thrown us a stunning gift visible in the night sky.

Photo by Mike Ranck

Sky watchers have been gleefully buzzing this month with talk and photographs of Comet NEOWISE, purportedly the best comet seen from earth in 23 years (the last one being Comet Hale-Bopp). While, on average, a comet passes by Earth once every year, very rarely are they more than faintly observable to the naked eye. NEOWISE, however, has been clearly visible in the night sky in areas with low light pollution making it an unexpected delight to those who have seen it.

Photo by Dave Thomas

A comet is a relatively small object in space, characterized by its release of gasses after passing close to our sun and being heated by its rays. These gasses produce an atmosphere around the comet and often a stunning tail, which comets have come to be known for. Comet NEOWISE measures about 3 miles across and has two tails: a magenta tail made of gas and ions and a second golden tail made of dust.

Photo by Wini Labrecque

Unfortunately, comets visible to us here on Earth are a bit of a rarity. In no small part because the sun is not an easy star to get close to and live to tell the tale. Many comets disintegrate in the sun's unrelenting heat before they are able to continue on their orbit past Earth. After the discovery of NEOWISE on March 27, 2020 by the NEOWISE space telescope, astronomers held their breath to see if this new comet would survive its pass around the sun. Fortunately for the comet (and all of us here on Earth), NEOWISE proved to be extremely adept at walking that fine line that Icarus never seemed to master. It passed by the sun just close enough to be able to produce two stunning tails to flaunt as it passed by Earth without getting too close.

Photo by Micah Uchida

Photo by Sam Crabtree Winter

Since then, professional and amateur stargazers have been waking up in the earliest hours of the morning to get a glimpse of the rare sight before it continues on its journey. We asked our facebook followers to share their pictures of NEOWISE and did they ever deliver! The photos submitted can be found on this page, but we couldn't fit them all in! To see even more photos of NEOWISE, check out the MROI's facebook post at https://www.facebook.com/MagdalenaRidgeObservatory/posts/10158239724763257

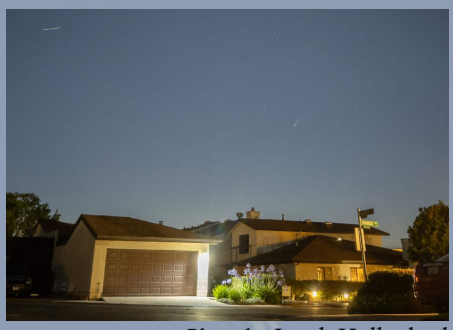


Photo by Jacob Hollenbeck

The appearance of a comet is called an apparition. And NEOWISE lives up to that name: the appearance of something remarkable or unexpected. The last time NEOWISE passed by Earth was 6,800 years ago, before the invention of the wheel. Likewise, Earth will not be graced with a view of NEOWISE for another 6,800 years. Hopefully when it does, it will find humanity in easier times and the Earth just as full with curious faces tilted up towards the sky.

Instrumentation Station:
Environmental Monitoring Systems

Shelbi Etscorn

It's easy to think that the only observing happening at a place like the MROI is the kind that's directed up towards the stars, but that isn't the case. In order to keep the telescopes doing their jobs observing the universe, researchers have to concern themselves with more Earthly matters, and they employ a variety of tools to do so.

These tools, called Environmental Monitoring Systems(EMS) report on a variety of conditions on the ground at the observatory to keep both scientists and scientific instruments safe and working at their highest ability. They keep track of the Electric field, the amount of humidty, the temperature inside certain buildings, and even the amount of dust in the air.

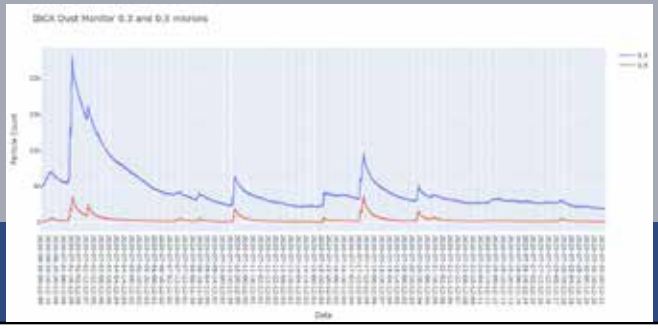
The electric field monitors are in place to warn researchers when lightning strikes near the observatory…which is often! There's a reason Langmuir Labs (which studies lightning strikes) is set up just a stone's throw away from the observatory. Lightning could be problematic not only for the electrical equipment at the observatory, but for the researchers themselves! A bright flashing light outside the observatory is connected to the electric field sensor; when the light begins to flash red, all workers at the MROI know it's time to get inside – and in a hurry!

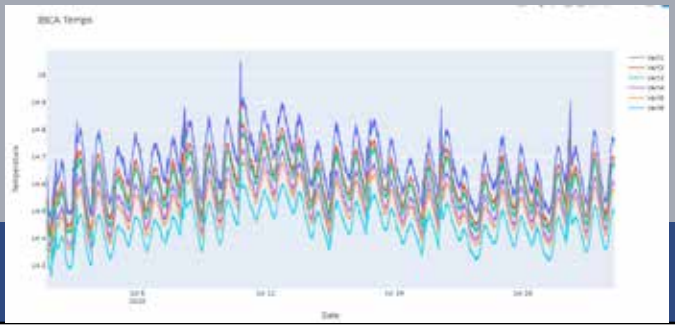
The humidity, temperature, and dust sensors are all important to make sure the telescope and scientific instruments are able to function properly. Humidity inside the telescopes dome could lead to droplets forming on the telescopes mirror. These droplets would distort any light that reaches the mirror leading to inaccuracies in observations.

Dust is monitored for a similar reason. Dust in the air or dust on the mirror would lead to the same distortion of the light that water droplets would whether they're in the telescope's dome or near the scientific instruments reading the light as it comes in. Dust might mean a crack is forming somewhere that is allowing in outside air and dust, which would have to be found and fixed by researchers. The graph to the left below is a graph showing the data from one of our dust sensors. Can you tell which days MROI workers were hard at work, going in and out of the room and letting dust in?

The temperature is an extremely important element being monitored at the MROI. Not only are the temperatures of different rooms monitored, but the temperature is measured at different heights in a single room and at different points in the width of the room. While the light makes its way from the telescope to the scientific instruments, even slight movements in the air can disturb the path the light takes and distort the observations. To counter this, the air inside the buildings that the light will travel through must be completely still. Since hot air rises and cold air sinks, these means the temperature of the air inside of the rooms must be consistent throughout the entire room, so the air becomes incredibly still.

All of these systems being monitored are reported automatically to researchers and updated online, so they can keep an eye on things even when they aren't up on the ridge. Anyone can access the data being reported by these systems at http://www.mro.nmt.edu/weather/environmental-data/ The graphs there represent the real time information being reported by our EMSs. Examples of these graphs are at the bottom of this page. Feel free to take a look to see how





The Langmuir Laboratory for Atmospheric Research

Harald Edens

Atmospheric research in New Mexico started in 1935 when E.J. Workman became interested in thunderstorms. Workman at the time worked at the University of New Mexico, but after the war he took his research division south to NMT, which back then was still called the New Mexico School of Mines. In the 1950s and 1960s Workman's research attracted a number of other researchers to the area, including Irving Langmuir, Bernard Vonnegut, Charles Moore, and Marx Brook.

Thunderstorm research in the early days were mostly a mobile operation involving multiple vehicles and large trailers housing radars and other instrumentation. Radar was (and still is) an important research tool. The thunderstorm environment could also be observed in-situ, using balloons and aircraft that flew near or into a cloud.

The logistics of operating mobile instruments became increasingly cumbersome, and the need emerged for a permanent facility dedicated to the studies of thunderstorms and lightning. The Magdalena Mountains west of Socorro were chosen because of their tendency to trigger orographic convection in the morning hours, resulting in short-lived, small, and "simple to study" thunderstorms -- if there is such a thing. With funds from the National Science Foundation, Workman and his group constructed Langmuir Laboratory, as a research division of New Mexico Tech. The facility was completed and dedicated in 1963, and was named in honor of Irving Langmuir. The Langmuir family later made a bequest to the facility that continues to support research done at the facility.

Above photo by Bob Martin

Experience gained by the early researchers lives on within the group to this day. In the atmospheric electricity research community, Langmuir Laboratory is well known for its expertise in lightning triggering, ballooning, radar, and other specialized instruments, much of which is custom designed and built in-house. Such instrumentation has proven transformative in the field of lightning research. Most recently, the late 90s saw the development of the three-dimensional Lightning Mapping Array (LMA), which is a set of ground-based VHF receivers that collectively map out lightning channels in three dimensions and time. It gives a complete picture of lightning activity inside a thunderstorm. Over the last decade, work at Langmuir Laboratory has redefined lightning interferometry, with the design of a VHF continuous broadband digital interferometer. It allows lightning flashes to be recorded and analyzed in their entirety, and in unprecedented detail. This resulted in important recent discoveries addressing the age-old question: How does lightning get started inside a thundercloud?

Lightning triggering is a convenient and controlled way to bring lightning to the instrument. A model rocket tows a steel wire several hundred feet up into the air, when conditions appear ripe for natural lightning to occur. If the timing is right, lightning intitiates from the rocket, and the ensuing processes can be observed in detail using interferometry, lightning mapping, high-speed video, current sensing resistors on the ground, and electric field-change meters. Langmuir Laboratory is one of the very few facilities in the world where lightning is triggered. This work, and the group's earlier efforts involving atmospheric sounding rockets and balloons, resulted in the need for a dedicated restricted airspace. This airspace, reaching up to 45,000 ft altitude, is under the direct control of Langmuir Laboratory and is activated whenever an experiment requires separation from other air traffic.

Nowadays, the group still goes "up close" by flying instruments in thunderstorms. Polyethylene balloons are flown with payloads to measure signals such as lightning-induced changes in the electric field, high-energy radiation from lightning, and the charge and shape of precipitation particles. The group is also developing a custom unmanned aircraft. However, due to modern advances in technology, nowadays one often doesn't need to be that close, and new secrets of lightning can still be unveiled by employing remote-sensing instruments. The group also collaborates with other groups in research projects elsewhere that involve field campaigns, volcanic lightning, lightning effects underground, and energetic radiation from thunderstorms. Recently it was discovered that lightning generates X-rays, and thunderstorms themselves are essentially particle accelerators, producing gamma rays and even exotic antiparticles such as positrons. Like many other fields of research, the field of atmospheric electricity is highly dynamic, driven by advances in technology and major novel discoveries.

All photos found on this page are by Harald Edens/Langmuir Laboratory unluess otherwise stated.

Spargo's Sky Report

August Skies

Have you seen Comet NEOWISE yet? If not, you can still find it for the first few days of this month. Find a good dark spot with a clear view of the northwest horizon. NEOWISE will be below the Big Dipper and headed in the general direction of the bright star Arcturus. To find Arcturus follow the curvature of the Big Dipper's handle and arc to Arcturus.

If it's August it always means the appearance of the Perseid Meteor Shower. Each year around the 12th of August the Earth plows through the debris trail left by comet Swift-Tuttle. Then the Earth's gravity takes over and pulls tiny rock fragments in the trail into our atmosphere at speeds approaching 62,000 mph! This year the peak of the meteor shower will occur on the night of August 11-12. The last quarter Moon will not rise until just after midnight making evening viewing of the shower possible. The peak of the shower will be after midnight and after Moonrise when only the brightest of the meteors will be visible. As soon as it is dark, look to the northeast horizon even before the constellation Perseus rises. That will be the general direction or the "radiant" of the shower. At its peak you should expect to see 50 to 75 meteors per hour.

Jupiter and Saturn will continue to dominate the early evening sky spending the month separated by only about 8 degrees. Jupiter shines at magnitude -2.6 and is well placed for viewing its clouds and the 4 Galilean moons. At magnitude +0.3 Saturn is also well placed for early evening viewing. Its magnificent rings are open to 22 degrees from horizontal, offering excellent viewing through small to medium-sized telescopes.

Mars rises about 3 hours after sunset and during this month will brighten to magnitude -1.8! The best viewing will be in the early morning hours just before sunrise when the red planet is near your local meridian (overhead). Venus rises around 3 a.m. for those of us at mid-north latitudes and reaches 40 degrees above the eastern horizon by the end of the month. The brilliant planet, shining at magnitude -4.4 will show its atmosphere at 59% illuminated by the end of the month.

The Moon will be full on the 3rd, last quarter on the 11th, new on the 19th, and first quarter on the 25th. Looking southeast on the 1st, about an hour after sunset, the Moon will be below and form an oblique triangle with Jupiter and Saturn. On the 9th, look high in the southern sky about an hour before sunrise to see the Moon passing about 1 degree below Mars. On the 15th, about an hour before sunrise, the waning crescent Moon will be just above and to the left of brilliant Venus. On the 28th the waxing gibbous Moon can be found visiting giant Jupiter again! On the following night of the 29th, the Moon will be below and to the left of the ringed planet Saturn.

Due to the closure of New Mexico Tech because of COVID-19 virus concerns, there WILL NOT be a first Saturday of the month star party at the Etscorn Campus Observatory.

Stay safe and Clear Skies!

WORD UNSCRAMBLE

otpehcsiamr _____ _____

mtrpetreaue _____ _____

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wosniee _____ _____

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moetc _____ _____

gaiurmnl _____ _____

Congratulations to Robert Kalita for being the first to submit the correct answers to June's Word Unscramble puzzle!

If you would like a chance to win a MROI prize, figure out the answers to this word scramble, and send them along with your name and address to info@mroi.nmt.edu with the with the subject "Word Unscramble".

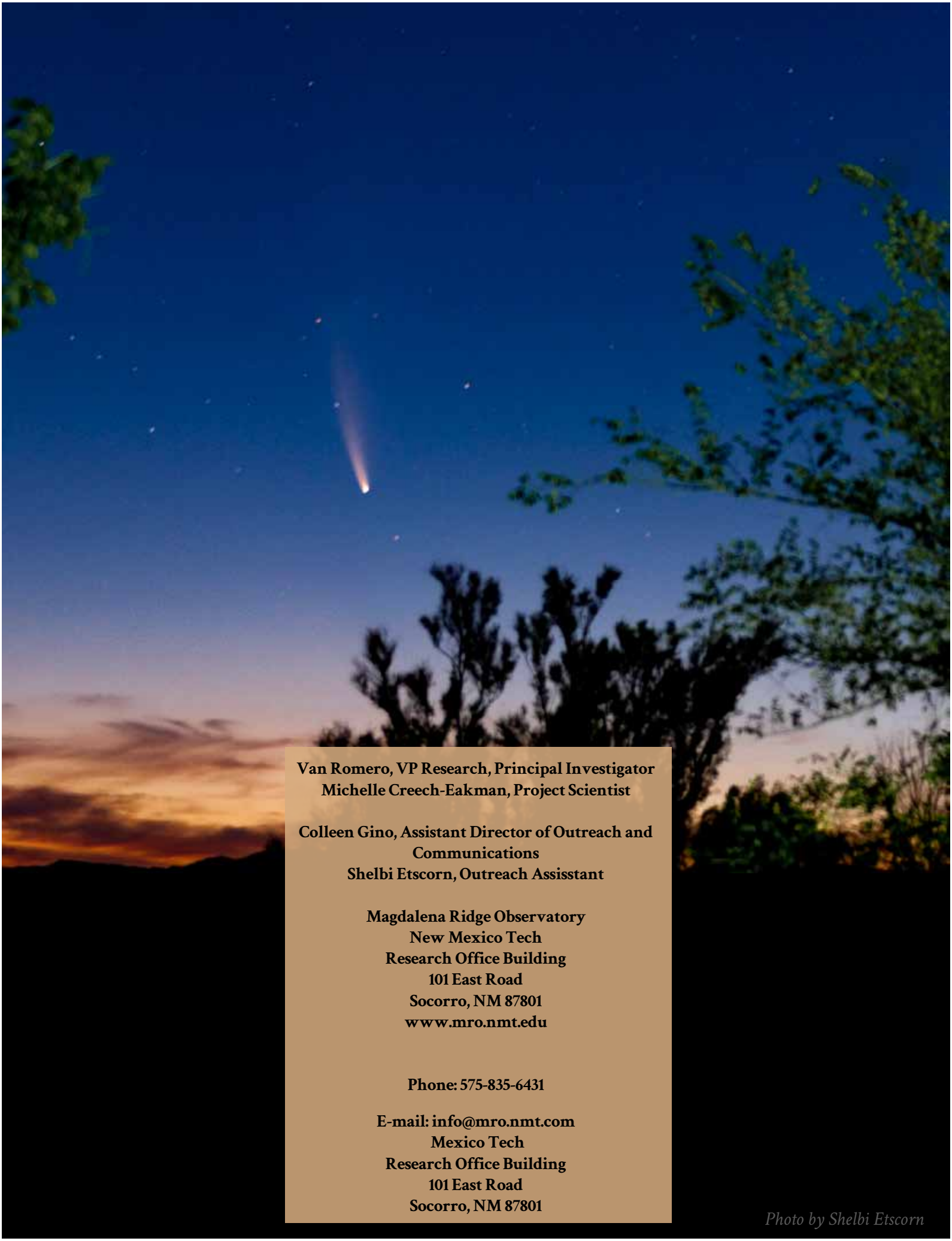

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Photo by Shelbi Etscorn