

The Prairie Astronomer

March 2021 Volume 62, Issue #3

March Program:

Sunlight in nature, Hydrogen fusion to Crawdads - Stephen Ramsden

The Jezero Crater Delta - Up Close



Night Sky Network



The Newsletter of the Prairie Astronomy Club

The Prairie Astronomer



NEXT MEETING AND PROGRAM

March 30, 7:30pm: "Sunlight in nature, Hydrogen fusion to Crawdads."

This 30 to 40 minute lecture will focus on the upcoming solar maximum, what equipment to use and what you may see, and some of the beautiful creatures on Earth that are a direct result of sunlight.

Stephen W. Ramsden, Director, Charlie Bates Solar Astronomy Project

Bob will send out the Zoom link to all club members on March 30th.

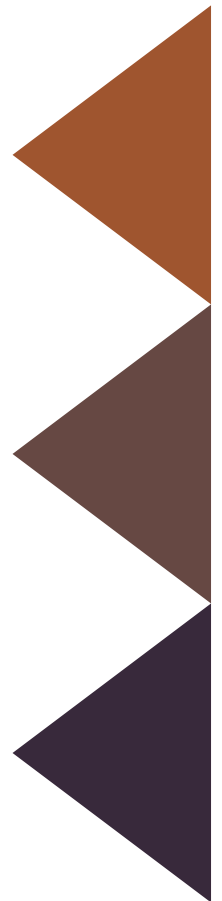
FUTURE PROGRAMS

To be announced

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Cover: Perseverance View of the Delta in Jezero Crater. See page 11.



CALENDAR

PAC Meeting
Tuesday, March 30, 2021, 7:30pm, via Zoom

PAC Meeting
Tuesday, April 27, 2021, 7:30pm

PAC Meeting
Tuesday, May 25, 2021, 7:30pm

Nebraska Star Party
August 1-6, 2021
Merritt Reservoir, Valentine, Nebraska

2021 STAR PARTY DATES

	Date	Date
January	8	15
February	5	12
March	5	12
April	2	9
May	7	14
June	4	11
July	2	9
August	Jul 30	6
September	Aug 27	3
October	1	8
November	Oct 29	5
December	Nov 26	3

Dates in **BOLD** are closest to the New Moon.

CLUB OFFICERS

President	Bob Kacvinsky kacvinskyb@yahoo.com
Vice President	Rick Brown rickbrown2000@gmail.com
2nd VP (Program Chair)	James Quach jamesq@utexas.edu
Secretary	Bill Lohrberg wmlohrberg89@gmail.com
Treasurer	John Reinert jr6@aol.com
Club Observing Chair	Jim Kvasnicka jim.kvasnicka@yahoo.com
Outreach Coordinator	Mike Kearns mkearns@neb.rr.com
Website and Newsletter Editor	Mark Dahmke mark@dahmke.com



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Night Sky Network



www.prairieastronomyclub.org

The President's Message

Bob Kacvinsky



Welcome to March where we have seen record -31 degrees and ~two weeks later 77 degrees. I feel like I am back in Fargo where there are only two seasons – Winter and Summer and the transitions occurred in about two weeks' time. Helps to explain this gentleman's confusion.

With the snow gone we had a nice club Star Party at The Farm March 5th. The transparency and seeing were average but we still had a nice 3+ hours of observing before the humidity washed out the sky. Seven club members attended, and it was a really good time seeing everyone again. We did a little ground maintenance from the farmer's cattle before hand but otherwise the observing site was in great shape. We enjoyed a few spring favorites

including M42 Orion Nebula, M81/M82, M44, M1 to name a few. Personally, I was able to log in 14 Hershel II objects. Thanks to all who attended.

Our March PAC meeting is on Tuesday, March 30th at 7:30 PM. We will have a live speaker Stephen Ramsden, Director of the Charles Bates Solar Astronomy Project, presenting "Sunlight in Nature, Hydrogen Fusion to Crawdads". The sun will be transitioning towards greater solar activity and Stephen will cover solar observing highlights. He also shares several great stories about how sunlight interacts with nature on earth. You will want to mark your calendars for this one. Thanks to Jack Dunn for the contact lead.

As we look ahead our April 27th meeting will be

a live presentation by our member Jim Kvasnicka who will share the ancient mythology of the constellations. Jim's monthly observing reports are shifting to highlighting individual constellations and his presentation will tie in nicely with his monthly observing reports.

As COVID vaccinations ramp up we are monitoring CDC and local recommendations around gathering vs continuing virtual meetings. We have live speakers planned above for March and April, May will also be virtual, and then June will be our in-person Solar Observing Party. Meeting after that will depend on when the city will allow opening and use of Hyde Observatory. This is the latest information that we have currently. Thanks for

everyone's patience as we navigate these uncharted times.

Please watch for updates in the newsletter and messages via the Nightsky Network. We plan to continue our club

membership star parties each month. Public star parties will continue on hold until we get guidance from public officials. I am hopeful that we will be able to start public activities early next fall.

Until then we can enjoy getting together as a club.

Clear Dark Skies to you,

Bob Kacvinsky
kacvinskyb@yahoo.com
402-840-0084



NASA TRIED TO BAN ME FROM THEIR PRESS BRIEFINGS, BUT IRONICALLY THEIR SECURITY WAS TOTALLY UNPREPARED TO DEAL WITH A SKYCRANE.

Meeting Minutes

Bill Lohrberg

PAC meeting minutes
February 23, 2021 as
recorded by Bill Lohrberg

Club President Bob
Kacvinsky hosted the
Zoom meeting which
began at 7:30pm
welcoming 17 attendees.

Jim Kvasnicka presented
the March observing
report. Details are found
in the club newsletter. Jim
announced club star party
dates for March 5 & 12,
locations to be determined
as we received several
inches of snowfall and site
conditions both at
Branched Oak
Observatory and Cortland
Farm could still be an
issue.

Bob introduced the
program, a video
presentation "A planet –
not our own" by Dr.
Elizabeth Tasker,
astrophysicist, science
writer and Associate
Professor at the Japan
Aerospace Exploration
Agency. Also author of
"The Planet Factory:
Exoplanets and the
search for second Earth".

Bob announced there will
be a club spring star party
at Lord ranch cabins
located 20 miles south of

Valentine, NE April 7th
through 12th. 1 out of the
5 cabins is still available
for \$110 per night. (2 beds
per cabin, with kitchenette
and other nice amenities.)
We have this 5th cabin
reserved but will likely
only hold for another 2 or
3 weeks from this time.

Bob Leavitt invited all to a
streaming event Friday
Feb 26, 11:10 am central
time program presented
by the Estes Valley
Amateur Radio Club and
Estes Park Elementary
School kids who are
having a chat with an
astronaut on the ISS
through a special
designed radio and
tracking antenna they
have set up. Those
interested will be directed
to where you can watch
the event on you tube. An
email will go out from Bob
via NSN PAC email
directing how to find the
link and event. A hearty
thanks to Bob Leavitt for
that and welcome back to
the PAC and the meeting
tonight.

Of interest in the news:
Some of the first photos of
the successful landing of
Mars rover Perseverance
were shared. Bob also

shared a video snippet
taken from Juno's close
pass of Jupiter in its
highly elliptical orbit.

Other events and
activities: Opening of
Hyde is getting closer –
anticipating a summer
opening possibly with
partial occupancy
depending on how things
go. A reminder to check
before making the trek to
club star party sites
through our Night Sky
Network messaging.
Next Club meeting will
likely be another Zoom
meeting March 30.

Club Treasurer John
Reinert reported no
changes, no new
updates, we did have a
new member added!

At approximately 7:50pm
the meeting was
adjourned with no further
business.

After the program
presentation video,
several were curious
about where to find more
information on the JAXA
Hayabusa2 project – type
HAYABUSA2.JAXA-JP in
your web browser.

NRAO Cosmic Coloring Compositor

Larry Stepp

The speaker at a recent TAAA meeting mentioned the Cosmic Color Compositor, available on the NRAO website. It lets a student combine images in different wavelengths, choosing a different color for each. I checked it out, and here is the link:

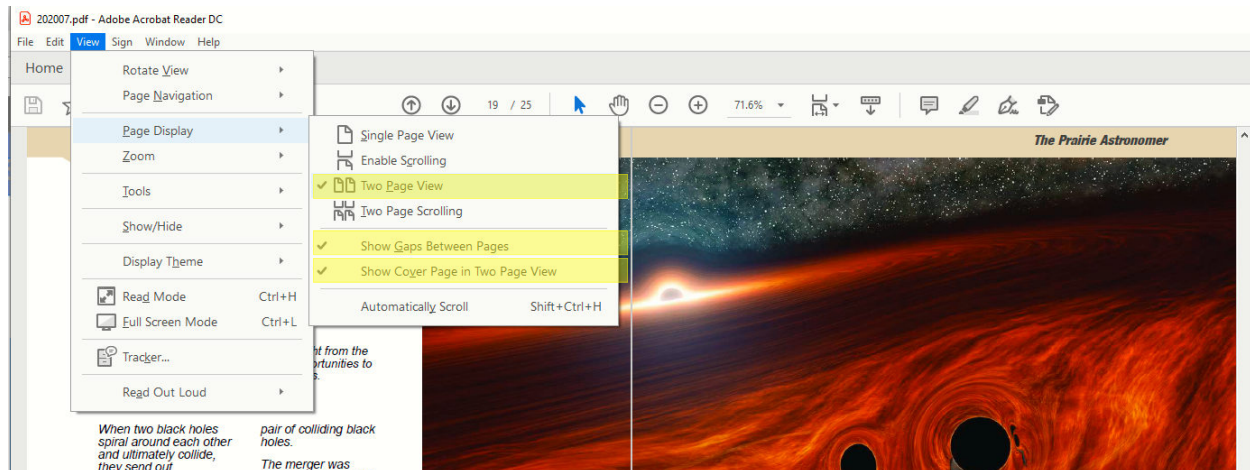
https://public.nrao.edu/color/?composite_id=8778

They have several objects to choose from. For fun, I tried M51. Here is an example of the output.



New Newsletter Format

How to Adjust Adobe Acrobat Settings for Two Page View



To view this newsletter in magazine spread format in Acrobat, select **View ->Page Display->Two Page View**. Acrobat will then show two pages side by side. Also make sure the checkboxes “Show Cover Page in Two Page View” and “Show Gaps Between Pages” are checked.

If you have it setup correctly, the cover page will be displayed by itself and subsequent pages will be side by side with the odd numbered pages on the left.



Rick Johnson

ARP 28

Arp 28 sits in a rather empty part of the sky. It is in Arp's class: Spiral Galaxies: One heavy arm. In some cases, I've had trouble seeing which arm Arp was talking about but this one is quite obvious for a change. Arp 28 is also known as NGC 7678 and is located near the center of the Great Square of Pegasus. It is classed as SAB(rs)c and is both a Seyfert 2 and starburst galaxy. It appears that heavy arm as a lot to do with the starburst classification. Arp's note: "Note straight heavy arm." The heavy arm is somewhat straight but so are other arm segments of the galaxy. It certainly is a disturbed galaxy. Redshift puts it about 140 million light-years away. A single Sosies measurement shows a slightly closer distance of 115 million light years. I'm not sure such a measurement is all that accurate for a highly disturbed galaxy but then neither is redshift if the galaxy has had a close

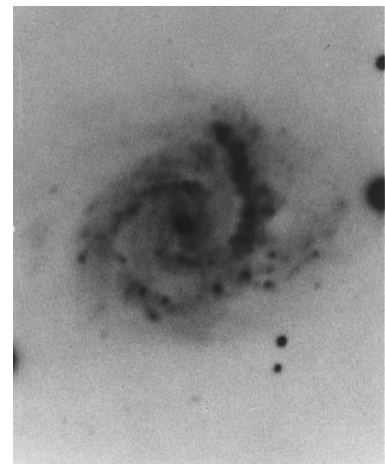
encounter that has accelerated it. The galaxy was discovered by William Herschel on September 15, 1784 but isn't in either of the Herschel 400 programs.

So has it encountered another galaxy? There's none in my image but that's my error. UGC 12619 is just below the bottom edge of my image. Somehow I didn't see it was there so put Arp 28 in the center of the image rather than a few minutes above center which would have then shown this galaxy. Redshift puts it at about 160 million light years. A bit further than Arp 28. Is it the culprit? It is a dim, low surface brightness galaxy with very disturbed spiral structure. It's classed as SAB(s)dm.

The area of Arp 28 is outside the SDSS search area nor has Hubble imaged it. NED has little detail on any of the other galaxies in the image. You have to look hard to find many. The largest and

brightest, a blue galaxy to the northwest of Arp 28 isn't in NED. Only IR galaxies from the 2MASX survey are listed. Those tend to look red though that isn't necessarily the case.

This image appears on page 55 of the November 2017 issue of Sky and Telescope Magazine. It is the first image in an article on square galaxies. It never mentions its Arp number but does mention it as being in his Atlas.



ARP's image

The Mantrap Skies Image Catalog

Rick Johnson, a founding member of the Prairie Astronomy Club, passed away in January, 2019. His legacy lives on through his comprehensive catalog of over 1600 images at www.mantrapskies.com.



April Observing

Jim Kvasnicka



This is a partial list of objects visible for the upcoming month.

Planets

Venus: Makes its return on April 18th as an evening star just 4° above the horizon.

Mercury: Joins Venus in the evening sky on April 25th.

Mars: Shines at magnitude +1.4 in Taurus.

Saturn: In Capricornus at magnitude +0.8.

Jupiter: Rises two hours before the Sun at magnitude -2.1.

Uranus and Neptune: Neptune not visible, Uranus difficult to see in the evening.

Meteor Showers

Lyrids: Peaks the night of April 21-22. Expect up to 20 meteors per hour. The waxing gibbous Moon will interfere.

Messier List

M40: Multiple star in Ursa Major.

M65/M66: Part of the Leo Triplet Group.

M95/M96: Galaxies in Leo that fit in the same FOV.

M105: Galaxy in Leo.

M106: Galaxy in Canes Venatici.

M108: Galaxy in Ursa Major.

M109: Galaxy in Ursa Major.

Last Month: M41, M44, M46, M47, M48, M50, M67, M81, M82, M93

Next Month: M49, M51, M61, M63, M64, M85, M94, M101, M102, M104

NGC and other Deep Sky Objects

NGC 2903: Elongated galaxy in Leo.

NGC 3077: Galaxy in Ursa Major.

NGC 3384: Galaxy in Leo.

NGC 3521: Elongated galaxy in Leo.

NGC 3675: Elongated galaxy in Ursa Major.

Double Star Program List

Alpha Leonis: Regulus, white and yellow stars.

Gamma Leonis: Algieba, pair of yellow stars.

54 Leonis: Yellow primary with a greenish colored secondary.

Alpha Canum Venaticorum: Cor Caroli, bluish white and greenish yellow stars.

Zeta Ursa Majoris: Mizar, pair of white stars.

Gamma Virginis: Porrima, close pair of yellow stars.

24 Comae Berenices: Yellow primary with a pale blue secondary.

Delta Corvi: White and rose colored stars.

Challenge Object

NGC 3190 Group: NGC 3190 is the brightest member in a group of galaxies in Leo that include NGC3185, NGC 3187, and NGC 3193.

Focus on Constellations

Ursa Major

Jim Kvasnicka

Ursa Major, The Great Bear, is the third largest constellation covering 1,280 square degrees. Seven of the brightest stars form the Big Dipper, the best known of all the star patterns. The Big Dipper is only the hind quarters and tail of the Great Bear. Ursa Major lies far away from the Milky Way, therefore it is rich in galaxies, or in the case of Ursa Major it is exceptionally rich in galaxies. Ursa Major is best seen in the month of April.

Showpiece Objects

Galaxies: M81, M82, M101, M108, M109

Planetary Nebulae: M97

Double Stars: Mizar and Alcor

Mythology

In Greek mythology Zeus fell in love with Callisto, a beautiful young woman. Hera, Zeus's wife found out and turned Callisto into a bear, but she kept her human feelings. She roamed the woods in fear of the other animals and of hunters. One day she came face to face with a young hunter who she recognized as her own son Areas. She rushed to

hug him but Areas didn't know the bear was his mother. Thinking the bear was attacking he raised his spear and was about to throw it when Zeus turned him into a bear like his mother. Callisto became Ursa Major and Areas became Ursa Minor.

Number of Objects Magnitude 12.0 and Brighter

Galaxies: 84

Globular Clusters: 0

Open Clusters: 0

Planetary Nebulae: 1

Dark Nebulae: 0

Bright Nebulae: 0

SNREM: 0



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NASA's Perseverance Drives on Mars' Terrain for First Time

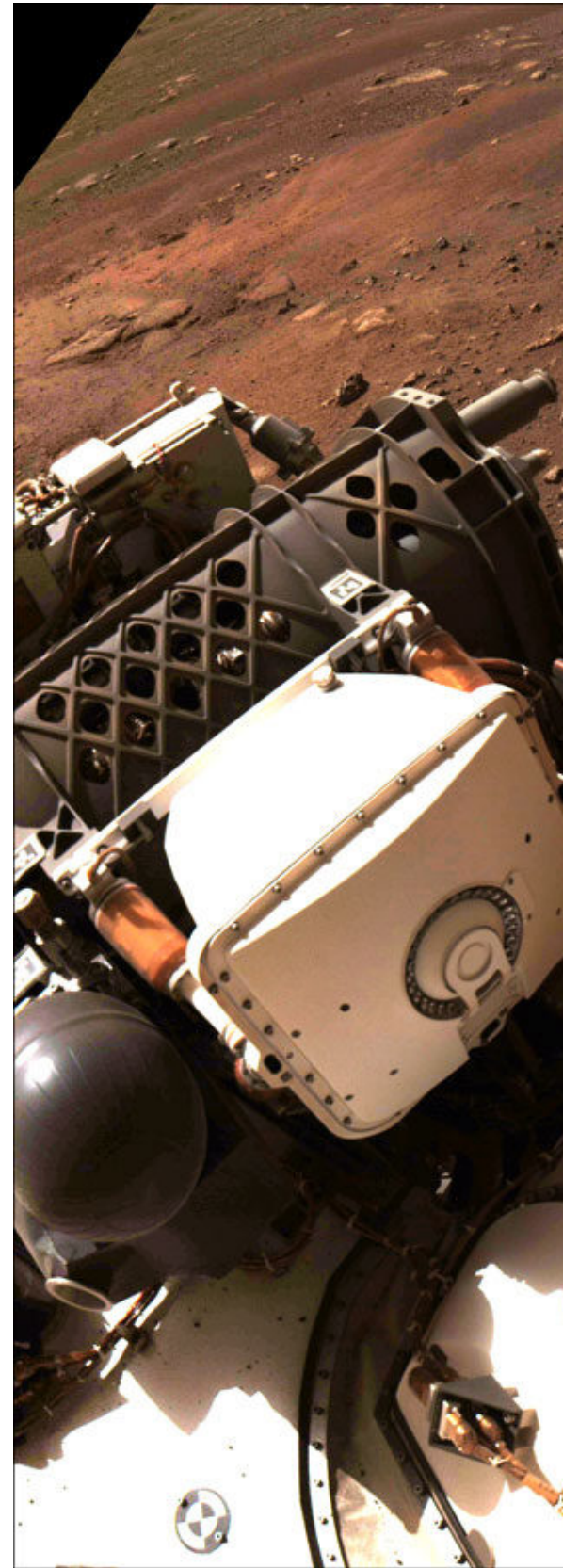
How two new technologies will help Perseverance, NASA's most sophisticated rover yet, touch down onto the surface of Mars this The first trek of the agency's largest, most advanced rover yet on the Red Planet marks a major milestone before science operations get under way.

NASA's Mars 2020 Perseverance rover performed its first drive on Mars March 4, covering 21.3 feet (6.5 meters) across the Martian landscape. The drive served as a mobility test that marks just one of many milestones as team members check out and calibrate every system, subsystem, and instrument on Perseverance. Once the rover begins pursuing its science goals, regular commutes extending 656 feet (200 meters) or more are expected.

"When it comes to wheeled vehicles on other planets, there are few first-time events that measure up in significance to that of the first drive," said Anais Zarifian, Mars 2020 Perseverance rover mobility test bed engineer at NASA's Jet Propulsion

Laboratory in Southern California. "This was our first chance to 'kick the tires' and take Perseverance out for a spin. The rover's six-wheel drive responded superbly. We are now confident our drive system is good to go, capable of taking us wherever the science leads us over the next two years."

The drive, which lasted about 33 minutes, propelled the rover forward 13 feet (4 meters), where it then turned in place 150 degrees to the left and backed up 8 feet (2.5 meters) into its new temporary parking space. To help better understand the dynamics of a retrorocket landing on the Red Planet, engineers used Perseverance's Navigation and Hazard Avoidance Cameras to



Below - vPerseverance Is Roving on Mars: This image was taken during the first drive of NASA's Perseverance rover on Mars on March 4, 2021. Perseverance landed on Feb. 18, 2021, and the team has been spending the weeks since landing checking out the rover to prepare for surface operations. This image was taken by the rover's Navigation Cameras. Credits: NASA/JPL-Caltech.



Rover Landing, continued.

image the spot where Perseverance touched down, dispersing Martian dust with plumes from its engines.

More Than Roving

The rover's mobility system is not only thing getting a test drive during this period of initial checkouts. On Feb. 26 – Perseverance's eighth Martian day, or sol, since landing – mission controllers completed a software update, replacing the computer program that helped land Perseverance with one they will rely on to investigate the planet.

More recently, the controllers checked out Perseverance's Radar Imager for Mars' Subsurface Experiment (RIMFAX) and Mars Oxygen In-Situ Resource Utilization Experiment (MOXIE) instruments, and deployed the Mars Environmental Dynamics Analyzer (MEDA) instrument's two wind sensors, which extend out from the rover's mast. Another significant milestone occurred on March 2, or Sol 12, when engineers unstowed the rover's 7-foot-long (2-meter-long) robotic arm

for the first time, flexing each of its five joints over the course of two hours.

"Tuesday's first test of the robotic arm was a big moment for us," said Robert Hogg, Mars 2020 Perseverance rover deputy mission manager. "That's the main tool the science team will use to do close-up examination of the geologic features of Jezero Crater, and then we'll drill and sample the ones they find the most interesting. When we got confirmation of the robotic arm flexing its muscles, including images of it working beautifully after its long trip to Mars – well, it made my day."

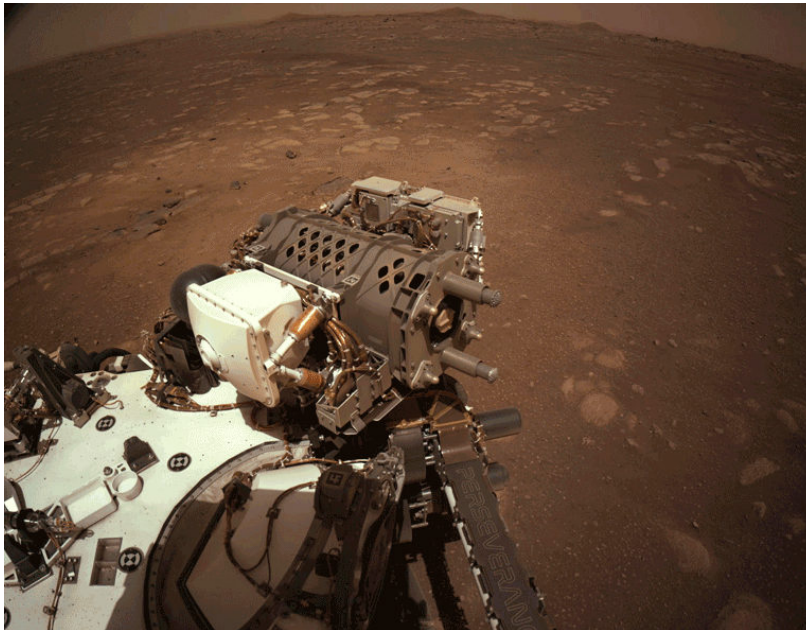
Upcoming events and

evaluations include more detailed testing and calibration of science instruments, sending the rover on longer drives, and jettisoning covers that shield both the adaptive caching assembly (part of the rover's Sample Caching System) and the Ingenuity Mars Helicopter during landing. The experimental flight test program for the Ingenuity Mars Helicopter will also take place during the rover's commissioning.

Through it all, the rover is sending down images from the most advanced suite of cameras ever to travel to Mars. The mission's cameras have already sent about 7,000



images. On Earth, Perseverance's imagery flows through the powerful Deep Space Network (DSN), managed by NASA's Space Communications and



Navigation (SCaN) program. In space, several Mars orbiters play an equally important role.

“Orbiter support for downlink of data has been a real gamechanger,” said Justin Maki, chief engineer for imaging and the imaging scientist for the Mars 2020 Perseverance rover mission at JPL. “When you see a beautiful image from Jezero, consider that it took a whole team of Martians to get it to you. Every picture from Perseverance is relayed

by either the European Space Agency's Trace Gas Orbiter, or NASA's MAVEN, Mars Odyssey, or Mars Reconnaissance Orbiter. They are important partners in our

explorations and our discoveries.”

The sheer volume of imagery and data already coming down on this mission has been a welcome bounty for Matt Wallace, who recalls waiting anxiously for the first images to trickle in during NASA's first Mars rover mission, Sojourner, which explored Mars in 1997. On March 3, Wallace became the mission's new project manager. He replaced John McNamee, who is stepping down as he

intended, after helming the project for nearly a decade.

“John has provided unwavering support to me and every member of the project for over a decade,” said Wallace. “He has left his mark on this mission and team, and it has been my privilege to not only call him boss but also my friend.”

Touchdown Site Named

With Perseverance departing from its touchdown site, mission team scientists have memorialized the spot, informally naming it for the late science fiction author Octavia E. Butler. The groundbreaking author and Pasadena, California, native was the first African American woman to win both the Hugo Award and Nebula Award, and she was the first science fiction writer honored with a MacArthur Fellowship. The location where Perseverance began its mission on Mars now bears the name “Octavia E. Butler Landing.”

Official scientific names for places and objects throughout the solar system – including asteroids, comets, and

locations on planets – are designated by the International Astronomical Union. Scientists working with NASA's Mars rovers have traditionally given unofficial nicknames to various geological features, which they can use as references in scientific papers.

“Butler’s protagonists embody determination and inventiveness, making her a perfect fit for the Perseverance rover mission and its theme of overcoming challenges,” said Kathryn Stack Morgan, deputy project scientist for Perseverance. “Butler inspired and influenced the planetary science community and many beyond, including those typically under-represented in STEM fields.”

“I can think of no better person to mark this historic landing site than Octavia E. Butler, who not only grew up next door to JPL in Pasadena, but she also inspired millions with her visions of a science-based future,” said Thomas Zurbuchen, NASA associate administrator for science. “Her guiding principle, ‘When using science, do so accurately,’ is what the science team at NASA is all about. Her work

continues to inspire today’s scientists and engineers across the globe – all in the name of a bolder, more equitable future for all.”

Butler, who died in 2006, authored such notable works as “Kindred,” “Bloodchild,” “Speech Sounds,” “Parable of the Sower,” “Parable of the Talents,” and the “Patternist” series. Her writing explores themes of race, gender, equality, and humanity, and her works are as relevant today as they were when originally written and published.

More About the Mission

A key objective of Perseverance’s mission on Mars is astrobiology, including the search for signs of ancient microbial life. The rover will characterize the planet’s geology and past climate, pave the way for human exploration of the Red Planet, and be the first mission to collect and cache Martian rock and regolith.

Subsequent NASA missions, in cooperation with ESA (European Space Agency), would send spacecraft to Mars to collect these sealed samples from the surface and return them to Earth

for in-depth analysis.

The Mars 2020 Perseverance mission is part of NASA’s Moon to Mars exploration approach, which includes Artemis missions to the Moon that will help prepare for human exploration of the Red Planet.

JPL, which is managed for NASA by Caltech in Pasadena, built and manages operations of the Perseverance rover.

From the Archives

March, 1981

Observatory Nets Humanities Grant

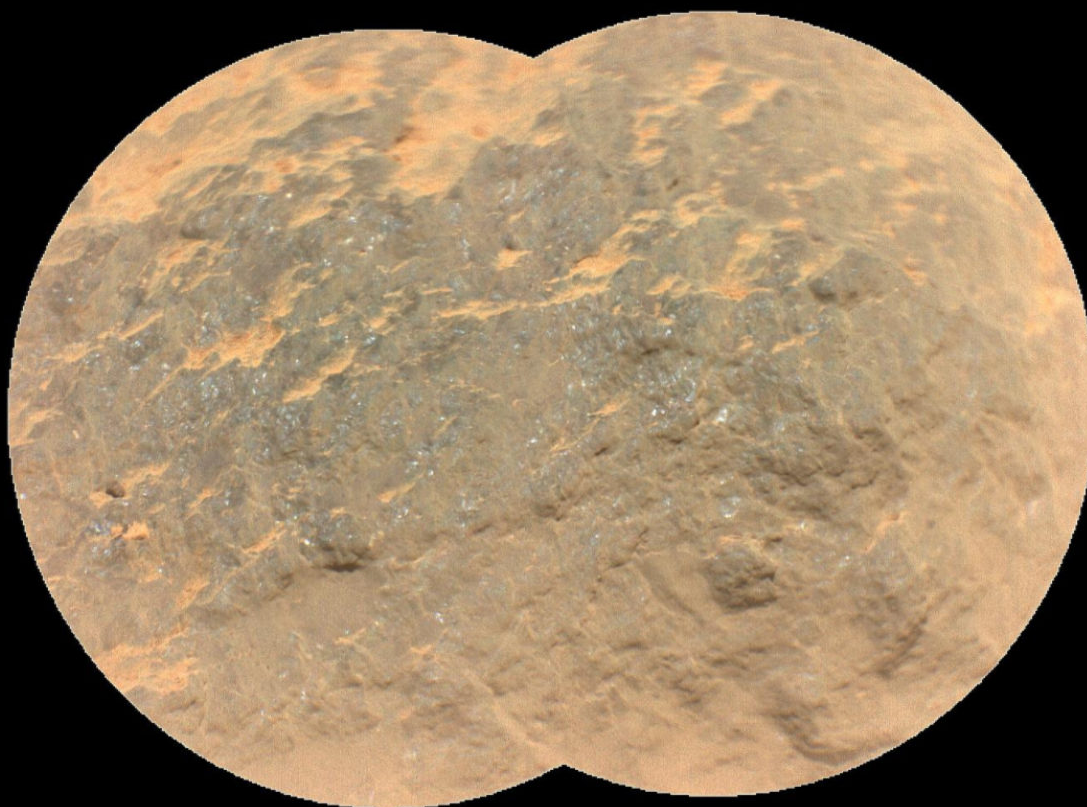
A "mini-grant" in support of a \$2,000 project to create a slide/tape series of four programs on the constellations was announced by the Nebraska Committee for the Humanities, an affiliate of the National Endowment for the Humanities. The funds from the grant come in the form of matching dollars for services and expenditures contributed by the Observatory and its steering committee in preparation and presentation of the slide/tape programs.

Carroll Moore is Chairperson of the Grant Committee, Lee Thomas is Treasurer, and Jack Dunn is Publicity Director.

The programs, one for each of the seasons, will be available for use on Public Nights at the Observatory for the next year, and then will become the permanent property of the Observatory. Included in the project grant are funds for acquisition of a new cassette deck, slide—change/dissolve programmer, and a second projector which will facilitate smooth presentation of the programs. This equipment will become a permanent addition to the Observatory's audio-visual booth.

Plans for the project call for development of a 40 constellation series of slides, 3 for each constellation. The first slide would be an actual

color photo of the constellation as it is seen in the sky, with just enough stars visible to approximate its naked—eye appearance. The second slide would interconnect the principal stars of the constellation with simple lines, and designate the major deep sky objects within the constellation boundaries. The third slide would overlay the first with a line drawing of the mythological figure for which the constellation was named. The soundtrack will describe the constellation, its features, and the background of its mythology. The first program in the series should be ready for use this summer, according to the committee.



This mosaic shows a close-up view of the rock target named "Yeegho" from the SuperCam instrument on NASA's Perseverance rover on Mars. The component images were taken by SuperCam's Remote Micro-Imager (RMI) on March 7, 2021 (the 16th Martian day, or sol, of Perseverance's mission on Mars). For more info see: <https://www.jpl.nasa.gov/images/supercam-close-up-of-yeegho-target>

Tech Tips

Those of us who are amateur astronomers often suffer from GAS. No, not that kind! I'm referring to Gear Acquisition Syndrome. Photographers are also at risk for this syndrome.

These days most of the gear has power requirements. Often these items are single-taskers and each has its own type of battery, voltage requirements and often incompatible power cords, resulting in a lot of clutter.

Slowly the industry is converging on some standards, the most promising of which is USB-C, with its ability to support devices that require high current during operation or when recharging.

However there's still a lot of equipment that requires 12 volts DC and is designed to run off of a car or deep cycle battery.

For work, I have six high capacity (89Wh) DJI Phantom 4 drone batteries that require a dedicated 12V or A/C charger. When I'm on the road I sometimes have to recharge more than once during a job and often charge two batteries at a time.

My LX-D75 telescope mount runs on 12V and comes with a battery case that holds 6 D cells.

My Panasonic Lumix G9 supports USB and can be charged or run directly off USB, making it possible to shoot long time lapse sequences without worrying about changing batteries. But the camera uses a unique Panasonic battery that has its own A/C charger.

As convenient as Lithium Ion or LiPo batteries are, they are a nuisance because there are too many of them, too many different form factors and even if they're "smart" batteries, they require some attention and care to avoid having them swell up or (rarely) catch fire.



Mark Dahmke

Over the years as I replace equipment, I've tried to buy products that use the same batteries or at least support USB-C. Convergence is a long way in the future, but we're getting there!

The purpose of this article is to talk about some of the gear I use and solutions I've found for minimizing the number of incompatible cables and batteries I have to pack when planning a road trip to the Nebraska Star Party or to my next drone photography job.



*The Goal Zero Yeti 400 Lithium Ion Power Station
Rated at 428Wh, pure sine wave, 300W continuous,
1200W surge max*

A Versatile Power Source

I started looking for a backup power supply a few years ago. I considered a small gasoline generator but they're loud, have moving parts and require periodic maintenance. I wanted something that I could use in the car when out on jobs, as a backup for outages, and of course for astronomy.

I decided on a Goal Zero Yeti 400 Lithium Power Station. It's gotten good reviews and has many nice features, including being able to use it while it is recharging. It can be charged via an A/C adapter, 12V car charger or solar panel.



Above, the Yeti with my Meade LXD-75 GEM.



The TwelSeavan Portable 120W Solar Panel Charger. I found this foldable panel on Amazon. It has three USB ports and a 12V barrel connector with adapter cable that matches the 12V input on the Yeti.

It has a 12V cigarette lighter adapter, two 120V plugs and 3 2.4A USB ports.

I can plug the LXD-75 mount directly into the Yeti cigarette lighter port, and can power my camera from the USB port.

I can charge two drone batteries simultaneously using the A/C adapters (for some reason the 12V output of the Yeti is a bit low for the DC drone charger, but there's yet-another-adapter to fix that,



Above: the Panasonic Lumix G9 has a USB connector that can power the camera and also recharge the battery. It can also be used to connect to a PC for tethered image capture.

so I opted to use the two A/C adapters I already have).

I also have an Edelkrone motorized pan-tilt head that I use for panoramics and to program video sequences. It uses NP-FV or Canon batteries, or an A/C adapter.

In the field, the Yeti can be charged from a car (either 5A or 10A), from an A/C adapter or can handle a solar panel rated at up to 150 watts.



Above: charging drone batteries on the road, either using the A/C or 12V car charger.



Tech Tips, continued.



Power connectors and status display of the Goal Yeti 400

The Yeti 400 is no longer available, but the Yeti 500X costs about \$700 and they also have a 200Wh model. If you need even more power or want power outage protection at home, they also have models that range from 1500 to 6000Wh.

A Multitasker Star Tracker

Last year I sold my iOptron SkyTracker Pro and bought a MIOPS Capsule 360. The SkyTracker is ok, but is not a multitasker. It's also fairly bulky and takes up too much room in my carry-on suitcase. The MIOPS is operated through a phone app and can be used as a star tracker, panoramic motorized head, or can be used for product photography.

I built a portable wedge out of oak that can support the weight of a camera and ball head at an angle required for mid-latitude polar alignment. The wedge is offset so the center of gravity is over the top of the tripod. It has a bubble level and thumb screws to adjust latitude. It uses an internal lithium battery (but has a USB connector for charging). It folds flat for travel and is much more compact than the Sky Tracker.





I also have a MIOPS Remote camera trigger. It supports several time lapse modes, plus can be triggered by lightning, sound or laser. It also has an internal lithium battery, but will hold a charge for a very long time. I seldom need to recharge it, even when it's been sitting on the shelf for months.



Recently the hand controller cable for my LX85 broke. Instead of ordering an expensive replacement, I got out my RJ45 cable tester and discovered that it has the same pinout as an ethernet rollover cable. This means that the pin order is exactly the opposite of a standard ethernet patch cable. I found a \$10 rollover adapter on Amazon, so now I can use any ethernet cable with the hand controller!



This is my Edelkrone motorized pan-tilt head. I also have a 24" rail slider that is part of their ecosystem. The slider and pan tilt motors can all be controlled and synchronized through a phone app. I use it for multi-row panoramics, product shots and time lapse or video motion sequences. I was trying to find a multitasker pan-tilt head that also functioned as a star tracker (like the MIOPS Capsule 360) but the MIOPS system doesn't do everything the Edelkrone does and the Edelkrone is too big and heavy to carry along on vacation.

Estes Park Students Talk to ISS Astronaut

Bob Leavitt

Since the early days of the Shuttle program amateur radios have been used to communicate between the Shuttle and groups of students on the ground, facilitated by ham radio operators. In the year 2000 an organization called Amateur Radio on the ISS (ARISS) began running these events for NASA and the ISS. Since 2000 there have been over 1,000 ARISS sessions. In the fall of 2019 the Estes Park



Elementary School approached our Estes Valley Amateur Radio Club (EVARC) and asked if we would be interested in partnering with the school on an ARISS event for the 5th grade. We immediately accepted. Working with the school we put together an application. This is a world-wide highly competitive application process, and we were delighted to have our application accepted in January 2020.

There are two ways to set up an ARISS event. Most schools choose what's called a "telebridge." The ham radio station providing the ISS contact is located somewhere other than the school. (In practice it could be anywhere in the world).

An audio channel is set up between the ISS, the ham radio station, and the school. Students talk to the ISS through this channel. The other method of communication is directly from the school site. This is the approach we took. It hadn't been done anywhere since the Covid pandemic began and hadn't been done in Colorado since 2011. We set up our VHF FM radios, computers, and tracking antennas in the Estes Park Memorial Observatory located on the school campus. Our setup included redundant radio equipment, power supplies, and antennas in case of a failure during the event. This took months of planning, equipment acquisition, and coordination with our ARISS / NASA liaison. Grants were obtained to cover most of the cost.



The ISS is in low earth orbit. As such a given pass lasts only 10-11 minutes, depending on the elevation of the ISS during the pass, which in turn dictates the size of the radio communications window at our location. To make the most of the event the

students prepared a list of questions and practiced them over and over. Our designated astronaut (Shannon Walker) was also given the list to prepare her answers. To make these communications legal, both the astronaut and the station operators on earth must have ham radio licenses. Shannon's is KD5DXB. Currently, five of the seven astronauts on the ISS have ham radio licenses.



Our EVARC team did a lot of practicing. The ham radios on the ISS operate in repeater mode when not being used for ARISS events. In repeater mode the radio receives on one frequency and transmits on another. Ham operators around the country talk to each other through the repeater during a pass over their locations. Using this repeater mode we were able to test our radios and antennas while tracking and communicating with hams



through the ISS radio. The ISS must be above the horizon for hams to communicate with each other, or within a circle approximately 2,800 miles in diameter on the Earth's surface below the traveling ISS.

Originally we planned to have the event in October 2020, but the Covid pandemic and related restrictions forced a postponement to February 2021. About 2 weeks before our scheduled date, the ham radio on the US side of the ISS quit working. During a spacewalk an upgraded antenna cable had been installed, but it was later discovered to be defective. Fortunately an identical radio was in place on the Russian side, and they agreed to let us use it. NASA was nervous about allowing a direct contact event as opposed to telebridge, since it hadn't been done since the Covid pandemic began. NASA

required us to prepare a Covid risk mitigation plan, examined it closely and insisted on making changes in it before allowing us to proceed.



Finally the day came, February 27, 2021. We had done so much planning and practicing that we were confident everything would work well. However, when we arrived that morning we learned that the school system's internet was down with no hope of coming back up anytime soon. Our plan had been to live stream the event on YouTube and throughout the school to all K-12 grades. Yikes! What to do! The school's IT guy managed to rig up an internet connection through his cell phone and personal account. It worked, with only a few pauses early in the live stream. In the live stream there is about 25 minutes of pre-recorded video about the school, Estes Park, and the EVARC club. After that there's some live video with no one speaking as we waited for the pass to start, which is at 41:00 into the video. At that point our antenna locked on to the ISS and communications began. The well prepared students managed to ask 18 questions and get answers from Shannon Walker during the 10 minute pass.

Besides the live stream on YouTube we also had two Denver TV stations reporting on the event, one with a cameraman on site. The links are at the end of the article.

Our plan is to keep the radio station at the Estes Park Observatory. Students will get an opportunity to use the radios to communicate with the ISS radio and other amateur radio satellites (which work much like the ISS in repeater mode). We may add a traditional shortwave transceiver (HF) to the equipment. As a result of this event several students and two teachers are interested in getting ham radio licenses. A class is being planned. We have



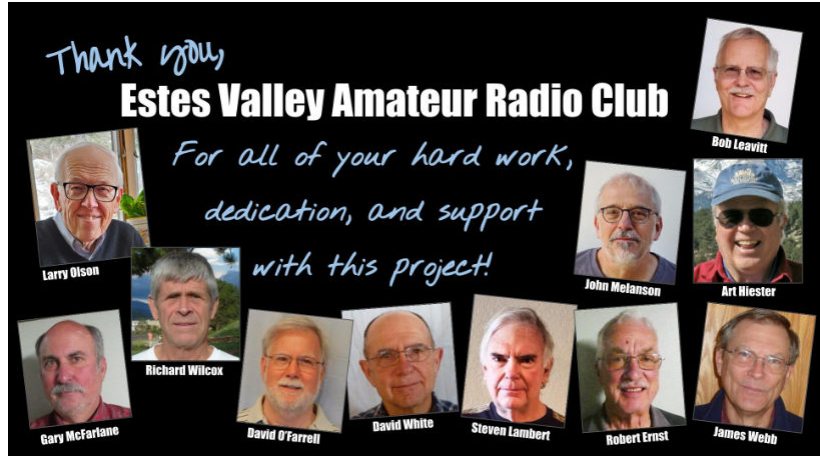
also given presentations on radio technology and the ham radio hobby to grade school and high school students. Last year we held an on-air event for high school students using an HF shortwave radio we brought into the high school. The students were able to talk to other schools across the country. The school now has a call sign (W0EPH) and we're hoping that a club can be formed. The school system loves what we're doing as it folds nicely into their STEM education program.

The Estes Park Memorial

Observatory includes a 16 foot dome with a 16" Ritchey-Chretien telescope on a Paramount ME II robotic mount. The building includes an auditorium much like Hyde's, an office, and storeroom. We took over the storeroom for our radio station. The observatory and



local astronomy club have programs with invited speakers once a month. Other times it's available for school students and private groups by appointment. The club has several dobs and equatorially mounted telescopes that are brought out for star parties. Some star parties are held in coordination with RMNP staff inside the Park. The observatory also has a radio telescope that has been used by students, teachers, and some club members.



Links

YouTube video of the ARISS event [EPES Ariss Contact Feb 2021 - YouTube](#)
Prerecorded video starts at 2:38. Contact with the ISS starts at 41:00.

Denver NBC Channel 9 coverage
[Estes Park elementary students contact astronauts through HAM radio - YouTube](#)

Denver CBS Channel 4 coverage
[Estes Park Elementary School Students Speak With Astronaut Aboard ISS -](#)

[YouTube](#)

Estes Park Memorial Observatory <https://www.angelsabove.org>

ARISS www.ariss.org

Bob Leavitt (KE0SDV)
President, Estes Valley Amateur Radio Club



CLUB MEMBERSHIP INFO

REGULAR MEMBER - \$30.00 per year. Includes club newsletter, and 1 vote at club meetings, plus all other standard club privileges.

FAMILY MEMBER - \$35.00 per year. Same as regular member except gets 2 votes at club meetings.

STUDENT MEMBER - \$10.00 per year with volunteer requirement.

If you renew your membership prior to your annual renewal date, you will receive a 10% discount.

Club members are also eligible for special subscription discounts on Sky & Telescope Magazine.

CLUB TELESCOPES

To check out one of the club telescopes, please contact a club officer. Scopes can be checked out at a regular club meeting and kept for one month. Checkout can be extended for another month if there are no other requests for the telescope, but you must notify a club officer in advance.

100mm Orion refractor: Available
 10 inch Meade Starfinder Dobsonian: Available
 13 inch Truss Dobsonian: Needs repair
 10 inch Zhumell: Needs mount

Buy the book! The Prairie Astronomy Club: Fifty Years of Amateur Astronomy. Order online from Amazon or lulu.com.

ADDRESS

The Prairie Astronomer
 c/o The Prairie Astronomy Club, Inc.
 P.O. Box 5585
 Lincoln, NE 68505-0585

info@prairieastronomyclub.org

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