February 2021 **Volume XXI Number 2**

Observe - Learn – Share

Editor's Note:

Welcome to the first issue of the new North Star Newsletter. Much information has been moved to the North Houston Astronomy Club website (www.astronomyclub.org). We will focus on news and information. Enjoy. – Aaron Clevenson

February's Meetings (Friday, February 26, 2021):

Novice Session 6:30pm:

Rob Brayton, Vice President of NHAC, will present the novice session, focusing on the March Conjunctions and Equinox and introduce Stellarium. Everyone is encouraged to bring a laptop, tablet or smartphone with Stellarium already loaded. It is free and works on Windows, Mac, Linux, Android, IOS and even on a website. See stellarium.org for download information.

Main Presentation 7:30pm:

Stephen Hummel, Dark Skies Specialist at the McDonald Observatory, will be talking about the history of the McDonald Observatory, the design and history of the main telescopes and the discoveries they have made. http://astronomyclub.org/nhacwp/

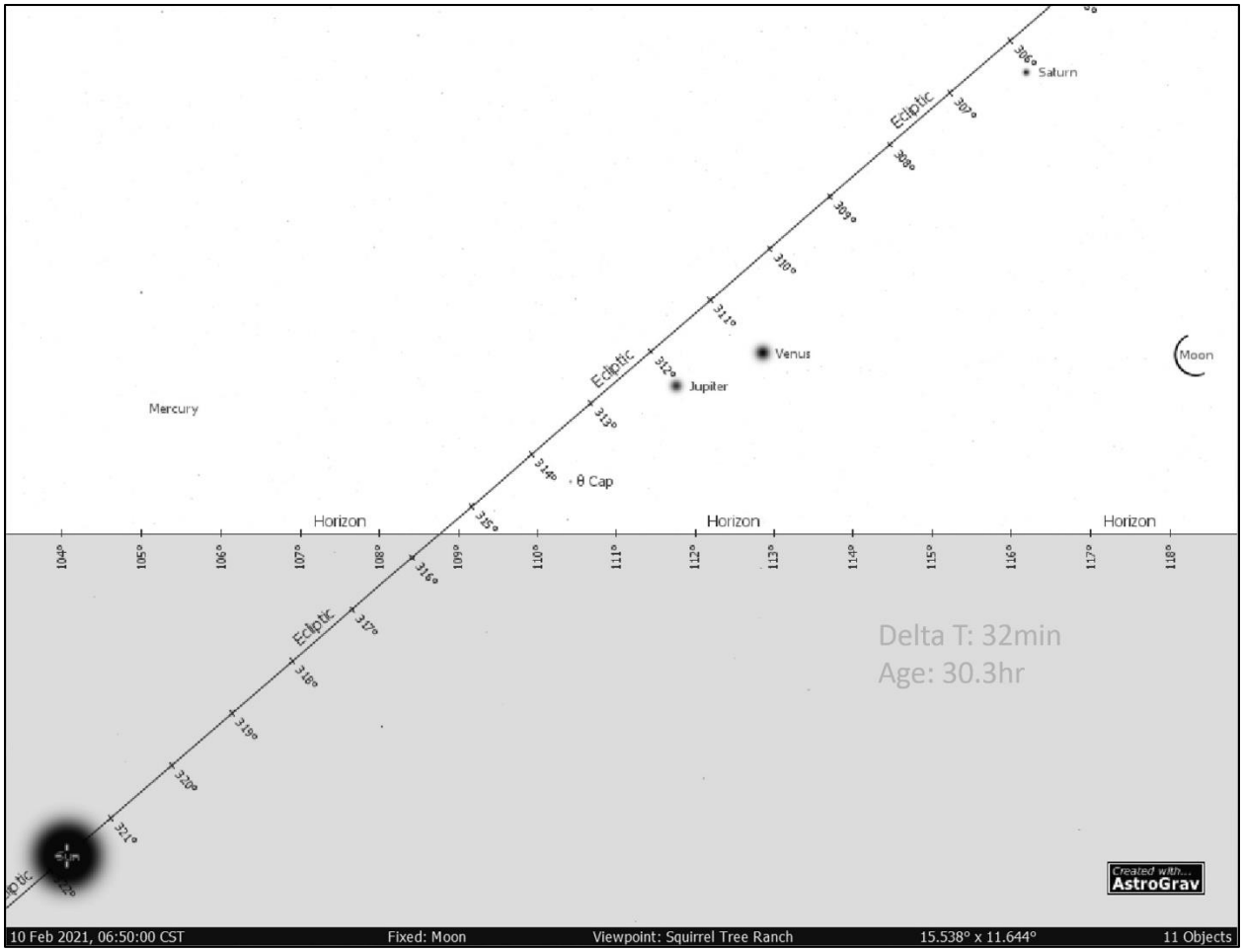
Contents

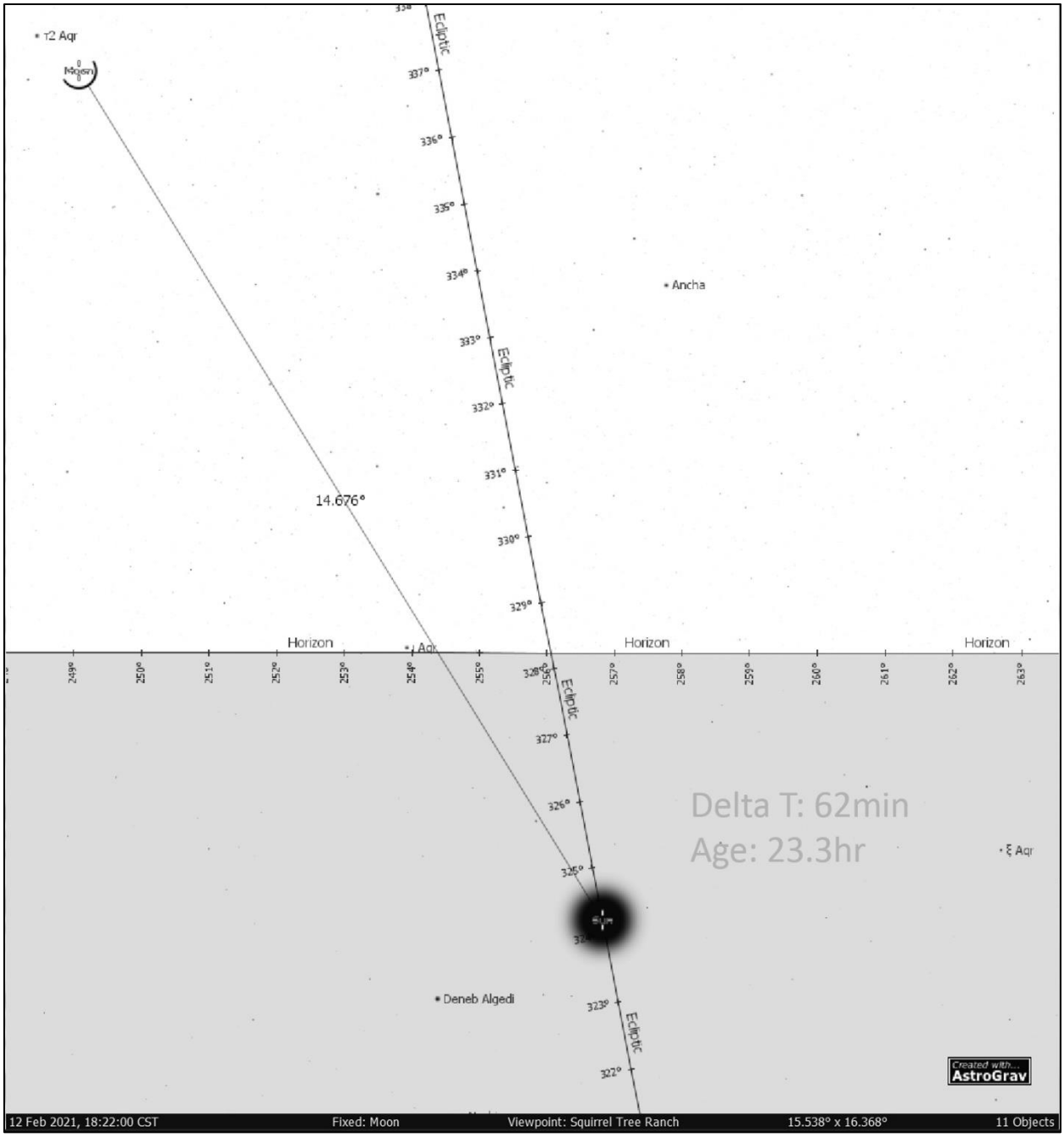
Observing Notes from Drako's Room - Chapter 2: Thirty Plus Years of Chasing Thin Moons

- Kenneth (Drako) Drake

One of my astro-fascinations is trying to view very thin crescent moons. Those that have small elongations from the Sun and are less than 24 hours from new (before or after). I find it a satisfying challenge. I began the chase in the late 80s when I did not have the luxury of desktop computers, smart phones and fancy software. In order to find the position of those small crescents, it had to be worked out with pencil and scratch pad. Today, things are made somewhat easier. The hunt continues.

Many things effect the visibility when trying to spot an elusive crescent. Mostly sky conditions, cloud cover and type of clouds. Often a thick, dark bank of clouds near the horizon can actually assist by darkening the bright line caused by the sun below. Other factors are altitude, elongation, ecliptic tilt, position of Moon relative to the ecliptic and delta time between sunset/moonset or moonrise/sunrise. I've learned to see that last factor, barring weather, as the most important. Compare the two thin moons in February. Both have similar elongation but because of the ecliptic tilt and side of the ecliptic the Moon is on, makes a large difference in the Delta T.





Note that the 30 hour moon with the larger elongation is the more difficult of the two.

Today there are a number of software packages that will assist in setting up a simulation graphic or a simple table of information. Several I have used include AstroGrav, Stellarium, Cartes du Ciel, Virtual Moon Atlas (to simulate the arc of illumination), & MoonCalc6 (8bit DOS). Tools I recommend for searching include a compass, binoculars and a tripod. I generally record a time signal of WWV for any audio notes I make during an observation.

About 30% of my hunts have been failures due to weather while about 50% of the remaining attempts were simply not visible. Many have been exciting travels with friends. One of the

absolute finest was from Skyline Dr. in Davis Mts. State Park on October 11, 1996. I was accompanied by Don Pearce, Scott Mitchell, Tom Fox, John Blubaugh & Charles Botkin. We had gathered at the top of Skyline Dr. about 6:30am as moonrise was at 7:00 with sunrise following at 7:55. The age of the Moon was 25h43m before new with an elongation of 11d35m so this was not expected to be a difficult acquisition. The ecliptic was nearly vertical and the Moon was only ½ degree south of it. Conditions were near perfect but the temperature was not recorded. I had predicted beforehand the exact location of the rising moon to be in a notch between two distant mountain peaks. At 7:04 the group was treated to a moon awash in Earthshine in the notch and then immediately the horns appeared. It was simply one of the most picturesque crescents I had ever witnessed. Don later made a drawing of his visual impression and I believe that Charles snapped an Ecktachrome.

Happy Mooning,

AL Observing Programs

- Aaron Clevenson – AL-Cor

One thing that all amateur astronomers have in common is a desire to look at cool stuff through a telescope. Some of us take images, some of us like to look with our eyes. One of the greatest things about astronomy is that there is always something new to

observe, something you have never seen before. But a challenge that many of us face is “What to look at?”

As a member of the North Houston Astronomy Club, you are automatically a member of the Astronomical League (AL). You get the quarterly Reflector Magazine and other benefits, but you also get access to the over 70 Observing Programs that the AL provides. Each of these Observing Programs give you a list of choice objects to seek out and observe. No matter who you are, novice or expert, imager or visual observer, equipment or no equipment, and no matter what your personal observing goals are, there is an Observing Program for you.

I would like to take a moment to share with you what’s new in the AL Observing Programs. Each summer, the AL Council adopts new Observing Programs (OPs). This past summer they adopted: Alternate Constellations OP, Foundations of Imaging OP, Master Imager Award, Lunar Evolution OP, and the Library Telescope Award. In addition to these, some additional OPs were adopted in then: Youth Astronomer OP (age 17 and younger), 75th Anniversary AL Observing Challenge, and the Perseverance Lander NASA Observing Challenge.

We are most excited about the Youth Astronomer Observing Program. It is aimed at those too old or too advanced for the Sky Puppies OP (10 and under). It is designed to let the youth try a number of different OPs and see what type of observing they are interested in.

For information on these OPs and all the other options, please go to the AL Website: https://www.astroleague.org/al/obsclubs/AlphabeticObservingClubs.html or contact me the NHAC AL-Cor at aaron@clevenson.org

Perseverance (from NASA)

The largest, most advanced rover NASA has sent to another world touched down on Mars Thursday, after a 203-day journey traversing 293 million miles (472 million kilometers). Confirmation of the successful touchdown was announced in mission control at NASA’s Jet Propulsion Laboratory in Southern California at 3:55 p.m. EST (12:55 p.m. PST).

Packed with groundbreaking technology, the Mars 2020 mission launched July 30, 2020, from Cape Canaveral Space Force Station in Florida. The Perseverance rover mission marks an ambitious first step in the effort to collect Mars samples and return them to Earth.

“This landing is one of those pivotal moments for NASA, the United States, and space exploration globally – when we know we are on the cusp of discovery and sharpening our pencils, so to speak, to rewrite the textbooks,” said acting NASA Administrator

Steve Jurczyk. “The Mars 2020 Perseverance mission embodies our nation’s spirit of persevering even in the most challenging of situations, inspiring, and advancing science and exploration. The mission itself personifies the human ideal of persevering toward the future and will help us prepare for human exploration of the Red Planet.”

About the size of a car, the 2,263-pound (1,026-kilogram) robotic geologist and astrobiologist will undergo several weeks of testing before it begins its two-year science investigation of Mars’ Jezero Crater. While the rover will investigate the rock and sediment of Jezero’s ancient lakebed and river delta to characterize the region’s geology and past climate, a fundamental part of its mission is astrobiology, including the search for signs of ancient microbial life. To that end, the Mars Sample Return campaign, being planned by NASA and ESA (European Space Agency), will allow scientists on Earth to study samples collected by Perseverance to search for definitive signs of past life using instruments too large and complex to send to the Red Planet.

“Because of today’s exciting events, the first pristine samples from carefully documented locations on another planet are another step closer to being returned to Earth,” said Thomas Zurbuchen, associate administrator for science at NASA. “Perseverance is the first step in bringing back rock and regolith from Mars. We don’t know what these pristine samples from Mars will tell us. But what they could tell us is monumental – including that life might have once existed beyond Earth.”

Some 28 miles (45 kilometers) wide, Jezero Crater sits on the western edge of Isidis Planitia, a giant impact basin just north of the Martian equator. Scientists have determined that 3.5 billion years ago the crater had its own river delta and was filled with water.

The power system that provides electricity and heat for Perseverance through its exploration of Jezero Crater is a Multi-Mission Radioisotope Thermoelectric Generator, or MMRTG. The U.S. Department of Energy (DOE) provided it to NASA through an ongoing partnership to develop power systems for civil space applications.

Equipped with seven primary science instruments, the most cameras ever sent to Mars, and its exquisitely complex sample caching system – the first of its kind sent into space – Perseverance will scour the Jezero region for fossilized remains of ancient microscopic Martian life, taking samples along the way.

“Perseverance is the most sophisticated robotic geologist ever made, but verifying that microscopic life once existed carries an enormous burden of proof,” said Lori Glaze, director of NASA’s Planetary Science Division. “While we’ll learn a lot with the great instruments we have aboard the rover, it may very well require the far more capable laboratories and instruments back here on Earth to tell us whether our samples carry evidence that Mars once harbored life.”

Paving the Way for Human Missions

“Landing on Mars is always an incredibly difficult task and we are proud to continue building on our past success,” said JPL Director Michael Watkins. “But, while Perseverance advances that success, this rover is also blazing its own path and daring new challenges in the surface mission. We built the rover not just to land but to find and collect the best scientific samples for return to Earth, and its incredibly complex sampling system and autonomy not only enable that mission, they set the stage for future robotic and crewed missions.”

The Mars Entry, Descent, and Landing Instrumentation 2 (MEDLI2) sensor suite collected data about Mars’ atmosphere during entry, and the Terrain-Relative Navigation system autonomously guided the spacecraft during final descent. The data from both are expected to help future human missions land on other worlds more safely and with larger payloads.

On the surface of Mars, Perseverance’s science instruments will have an opportunity to scientifically shine. Mastcam-Z is a pair of zoomable science cameras on Perseverance’s remote sensing mast, or head, that creates high-resolution, color 3D panoramas of the Martian landscape. Also located on the mast, the SuperCam uses a pulsed laser to study the chemistry of rocks and sediment and has its own microphone to help scientists better understand the property of the rocks, including their hardness.

Located on a turret at the end of the rover’s robotic arm, the Planetary Instrument for X-ray Lithochemistry (PIXL) and the Scanning Habitable Environments with Raman &

Luminescence for Organics & Chemicals (SHERLOC) instruments will work together to collect data on Mars' geology close-up. PIXL will use an X-ray beam and suite of sensors to delve into a rock's elemental chemistry. SHERLOC's ultraviolet laser and spectrometer, along with its Wide Angle Topographic Sensor for Operations and eNgineering (WATSON) imager, will study rock surfaces, mapping out the presence of certain minerals and organic molecules, which are the carbon-based building blocks of life on Earth.

The rover chassis is home to three science instruments, as well. The Radar Imager for Mars' Subsurface Experiment (RIMFAX) is the first ground-penetrating radar on the surface of Mars and will be used to determine how different layers of the Martian surface formed over time. The data could help pave the way for future sensors that hunt for subsurface water ice deposits.

Also with an eye on future Red Planet explorations, the Mars Oxygen In-Situ Resource Utilization Experiment (MOXIE) technology demonstration will attempt to manufacture oxygen out of thin air – the Red Planet's tenuous and mostly carbon dioxide atmosphere. The rover's Mars Environmental Dynamics Analyzer (MEDA) instrument, which has sensors on the mast and chassis, will provide key information about present-day Mars weather, climate, and dust.

Currently attached to the belly of Perseverance, the diminutive Ingenuity Mars Helicopter is a technology demonstration that will attempt the first powered, controlled flight on another planet.

Project engineers and scientists will now put Perseverance through its paces, testing every instrument, subsystem, and subroutine over the next month or two. Only then will they deploy the helicopter to the surface for the flight test phase. If successful, Ingenuity could add an aerial dimension to exploration of the Red Planet in which such helicopters serve as a scouts or make deliveries for future astronauts away from their base.

Once Ingenuity's test flights are complete, the rover's search for evidence of ancient microbial life will begin in earnest.

"Perseverance is more than a rover, and more than this amazing collection of men and women that built it and got us here," said John McNamee, project manager of the Mars 2020 Perseverance rover mission at JPL. "It is even more than the 10.9 million people who signed up to be part of our mission. This mission is about what humans can achieve when they persevere. We made it this far. Now, watch us go."

More About the Mission

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

Subsequent NASA missions, in cooperation with ESA, will send spacecraft to Mars to collect these cached 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, a division of Caltech in Pasadena, California, manages the Mars 2020 Perseverance mission and the Ingenuity Mars Helicopter technology demonstration for NASA.

Check out the Astronomical League's NASA Challenge for Perseverance:

https://www.astroleague.org/programs/nasa-observing-challenges-special-awards-introduction

The Astronomical League's 75th Anniversary Observing Challenge

This year is the 75th Anniversary of the Astronomical League (AL). To commemorate this event and in cooperation with the planet Jupiter, the AL has implemented an AL Observing Challenge - focusing on Jupiter. All the details can be found on the AL web page:

https://www.astroleague.org/content/al-observing-challenge-special-observing-award

Jupiter has just started a new apparition. It is only available in the morning before sunrise, but every night it rises earlier and earlier. Here are some of the features of the Challenge:

- Observations may be done either naked-eye, or through imaging.
- There are 75 required observations:
  - Limb to Transit, or Transit to Limb observations of the Great Red Spot.
  - Great Red Spot observations bracketing the Transit.
  - Observations of the orbits of the Galilean Moons.
  - Changes in Jupiter's Atmosphere.
  - Observe Jupiter's TOES (transits, occultations, eclipses, shadow transits). For more information check out the AL's web page for Galileo's TOES:

    https://www.astroleague.org/content/galileos-toes

Mutual Events

Most of us are aware that Jupiter's Galilean Moons interact with the planet (from our perspective). They can be seen transiting across Jupiter, casting a shadow that transits Jupiter, being eclipsed by the planet Jupiter (entering into Jupiter's shadow), and the moons are occulted by Jupiter (move behind Jupiter from our perspective). There are four moons, four events, and either ingress or egress: a total of 32 events. These events are the topic of the Galileo's TOES certification. Details can be found on the AL web page:

https://www.astroleague.org/content/galileos-toes

But, every six years, Jupiter reaches a point in its orbit around the Sun when we can see the orbits of the Galilean Moons edge-on. At these times, the Galilean Moons interact with each other. There are Eclipses and Occultations of each moon by the other moons. Four moons, two events, with three other moons; a total of 24 events. Details can be found on the AL web page:

https://www.astroleague.org/content/galileos-toes-phase-2

Insperity Observatory

Although COVID-19 is reeking havoc with astronomical observing, outreach does continue. The Insperity Observatory still has Public Nights on the first Friday of each month. Reservations are required. For more information check out the Observatory's website at:

www.humbleisd.net/observatory

Contributions Encouraged

If you have a story to share, or if you hear some astronomy news, we would like to include it here. We will also include images.

Please send contributions to Aaron Clevenson at aaron@clevenson.org

North Houston Astronomy Club website

www.astronomyclub.org