Keene Amateur Astronomers

The Newsletter for Keene Amateur Astronomers

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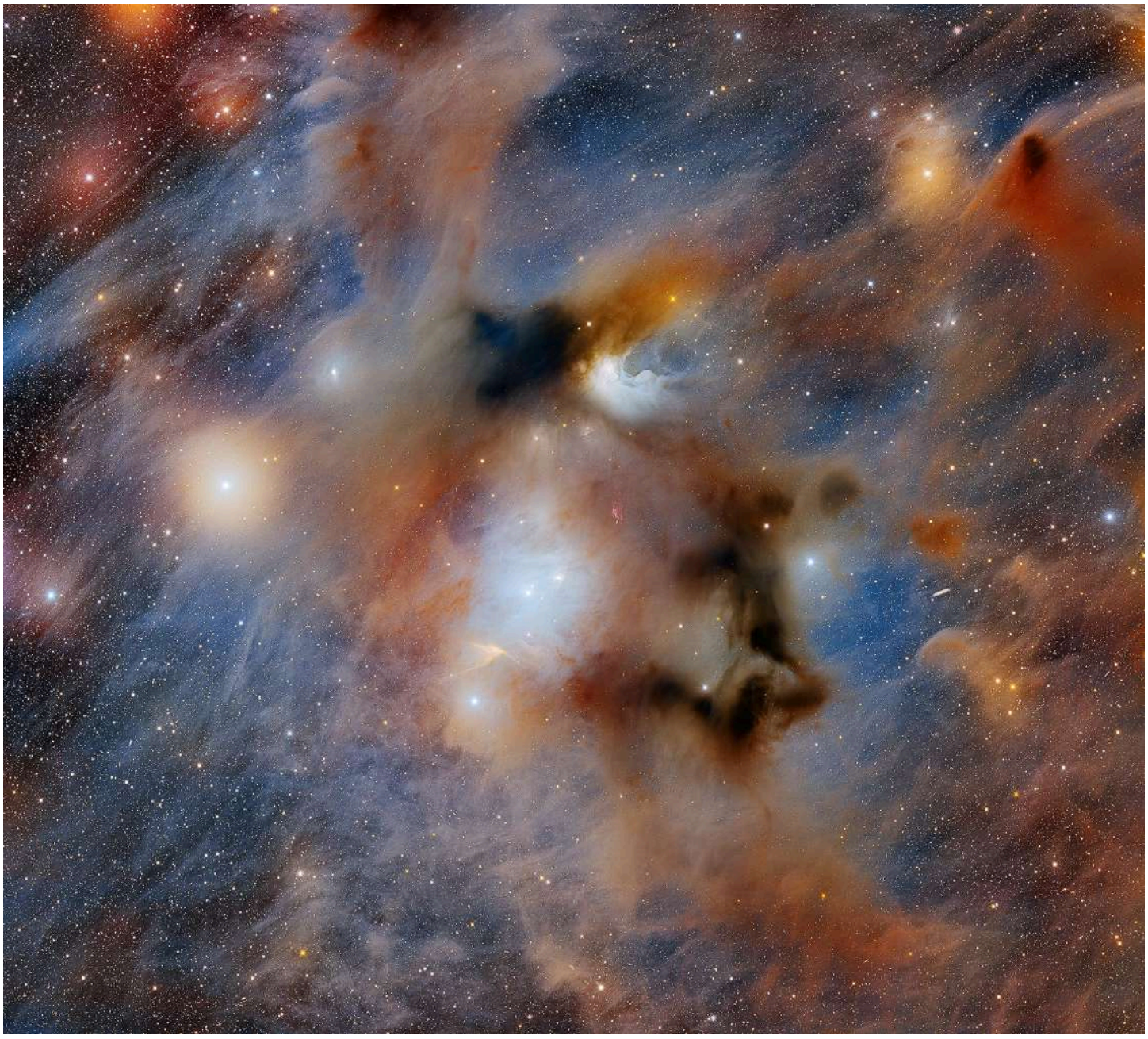
Chamaeleon I



Chamaeleon I is the closest star forming region to Earth. It has been captured here by the Dark Energy Camera which is a powerful survey instrument at the Cerro Tololo Inter-American Observatory in Chile. Credit: CTIO/NOIRLab/DOE/NSF/AURA (*image*); T. A. Rector/University of Alaska Anchorage/NSF NOIRLab/M. Zamani/D. de Martin/NSF NOIRLab (*image processing*) (CC BY 4.0)

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Editor's Message

I hope you had a wonderful New Year's Eve. This year will offer some wonderful opportunities to enjoy the night sky.

This month, Jupiter will be at its brightest. It has been an easy object to spot in the night sky because of its brilliance in the East in the evening sky. It is currently in the constellation Gemini. Saturn is visible in Southwestern horizon after sunset. If Neptune has been on your list of planets to see, this would be a great time to find it because it is currently close to Saturn. A good pair of binoculars are needed to see Neptune but should fit into the same field of view with Saturn, making it an ideal time to find this distant planet. While you are out there with a pair of binoculars, you can look at the Pleiades and Uranus which should also be in the same field of view when using a pair of 10 x 50 binoculars.

The Quadrantid Meteor shower will peak on January 3rd. The Full Moon on the same night will make it hard to see fainter 'shooting stars.'

Great objects to view this month:

- **Messier 41 - Aristotle's Cluster** can be found just south of Sirius. It can be seen without aid under dark sky conditions. A telescope will resolve the hazy patch into a number of white and blue stars.
- **Castor,** one of the twin stars in Gemini. This star is actually composed of three pairs of stars. A telescope with 100x magnification will reveal a pair of white stars of similar brightness..
- **NGC 2237 - The Rosette Nebula** This object is a favorite of astrophotographers and is a great object to image with a smart telescope.

One event you might want to mark down for next month is the occultation of Regulus by the Full Moon on February 2nd. Be sure to check your favorite astronomy software to see when this will occur at your

location. The Monadnock region will see Regulus disappear behind the Moon shortly after 8:40 PM and re-emerge a little after 10 PM.

As always, please send any images or pictures you would like to share with the club.

Happy viewing and stay warm.

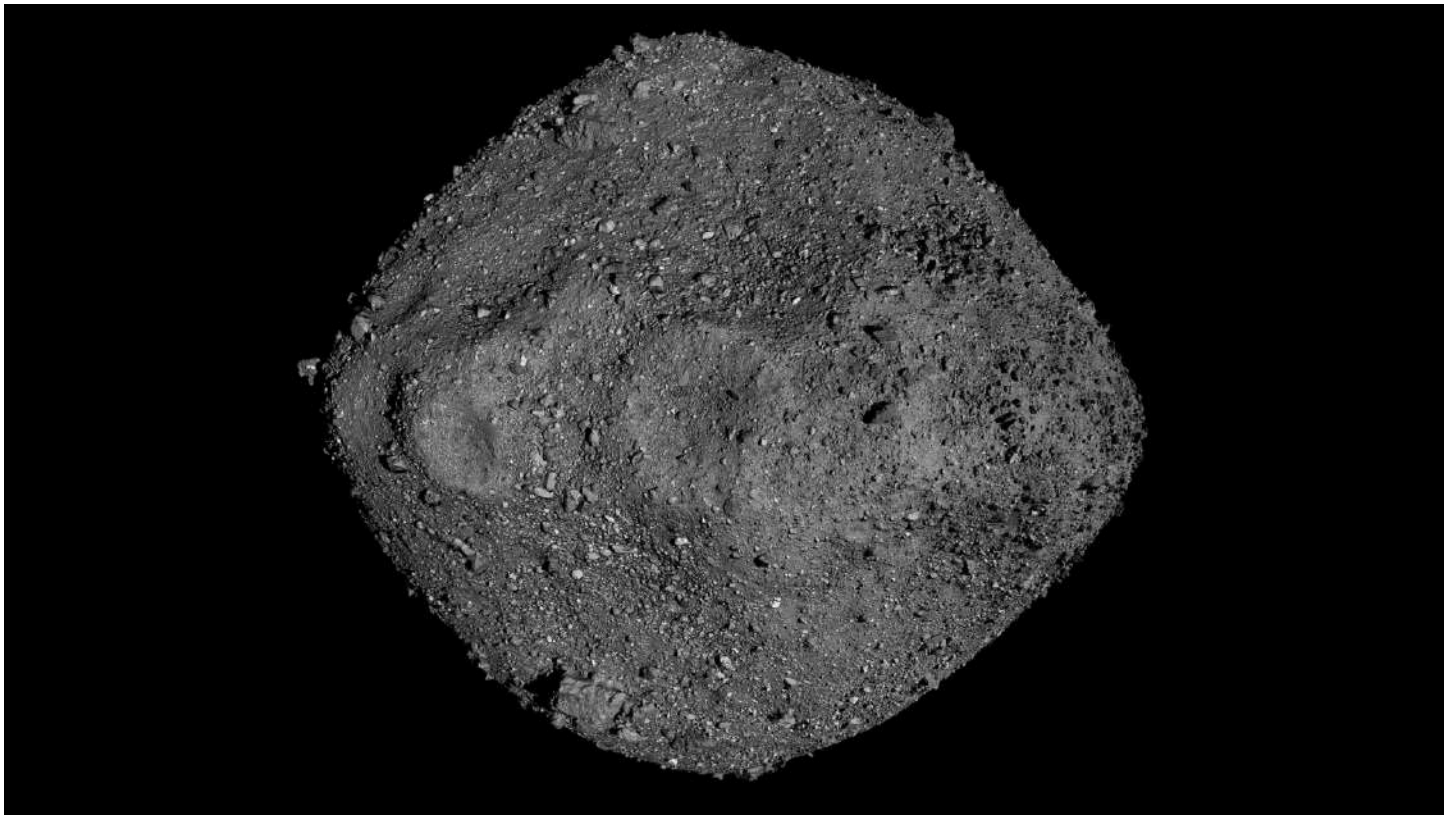
- Susan Rolke

Monthly Business Meeting

Club meetings will resume in April.

Asteroid Bennu: Clues to the Origins of Life

By Susan Rolke



A mosaic of Bennu created from observations made by NASA's OSIRIS-REx spacecraft, which was in close proximity to the asteroid for over two years. Credit: NASA/Goddard/University of Arizona

The OSIRIS-REx mission made history as the first NASA mission to return a sample of an asteroid to Earth. Launched in 2016, the spacecraft arrived at the near-Earth asteroid Bennu in 2020. After briefly touching down on the surface, it collected approximately 4.3 ounces (121.6 grams) of rock and dust. That sample was safely returned to Earth in 2023, a feat that had only been accomplished once before, when the Japan Aerospace Exploration Agency (JAXA) returned a sample from the asteroid Ryugu in 2020.

One of the containers holding rocks and dust from asteroid Bennu. Credit: NASA/Erika Blumenfeld and Joseph Aebersold

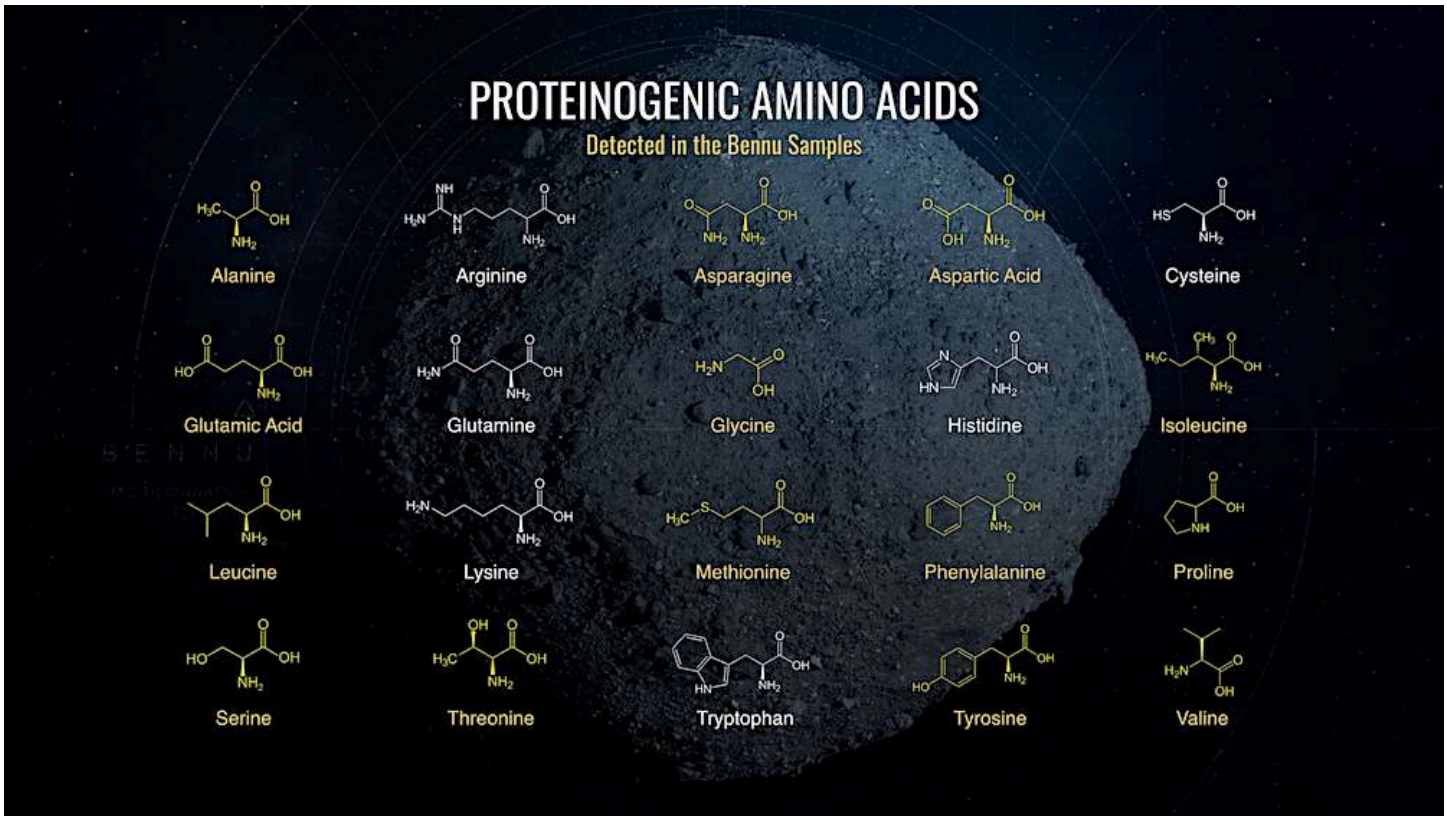
Bennu is of particular interest because it is essentially a time capsule from the early solar system. Its chemical makeup preserves materials that date back roughly 4.5 billion years, offering scientists a rare glimpse into the conditions that existed long before Earth became habitable. Scientists believe Bennu originally formed in the main asteroid belt between Mars and Jupiter, before later being ejected into a near-Earth orbit.

The elements that make up Bennu are even older than the asteroid itself. They were forged inside massive stars that ended their lives as supernovae. These stellar explosions acted as cosmic furnaces, creating the elements that later became part of Bennu and other objects throughout the solar system.

After its formation, Bennu endured additional heating from impacts that shaped it, as well as long-term exposure to radiation from the Sun. Despite this violent history, Bennu retained a chemical record of the early solar system, making it an ideal target for scientific study.

Studies of Bennu's samples have revealed an extraordinary collection of organic compounds. Researchers have detected 33 amino acids, including 15 of the 20 amino acids used by life on Earth to build proteins. All five biological nucleobases, the components that make up the genetic code in DNA and RNA were also found, along

with phosphates and six different types of sugars. Together, these compounds represent all the basic ingredients needed to form proteins, enzymes, and RNA.



Bennu samples contain amino acids. Credit NASA.

In addition, scientists identified ammonia and formaldehyde, chemicals believed to be precursors to amino acids. Bennu also contains a variety of minerals, further contributing to a chemical environment rich in the building blocks of life. While these discoveries do not indicate that life ever existed on Bennu, they do show that many of the components required for life were present in the early solar system and were not unique to Earth.

One of the most significant discoveries from Bennu's samples is the detection of the amino acid tryptophan. This finding brings the total number of amino acids used by life on Earth identified in Bennu to 15. Tryptophan is especially important because it is a relatively complex amino acid and, until now, had never been detected in a meteorite or any other space sample.

Tryptophan is also considered an essential amino acid, meaning living organisms cannot produce it on their own and must obtain it from their environment. Its presence in Bennu strongly supports the idea that complex organic molecules can form naturally within asteroids or comets. Finding tryptophan expands the "alphabet" of amino acids known to be produced in space.

Another major breakthrough was the detection of sugars within Bennu's samples. Scientists identified the five-carbon sugar ribose and, for the first time in an extraterrestrial sample, the six-carbon sugar glucose.

Ribose was found in extremely small quantities, just 0.097 nanomoles per gram of asteroid material. Despite its small quantity, this discovery is monumental. Ribose is a fundamental component of RNA, forming part of the sugar-phosphate “backbone” that links nucleobases together. RNA plays many essential roles in living systems, and life as we know it could not exist without it.

The discovery of glucose, the most common energy source used by life on Earth, represents the first evidence that a key biological “fuel” was present in the early solar system. Together, these sugars are basic organic molecules essential to all known biological systems.

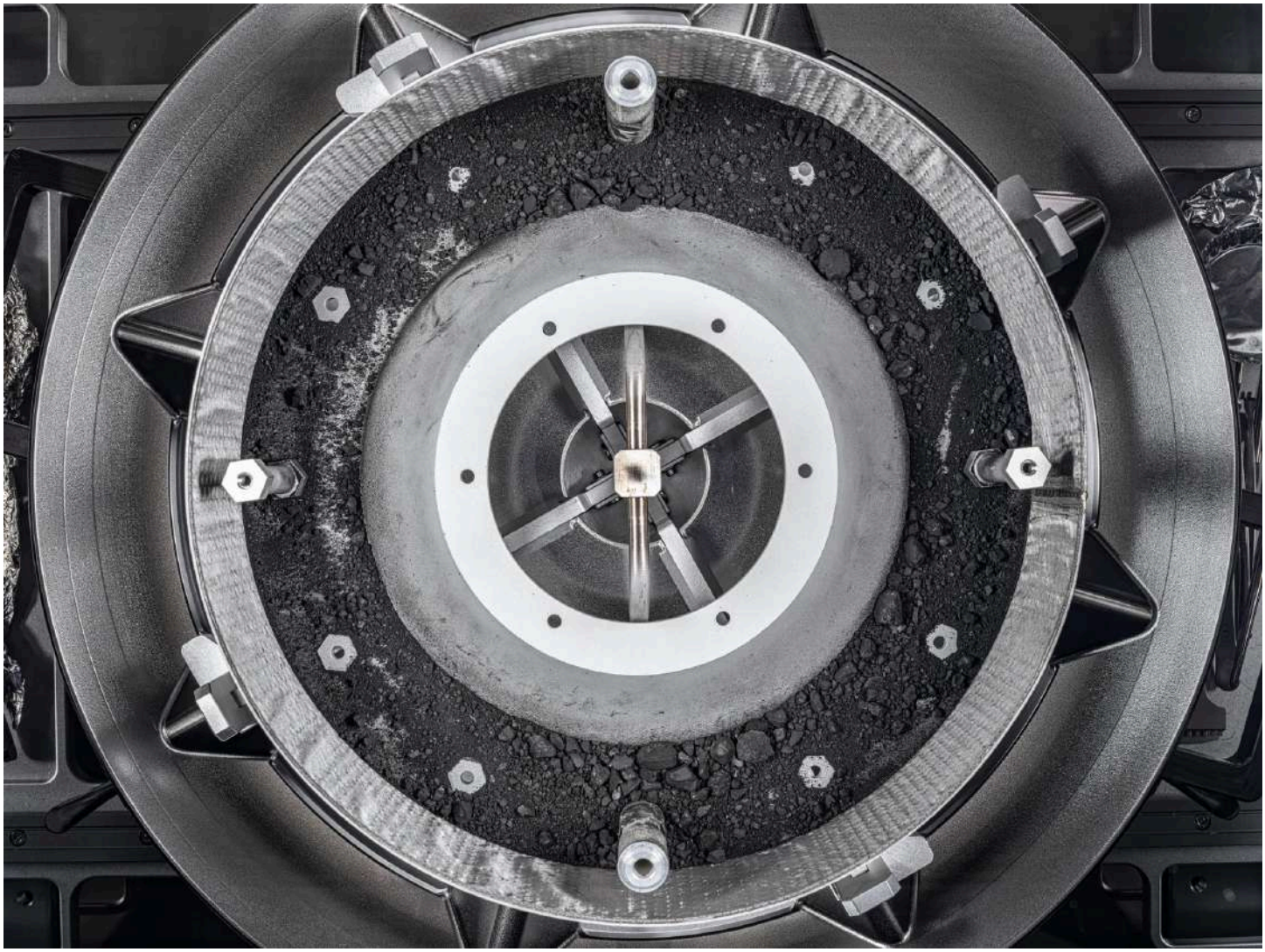


Image of the Touch-and-Go-Sample-Acquisition-Mechanism (TAGSAM) of OSIRIS-REx that collected the asteroid sample on Bennu. Credit - NASA / Erika Blumenfeld & Joseph Aebersold

The detection of sugars, amino acids, nucleobases, and other organic compounds provides an increasing body of evidence that the building blocks of life were widespread throughout the early solar system. Bennu’s rock and dust also reveal evidence of a history involving saltwater. This salty environment may have served as a chemical “broth,” allowing organic molecules to interact and combine.

These findings lend support to the “RNA world” hypothesis, which proposes that early life relied on RNA to store information and drive chemical processes.

These findings from the NASA mission to Bennu are similar to those from Japan’s Hayabusa2 mission, which returned samples from asteroid Ryugu. Researchers found similar organic compounds and are currently analyzing the samples for the presence of sugars.

This rock sample from Bennu has provided a wealth of new information, however, many mysteries remain. Amino acids can exist in two forms that are mirror-image of each other, like left and right hands. Life on Earth almost exclusively uses the left-handed version of amino acids, yet Bennu’s and Ryugu’s samples contained equal amounts of both versions. This suggests that amino acids on early Earth may have started out evenly mixed. Why life favored the left-handed form remains unknown.

The growing body of evidence from Bennu and Ryugu indicates that the raw materials for life were common in the early solar system. These materials may have been delivered to Earth and potentially to other planets and their moons by asteroids and comets. While no evidence of life itself has been found, the conditions necessary for life’s emergence appear to have been widespread. This raises interesting questions regarding whether or not life evolved on Mars, Venus, or other places in our solar system.

If the chemical components that are necessary for life were widely available throughout our solar system, it raises more questions regarding whether or not there is life out there in our solar system or beyond.

Future missions like OSIRIS-REx may help address one of humanity’s most profound questions: how did life begin on Earth? By studying ancient asteroids like Bennu, researchers have discovered that the ingredients for life were delivered early and widely throughout the solar system, and possibly to worlds beyond. For anyone who looks up at the night sky, this raises one of astronomy’s most compelling questions: could life exist elsewhere among the stars, seeded by the same cosmic materials that helped life begin here?

- Video: Bio-essential Sugars Detected in Samples from Asteroid Bennu

Night Sky Network Online Webinar

Join the NASA Night Sky Network on January 28th at 9 PM EST along with Carina Poulin, to learn about the PACE mission and explore strategies for communicating Earth science to diverse audiences.

McDonald Observatory Livestream

Join McDonald Observatory livestream on January 14th at 8:30 PM EST for their Deep Sky Tour Orion.

Observing

To find out skywatching tips for this month, click on the following link to learn more.

Video: What's Up January 2026 Sky Watching Tips from NASA

You can find past pdfs of the Astronomical League charts **here.** Turn to the end of the Newsletter to see what is up this month.

NASA Night Sky Notes

Night Sky Notes:

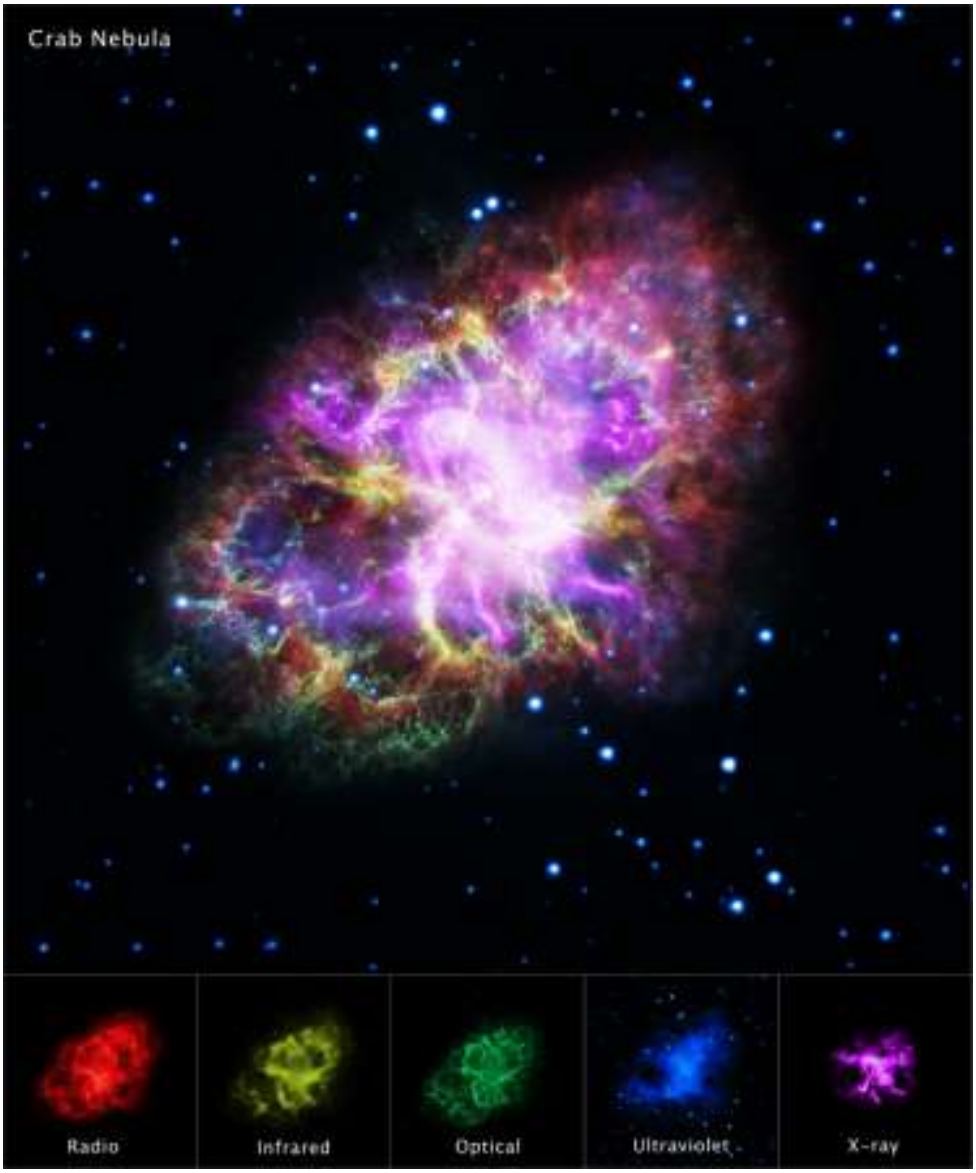
Betelgeuse and the Crab Nebula: Stellar Death and Rebirth

By Dave Prosper

What happens when a star dies? In 2019, Betelgeuse dimmed in brightness, sparking speculation that it may soon explode as a supernova. While it likely won't explode quite yet, we can preview its fate by observing the nearby Crab Nebula.

A view of the constellations Orion and Taurus, along with notable features: Betelgeuse in Orion, and Aldebaran and the Crab Nebula in Taurus. Credit: Stellarium Web.

Betelgeuse is easy to find as the red-hued shoulder star of Orion. A variable star, Betelgeuse, usually competes with the brilliant blue-white Rigel for the position of the brightest star in Orion. Betelgeuse is a young star, estimated to be a few million years old, but due to its giant size, it leads a fast and furious life. This massive star, known as a supergiant, exhausted the hydrogen fuel in its core and began to fuse helium instead, which caused the outer layers of the star to cool and swell dramatically in size. Betelgeuse is one of the few stars for which we have any detailed surface observations, due to its vast size – somewhere between the diameters of the orbits of Mars and Jupiter – and its relatively close distance of about 642 light-years. Betelgeuse is also a "runaway star," with its remarkable speed possibly triggered by a merger with a smaller companion star. If that is the case, Betelgeuse may actually have millions of years left! So, Betelgeuse may not explode soon after all, or it might explode tomorrow! We have much more to learn about this intriguing star.



This image of the Crab Nebula combines data from five different telescopes: The Very Large Array (radio) in red; Spitzer Space Telescope (infrared) in yellow; Hubble Space Telescope (visible) in green; XMM-Newton (ultraviolet) in blue; and Chandra X-ray Observatory (X-ray) in purple. It is known as the expanding gaseous remnant from a star that self detonated as a supernova, briefly shining as brightly as 400 million suns. Credit: NASA, ESA, G. Dubner (IAFE, CONICET University of Buenos Aires) et al.; A. Loll et al.; T. Temim et al.; F. Seward et al.; VLA/NRAO/AUI/NSF; Chandra/CXC; Spitzer/JPL-Caltech; XMM-Newton/ESA; and Hubble/STScI

The **Crab Nebula** (M1) is relatively close to Betelgeuse in the sky, in the nearby constellation of Taurus. Its ghostly, spidery gas clouds result from a massive explosion; a supernova observed by astronomers in 1054! A backyard telescope allows you to see some details. Still, only advanced telescopes reveal the rapidly spinning neutron star found in its center: the last stellar remnant from that cataclysmic event. These gas clouds were created during the giant star's violent demise and expand ever outward to enrich the universe with heavy elements like silicon, iron, and nickel. These element-rich clouds are like a cosmic fertilizer, making rocky planets like our own Earth possible. Supernovae also send out powerful shock waves that help trigger star formation. In fact, if it weren't for a long-ago supernova, our solar system – along with all of us – wouldn't exist! You can learn much more about the Crab Nebula in a video from NASA's James Webb Space Telescope: bit.ly/CrabNebulaVisual

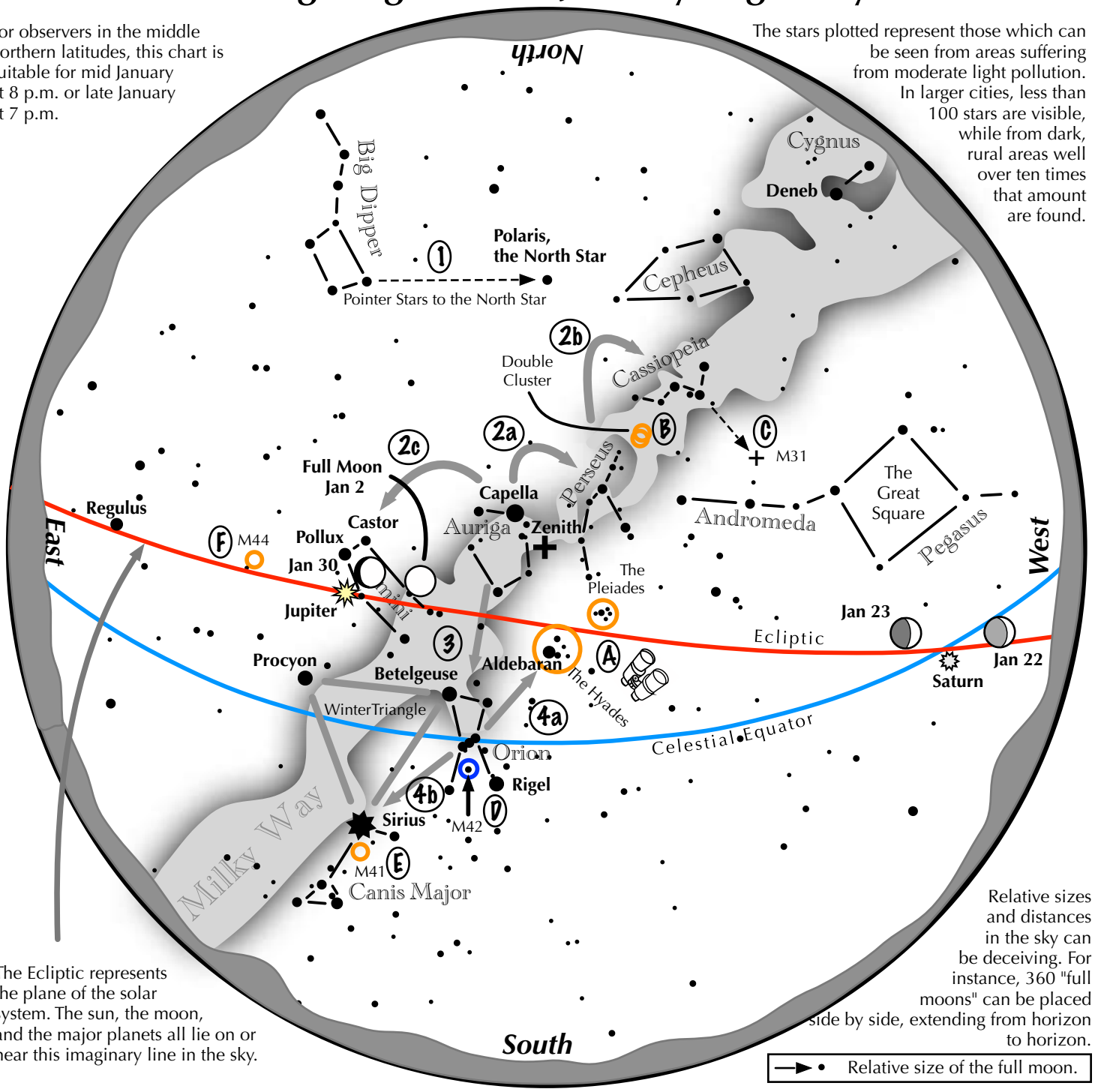
Want to know more about the life cycle of stars? Explore stellar evolution with "The Lives of Stars" activity and handout at bit.ly/starlifeanddeath, part of our *SUPERNOVA!* toolkit.

Navigating the mid January Night Sky

2026

For observers in the middle northern latitudes, this chart is suitable for mid January at 8 p.m. or late January at 7 p.m.

The stars plotted represent those which can be seen from areas suffering from moderate light pollution. In larger cities, less than 100 stars are visible, while from dark, rural areas well over ten times that amount are found.



The Ecliptic represents the plane of the solar system. The sun, the moon, and the major planets all lie on or near this imaginary line in the sky.

Relative sizes and distances in the sky can be deceiving. For instance, 360 "full moons" can be placed side by side, extending from horizon to horizon.

Relative size of the full moon.

Navigating the winter night sky: Simply start with what you know or with what you can easily find.

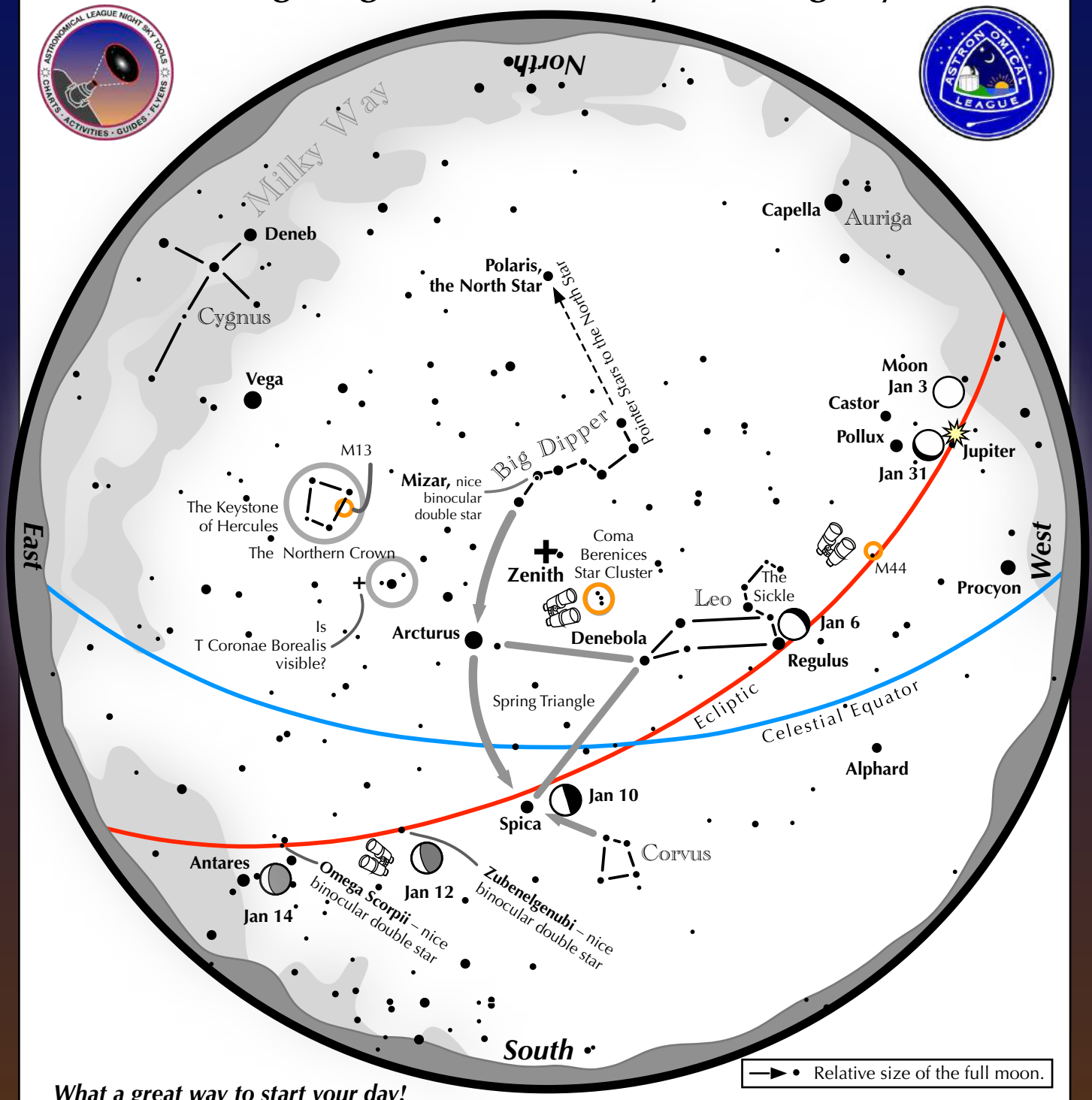
1. Above the northeast horizon rises the Big Dipper. Draw a line from its two end bowl stars upwards to the North Star.
2. Face south. Overhead twinkles the bright star Capella in Auriga. Jump northwestward along the Milky Way first to Perseus, then to the "W" of Cassiopeia. Next Jump southeastward from Capella to the twin stars Castor and Pollux of Gemini.
3. Directly south of Capella stands the constellation of Orion with its three Belt Stars, its bright red star Betelgeuse, and its bright blue-white star, Rigel.
4. Use Orion's three Belt stars to point to the red star Aldebaran, then to the Hyades, and the Pleiades star clusters. Travel southeast from the Belt stars to the brightest star in the night sky, Sirius.

Binocular Highlights

A: Examine the stars of the Pleiades and Hyades, two naked eye star clusters. **B:** Between the "W" of Cassiopeia and Perseus lies the Double Cluster. **C:** The three westernmost stars of Cassiopeia's "W" point south to M31, the Andromeda Galaxy, a "fuzzy" oval. **D:** M42 in Orion is a star forming nebula. **E:** Look south of Sirius for the star cluster M41. **F:** M44, a star cluster barely visible to the naked eye, lies to the southeast of Pollux.

Navigating the mid January Morning Sky

2026



What a great way to start your day!

For observers in the middle northern latitudes, this chart is suitable for mid January at 5:30 a.m.

Late sunrises in January provide opportunities for early morning skywatching.

- Bright Jupiter shines in the west-northwest and moves below Pollux in Gemini.
- The third quarter moon floats near Spica on January 10.
- The waning crescent moon glows near Antares on January 14.
- Continue watching for a sudden and rapid brightening of T Coronae Borealis. When will it explode?
- A great time for viewing the Big Dipper, Leo, and Hercules. And it is time for galaxy viewing!

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