
YOUNG ASTRONOMERS NEWSLETTER

POSSIBLY THREE MISSIONS TO BE SENT TO MARS THIS SUMMER

It's possible that three separate agencies will send rovers to Mars in mid-summer 2020. These are the U.S. (NASA), the European Space Agency (ESA) jointly with the Russian space agency, Roscosmos, plus the China National Space Administration (CNSA). Included in the NASA plan is to collect samples that will be cached and then retrieved on some later mission.

Mars reaches its closest point to Earth every 26 months. Timing for the launching of Mars missions takes advantage of this relationship, and the summer of 2020 is a favorable window of opportunity.

All three missions will carry a rover, but the Chinese spacecraft will be a triple package of orbiter, lander and rover. This is similar to the make-up of the Chinese lunar mission, Chang'e-4 which made its Moon landing last January.

The NASA 2020 rover (to be given a name at a later time) is aimed to set down in the Jazero Crater, which is believed to be the location for an ancient lake or sea. The European-Russian Mars mission is shooting for a plain called Oxia Planum. The specific target for the Chinese rover is not yet identified, but two possibilities are Chryse Planitia and Isidis Planitia. [Chem. & Ind. News, July 22, 2019 and Space.com, Oct. 12, 2019].

ASTEROID HYGIEA MAY BE ADDED TO THE LIST OF DWARF PLANETS

Thanks to the superb resolution of the SPHERE instrument at the Very Large Telescope in the high desert of Chile, astronomers have determined that the asteroid Hygiea could be classified as a dwarf planet. This is the

conclusion drawn by members of the European Southern Observatory that work with the VLT-SPHERE system.

Hygiea is the fourth largest asteroid, after Ceres, Vesta and Pallas. Its orbit lies at about 300 million miles from the Sun, which puts it at the outer edge of the asteroid belt. It has a diameter of 430 km (267 mi), which is less than half that of Ceres at 950 km.

The criteria that put Hygiea in the dwarf planet category are its spherical shape and the fact that it does not clear its orbit of debris. Going along with this is that Hygiea orbits the Sun, it is not a moon and it has enough mass to form a spherical conformation.

If given the dwarf planet designation, Hygiea will become the smallest in the group. [SciTech Daily, Nov. 6, 2019].

APPRECIATE THE DOGS OF WINTER

One of the contributing editors of Astronomy magazine is Bob Berman. He can be counted upon to write interesting articles that have a clever twist. In the December issue he writes about The Pup, the companion star to Sirius. Sirius is the most prominent star (alpha star) in the constellation, Canis Major, the Large Dog. Canis Major is a winter constellation that lies to the east of Orion the Hunter. Orion is the constellation that has the three stars in a row which constitutes Orion's belt. It is easy to find it from November to March. Canis Major climbs up to the east of Orion in early December.

Getting back to Sirius, this star happens to be the brightest star in the whole sky (except for the Sun, of course). It has a magnitude of -1.46 (Recall that the smaller the magnitude, the brighter is the star. So, a negative magnitude

star is really bright.) Sirius has a companion star designated as Sirius B. But astronomers have given it the nickname: The Pup.

It is impossible for us to see Sirius B without the use of very powerful telescopes. That's because "B" is really a dead star. It is a dim glowing ember, though still quite hot. It is classified as a white dwarf and it is extremely dense. If you stood on Sirius B, you wouldn't be able to raise your arms.

Sirius A is so bright because it is fairly close at 8.6 light-years and it is a very hot A-class star. This accounts for its outstanding brightness. Sirius A and B spin together with a 50-year orbit, and Bob Berman tells us that B is currently extending outward in its orbit, so those with telescopes can now spot it at some distance from A.

So, if you can dress for a cold, crisp and clear winter night, look to the southeast for the brightest star, Sirius. (You can use Orion's belt to point to it.). But you won't see Sirius B without a very good telescope.

But there's more to our canine story. From Sirius, look toward Betelgeuse, the red star in Orion's right arm. Sirius and Betelgeuse form two vertices of a triangle; and then if you look up toward the northeast, you will see another bright star, which is Procyon. Procyon, is the alpha star of Canis Minor, the Small Dog. It forms the third member of the Winter Triangle. And would you believe..Procyon has a companion star, Procyon B which is a white dwarf!

The winter sky presents us with many remarkable sights that includes red giant stars, white giants, nebulae, open clusters and globular clusters. So, bundle up and take your telescope or binoculars out with you and see how many of these objects you can find. [Astronomy, Dec. 2019].

AN INVITATION TO NAME THE NEW MOONS OF SATURN

Twenty new moons have been discovered orbiting Saturn. That gives it a total of 82 moons, which puts it ahead of Jupiter with 79. The Carnegie Institution for Science is holding a contest open to the public to name these 20 Saturnian moons. There are guidelines for submitting your nomination. Go to the website: <https://carnegiescience.edu/NameSaturnsMoons>. You have to hurry. The deadline is December 6, 2019.

OFFICIAL NAME GIVEN TO THE MOST DISTANT OBJECT EXPLORED BY MAN

Remember back to last January when the New Horizons spacecraft reached Ultima Thule in the Kuiper Belt at a distance of about 4 billion miles? Well, Ultima Thule has now been given an official name: Arrokoth. This name originates from the Powhatan/ Algonquian language. It means "sky". The New Horizons team felt that the name conveys our wonder of the heavens and about worlds beyond our own. [Space.com, Nov. 13, 2019].



**ULTIMA THULE, NOW NAMED ARROKOTH
(NASA photo)**

NASA'S PARKER SOLAR PROBE COMPLETES THREE ORBITS

The Parker Solar Probe has completed three orbits of the Sun, and NASA is releasing data that it collected during the first two orbits. Orbit number three was completed on November 13. The reader can go to the NASA Space Data Facility to read about the findings directly.

The Parker spacecraft was launched August 12, 2018. It is scheduled to complete 25 solar orbits and last until at least 2025. During its close approach to the Sun (called perihelion), it gets to within 4 million miles of the solar surface as it travels at speeds reaching 400,000 mph, the fastest human-made object. The spacecraft will examine the solar corona (the outer part of the Sun's atmosphere) and the solar wind, which is the stream of charged particles that fly outward from the surface. [parkersolarprobe.jhuapl.edu].

HUMANS TO COLONIZE MARS? NOT SO EASY

There is much talk about setting up a colony of earthlings on Mars. But the red planet has a lot of unique characteristics that put up some challenges to human ingenuity.

An article by Jim Bell, planetary astronomer at Arizona State University describes in the December issue of *Sky and Telescope* some of the extreme, un-earth-like conditions that we encounter on the Red Planet.

First, we must realize that Mars is much farther from the Sun than is Earth. So, we should expect it to be cold. And it is. Near the peak of summer, at the Martian equator, the surface temperature during "the heat of the day" can briefly get to 41°F to 50°F. But for most of the Martian year, temperatures would be below freezing, and humans would have to provide some sort of consistent heat source. This is kind of like the research stations we have in Antarctica.

Furthermore, Mars has no atmosphere like ours. It is mostly (95%) carbon dioxide (CO₂) and it is only at about one percent the atmospheric pressure of Earth's. So, we have to find ways to generate oxygen to breath as well as water to drink and possibly use for irrigation. The low atmospheric pressure does some other weird things. The thin atmosphere does not retain the heat. If the temperature is at 14°F at our feet, it can be -22°F at our face.

The thin atmosphere has no protective ozone layer to shield us from ultraviolet rays coming from the Sun. So, you would be cold, but still getting a sunburn.

The planet's polar regions are the coldest; similar to what we experience on Earth. But the Martian poles are so cold, roughly -100°C, that the carbon dioxide in the atmosphere freezes out to form a mass of "dry ice". The white polar caps are visible in telescopes. We wouldn't want to put our human colony in those regions.

And, there are the dust storms. Even though the atmosphere is thin, there is enough energy in the air to blow around the talcum powder surface dust. The storms vary in size and severity and they follow reliable patterns of direction and season. They can last months. Storm wind speeds can reach more than 100 mph. But the thin air would feel like a 13 mph breeze here on Earth. No fabric ripping gales as shown in the movie "The Martian".

There is constant airborne dust that colors the sky pinkish-tan and makes the sunsets and sunrises blue, rather than red, as here on Earth.

Travel to Mars is tricky because of the great distance. Orbital synchronization is needed. Typical travel durations of scientific missions run about 200 days; around seven months.

Seasons last twice as long on Mars than on Earth. One-way communication messages to Earth take from 3 to 25 minutes. [Sky & Telescope, Dec. 2019].

BIRTHDAYS IN December:

Isaac Newton (Eng.), b. Dec. 25, 1642, d. Mar. 20, 1727. Astronomer-mathematician. Developed laws of gravity, calculus, invented the reflector telescope, studied diffraction of light.

Tycho Brahe (Danish), b. Dec. 14, 1546, d. Oct. 24, 1601. Carefully plotted the positions of the known planets (before the use of telescopes). This enabled Kepler (see below) to formulate his laws of planetary motion.

Annie Jump Cannon (Amer.), b. Dec. 11, 1863; d. Apr. 13, 1941. Astronomer who studied variable stars and established the O,B,A,F,G,K,M classification of star luminosity/temperature. She did most of her work at the Harvard College Observatory. She created the Henry Draper Catalogue of star spectra.

Gerard Peter Kuiper (Amer., Dutch born), b. Dec. 7, 1905, d. Dec. 23, 1973. Studied the atmospheres of the planets. Discovered Saturn's moon, Miranda and Neptune's moon, Nereid.

Johannes Kepler (Ger.), b. Dec. 27, 1571, d. Nov. 15, 1630. Formulated the famous three laws of planetary motion.

Arthur Stanley Eddington (Brit.) b. Dec. 28, 1882, d. Nov. 22, 1944. English astro-physicist, who worked out various laws for stellar pressure-temperature dynamics and utilization of Einstein's theory of relativity.

Maarten Schmidt (Dutch) b. Dec. 28, 1929; d. Measured distances to quasars. Proved the vast size of the universe.

Albert A. Michelson (Amer.) b. Dec. 19, 1852, d. May 9, 1931. Physicist who specialized in optics. Noted for measuring the speed of light and the diameter of the red supergiant star, Betelgeuse in 1921. Nobel Prize in physics in 1907.

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MOON PHASES IN DECEMBER: First qtr.: Wed. the 4th; Full: Thurs. the 12th; Last qtr.: Wed. the 18th; New: Thurs. the 26th.

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THE PLANETS IN DECEMBER: Venus, Jupiter and Saturn are strung out low in the southwest right after sundown. Jupiter is the lowest with a magnitude of -1.8. Then above it, and brighter, comes Venus with a mag. of -3.9. A little higher up, we have Saturn with a mag. of 0.6 . Jupiter drops into the glare of the setting Sun by the second week of the month. Also, Saturn slips downward and is lost in the Sun's glow by Christmas. That leaves bright Venus to rule the western sky for the weeks ahead. Meanwhile, for early risers, you can catch **Mars** coming up in the east around 4:30 a.m. This is followed about an hour later by **Mercury**. But, by mid-month, Mercury is lost in the Sun's morning glow.

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OTHER EVENTS DURING DECEMBER: **Geminid Meteor shower** peaks around the 14th. However, there will be some interference from the waning gibbous Moon. The **Ursid Meteor shower** is to peak around the night of Dec. 22/23. The Moon will not be so much of a problem, although the Ursids are typically not too active.

The winter solstice occurs on the 21st. That's when the Earth's southern hemisphere is tilted the most toward the Sun; making it summertime in Australia and New Zealand.

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FORSYTH ASTRONOMICAL SOCIETY: Meetings are held the second Wednesday of the month at 7:30 p.m. at Kaleideum North (formerly Sciworks). Visitors are welcome. A program of general interest to amateur astronomers is given as part of the meeting. Check the FAS website to learn about special activities such as public observations. Outdoor activities are always subject to cancellation due to unfavorable weather. Check the website at www.fas37.org

Check page 6 for a sky map that illustrates the more prominent sky objects for the winter season.

FROM THE EDITOR: Dear readers, I'm sorry to report that this December issue of the Young Astronomers Newsletter is my last. It has been an educationally rewarding four years for me, as I made the effort to scour the internet and paper periodicals for worthwhile topics for those interested in astronomy. I feel that it is time for me to step aside and make room for fresh and creative (and younger) minds.

I wish to convey my gratitude to our For. Ast. Soc. President, Dave Morgan for reviewing each YAN manuscript and to Sean Wood, who facilitated in putting each month's newsletter into the FAS website.

Future publications of astronomy news will be handled by Bruce Gavett, a fellow member of the Forsyth Astronomical Society. The news will be published in a different way, as explained below by Bruce.

I wish you all the best in your future study of the outstanding science of astronomy. Don't lose your innate curiosity of nature's wonders.

Bob Patsiga

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With the new year, The Forsyth Astronomical Society (FAS) will be changing the format of the Young Astronomers Newsletter. Rather than a publication published on a monthly basis, the newsletter will become a series of on-line articles, a "blog" you might say.

The articles will be posted to this location:

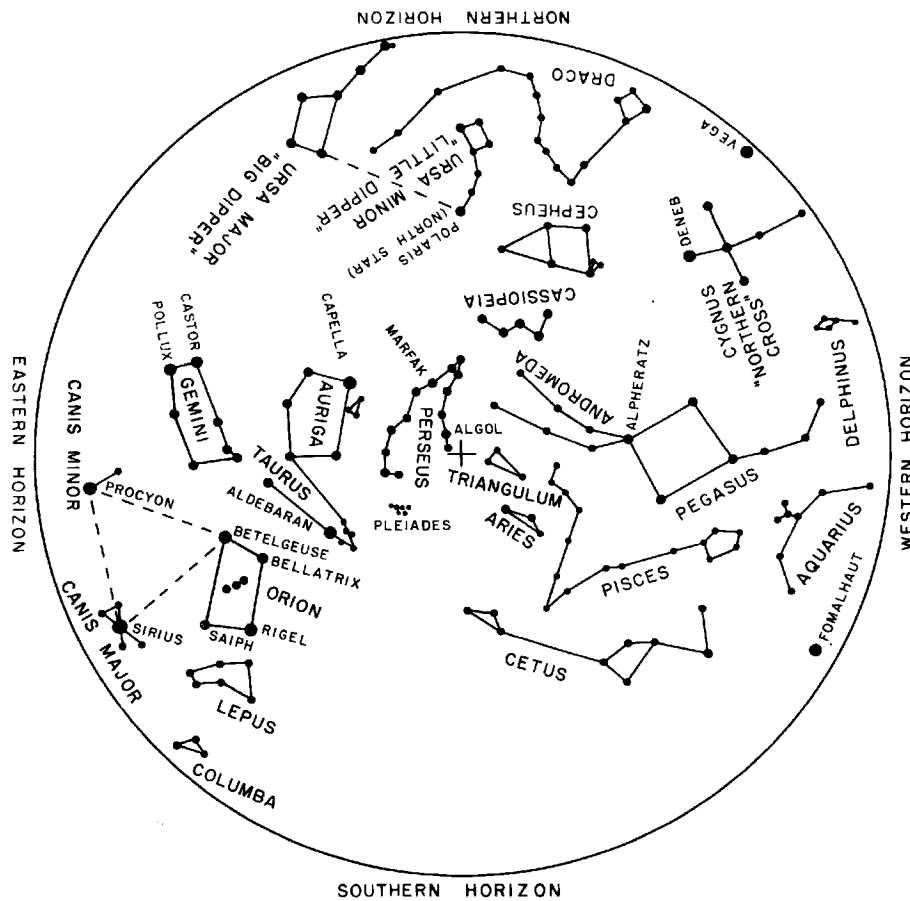
<https://www.fas37.org/wp/category/astronomy/youngastronews/>

The entire membership of FAS would like to extend a huge THANK YOU to Bob Patsiga who will be retiring as the editor of the Young Astronomers Newsletter at the end of 2019.

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THE WINTER SKY

There are a lot of neat constellations in the winter season. We are looking through the cross section of the Milky Way and so, we see many stars. In December, low in the east, we see the bright star, Sirius, the brightest star in the sky (mag. -1.4, 8.6 LY). Sirius is also known as the Dog Star, because it is found in Canis Major. Up from Sirius, you will see three stars in a row which make up the belt of Orion the Hunter. Sirius and Orion will gradually shift to the west (and more straight up) as we progress into January and February. The right arm of Orion (to our left) is the red giant star Betelgeuse (mag. 0 – 1 variable, 400 LY). In Orion's left leg we see Rigel (mag. 0, 800 LY). With binoculars, you should be able to find the Orion Nebula in the sword of Orion. It shows up as a bright fuzzy region. If you go toward the zenith from Orion, you should see a large pentagon. This is the constellation Auriga, with its main star, Capella. Off to the right (west) of Orion is Taurus the Bull. One of the horns of the bull is part of Auriga. Continuing westward a bit, you'll see the Pleiades star cluster, which is very easy to spot. Going in the eastward direction from Orion, we find Gemini. The Geminid meteor shower occurs in mid December.



THE NIGHT SKY IN DECEMBER