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# YOUNG ASTRONOMERS NEWSLETTER

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## MARS ROVERS UPDATE

**Curiosity:** Curiosity is the more recent of two rovers still functioning on the Martian surface. It landed August 6, 2012 into the Gale Crater. In four and two-thirds years, it has travelled 9 miles (15 km) and sampled the rocks and soils as it made slow, but deliberate progress toward its first goal, the central mound in the crater called Aolis Mons, also called Mount Sharp.

Curiosity carries 17 cameras, several spectrometers, miniature laboratories and other specialized instruments. It weighs about 1,900 pounds. Samples can be scooped up or drilled. In addition to the lofty goal of pure discovery and unveiling of pristine, extraterrestrial terrain, the rover is directed to look for signs that water existed on the Martian surface during the past billion years. The presence of water, is a strong indicator that the planet was habitable. Another objective is to find and identify organic compounds, which could also be indicators of past life.

Sampling and analysis has identified a number of minerals that, on Earth, are associated with water flow and lakes. Samples identified as clay minerals, mudstone and iron hematite are associated with the action of water on Earth. Also deposits of calcium sulfate containing veins of boron were identified. This is the first discovery of boron on Mars. It is most likely in the form of borax, such as found in dried lakes in the American southwest desert. (the analysis method does not specify the chemical form of the boron.) The specific minerals are believed to have been deposited from neutral waters (neither too acidic nor too alkaline).

Curiosity found that the release of methane (at the parts per billion level) into the Martian atmosphere occurs in season-related

fluctuations. Also, the organic compound, chlorobenzene was discovered. This may have formed from the reaction of perchlorate ( $\text{ClO}_4^-$ ) found in some deposits containing aromatic hydrocarbons.

Curiosity is continuing the climb up Mount Sharp and continuing to analyze the geologic strata. But it has to carefully choose its pathway, since at least one wheel is showing some deterioration due to the rocky terrain. [Sky & Tel., April 2017 and Sci. News, Dec. 14, 2016].



**Mars Rover Curiosity (NASA photo)**

**Opportunity:** This is an old-timer rover that landed on the red planet back in January of 2004. It, and its twin sister rover, Spirit (also landed in Jan. 2004) were expected to have a lifetime on Mars of about three months. At around 400 pounds, it is about one-fifth the weight of Curiosity.

So, Opportunity is still chugging along, thirteen years after its landing, and during that time it has covered about 27 miles. It endured Martian dust storms as well as the expected extreme cold of Martian winters. It discovered

hematite, the iron-bearing mineral associated with an aqueous environments, and it discovered a non-Martian meteorite (called the Heat Shield Rock).

Its mission, as for Curiosity's, is to look for geological signs that water existed on the ancient Mars surface. It is now on its way to investigate its fourth crater target, Endeavor (previous: Eagle, Endurance, Victoria).

[[mars.nasa.gov/mer/mission/status\\_opportunityAll.html](https://mars.nasa.gov/mer/mission/status/opportunityAll.html)]

Opportunity's partner **Spirit** also landed in January, 2004, on the opposite side of the planet. And, it produced scientifically significant discoveries for five years. It then got bogged down in soft Martian sand and was not able to extract itself. It gradually lost power and sent its last communication in March of 2010.

Although not designed as a rover, the Mars lander, **Phoenix**, should be mentioned as an additional member of this all-star cast. Opportunity, Spirit and Curiosity all landed within a few degrees of the Martian equator. Phoenix, on the other hand, landed in May of 2008 near the planet's north polar cap, at a latitude of about +70 degrees. In this region, temperatures hover around minus 100 degrees Celsius (-150 F°).

The Mars Odyssey Orbiter had previously used its spectrometer to detect the presence of water in the polar region. So, Phoenix used its robotic arm to dig at least a foot into the terrain, and it used its chemical analysis equipment to identify compounds and minerals.

Phoenix scraped off some top soil and found an icy-sandy deposit at a depth of about 15 centimeters. It identified calcium carbonate as well as other aqueous-dwelling ions, including perchlorate. The presence of ice was definitely confirmed.

However, after six months of useful scientific work, Phoenix ceased transmitting in November. This exceeded its planned lifetime. Attempts to contact the lander by way of the Mars Odyssey Orbiter were unsuccessful. During that winter, Phoenix would have been covered with about a 1-meter thick layer of solid carbon dioxide. But, unfortunately, Phoenix was not able to record this. [[https://www.nasa.gov/mission\\_pages/phoenix/news](https://www.nasa.gov/mission_pages/phoenix/news)].

### **CHINA COMPLETES CONSTRUCTION OF THE WORLD'S LARGEST RADIO TELESCOPE**

In September, 2016, China flipped the switch on its Five-hundred-meter Aperture Spherical Radio Telescope (FAST). Its size surpasses the previous record-holder, the 305 m Arecibo radio telescope in Puerto Rico, in the class of single-dish radio telescopes.

Just like Arecibo, the FAST is nestled in a natural bowl depression in the landscape. Also, like Arecibo, the detector/receiver is suspended over the telescopic dish. The dish is constructed to be deformable in order to sharpen the image. This adjusts the paraboloid segments of the dish almost instantly by computer-controlled cables. {Sky & Tel., Feb., 2017}.

### **THREE DECADES OF STUDY OF SN 1987A**

Back in 1987, astronomers discovered a cosmic blast in the Large Magellanic Cloud (a small satellite galaxy of the Milky Way). The expanding dust and gas has now been studied for three decades in every type of light. An interesting outcome of the supernova is the geometric patterns that have been formed as the result of the expanding energy impinging on the ring of matter pre-released from the original star. This produced a symmetrical ring of knots around the central remnant that looks like a pearl necklace. [Astronomy, March, 2017]. Also, there has been just discovered an on-going supernova in galaxy NGC 5643. (See the Astronomy website Astronomy.com).

**APRIL BIRTHDAYS:** **Arno Allen Penzias**, (Ger.- Amer.) b. April 26, 1933, Co-discovered cosmic microwave background radiation. Nobel Prize, 1978 (with Robert Wilson). **Christian Huygens** (Dutch), b. April 14, 1629, d. July 8, 1695. Discovered the rings of Saturn, Saturn's moon Titan; invention of the pendulum clock. **Jan Hendrik Oort**, (Dutch) b. April 28, 1900, d. Nov. 5, 1992. Studied the rotation of the Milky Way.

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**MOON PHASES FOR APRIL:** First Qtr.: Mon. 4/3; Full: Tues. 4/11; Last Qtr.: Wed. 4/19; New: Wed. 4/26.  
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**THE PLANETS IN APRIL:** **Mercury** has now taken the place of Venus in the west, right after sunset. Mercury is smaller and farther away than Venus, nevertheless, it puts on a pretty good show at around magnitude zero (recall that the smaller the magnitude, the brighter is the object). But it is a very brief show. After its maximum height on April first, the fast-moving planet starts to drop, and is lost below the horizon in a few days. **Mars** still hovers in the west. It will pass a bit south of the Pleiades cluster on the 19<sup>th</sup> and 20<sup>th</sup>. **Venus** can now be found in the early morning. It rises an hour before the Sun on the first. It rises a bit earlier throughout the month, and it gets brighter with a magnitude of minus 4.7 on the 30<sup>th</sup>. **Saturn** rises in the wee hours of the morning in the vicinity of the constellation, Sagittarius. During the month, it will look at us at a favorable angle so that its rings show up well using telescopes. Views of **Jupiter** will be outstanding during April. It will gradually rise higher each night and reach opposition on the 7<sup>th</sup> at which time it will be strikingly bright with a magnitude of minus 2.5. It is situated in the constellation Virgo (the bright star Spica will be nearby).

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**LYRID METEOR SHOWER:** The Lyrids are predicted to be decent this year. Look for them in the period April 16 to 25. Peak frequency will be around April 22. Lyra is in the Summer Triangle (in the northeast).  
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**EARTH DAY 2017:** Do something good for the environment on Earth Day, Saturday, April 22.  
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**COMETS IN APRIL:** Two comets will be in roughly the same region of the sky during April. The more prominent one is labeled **C/2015 V2 (Johnson)** and is expected to be visible with binoculars in the north east. Scan the region of Draco (between the big and little dippers, and Hercules. The other one is identified as **41P/Tuttle-Giacobini-Kresak** which will also be in roughly the same area, but a bit fainter. Take your binoculars out on a clear night in April.  
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**CALCULATOR CORNER:** Assuming that the rings of Saturn extend outward to give an overall diameter of 170,000 miles, how long (in days) would it take to drive around on the circumference of the outermost ring at 55 miles an hour? (answer below).  
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**Forsyth Astronomical Society website:** <http://www.fas37.org>. **SciWorks Tel: 336-767-6730, ext. 1000**

**Remember that the name SciWorks will be gradually phased out. Replaced by: KALEIDEUM**

Have a great month     Bob Patsiga, editor     [calculator answer: 405 days]