

From VOA Learning English, this is Science in the News. I'm June Simms.

And I'm Jim Tedder. Today on the program, we tell about developments in space exploration. We tell about an American decision to extend the life of the International Space Station. We also tell about the American space agency's Mars rover Opportunity and new findings from the red planet. We have a report about what appear to be high energy particles from outside our solar system. But first, we report on plans for an unusual map.

A man-made satellite called Gaia started a long trip late last year. The satellite was designed to travel more than a million kilometers from Earth. Scientists are hoping that Gaia will take pictures of our galaxy, the Milky Way. They plan to use the pictures to create the first three-dimensional -- or 3-D -- map of the Milky Way. It will show the height, depth and width of stars and other large, recognizable objects.

The satellite weighs two tons. It was launched on a Russian Soyuz rocket last December from the European Space Agency's center in French Guiana. Gaia rose quickly and soon began orbiting the Earth. It then deployed a 10-meter-large circular sunshield. The device is keeping instruments on the satellite -- including two telescopes -- cool on the long trip.

The scientists hope to use the telescope to study distant stars. Gaia was designed to be mechanically stable. That is why the satellite has so few moving parts. In addition, its temperature must not change very much.

Mark McCaughrean is the chief scientist for the Gaia mission. He says the information Gaia gathers will help scientists understand how our galaxy developed, how it looks today, and how it may change.

"It will measure the positions of a billion stars but also their speeds, their motions. And with that we can run a movie of the Milky Way. We can run it forwards, into the future, how the Milky Way will develop by looking at all the stars and how they move.

But we can run it backwards as well, and we can see how the Milky Way actually formed in the first place.”

Gerard F. Gilmore is with the Institute of Astronomy at England’s Cambridge University. He says the 3-D images will one day show half of the Milky Way. He says the map will provide new knowledge about what keeps the galaxy together.

“And the particular interest that I have in here, locally, is in the nature of dark matter. What is dark matter made of? Dark matter is most of the weight in the Milky Way. It is dark matter that holds the Milky Way together. If there weren’t all this dark material, our sun would fly off away from the galaxy. The whole galaxy would fall apart.”

Scientists expect the satellite to operate for five years in an area about 1.5 million kilometers from Earth. It will take about 70 pictures of each of the one billion stars in the Milky Way. The mission is expected to cost about \$1.3 billion.

The United States' space agency has announced plans to keep the International Space Station operating until 2024. The \$100 billion space station has already been in service for 15 years. It was supposed to halt operations in 2020.

The space agency and the Obama administration say extending the life of the space station will help the US and its international partners meet several goals. These include scientific research and giving private businesses time to fully take responsibility for transporting shipments and crew to low-Earth orbit.

One of the private companies is Orbital Sciences Corporation. It sent a supply flight to the space station in early January. The space agency retired the last of its space shuttles in 2011. Since then, it has been using Orbital Sciences and another company -- SpaceX -- to transport supplies to the space station. It has also been getting support from Russia. Flight crews are brought to the space station on Russian Soyuz spacecraft.

The US space agency says its Mars rover vehicle "Opportunity" is still working more than 10 years after arriving on the red planet.

Opportunity landed on Mars on January 24, 2004 -- several weeks after another rover vehicle, called "Spirit."

NASA, the National Aeronautics and Space Administration, says one of Opportunity's six wheels and two instruments stopped working long ago. But those are minor problems when you think about how long the project was supposed to last: just three months. Spirit stopped sending signals in 2010 after getting stuck in sand.

Opportunity has travelled about 39 kilometers on the planet's surface. NASA scientists say the rover continues making new discoveries. It recently overturned a rock, so that its bottom was exposed to the Martian atmosphere for the first time in perhaps billions of years.

Early discoveries by the two rovers showed the planet may have at one time been much warmer and wet. And recently, Opportunity found geologic evidence of water in an area called the Endeavour Crater.

Scientists believe the discovery could help them find places other than the Earth where simple life forms could have survived.

New research shows mineral-eating organisms could have lived on Mars. Scientists say this is the best evidence yet that the planet could once have supported life forms.

Last year, scientists reported evidence of water on Mars. In the latest research, the Mars rover vehicle "Curiosity" found two minerals -- iron and sulfur -- in different chemical states at the bottom of a former lake. The finding is important because the different states suggest that electrons could move around in that environment. Scott McLennan is a professor of geoscience at Stony Brook University in New York.

"If you can move electrons around you have basically got food."

Professor McLennan is part of the Mars rover team that made the discovery.

“In principle, you would have microbes that could eat the rocks and eat the minerals. And that is very common on Earth. They are primitive life forms but they are very, very well-known and very well-characterized.”

Such life forms are found in dark caves and deep-sea thermal vents on Earth. These areas do not get the sunlight that is the root of all life on our planet’s surface.

Hap McSween is a planetary science professor at the University of Tennessee. He says recent research papers claimed there could be life on Mars. But he says this was the first time he has been persuaded of it.

Professor McSween was not involved in the recent study. He says it is not the first time researchers have found water or important minerals on Mars.

“But never the whole package. And this place really does seem to have the whole package.”

The materials were found near the place where Curiosity landed. The area appears to have been a lake about four billion years ago. Professor McSween notes that was around the time life was appearing on Earth.

“It could be that the two planets had emerging but very, very simplified life at the same time. But we are a long way from figuring out that this interesting lake deposit actually has any evidence for life.”

Sensing equipment buried deep in the Antarctic ice has found evidence of high energy particles from outside our solar system.

IceCube is the name of a device operating in Antarctica. It has more than 5,000 light sensors buried as deep as two kilometers below the surface. IceCube has been called, the world’s largest particle detector searching for “neutrinos”.

Neutrinos are unimaginably small particles. They travel from the sun or Earth’s own atmosphere at near light speed. Billions of them pass through us every second.

But these are low energy neutrinos. They are not what interest the 250 scientists from 11 countries working with information from IceCube.

Francis Halzen is the lead investigator on the project and a physics professor at the University of Wisconsin. He says IceCube is looking in the ice for high-energy neutrinos from outside the solar system.

“What we want to see is a handful of events sent to us by the universe. We’ve finally discovered those.”

When the neutrinos mix with atoms inside the deep ice instrumentss, they sometimes give off small amounts of light. In 2010, scientists discovered two high-energy neutrinos. Two years later, they found 26 more -- including the most-energetic neutrinos ever observed.

Nathan Whitehorn is a physicist at the University of Wisconsin. He also is working on the IceCube project. He says the discovery of the 26 neutrinos after finding the first two was very important.

“It was almost impossible, without more data and data at lower energies, to be sure that these two neutrinos that we found were part of a larger pattern indicating an extraterrestrial population, instead of some statistical fluke.”

Neutrinos have almost no mass or weight, and no electric charge. That is why the Earth’s magnetic fields have no effect on them. Neutrinos move quickly and in a straight line through the solar system. That movement is very different from electrically-charged cosmic rays. Professor Whitehorn says the lack of an electric charge in neutrinos means they can help scientists find where cosmic rays came from.

“We expect that anything that is making high-energy cosmic rays -- the most energetic phenomenon in the universe -- whatever they are, will make neutrinos at the same time and if we are able to identify the origin of these high-energy neutrinos, they will provide some very powerful clues about the origin of the highest-energy cosmic rays.”

Scientists have been attempting to solve this mystery for more than a century. They hope these extraterrestrial messengers will help them do that.

This Science in the News was written and produced by Christopher Cruise. I'm Jim Tedder.

And I'm June Simms. Join us again next week at this time for more news about science on the Voice of America.

