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A BID TO UNLOCK THE MYSTERIES OF SOLAR SYSTEM

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As we go about our daily routines on Earth, Japanese robots are literally hopping about on the surface of a primitive asteroid called Ryugu, some 280 million km away. The data they are collecting might unlock some of the most fundamental mysteries of our solar system.

The asteroid-exploring spacecraft, Hayabusa 2, was launched by the Japan Aerospace Exploration Agency (JAXA) in December 2014 and took three and a half years to reach its destination. In late September this year, it made history by releasing two moving rovers onto the asteroid's surface.

The rovers are designed to bounce, because the lack of gravity on Ryugu makes it impossible for them to roll.

Together with another, largely stationary, lander that joined them on October 3, the probes are not only providing images of what until now had been just a dot at the end of even our most powerful telescopes, but measuring temperatures and magnetic fields, as well as investigating mineral composition with microscopes.

The most ambitious part of the project, a surface landing by the mother ship itself, has however had to be delayed by several months, after initial explorations revealed Ryugu's surface to be far rockier than anticipated. Boulders, some as big as 130 m, are strewn all across the surface.

This final part of the mission will now take place in January next year at the earliest. It will be preceded by the creation of an artificial crater to expose material that lies below the surface of the asteroid.

The plan is for the spacecraft to head back by late 2020 to Earth, carrying soil and other material samples, where they can be studied using the most sophisticated scientific instruments available.

"We might be able to get information about the origins of life that is still preserved in the body of the asteroid," said Yuichi Tsuda, project manager of the Hayabusa 2 mission, when asked about the most optimistic, yet realistic, outcome of the mission.

Fast-moving time capsule

Because asteroids are thought to have formed from the same material that made up the planets, they are a kind of fast-moving time capsule that can take us back 4.6 billion years ago, to the infancy of our solar system.

Asteroids like Ryugu have not been exposed to the same geological processes that caused erosion on Earth's rocks. Consequently, their surfaces are preserved and studying their composition could provide clues about the origin of life. "For example, we may discover molecules of carbon or water," explained Mr. Tsuda.

Although the data that has been collected so far has not revealed any water molecules on Ryugu, Mr. Tsuda said that sub-surface exploration might yet reveal hydrated minerals (minerals

that contain water in their crystalline structure).

Scientists have been studying asteroids for years, but where Hayabusa 2 has scored a first is in having deployed moving rovers. Moreover, Ryugu is what is called a C-type or carbonaceous asteroid which, according to Mr. Tsuda, is more likely to yield clues about the origins of life than the S-type or silicaceous asteroids that have been more commonly explored.

C-type asteroids exist furthest from the Sun, and have consequently been least altered by heat and are, therefore, most likely to contain water.

If all goes according to plan, Hayabusa 2 will become the world's first asteroid sample-collecting mission to return to Earth from a C-type asteroid.

The plan for the Japanese spacecraft exploring the asteroid Ryugu is to head back by late 2020 to Earth, carrying soil and other material samples, where they can be studied

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