

# Riding an asteroid: China's next space goal

After sending a probe to Mars in 2020, China plans to explore three asteroids and land on one of them to conduct scientific research, according to a Chinese asteroid research expert.

The "China's Space Activities in 2016" white paper, issued by the Information Office of the State Council recently, also mentioned asteroid exploration in outlining the major tasks of the country's space industry in the next five years.

Ji Jianghui, a researcher at the Purple Mountain Observatory of the Chinese Academy of Sciences and a member of the expert committee for scientific goal argumentation of deep space exploration in China, took part in expert discussions on the main scientific goals of China's deep space exploration in the next two decades.

The committee basically decided to conduct expeditions to asteroids and then Jupiter and its moon system after the Mars expedition.

"The experts' plan is to fly a probe by an asteroid, to fly side by side with an asteroid for a period, and to land on a third one to conduct in situ sampling analysis on the surface," said Ji.

So far, only the United States and Japan had landed probes on asteroids. Japanese probe Hayabusa 1 landed on the asteroid Itokawa, and brought samples back to Earth.

"China will send the Chang'e-5 lunar probe to the moon and bring samples back in 2017. If that mission succeeds, it would mean China, like Japan, would be able to bring back samples from asteroids to study in labs on Earth in the future," said Ji.

Scientists would give priority to detecting near-Earth asteroids to analyze their probability of colliding with Earth.

At the same time, they are eager to study the formation and evolution of asteroids, which might shed light on the origins of the solar system, as well as the origins of life and water on Earth.

Chinese scientists plan to fly a probe side by side with an asteroid called Apophis for a period to conduct close observation, and land on the asteroid 1996 FG3. The probe is also expected to conduct a fly-by of an asteroid to be selected according to the launch time. The whole mission would last around six years, said Ji.

## THREATS FROM SPACE

Discovered in 2004, Apophis is about the size of two football fields, with

its longest diameter at about 394 meters. Analysis shows it will come very close to Earth in 2029, missing our planet by some 30,000 kilometers. The distance, a hair's breadth in astronomical terms, is within the orbit of the moon, and even closer than some man-made satellites. It will be the closest asteroid of its size in recorded history. The asteroid is supposed to come around Earth again in 2036.

Apophis was believed to pose a big threat to Earth when it was first discovered. More than 100 scientific groups around the globe are studying it. Further study has shown it has only a 1-in-a-million chance of hitting the Earth in 2029.

Although we don't have to worry about Apophis for the time being, scientists estimate there are about 300,000 near-Earth objects with a diameter over 40 meters, and only 3 percent of them have been discovered. An international asteroid warning network was set up in December 2013 to monitor potential threats.

As a member of the warning network, China's Purple Mountain Observatory, discovered three new near-Earth asteroids – 2017 BK3, 2017 BM3 and 2017 BL3 – in January this year, and 2017 BL3 poses a potential threat to Earth, said Ji.

"In order to cope with the potential threat of the near-Earth objects, we need not only ground-based telescopes to form a monitoring and warning system, but also space probes to conduct close investigations of the asteroids to study their physical characteristics, interior structure and content," Ji said.

China's asteroid exploration will help scientists better understand the basic features of the near-Earth objects, and seek effective measures to deal with the possibility of a collision, said Ji.

## ORIGINS OF LIFE?

Some scientists believe asteroid 1996 FG3 might hide the secret of the origins of life on Earth.

At present, there are two main theories about the origins of life. One is that life was conceived on Earth itself, and the other is that life originated in outer space. Scientists have discovered many meteorites containing organic compounds, which are believed to be related to the origins of life.

Many asteroids also contain water. And some scientists believe the water on Earth might have been brought by asteroids or comets.

"Scientists have conducted many ground-based astronomical observations on asteroid 1996 FG3. Spectral analysis shows that it is a carbonaceous asteroid, and it's very likely that it contains organic components which are needed for the origins of life," Ji said.

China has already conducted a fly-by observation of an asteroid named

Toutatis.

On Dec. 13, 2012, China's second lunar probe, Chang'e-2, after successfully completing its mission, rendezvoused with Toutatis at a distance of 770 meters, as the space rock, bigger than a city block, swept by Earth at a distance of around 7 million kilometers.

It was the world's first close fly-by observation of Toutatis. The probe took high-resolution images providing a number of discoveries.

Ji and his collaborators conducted intensive research, finding the ginger-root-shaped asteroid is about 4,750 meters long and 1,950 meters wide. They studied how it rotated in space.

The research also revealed new insights into the geological features and formation of the asteroid, showing it was essentially rubble and that the impact craters on its surface could be 1.6 billion years old.