

## **SCIENTIST FOR A DAY**

Target 2, featuring three of the most interesting moons of Saturn, is a must for investigation. The unique features of each of these moons will have a scientific significance.

Titan, the largest moon of Saturn, owns its fame for the possibly unique dense nitrogen-rich atmosphere and the methane seas. It is analogous to the early Earth as hydrocarbon precipitation happens just as rainfall does on Earth. More importantly, recent research has discovered that amino acids and nucleotide bases can form in laboratory stimulation of Titan's atmosphere without water. Although the finding does not mean molecules in Titan's atmosphere will necessarily combine to make life materials, this has raised the potential of other-than-earth celestial bodies hosting simple forms of life. Should prebiotic molecules be proven to form in Titan's atmosphere, which may be similar to the early Earth's, this will raise the hypothesis of Earth's atmosphere being the origin of terrestrial organisms, thus having an influence in ecology. The Cassini's narrow-angle camera has specific filters with wavelengths at which methane absorbs strongly so the image it produces can aid investigation of Titan's atmosphere. Nevertheless, for the formation of prebiotic molecules without the presence of water, oxygen is a vital ingredient. Therefore, a helping hand is needed.

Enceladus, another fascinating moon of Saturn, has the most reflective surface in the solar system. Dominance of the fresh ice and regions of smooth young terrain suggested that Enceladus must be tectonically active. Furthermore, water-rich plumes venting from the south pole confirmed that there are cryovolcanoes on the moon and reservoir of water, an essential component for the sustainability of life. This discovery is tremendous as it makes Enceladus one of the very few candidates of future habitat. If scientists can identify the source of heat energy needed to trigger eruption, they will be able to predict the habitability of the moon.

The materials from cryovolcanic plumes might be the source of particles of Saturn's E ring, and the oxygen required in Titan's atmosphere. An image at target 2 will help determine the composition of Saturn's ring and the destination of Enceladus' water plumes.

Tethys's surface features have labelled itself one of the most interesting worlds. The presence of the enormous impact crater Odysseus provokes a mystery why Tethys did not shatter in such an impact and leads to the hypothesis that Tethys might have existed in semi-liquid state. The huge valley Ithaca Chasma then puts forward that the internal water might have solidified, causing the rock to expand. The driving force may come from the tidal heating resulted from orbital resonance between Dione and Tethys. Examination of the moon's oscillation may verify the hypothesis of tidal heating.

In conclusion, all three moons have shown a dawn of presence of liquid, which is the basis of any life forms. Enceladus would even be a splendid habitat provided its surface temperature surged. If Cassini's photographs can reveal the secrets of Enceladus' plumes and tidal heating, we will get a meaningful insight into the Saturn system.