

Hayabusa exploration of the solar system

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The potential correlations between asteroids and the meteorites we recover has been widely recognised. In particular, the nature of IR spectra has allowed the possible correlation of S-type asteroids containing ferromagnesian silicate minerals with chondrites, and the correlation of C-type asteroids having a very flat, low-albedo, signature with carbonaceous chondrites. The issue has always been enigmatic because while C-type asteroids are the most common, carbonaceous chondrites comprise one of the rarer classes. The JAXA Hayabusa mission launched in 2003 and set out to visit asteroid Itokawa and bring a sample back. While the touchdowns did not proceed fully as planned, the spacecraft successfully returned to Earth in 2010 in the Woomera desert of Australia. On opening the space capsule, sufficient material was present to clearly identify Itokawa as a parent body of LL chondrites. The success of Hayabusa led to the rapid deployment of Hayabusa2, which launched in 2014. Hayabusa2 performed flawlessly at Ryugu and throughout its travels and returned to Earth in 2020. Samples totalling 5g have been recovered and are now undergoing intensive study prior to an international release later this year. However, preliminary examination reveals that Ryugu is indeed a carbonaceous chondrite parent body, and moreover a parent body for the rare CI chondrites. It is remarkable that the success of the Hayabusa missions has opened up the ability to visit and recover material from asteroidal bodies, and through it the understanding of the makeup of the solar system.