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ROSETTA

Ken Tapping, 5th August, 2014

On the evening of 12 August, people will be in their backyards or at our annual Perseid Star Party to see particles of comet debris burning up in the Earth's atmosphere, leaving glowing tracks in the sky – meteors. Astronomers long suspected that meteor showers are connected with comets. They saw some comets disintegrating while passing close to the Sun, and that showers of meteors often occur when the Earth crosses comet orbits.

However, it was not until 1986, when Halley's Comet last visited the inner Solar System, that we had our first true glimpse of what is going on. The European Space Agency launched a spacecraft named Giotto, after the 13-14th Century artist whose picture of the Nativity had what would later be named Halley's Comet in the background.

As the spacecraft approached, its cameras showed a potato-shaped lump of ice and dust a few kilometres across, emitting jets of vapour and particles, which surrounded the object with a glowing fog; some of that fog was blown outward by the solar wind and sunlight to form the tails that make comets so spectacular. However, Giotto had no means of slowing down, so we just got an extended glimpse as it shot past. Nevertheless, the results were so exciting that another mission was planned, where the spacecraft would rendezvous with a comet and fly along with it as it passes close to the Sun and then outward again. The spacecraft was named "Rosetta", because it is expected to have an impact on our ability to understand comets comparable to the impact the Rosetta Stone had on our ability to read the writing of the ancient Egyptians. Comet Churyumov-Gerasimenko was chosen to be the target. In addition, when it arrives at the comet, the Rosetta spacecraft will release a lander, called Philae (named after an island in the Nile), which will land on the comet's surface. If all goes well, we will see for the first time what happens to a comet as it gets closer to the Sun, with the increasing heat evaporating the comet's material faster and faster.

Putting a lander on the surface of a comet will be nothing like landing something on the surface of the Moon or another planet. The gravitational attraction of a ball of frozen slush a few kilometres across will be very weak. The escape velocity - the speed something has to be thrown upward in order never to come down - is less than 50 centimetres a second, compared with the Earth's escape velocity of 11.2 kilometres a second. You could just jump into orbit from a comet!

The landing will go something like this. Philae will be released and allowed to fall slowly to the comet. The impact speed will be so low that no jets will be needed to slow the descent. The big problem will be to stop the lander bouncing off into space again, maybe falling back upside down. To prevent this a jet will fire on impact, holding the lander down while anchors are pushed deep into the comet's surface. Without them, pushing drills and probes into the comet's surface will be impossible.

Rosetta was launched on 2 March, 2004. After having a close look at the asteroids Stein and Lutetia it was put into hibernation to save power and avoid thermal problems on the long journey to the comet. It was successfully woken up last January and is due to arrive at the comet on 6 August. It will then fire its jets and go into a slow orbit close to the comet, riding along with it as it approaches the Sun. If all goes well it will release the lander in November. We will then get a grandstand view as the comet passes at its closest to the Sun on 13 August, 2015. Observations will continue as the comet moves outward again, returning to the outer Solar System, at least until 31 December, 2015.

Venus shines brightly in the predawn twilight. Saturn lies in the southwest during the evening, with Mars a little lower and further west. The Moon will be Full on the 10th.

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