

Space exploration promises to be spectacular in 2015

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Hey Jupiter and Io, I'm on my way to Pluto. NASA, CC BY

There is no doubt that 2014 was a fantastic year for planetary sciences – the high points were the successful landing of Philae on comet 67P, the discovery of methane by the Curiosity rover on Mars and a doubling in the number of known exoplanets.

As well as scientific advances, there were important technology developments – the arrival of the Mangalyaan spacecraft at Mars signalled that India had become a significant member of the space-faring club of nations. And China continued its inexorable progress in lunar exploration with the successful launch and return of a robotic mission to

the moon.

Despite setbacks in [human space exploration](#), most notably the explosion of Virgin Galactic's SpaceShip Two and the tragic death of its pilot, there were encouraging steps forward, including a successful test flight of NASA's Orion exploration vehicle.

How can 2015 follow these achievements?

Early in the new year, NASA's Dawn mission will approach the largest body in the asteroid belt, [Ceres](#). This stony object is about 1,000 km across and is thought to be almost completely unchanged since its formation some 4.6 billion years ago.

The [New Horizons mission](#) will take increasingly detailed images of Pluto and its moons, leading up to closest approach in July. This mission was launched back in 2006 – when Pluto was still considered a planet. Now Pluto is classified as a Kuiper Belt object (KBO), demoted by the International Astronomical Union a few years ago. The Kuiper Belt, a swarm of many thousands of rocky and icy objects which orbit the sun beyond Neptune, is also presumed to be the location from which many short-period comets originate.

Comets, or at least one comet, 67P Churyumov-Gerasimenko, will continue to hog science headlines, as the Rosetta spacecraft accompanies the comet on its approach towards the sun. By late spring, it is hoped that the Philae lander will have warmed sufficiently for its solar-powered batteries to charge up, allowing the probe to continue its analysis of the cometary nucleus. Even if that does not happen, there will be spectacular images from Rosetta of changes to the comet's surface. Perihelion ([closest approach](#) to the sun) is in August, by which time the comet's tail should be well developed.

The space twins experiment

The Human Space Exploration programme will remain centred on the operation of the International Space Station – especially from March when the NASA astronaut Scott Kelly and the Russian cosmonaut Mikhail Kornienko are due to commence a [one-year mission](#). They will be closely monitored for the effects of lengthy space habitation in preparation for future space travel to Mars. Scott Kelly's twin brother Mark, who is also an astronaut, [will remain on Earth](#) and will be monitored as a terrestrial "control" for the mission. There will be a roster of astronauts joining Kelly and Kornienko, including Tim Peake, the UK's first astronaut to visit the ISS. He will join the crew in November 2015.

Depending on when the launch takes place, Kelly and Kornienko might have a prime view of the total eclipse of the sun, which is due to take place on March 20. The eclipse track is across the northern hemisphere, but only crosses the land masses of [Svalbard and the Faroe Isles](#).

A week before the eclipse, NASA plans to launch the [Magnetosphere MultiScale](#) (MMS) mission into Earth orbit. This is a flotilla of four probes which, broadly speaking, will measure interactions between the solar wind and the Earth's magnetic field. The observations will not only help us to understand (and possibly predict the effects of) space weather, but will also cast light on behaviour of turbulent plasmas in other environments, such as close to black holes.

So 2015 promises many exciting events – and these are only the ones which are planned. The excitement of planetary sciences is that we don't know what else might be in store. A new, bright comet might swim into view, an Earth-sized exoplanet with an oxygen-rich atmosphere might be discovered, or a meteorite might hit the Earth, bringing fresh information about our origins.

No-one knows what is in store – but I wish that whatever your field all your systems will be nominal.

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