

## Reaching for the stars

by Bethan Cable Issue 943

**2011 is set to be a seminal year for space exploration, Bethan Cable takes a look at what the major space agencies have in store for the year ahead.**

**Less than two full months into 2011, and already the year is shaping up to be full of groundbreaking moments when it comes to space exploration. Whether it's a mission to Mars, the first simultaneous observation of both sides of the sun, or the possibility of sending a space station to an asteroid, 2011 looks set to be full of new discoveries, new missions and new surprises.**

Four and a half years ago, NASA launched the two STEREO (Solar Terrestrial Relations Observatory) spacecraft from Cape Canaveral in Florida. The spacecrafts' mission was to capture stereoscopic (3D) images of the Sun and solar phenomena, such as coronal mass ejections, by circling them on two different orbits, effectively allowing views that can look at both sides of space phenomena at once. Over time, the satellites will orbit further and further apart, and are expected to approach Earth again some time in 2023, but will never return to Earth.

Initially used to search for Langranian (or Trojan) asteroids, which are minor planets or moons thought to be orbiting Earth, the major phase of their mission began last week. On February 6, the STEREO satellites were 180 degrees apart (on opposite sides of Earth's orbit), which finally allowed both sides of the Sun to be viewed simultaneously for the first time. Combined with an Earth-based view (from observatories such as the Solar Dynamics Observatory launched last year), STEREO will allow observations of the whole Sun for several years, allowing NASA's scientists to directly monitor the Sun for solar flares and, more importantly, coronal mass ejections (CMEs).

CMEs, which are huge bursts of magnetic fields, solar plasma and solar winds frequently ejected far into space by the Sun, are hugely dangerous. They have the potential to disrupt Earth's communication systems, power grids and satellites – they may even damage aircraft due to interference with communication systems and exposing passengers to intense radiation.

Since the Sun rotates every twenty-five days, half of it is completely unviewable for days at a time – STEREO means that this will not be a problem for several years, and will allow scientists to monitor the build-up of sunspots which are believed to be linked to CMEs. Information from STEREO is already being used to help build forecasts of solar activity for airlines, power companies, satellite operators, and others.

When he came to power in 2009, the US's President Obama threw out George W. Bush's original plan to return humans to the moon by 2020; in April last year, he instead proposed to send astronauts to an asteroid by 2025. NASA has been trying to work out the details of how to fulfil this plan ever since, and last year held a conference on the topic in Washington, DC. According to the New Scientist, NASA is considering using part of the International Space Station to build a spaceship that could be sent to an asteroid when the 100 billion-dollar Space Station is retired in 2020. One of its crew compartments could be used to build a capsule that would be launched from orbit, rather than launching a new spaceship from Earth – not a bad bit of recycling, given how much the original is worth.

The conference last year also promoted a very novel method of creating artificial gravity in space, by rotating two spaceships around each other. As well as allowing astronauts to walk, rather than float, the artificial gravity would reduce the bone and muscle-loss astronauts now suffer as a result of long space missions.

However, NASA emphasised that this idea was more of a concept than a real plan, so anyone hoping to see the spaceships of Star Trek or 2001: A Space Odyssey become a reality should probably not hold their breath.

Not to be left out, the Russian Institute of Biomedical Problems, is running a simulated mission to Mars with the help of the European Space Agency (ESA). Mars500, so-called because it simulates the plausible length of a real mission to Mars, 250 days to get there, 30 days on the surface, and 240 days to get back (a total of 520, but Mars520 doesn't sound quite as snappy a title), is made up of six 'astronauts' who have been sealed since June in a simulated spaceship made up of steel containers.

On Valentine's Day, three of the group are due to 'descend' to the surface of Mars – actually the sandy floor of another module at the Moscow-based experiment – for the first time, wearing real spacesuits and carrying out the kind of experiments that would be done on a real mission to Mars. The experiment, which aims to study the likely physiological and psychological impacts of a genuine trip to Mars or other long-duration spaceflight, is intended to simulate as closely as possible the genuine conditions of such a trip. The six men – three Russians, two EU citizens and a Chinese national – are due to 'return to Earth' in November this year.

Finally, astronomers were 'stunned' this month to discover six exoplanets orbiting a star 2000 light-years away, a set-up very much similar to our own solar system of eight planets orbiting the sun. Although the planets are likely to all be too hot to support life, as they all orbit closer to their star than Mercury orbits to our own, the Sun, the information forms part of the latest data release from the Kepler space telescope.

According to the leader of the study, Dr Jack Lissauer, the new information from Kepler, challenges the previously-held theory that planets form by coalescing from the debris around young stars and 'bump' into each other violently which casts them into irregular elliptical orbits. In January, the Kepler team announced that Kepler had found the first definitely rocky exoplanet, Kepler-10 – a milestone in the search for the other planets that could support life.