

Microlensing detects most Earth-like exoplanet

A planet of a mass of only about five times that of the Earth has been discovered at a distance of about 20 000 light years, not far from the centre of the Milky Way. It circles its parent low-mass star in about 10 years at more than three times the Sun–Earth distance. The planet must therefore be very cool with an estimated temperature of -220°C . The lightest extra-solar planet ever detected around a normal star, it may have a thin atmosphere, like the Earth, but its rocky surface is probably deeply buried beneath frozen oceans. It may therefore more closely resemble a more massive version of Pluto, rather than the rocky inner planets such as Earth and Venus.

Since the discovery in 1995 of the first planet orbiting a star other than the Sun, nearly two hundred extra-solar planets (or exoplanets) have been detected (*CERN Courier* October 2004 p19). Almost all of them orbit nearby stars and have been detected using the radial velocity method, which measures the wobble of the star induced by the gravitational pull of the orbiting planet. However, the newly discovered planet, designated as OGLE-2005-BLG-390Lb, is only the third planet to be discovered through



Artist's impression of the exoplanet and its parent star. (Courtesy ESO.)

gravitational microlensing, an effect noted by Albert Einstein in 1912.

The planet was detected because it crossed the line of sight to a background star. By moving exactly in front of the remote star, the mass of the planet and its parent star distort space–time locally and act as lenses, focusing the light of the background star and making it appear brighter.

The first indication of the discovery was the brightening of a star first noticed by the Optical Gravitational Lensing Experiment (OGLE) on 11 July 2005, although it was just one out of about 500 microlensing events detected each year by scanning most of the central Milky Way

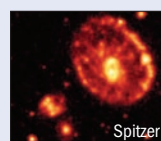
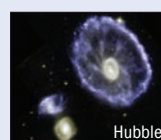
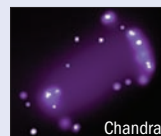
every night. These events are owing to intervening stars and last about a month. Any planet orbiting a star can produce a small additional signal, lasting days for giant planets down to hours for Earth-mass planets. To detect the signature of low-mass planets, astronomers must observe these events more frequently than OGLE's one survey a night. This was done by an international collaboration called the Probing Lensing Anomalies Network, which is able to observe 24 hours a day with a set of telescopes distributed all around the world. The signal of the small planet was detected during the night of 10–11 August 2005 mainly with the Australian Perth telescope and the Danish telescope at La Silla, Chile.

Microlensing is probably the only method currently capable of detecting planets similar to Earth, which are the most difficult to detect. That the third planet discovered this way is a low-mass planet is encouraging and could mean that they are more common than their larger, Jupiter-like brethren. The quest to find a twin for Earth continues.

Further reading:

J-P Beaulieu *et al.* 2006 *Nature* **439** 437.

Picture of the month



Composite image (left) of the Cartwheel Galaxy, combining data from four different observatories: the Chandra X-ray Observatory (X-rays/purple); the Galaxy Evolution Explorer (GALEX) satellite (ultraviolet/blue); the Hubble Space Telescope (visible/green); the Spitzer Space Telescope (infrared/red). The unique shape of the Cartwheel Galaxy with its huge rim – larger than the diameter of the Milky Way – is likely to be due to a violent frontal collision with the bluish smaller galaxy on the lower left several hundred million years ago. The smaller galaxy produced compression waves in the gas of the Cartwheel as it plunged through it. These compression waves triggered bursts of star formation, which lit up the Cartwheel's rim (*CERN Courier* June 2004 p15). The insets to the right show how each telescope views the Cartwheel in original colours. (Courtesy NASA/JPL/Caltech/P Appleton *et al.*)