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Getting a fix on exoplanets

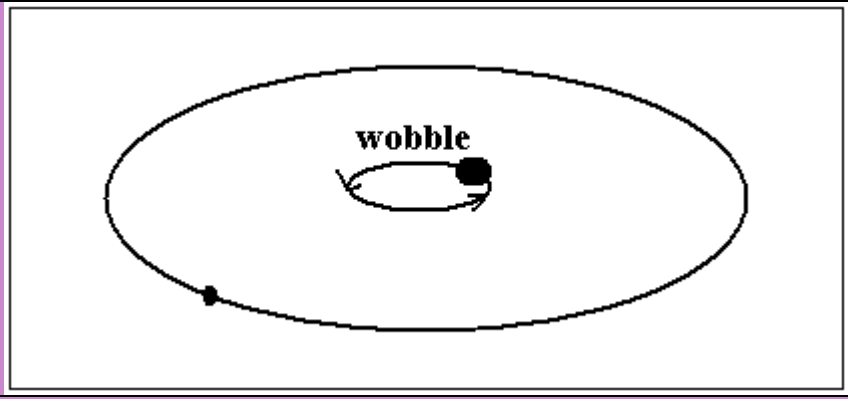
The quest for earth-like planets may have taken a little step forward, says S.Ananthanarayanan.

Most space exploration has at its deep centre the hope that we may discover a planet that is like our own earth and maybe has people like ourselves. The laws of science and probability rule strongly against such the second hope, but the first is certainly possible and we seem to inch closer day by day!

Extra-solar planets.

We know, of course, that none of the planets in our own solar system can support life, as we understand it, or at least that there is no evidence of anything of the sort. But there is every possibility that there is in some other solar system a planet just like the earth. And even if life like our own has not evolved there, it may be a refuge if things get too uncomfortable. This can happen due to overcrowding, war or even some unsupportable weather change.

The trouble is with spotting such a planet in any planet system around a star. As it is the nearest star to the earth, Proxima Centauris, is a good 4 light years away. The star itself is barely visible, what to say of an earth size planet? The other problem is that if there were such a planet and we trained a good telescope on the planet, the glare from the millions of times brighter star would make the planet quite invisible.

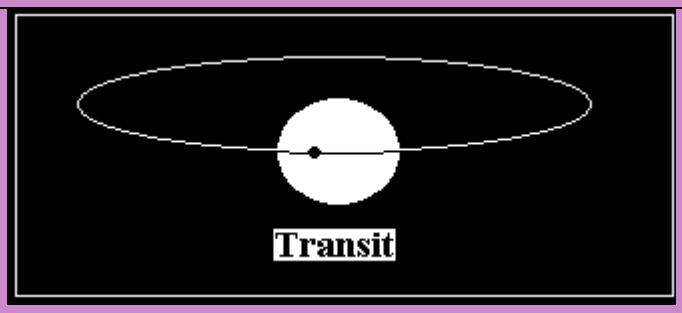


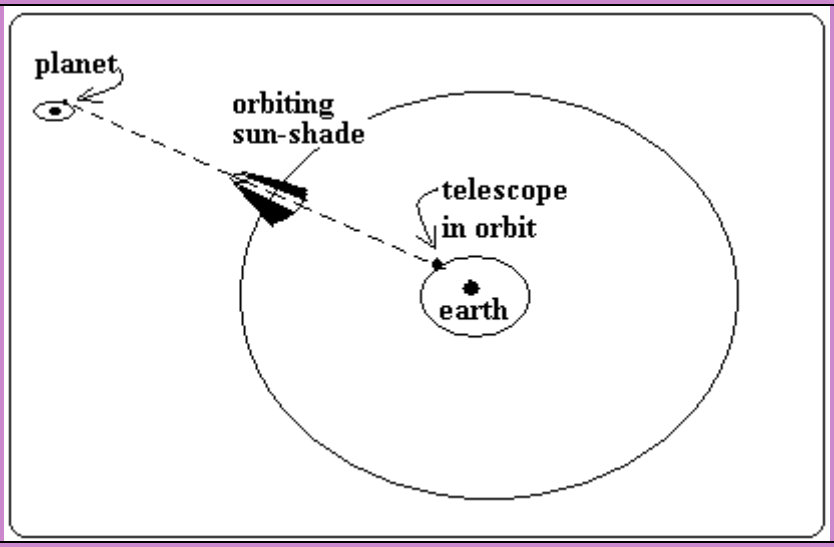
The only method to view planets of faraway stars has been by deduction, from the wobble in the motion of the star. In the star-planet system, each affects the motion of the other – although the planet seems to go around the star, in fact the star also goes around the planet, but in a much smaller circle. The result is that if a star has a planet, then the star moves forwards and backwards, with respect to us on earth, a little. This motion can be detected by changes in the wavelength of light coming from the star. And from this the size and orbit of the planet can be worked out.

The trouble is that this is practical only with very large planets or with approaches very close to the star. Both these conditions are non-earth-like.

Other methods

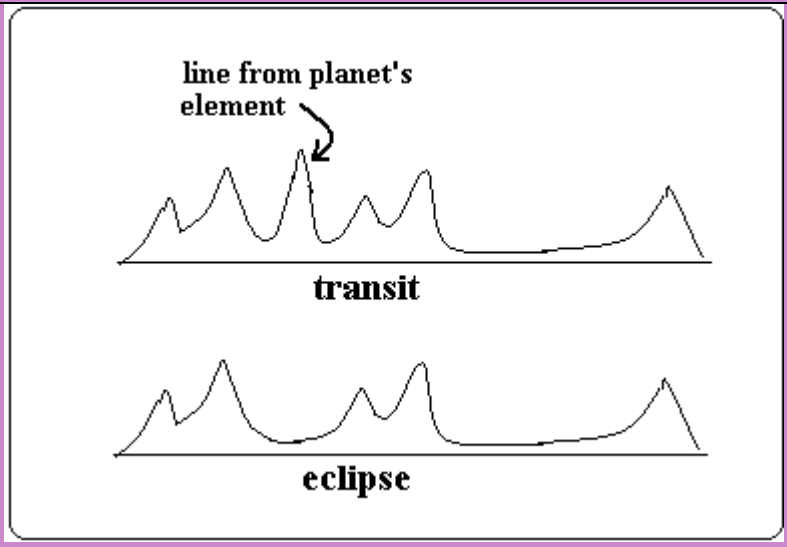
Another method that has been successful is to observe the transit of the planet across the star. The transit is known to cause a tiny drop in the quantity of light coming in from the star and instruments are sensitive enough to detect the fact.





But this again does not reveal the details of the planet. Yet another method, in theory, so far, is to use a 'sun-shade' out in space, to block out the glare from the star. But a proper look at an 'exoplanet', as it is called, has not so far been possible.

Spectral method



But yet another method is to look carefully at the spectrum of the light when the planet is transiting and when it is eclipsed – that is, when it there, in front of the star and again when it is hidden behind the star. It turns out that the chemical elements present in the planet, and different from those in the star, would emit clear spectral lines that would be missing when the plant is hidden.

Nature reports this week the work of scientists in Goddard Space Flight Centre, USA. They used this method, during predicted eclipses in July 2005, to detect emission from the planet at a particular wavelength, in the infra red region. They have been able to establish that this should be from silicate clouds around the planet – the first time such a detail of an expoplanet has become known!