Venus' transit and the search for other worlds

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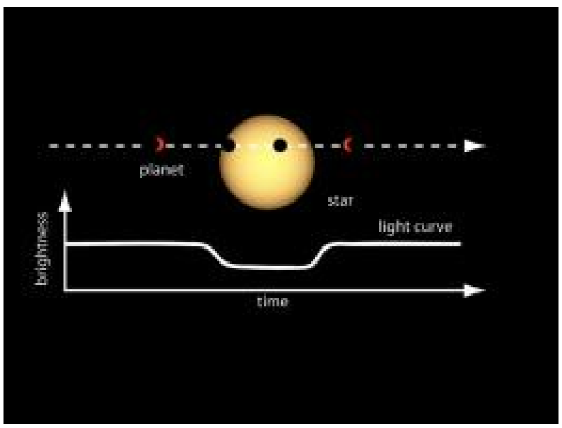
The first recorded transit of Venus: William Crabtree (1610-1644) was an astronomer, mathematician, and merchant from what is now Greater Manchester, England. He was one of only two people to observe and record the first predicted transit of Venus in 1639. Credit: Ford Madox Brown, mural at Manchester Town Hall.

(Phys.org) -- It's the final opportunity of the century to witness the rare astronomical reunion of the sun, Venus and Earth. On Tuesday, June 5 or 6, 2012 depending on your location, Venus will make its presence in the solar system visible from Earth’s day side. Viewers will see Venus as a small dot slowly drifting across the golden disk of the sun.

Transits of Venus are very rare, separated by more than a hundred years. There have been 53 transits since 2000 B.C. but only six have been witnessed since the invention of the telescope in 1608. These rare events occur in pairs, with the first transit occurring June 8, 2004. The next opportunity won't be until Dec. 10-11, 2117.

Jeremiah Horrocks and William Crabtree, two young astronomers from England, recorded the first observation of a transit in 1639. In 1769, survey crews, including Captain James Cook, gathered transit data from various locations around the world that were later used to calculate the distance between Earth and the sun, thereby establishing the solar system's scale.



Light curve of a planet transiting its star: Transit data are rich with information. By measuring the depth of the dip in brightness and knowing the size of the star, scientists can determine the size or radius of the planet. The orbital period of the planet can be determined by measuring the elapsed time between transits. Once the orbital period is known, Kepler's Third Law of Planetary Motion can be applied to determine the average distance of the planet from its stars. Credit: NASA Ames

"Throughout history, astronomers have creatively used nature's coincidences as opportunities to learn something new about the universe," said Natalie Batalha, Kepler mission scientist at NASA Ames

Research Center, Moffett Field, Calif. "Today is no different. As Venus crosses the disk of the sun, her shadow sweeps across the face of Earth in the same way that the shadows cast by distant exoplanets sweep across the face of the Kepler photometer."

Today, transit events are used to detect planets beyond the solar system. NASA's Kepler space telescope continuously measures changes in brightness of more than 150,000 stars to detect when a planet passes or transits in front of a star. Kepler does not directly image distant planets, as they are too far away.

Different size planets block different amounts of starlight. Kepler's exquisitely precise photometer, or light sensor, is designed to detect fractional changes in brightness. For an Earth-size planet transiting a sun-like star, the change in brightness is only 84 parts per million. That is less than 1/100th of one percent, or the equivalent of the amount of light blocked if a gnat crawled across a car’s headlight viewed from several miles away.

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Using the transit method, the Kepler mission has identified 61 planets and more than 2,300 planet candidates during the spacecraft's first 16 months of observation from May 2009 to September 2010.

Provided by JPL/NASA