

## Modern solar telescope network's view of Venus passage will help students use web to recall historical era

A global network of telescopes designed to watch the Sun's atmosphere pulsate will be pressed into service on June 8, 2004, to help students recreate early measurements of our solar system. It will also help solar scientists determine which way is "up."

The telescopes will record the transit of Venus as it crosses in front of the Sun. Transits once were the most valued of astronomical events, a rare chance for astronomers to size up the solar system. Today it is an opportunity to involve science teachers and students in studying both the Sun and mathematics.

The observations will be made by three of the six telescopes in the Global Oscillation Network Group (GONG).

The National Solar Observatory operates GONG under contract to the National Science Foundation.

Transits occur when Mercury or Venus passes between Earth and Sun. The timing is complex and depends on the relative motions of Earth and the other planet. Transits of Venus are rare, only six times in the last four centuries. The last was 1882; the next is in 2012, then in 2117.

In the 17th century, pioneering work by Jeremiah Horrocks (an English astronomer) and James Gregory (a Scottish astronomer) demonstrated that the transits could be used to determine the Earth-Sun distance. In 1716 Sir Edmund Halley published "A new Method of determining the

Parallax of the Sun, or his Distance from the Earth" by using many observational stations spread over the world. But Halley's own expedition in 1677 to observe the transit of Mercury came to naught when bad weather in England deprived him of half of the needed observations.

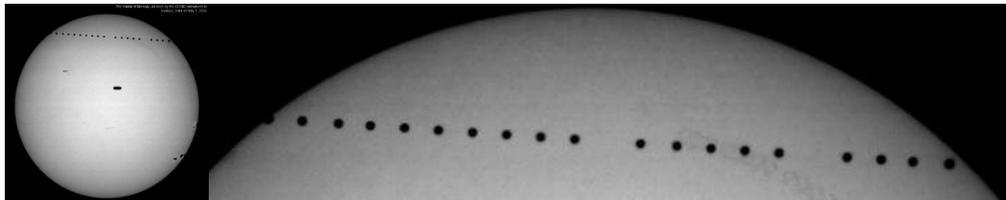
Several nations mounted expeditions in 1761 and 1769 to observe the transits of Venus. Using those data, Joseph Jérôme Lalande of France in 1771 calculated the Earth-Sun distance at 153 million km (95 million mi.), just 3.4 million km (2 million mi.) off the correct average number, 149,597,871 km (92,750,680 mi.). Today, radar ranging to the planets and tracking of deep space probes have relegated transits to reminders of the pioneering days of astronomy.

But GONG's constant watch on the Sun means that we don't have to mount a special expedition. For almost any transit event, at least one GONG station will see the entire transit, and two will see it at sunrise or sunset. As with last year's transit of Mercury, the eastern United States will only see it at sunrise, and the Southwest will miss the whole show.

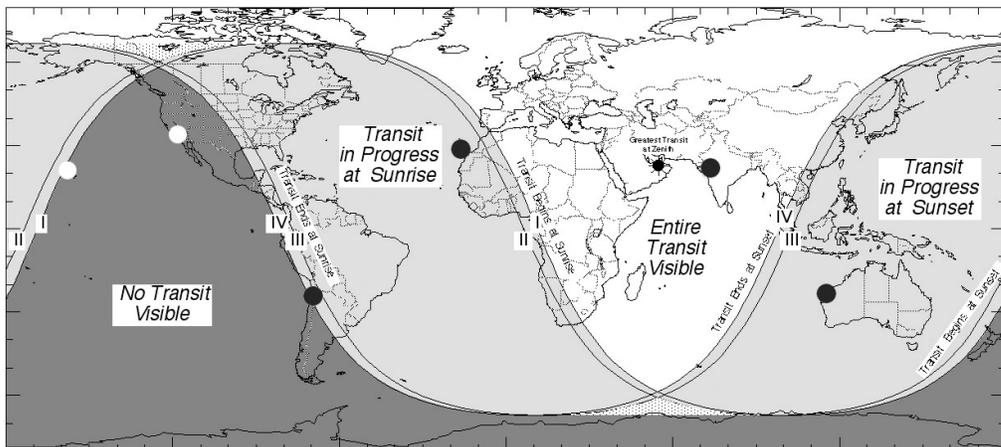
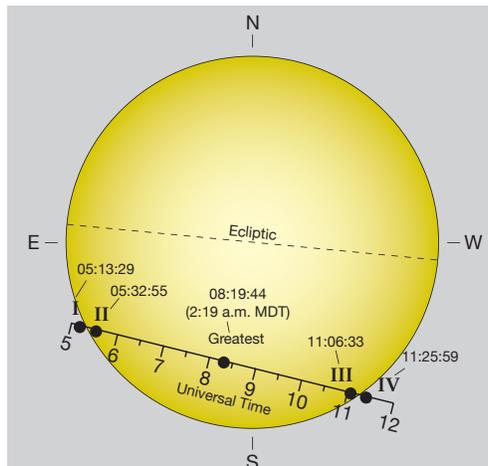
Dr. John Leibacher, the GONG program director in Tucson, AZ, said "It is of important practical use to us in establishing the precise orientation of the images taken with different GONG telescopes around the world."

GONG was designed to measure the pulsations of the visible surface of the Sun's atmosphere as it rings like a bell with millions of different harmonic notes. After the transit, the GONG team will prepare an educational CD-ROM with raw transit images taken every minute for a total of more than 300 images. Students can learn the triangulation method — which is outlined on the CD — and how to measure the Earth-Sun distance from planetary transits.

For information on availability of the GONG transit CDs, visit the GONG web site (<http://gong.nso.edu>).



Composite image (above) depicts the May 2003 transit of Mercury as seen by the GONG station in India. The transit of Venus will cut a line across the southern hemisphere of the Sun (right). Actual positions of Venus against the solar disk will vary with the observer's location on Earth, hence the value of such observations to early astronomers trying to gauge the size of the solar system. Of the six GONG stations (below), only Australia, India, and the Canary Islands will have a good view of the transit. The station in Chile may have a brief view at sunrise, while those in California and Hawaii will be in the dark. (Photo by GONG/NSO/NSF; Maps by Fred Espenak, NASA/GSFC)



### CAUTION

It is exceptionally dangerous to view the Sun without the right equipment. Blindness or painful, permanent eye damage will result.