Universitat de Barcelona

MIRALCEL

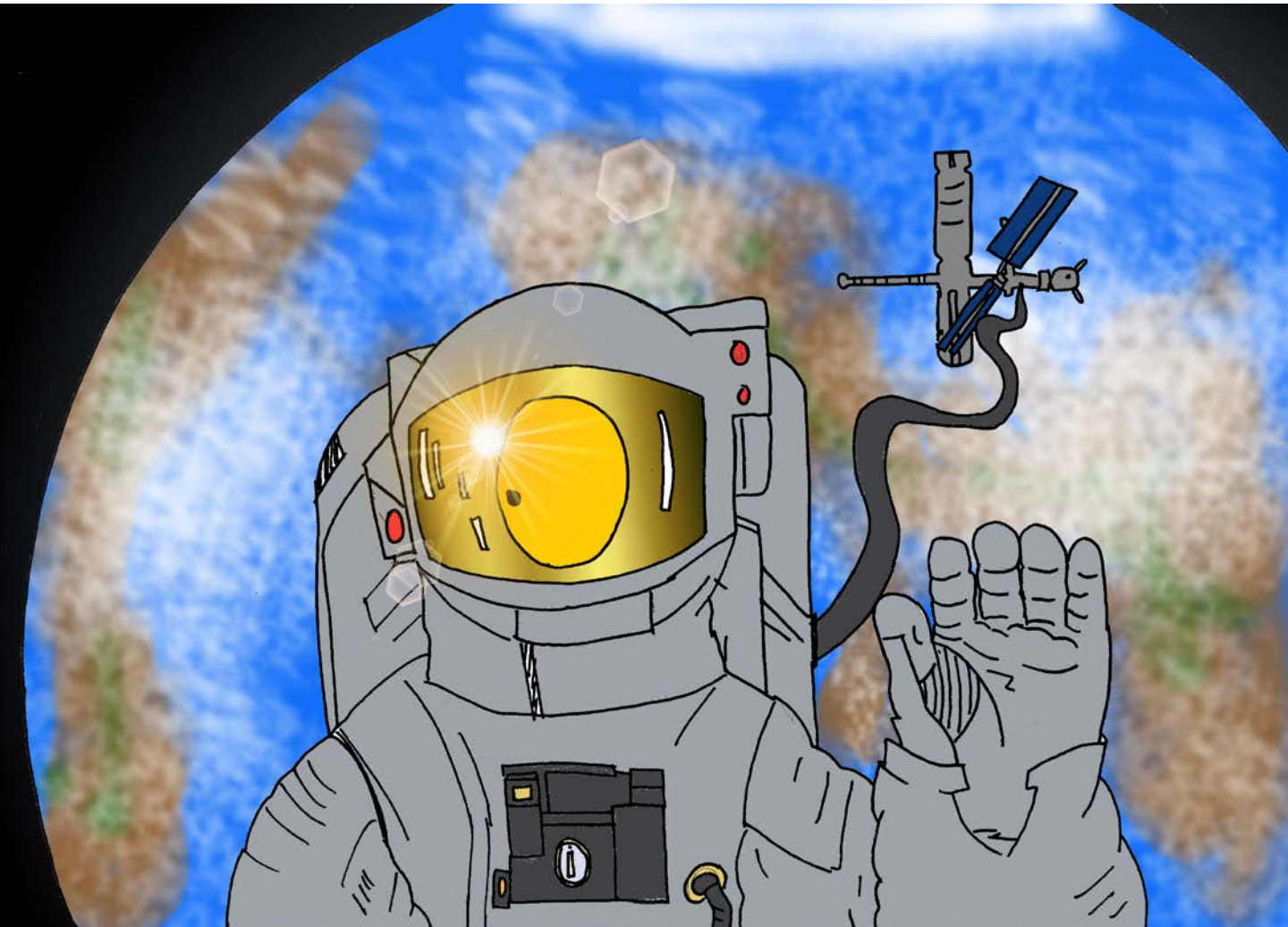
Transit of Mercury 9-05-2016

http://mercurio2016.ub.edu

The comic strip of transits

Josep Manel Carrasco & Jordi Del Río

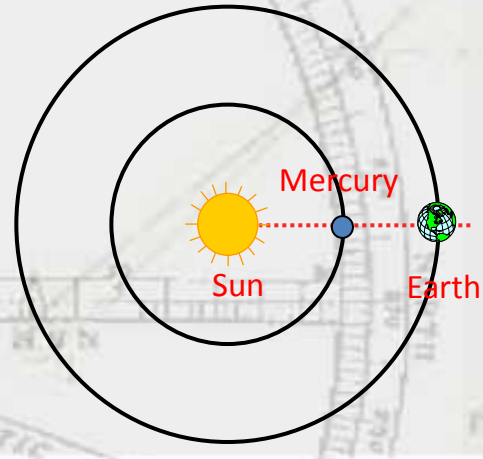
(from a text by Salvador Ribas)



Dear reader:

On 9th of May of 2016 a Mercury transit is going to happen. A transit is when a planet, or any other heavenly body passes in front of the Sun. Among all planets in the solar system, only Mercury and Venus, as they are closer to the Sun than Earth, can transit in front of the Sun from our point of view.

2003 Mercury transit as seen from Barcelona



During a transit, Venus, the Sun and the Earth are aligned

Planetary transits have been very important during the history of astronomy, as they were used to determine the distance to the Sun for the first time. In order to know the distance to the Sun the same transit need to be observed from different places on Earth.

This comic strip explains the different missions organized during XVIII and XIX centuries for this purpose and the problems they found.

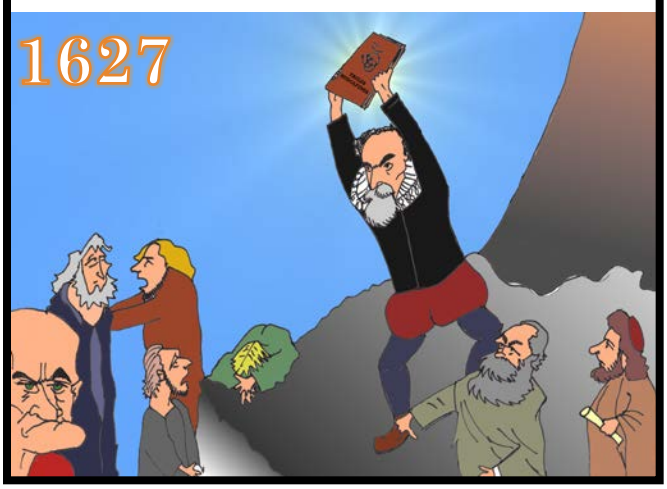
If you want to learn more things about the planetary transits or how they could be used to know the distance to the Sun, you can visit the following web page: http://mercurio2016.ub.edu/.

The authors

In order to predict Venus transits, we need to make very difficult computations. This is the reason why they couldn't be observed until the XVII century.

Thanks to the very detailed and systematic observations of the planets by Tycho Brahe, this situation could finally change.

Using Tycho's observations, Johannes Kepler could write his Rudolphine Tables and his famous 3 laws describing the motion of the planets.

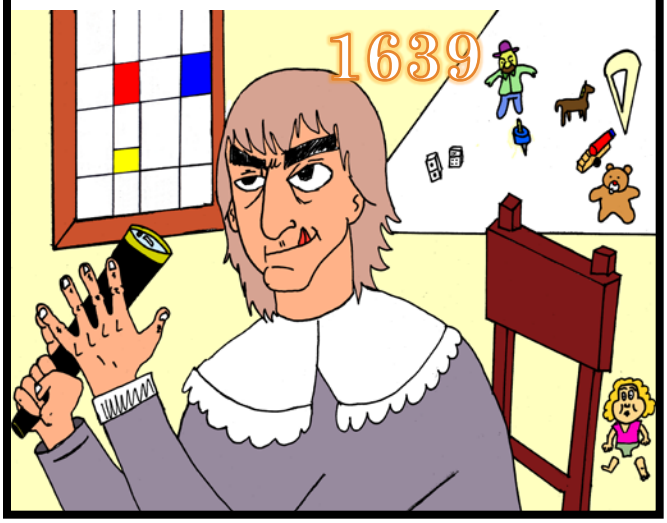


With Rudolphine Tables, Kepler was able to predict the transits of Venus and Mercury observed in 1631. Pierre Gassendi observed Mercury transit from Paris.

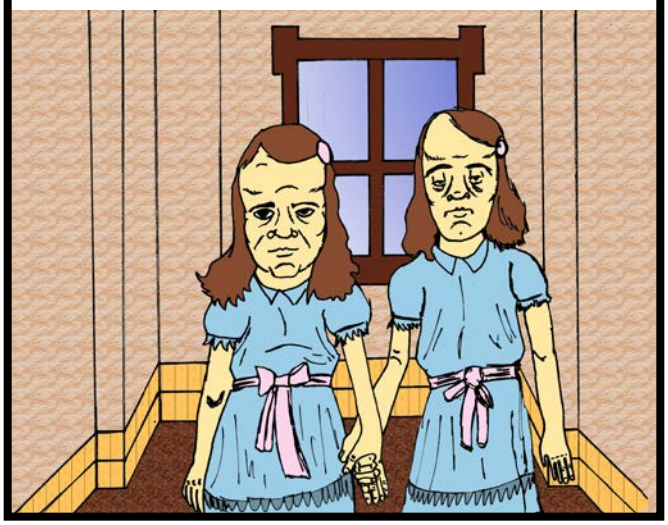
The same transit of Mercury was observed by father Cysatus (jesuit) from Tyrol, Remus Quietanus from Alsace and other anonymous jesuit observers from Bavaria.

The transit of Venus, in that same year, although, couldn't be observed from Europe, as it happened during the night.

A young man, named Jeremiah Horrocks, predicted the next Venus transit to be produced during the 4th December in 1639.



Horrock's prediction confirmed that transits of Venus happen in pairs, separated 8 years, and after that we need to wait 105 or 121 years to see the next two.



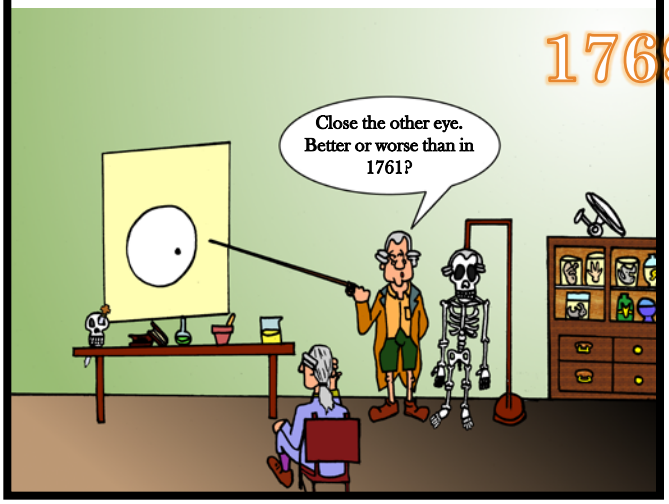
Horrocks observed the transit projecting the light into a screen and was the first one to derive the apparent size of Venus compared with the Sun.

William Cabtree also observed that Venus transit from Cambridge. But he was so amazed by the phenomena that he forgot to take any measurements.

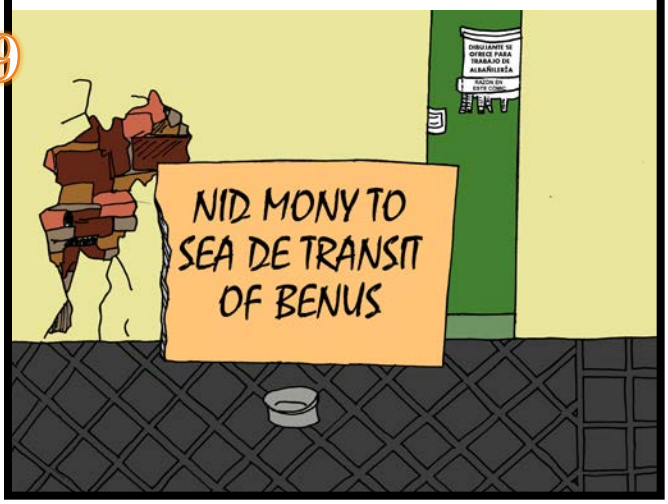
Edmond Halley observed a transit of Mercury in 1677, and he suggested a method that could be used to derive the distance from Earth to the Sun.

Halley's method (and another very similar proposed by Delisle) neede to observe the same transit of Venus from very different latitudes, at diferents places on Earth.

The 1761 and 1769 transits were used as tests for Halley's method, measuring the duration of the transits from different places.

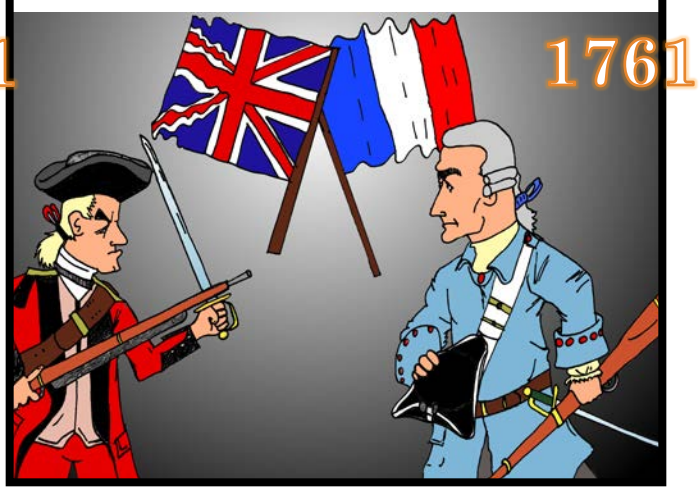


With these proposals, it was very common to organize international expeditions with astronomical purposes.

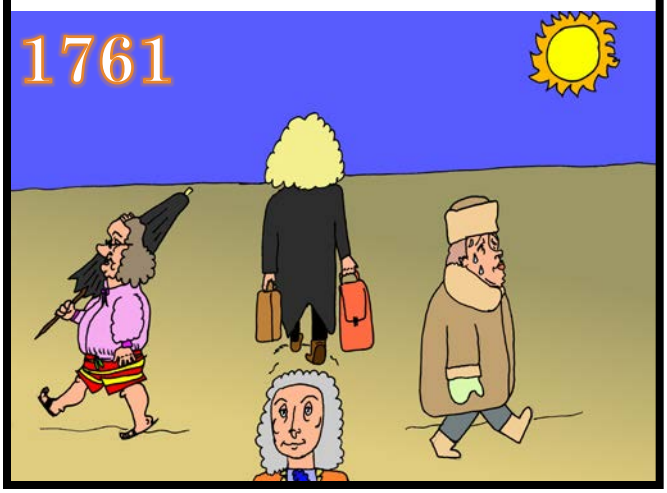


The transit of 6th Juny 1761, visible from Asia, Pacific Ocean, Europe and Africa, was very good training for scientist.

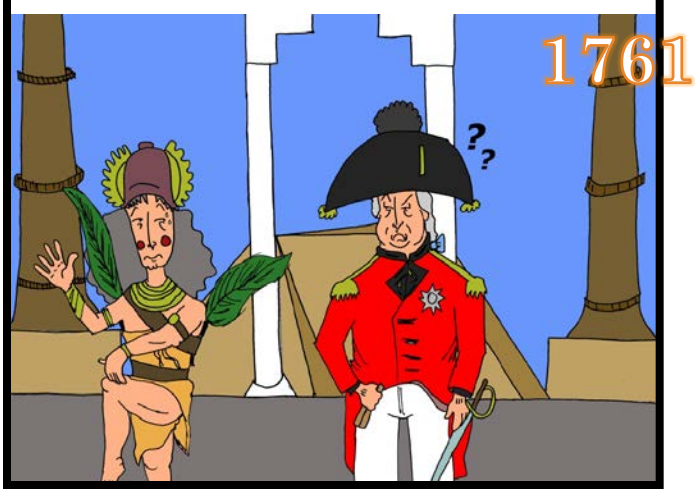
French Science Academy sent four different expeditions to countries friendly to France, during the 7 years war against England.



France sent expeditions to Viena (C. de Thury), to Siberia (Chappe de Auteroche), to Madagascar (Pingré) and India (Le Gentil).



Le Gentil had to run away from Pondichery (India) as English soldiers were occupying the territory and they killed all French people they found. He had to wait for the next transit in 1769 in Mauricio.



England sent an expedition to Saint Helene island, leaded by Maskelyne, but bad weather didn't allow the observation of the transit.

A second english team, leaded by Mason, Bradley and Dixon, as France was occupying Sumatra, had to observe from Cape Town.

In total, 120 astronomers from all around the world observed 1761 transit from 60 different places.

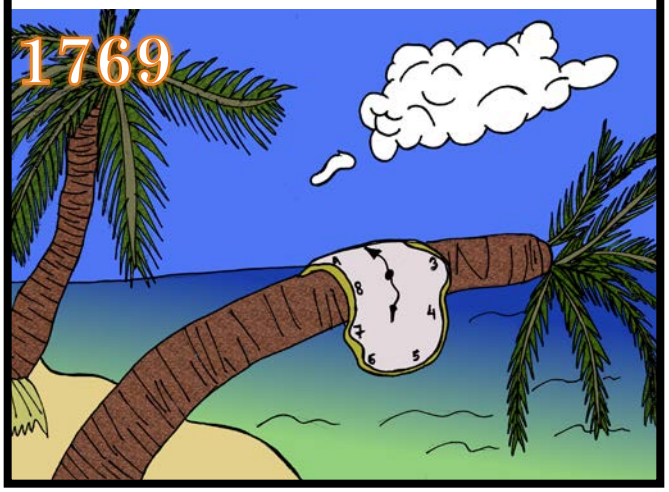
Black drop effect didn't allow a precise determination of the contact times. The effect of venusian atmosphere could begin to be suspected from transit observations.

For 3rd June 1769 transit, Le Gentil tried again to go to India. But bad weather didn't allow the observation. Two trials, zero success.

Chappe swapped Siberia for San José (Baja California) with Pauly, Noël, Dubois and spanish Vicente de Doz and Salvador de Medina.

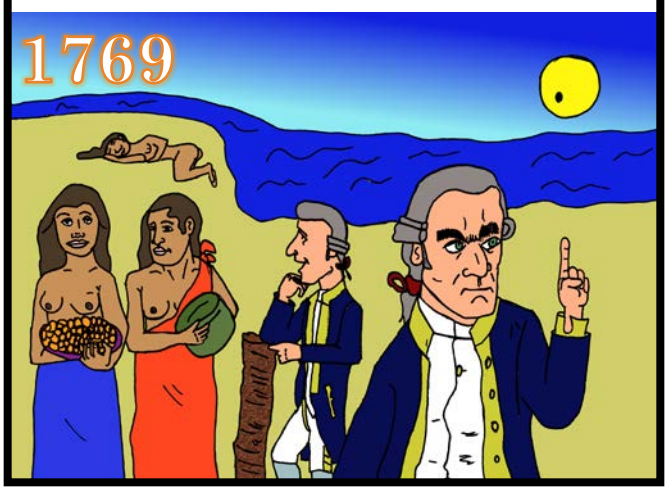
Chappe could observe the transit and Moon eclipse in 18th of June, but typhus disease killed all most of the expedition.

Finally, Pingré changed Madagascar for Santo Domingo, and he could do some tests with navigation clocks, and he could also successfully observe the transit.

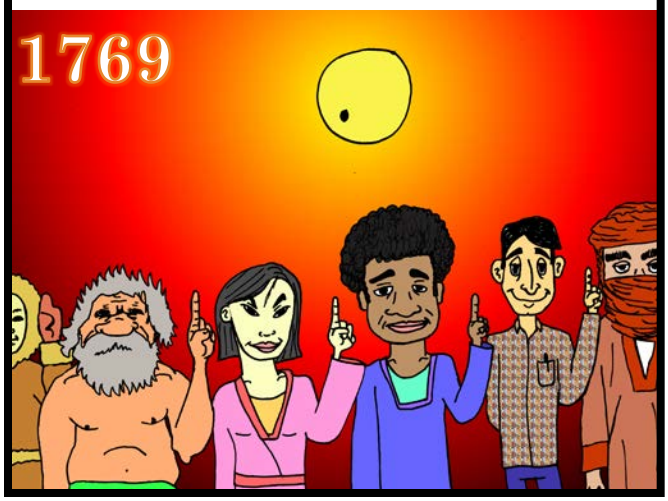


England sent one expedition to Hudson Bay (Dymon & Wales) and to Vardö, to the north of Scandinavia, in north pole region (Hell & Horrebow).

But the most famous expedition was the one leaded by captain James Cook, still unknown at that time, to Tahití, where he could successfully observe the transit.

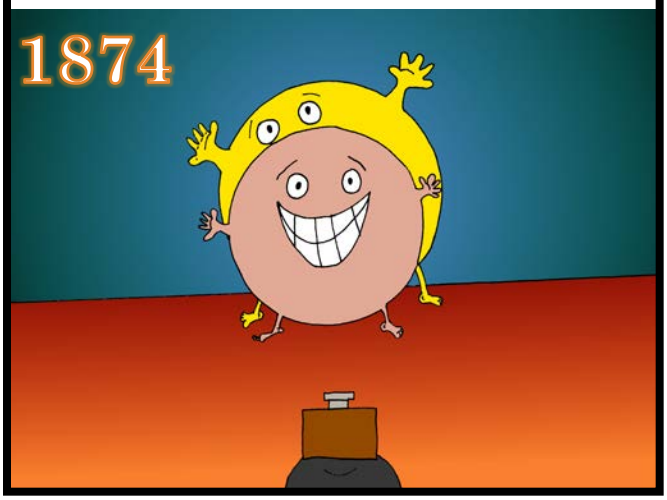


The growing interest led to other countries getting involved and finally, more than 150 observers combined their efforts to determine the distance to the Sun.

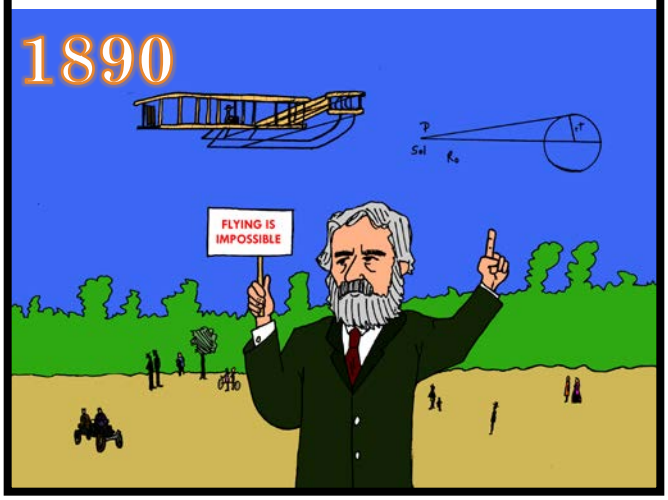


For the 1874 transit of Venus, visible from Oceania and Africa, the technological advances, allowed more and better expeditions.

France took advantage of the recently invented photography, and the 1874 transit was the first when real images were taken of the transit.

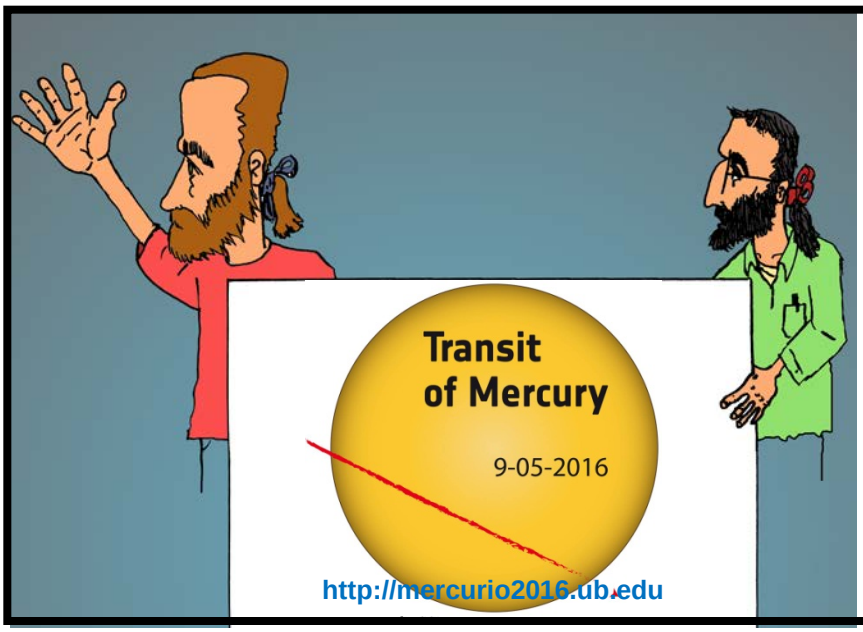


Collecting data from 1882 transit and all previously obtained, Simon Newcomb could finally derive a precise value for the distance to the Sun.

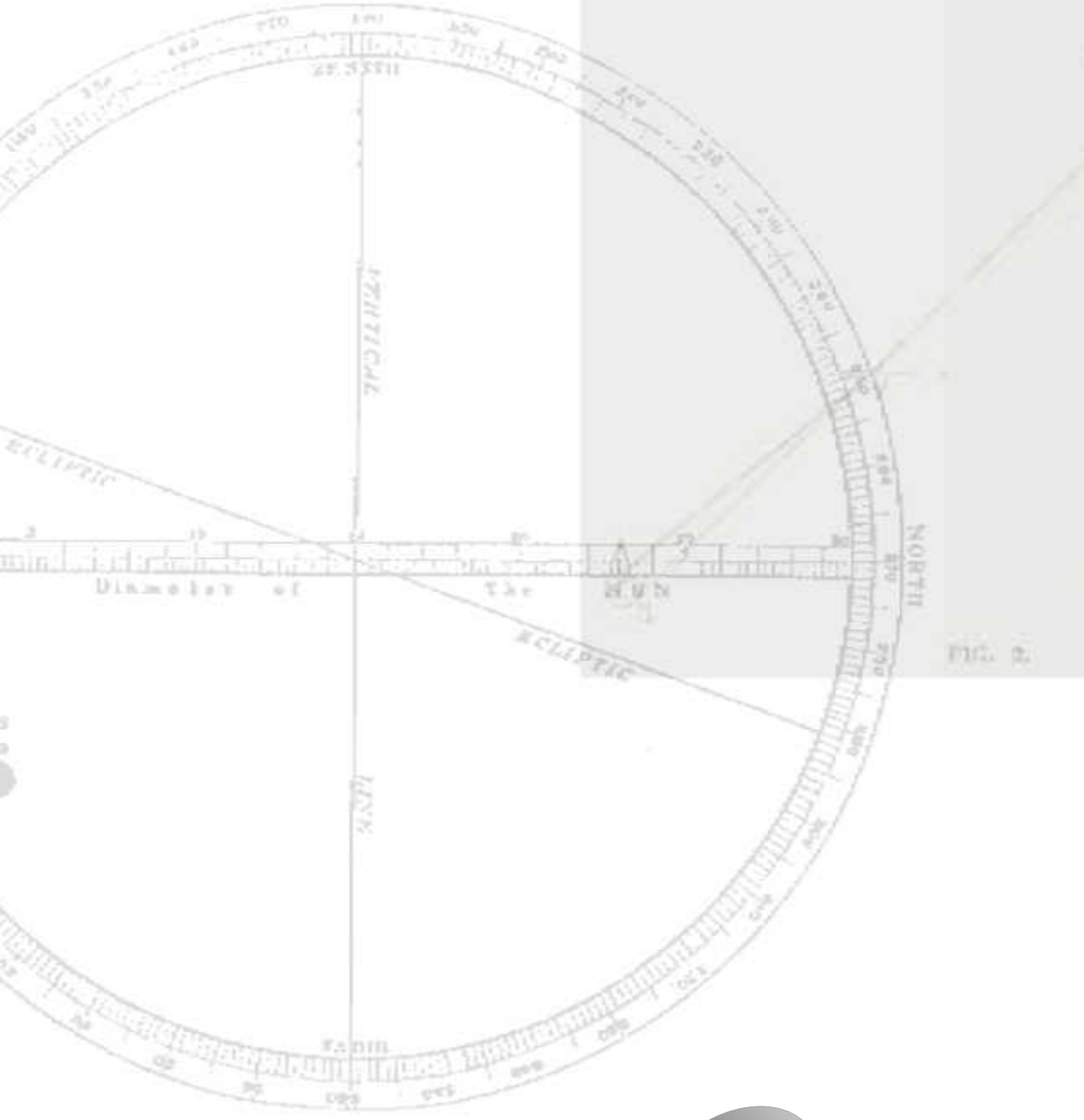


Nowadays, we know the distance to the Sun very accurately. The most precise technique uses radar, but other methods, such as Mars or asteroid observations have also been used to refine the distance to the Sun.

The distance to the Sun is 150 millions kilometers. If we travel by car, at 120 km/h, it would take 142 years to reach the Sun. Light makes this trip in only 8 minutes and 19 seconds.



21st century began with a lot of astronomial events observable from Europe.
In May 2003 we could see a transit of Mercury.
One year after that, in June 2004, we could see a transit of Venus.
5-6 June 2012, we could see the last transit of Venus of our lifetimes. The next one will be in 2117.
On 9th of May 2016, we have a new opportunity to observe a transit of Mercury
Now it is our time to write the History!



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