

VENUS TRANSIT 2004: A TREMENDOUS SUCCESS!

HENRI BOFFIN & RICHARD WEST (ESO)

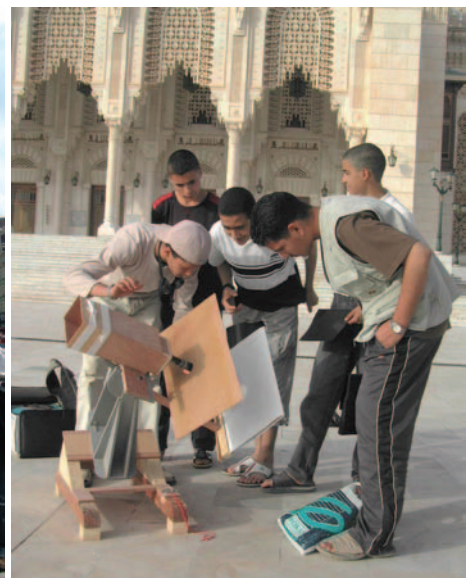
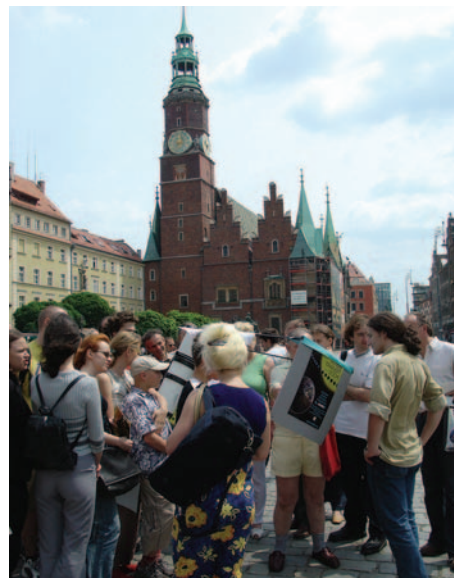
On June 8, a large part of the world shared a unique sight never seen before by any person now living. During a little more than six hours, planet Venus crossed the face of the Sun, offering a wonderful show for everybody to admire. And luckily, the observing conditions were rather favourable in large areas of the world.

Reports received testify to an extremely large numbers of public events spread over all continents. It appears that even the VT-2004 National Nodes, set up by the VT-2004 programme to, among others, provide access to comprehensive guides to events in their respective regions and countries in the local languages via their individual web-sites, are still struggling to get the full picture in their own area. Many events were indeed organized by the VT-2004 National Nodes and by other VT-2004 Network Members. Just to give a small hint of what was going on, here are some brief excerpts from recent reports by a few of the VT-2004 National Nodes:

Germany: Among the many public events, the most spectacular one in this country may have been that in the castle garden of Schwetzingen (a city close to Mannheim), organised by the most important astronomical institutions and publishers of astronomical journals in that region – the site was specially chosen as the Venus Transit was observed from here on June 6, 1761.

Hungary: Observations and demonstrations in high schools were organized by the Hungarian Astronomical Association (HAA) with the help of the Hungarian Schoolnet Physics Section. Visual, photographic and video observations were eagerly planned by dozens of active observers and co-ordinated by the Occultation Section of the Hungarian Astronomical Association. A member of the Association travelled to northern Norway to observe the transit from Vardø, i.e., the observing site of the famous expedition by Maximilian Hell in 1769. There were also Hungarian observers in Australia and Brazil.

Malta: Observations of the Venus Transit were held in the capital city Valletta in one of its recently restored public gardens, the Upper Barrakka Gardens which were used in the 16–17th centuries by the Knights of Malta.



A few examples of Venus Transit public events all around the world: Reckange/Mess (Luxembourg), Karditsa (Greece), Wroclaw (Poland), Constantine (Algeria), Dublin (Ireland), and Cologne (Germany).

A CD-Rom containing relevant information about the event and an 11-min video of how to observe the event (prepared with the courtesy of Czech producers Herafilm and Czech TV with the collaboration of the Czech British High Commission and with the assistance of ESO and NASA) was distributed in all

Maltese schools. This was greatly appreciated by all schools and by the Ministry of Education. This activity was the climax event of the Malta Astronomy Week organised from the 3rd to the 9th June 2004. Considering that that period is a peak period for tourists in Malta, brochures were also distributed in the

main hotels and this event was supported by the Malta Tourism Authority.

Spain: All national newspapers and monthly magazines carried news about the Venus Transit, and the National Radio Station (RNE-Radio 5) News Service was airing daily 3-min documentaries on the Venus Transit. Information brochures were distributed to over 150 planetariums, science centres, universities, observatories, amateur groups, etc. with a total of 30,000 copies. Several museums also printed materials, with information about the VT-2004 project. Three different planetarium shows were started, in Pamplona, La Coruña, Granada and Madrid, drawing many thousands of people. A CD-ROM with multimedia presentations, information and school activities was also distributed.

EVENTS AT ESO

Of course these were only a very minor part of the activities which took place all over the world. In Garching, the members of the ESO AGAPE amateur astronomers, in collaboration with the ESO Education and Public Relations Department, organized several activities. Apart from setting up some telescopes for ESO personnel to witness the event, a larger manifestation took place on the market place of Garching city, in close cooperation with the Garching City Council. Members of AGAPE welcomed about 1,000 persons eager to view the Venus Transit.

And for those who were as unlucky as astronomer Le Gentil in 1769 (who, having traversed a large portion of the globe, enduring all the perils of a long sea-voyage, and waiting for 8 years for the transit to occur, was unable to observe it because of a vexatious, black cloud that covered the Sun), or, more prosaically, for those who could not get to directly see the event for one reason or another, there was no need to despair. There



The ESO Amateur Astronomer group AGAPE was present on the central market place of Garching to share this unique event.

were indeed ample opportunities to witness the event in real-time from several websites, and in particular from the VT-2004 Central Display page.

This page, powered by Akamai and therefore mirrored on many hundreds of sites all over the world, offered selected images from the event, acquired by colleagues at the large solar telescopes, from the Canary Island to China. All images were chosen and commented live by a team of professional astronomers in the “VT-2004 Control Room” at the ESO headquarters in Garching.

The Central Display was duly archived. Anybody who was unable to follow the event, can therefore still see the evolution of the Central Display in this comprehensive archive.

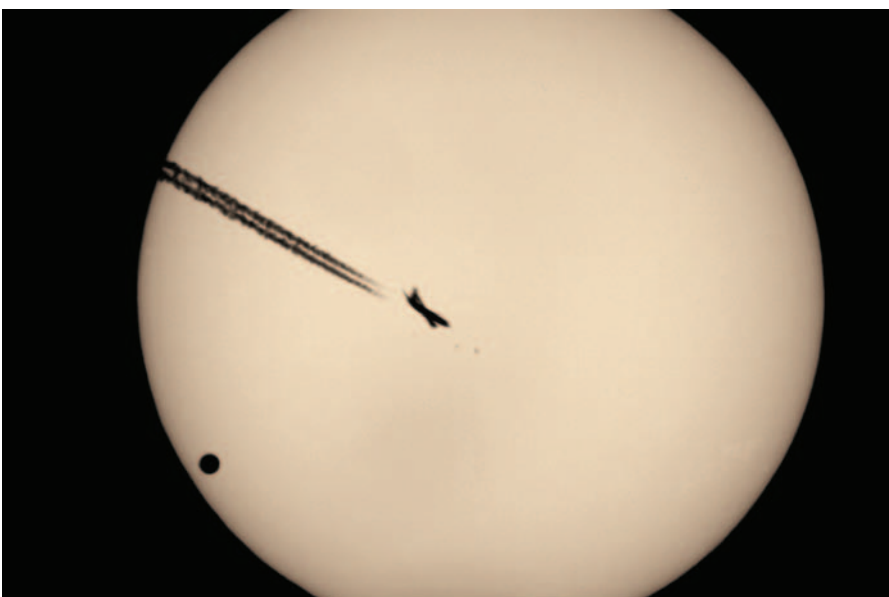
Judging from the number of Web hits, there is no doubt that the VT-2004 web site was a resounding success. Following the record impact of the Mercury transit last year, the present one was more than ten times higher, with more than 54 millions hits on the VT-2004 website and 1.75 terabytes of data delivered during an 8-hour interval, covering the transit period. Thanks to good preparation, the VT-2004 website with its hundreds of Akamai mirrors did not suffer the fate of several smaller servers which collapsed under the load as was reported in the news.

Another way to measure the big success of the Venus transit is the number of images which have appeared on many web sites: those from the members of the VT-2004 Network, the listed webcast sites, the websites linked directly from the National Nodes pages, etc. Many are displayed at the “Photos” section of the VT-2004 website.

It might be worth mentioning that a very useful “by-product” of the VT-2004 programme is the basic *Image Processing*, now available to everybody! Digital images frequently contain more information than is obvious at first glance. Wanting to help observers in getting the most out of their digital camera images, also those of the Venus transit, an easy-to-use facility was set up at the Ondrejov Observatory in the Czech Republic in the framework of the VT-2004 programme. Here, observers could submit their images and have a variety of well documented operations performed on them. Many amateur astronomers used the pipeline to analyse their images of the Transit and provide better timing measurements (see below).

Also particularly welcome were the

Credit: Observatoire de Paris/Meudon



large number of drawings made by children who witnessed the Venus transit. These drawings are now deposited in the VT-2004 Gallery and come from many different places in ESO countries and elsewhere, including, e.g., the Czech Republic, Luxembourg, Greece, Hungary, Slovenia or the United States. All drawings entered into the Gallery before June 30 had a chance to win one of 25 unique VT-2004 T-shirts. And apart from photos or drawings, the event has also inspired poetic expression and a new section on this subject was opened at the VT-2004 web site.

REAL-TIME AU MEASUREMENT

A unique aspect of the VT-2004 programme, the VT-2004 Observing Campaign, consisted of the real-time measurement of the Astronomical Unit – that is, the mean distance between the Earth to the Sun. Also this went very well. Over 2700 observing teams registered and at this date, 1500 have already entered their observations of the timings of the “contacts” of Venus’ black circle with the solar disc, with a total of ~4400 timings so far. This exceptional enterprise – a coordination of a large number of telescopes and instruments all over the world – has never been attempted before and proved very successful. During the event, and after, a real-time display showed the measured astronomical unit as more data came in. This allowed the VT-2004 computers to reenact live the measurement of the distance from the Earth to the Sun as was done by astronomers in the past centuries.

As could be expected, some contacts were easier to measure than others, and in particular, the data concerning the first contact were rather far off and the computed AU-value fluctuated as more and more observations were entered in the database. In retrospect, it appears that some observers posted their first contact measurements as if they corresponded to the third contact, making the dispersion larger than it really was. As soon as the second contact was measured, the measurement of the astronomical unit stabilized pretty close to the real value, 149.6 million km, with a dispersion of about 2 million km. It is perhaps somewhat surprising that the obtained value is so close to the correct one, therefore largely beating the uncertainty which plagued historical measurements of this fundamental unit. One reason is most certainly that in order to ensure maximum stability in this real-time calculation, it was necessary to introduce – for this particular phase of the project – scientifically more rigorous computations, within which it was assumed that the initial value of the astronomical unit was not too far from the real one. This particular mathematical method apparently stabilized the solution faster than anybody expected.

In a next phase, a solution according to Delisle's or Halley's method will be attempt-



A random selection of drawings received by the VT-2004 programme.

ed once the deadline for receiving timings, July 10, is past. This new solution will reflect in a more realistic way the errors by individual observers. Further calculations will include the determination of the size of the Sun, of Venus, etc. by means of other algorithms. This will allow gaining a complete picture of the characteristics of this large and absolutely unique database collected during this exceptional public exercise. The database is open for everybody to use and apply their own tools or methods.

THE PROGRAMME GOES ON

If the Venus transit is over, the VT-2004 programme certainly isn't. Apart from the living photo, videos, drawing, and writing galleries, the VT-2004 web site is a wonderful “memory” bank on the Venus Transit which will serve for many years to come. Information and Educational sheets, Teachers “cookbook”, and “Guidelines for Observers” are but a few examples of the rich material available.

Moreover, a video contest has been launched. In this, members of the public – either as individuals or in teams – are invited to present a video of maximum 8 minutes (in any European language but with an English transcript of the manuscript) in connection with the Transit of Venus on June 8, 2004. The video could either present the

astronomical event, the local event that was witnessed, including preparations for the observations, reactions of participants and on-lookers, ... or it could try to demonstrate sociological or historical aspects, or wider scientific or philosophical issues, etc.

From all the entries received before September 15, an international Jury will select 12 laureate videos which will be shown during the VT-2004 Final Event, to take place in November 5–7, 2004 in central Paris (France), and made available to the media. Two members of each laureate team will be invited to this Final Event, during which the Jury will award the prizes. The first prize of the video contest is a free trip for two to the ESO Paranal Observatory in Chile. The VT-2004 organisers have already received many expressions of interest in this contest from different places.

The Final Event, which will take place during the *European Science Week*, will be a true encounter between Science and Society during which the VT-2004 programme and the public impact of the Venus Transit will be discussed. We are convinced that this pilot project will serve as a very useful guide to future ones whenever opportunities again present themselves.

To get more information on the VT-2004 programme or to browse the galleries, go to <http://www.vt-2004.org>.