

Venus Transit Conference 2012



Preliminary programme

Friday, 01.06.	Saturday, 02.06.		Sunday, 03.06.	
Arrival	09.30	Registration and coffee	09.30	Paper IX
	10.00	Welcome, keynote speaker, memorial	10.00	Paper X
	11.00	Paper I	11.00	Paper XI
	11.30	Paper II	11.30	Paper XII
	12.00	Lunch	12.00	Lunch
	13.00	Paper III	13.00	Paper XIII
	13.30	Paper IV	13.30	Paper XIV
	14.00	Paper V	14.00	Paper XV
	14.30	Coffee break	14.30	Coffee break
Informal meeting in the city centre	15.00	Paper VI	15.00	Paper XVI
	15.30	Paper VII	15.30	Paper XVII
	16.00	Paper VIII	16.00	Paper XVIII
	evening	Dinner at <i>fjellstua café</i>	18.30	Departure post-conference trip to Vardø

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Details

KEYNOTE (45+10 min) Sven Widmalm, Uppsala University:

Science in transit: Astronomy and scientific modernization in 18th century Sweden

MEMORIAL (10 min) Chris Sterken: Hilmar Duerbeck in memoriam.

Each paper lasts (20+10 mins)

- PAPER 1 Suzanne Débarbat: "The Earth-Sun distance from Cassini (1625-1712) to the 21st century"
- PAPER 2 Steinar Thorvaldsen: "From Keplerian orbits to precise planet predictions: the mathematics behind the first observed transits of Mercury and Venus explained"
- PAPER 3 David Dunér: "Venusians: The Planet Venus in the Eighteenth Century Extraterrestrial Life Debate"
- PAPER 4 Eckehard Schmidt: "Vistas in Venus Transits on Stamps - Horizons of Astronomy and Culture"
- PAPER 5 Simone Dumont & Monique Gros: "Paris : The important role of two French astronomers J.-N. Delisle and J.-J. Lalande in the choice of observing places during the transits of Venus in 1761 and 1769"
- PAPER 6 Jean-Pierre Martin: "Jean Chappe d'Auteroche, collaborateur des Cassini"
- PAPER 7 Thomas Posch: "The Jesuit observatories of Central Europe and their role in the Venus transit observations of 1761"
- PAPER 8 Guy Ratier: "Observation of Venus and Mercury transits from the Pic-du-Midi Observatory"
- PAPER 9 Chris Sterken: : "Jean-Charles Houzeau and the 1882 Transits"
- PAPER 10 Päivi Maria Pihlaja: "A Quest for Renown – Venus passages and the Image of the Northern Regions in Eighteenth-Century Scholarly Networks"
- PAPER 11 Gudrun Bucher: "Transit observations as means to re-establish the reputation of the Academy of Sciences"
- PAPER 12 Per Pippin Aspaas: "Denmark-Norway, 1761-1769: two missed opportunities?"
- PAPER 13 Osmo Pekonen: "The amateur astronomer Anders Hellant and the plight of his observations of the transits of Venus in Tornio, 1761 and 1769"

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- PAPER 14 Ulrich Dornsiepen: "Travelling to Russia for the Transit of Venus"
- PAPER 15 Nils Voje Johansen – "The expeditions of William Bayly and Jeremiah Dixon to Hammerfest and Honningsvåg, 1769"
- PAPER 16 László Kontler: "Politicians, patriots and plotters: unlikely debates occasioned by the Venus Transit expedition of 1769"
- PAPER 17 Johan Stén: "Anders Johan Lexell's role in the determination of the solar parallax"

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KEYNOTE LECTURE

Sven Widmalm: "Science in transit: Astronomy and scientific modernization in 18th century Sweden"

Sven Widmalm, born 1956, is a professor of History of Science and Ideas at Uppsala University in Sweden. He has researched widely on the history of astronomy, physics, geodesy, cartography, technology and biology from the early eighteenth century to the present. Research politics, including interactions between scientists and society's economic and political elites as determining factors in processes of knowledge production is a favoured theme. In his keynote lecture Widmalm will analyse the cultural-political context of the highly successful Swedish Venus Transit enterprise of the 1760s.

Widmalm's publications in astronomy and related topics include

- "Character and Property in 18th-Century Swedish Astronomy: The Case of the Magnetic Aurora", forthcoming in *Acta Borealia* vol. 29,2(2012)
- "Astronomy as Military Science: the Case of Sweden, ca. 1800-1850", in David Aubin et al. (eds) *The Heavens on Earth: Observatories and Astronomy in Nineteenth-Century Science and Culture* (Duke University Press, 2010)
- "L'Espace scientifique scandinave", in Michel Blay et al. (eds) *L'Europe des sciences: Constitution d'un espace scientifique* (Seuil, 2001)
- "Professor Celsius and Don Andrea: North-South Dynamics in the Early Enlightenment", in Marco Beretta & Tore Frängsmyr (eds) *Sidereus nuncius & Stella Polaris* (Science History Publications, 1997)
- "A commerce of Letters: Astronomical Communication in the 18th Century", *Science Studies* vol. 5 (1992), pp. 43-58
- "Accuracy, Rhetoric, and Technology: The Paris-Greenwich Triangulation, 1784-88", in Tore Frängsmyr et al. *The Quantifying Spirit in the Eighteenth Century* (University of California Press, 1990)
- *In-Between Map and Reality: Geodesy and Mapping, 1695-1860* [in Swedish], doctoral thesis (Uppsala University, 1990)
- "The Engraver and the Docents: The Cosmographic Society in Uppsala 1758-1778" [in Swedish], in Gunnar Broberg et al. (eds) *Kunskapens trädgårdar* (Atlantis, 1988)



Abstracts

PAPER 1: “The Earth-Sun distance from Cassini (1625-1712) to the 21st century”

Suzanne Débarbat, Observatoire de Paris, SYRTE, CNRS et UPMC - Bureau des longitudes, France

Jean-Dominique Cassini, who died three centuries ago in 1712, is apparently in France the first astronomer of the modern period for astronomy to obtain the Earth-Sun distance at about ten per cent of the value presently admitted ; the shorter distance Earth-Mars having provided, in 1672, an opportunity for a young astronomer to observe it from Caïenne, while Picard and Cassini were doing the same in Paris. During the second decade of the 18th century, Halley in England shows that transits of Venus could provide good value of the Earth-Sun distance also named diurnal parallax and he insures the dates of the following such transits. International cooperation is requested for 1761 and 1769, after a new attempt with Mars by Lacaille when at the Cape of Good Hope (1751/1753). Both results do not satisfy the astronomers despite the efforts of Laplace to improve the result obtained from the whole set of data for the two observed transits. The 1874 and 1881 following transits were also disappointing and, in 1907, astronomers employed the small planet Eros. Meanwhile the Earth-Sun distance is adopted as the distance unit in the Solar System and, with the arrival of the space era, it's under study that this reference be given in kilometres. The 2004 and 2012 transits are not more in use for the Earth-Sun distance, but nowadays they are observed for pleasure.



PAPER 2: “From Keplerian orbits to precise planet predictions: the mathematics behind the first observed transits of Mercury and Venus explained”

Steinar Thorvaldsen, University of Tromsø

The first transits of Mercury and Venus ever observed were important for an entirely different reason than the transit of Venus observed in the 18th century. Good data of planetary orbits are necessary for the prediction of planetary transits. Under the assumption of the central position of the Sun, Johannes Kepler published the theory of the elliptical orbital motion of the planets in 1609, and this new astronomy made it possible to compute noticeably improved ephemerides for the planets. In 1627 Kepler published the Rudolphine tables, and thanks to these tables he was able to publish a pamphlet announcing the rare phenomenon of Mercury and Venus transiting the sun. Although the 1631 transit of Mercury was only observed by three astronomers in France and Switzerland, and 1639 transit of Venus was only observed by two amateur astronomers in the English countryside, their observation would hardly been possible without the revolutionary calculations and theories of Kepler. The Rudolphine Tables count among Kepler's outstanding astronomical works, and during the 17th century they gradually found entrance into the astronomical praxis of calculation among mathematical astronomers and calendar makers who rated them more and more as the most trustworthy astronomical foundation.



PAPER 3: “Venusians: The Planet Venus in the Eighteenth Century Extraterrestrial Life Debate”

David Dunér, History of Science and Ideas, Lund University, Sweden

Once, following Copernicus, the Earth was no longer the centre of the Universe, once Galileo had aimed his telescope towards the Moon and found it a rough globe with mountains and seas, once physico-theologists were convinced that the all-powerful Creator must have filled the entire Universe with life, then the assumption of life on other planets was not too far-fetched. In general there were no differences between Earth and Venus. They were both planets rotating the Sun, of similar size, with mountains and atmospheres. If there is life on Earth, why could not also life be found on Venus? In the extraterrestrial life debate during the seventeenth and eighteenth centuries our closest celestial body, the Moon, was the prime candidate for extraterrestrial life. But some scientists and scholars speculated also about life on Venus and other planets in our solar system and beyond. In this paper I will discuss the arguments for life on Venus and what scientific findings that were used for underpinning this statement. There are also some rare encounters with Venusians in the literature. One of the most detailed descriptions of Venusian life was written down by the Swedish scientist and spirit seer Emanuel Swedenborg in his book *De telluribus in mundo nostri solari, quæ vocantur planetæ*, published in London in 1758. He maintained that his encounter with the Venusians what not at all fictive, but a true testimony of Venusian life based on scientific facts.



PAPER 4: “Vistas in Venus Transits on Stamps - Horizons of Astronomy and Culture”

Eckehard Schmidt

The title implies that the paper is directed to the broad view of Venus Transits. It offers a prospect of where Venus Transits knowledge is going and, sometimes, where it has been. Yet there may still be other frontiers to explore - in the worlds of the culture and of the arts.

On the premise that the postage stamp may be regarded as an art form, this paper attempts to demonstrate the pleasure to be derived from collecting stamps printed with designs relating to Venus, Venus Transits, Eclipses and Astronomy in general. Some listeners and readers may be surprised to discover just how many aspects of Venus Transits have been depicted on stamps, pictorial handstamps and special cancellations. Again, the non-philatelist may not be aware of the additional items which can be included in a collection of this kind, nor of the importance of postal markings.

Philately is not so much a hobby, more a way of life. It leads to travel around the world to see astronomical events in the sky.



PAPER 5: “Paris : The important role of two French astronomers J.-N. Delisle and J.-J. Lalande in the choice of observing places during the transits of Venus in 1761 and 1769”

Simone Dumont and Monique Gros, France

Joseph-Nicolas Delisle (1688-1768), member of the Académie royale des sciences of Paris and professor at the Collège royal de France, went to England in 1724 to visit Newton and Halley (1656-1742). This last one suggested the observation of the transits of Venus in order to obtain the solar parallax. Delisle was also interested in the Mercury transits. After a stay of 22 years in St Petersburg, at his return to Paris, he threw an « avertissement » (warning) so that the astronomers all observe the same phenomenon, as the solar eclipse of 1748. Later, in 1760, Delisle presented an Adresse to the King and to the Académie where he precised his method with a « mappemonde » showing the best places where to observe the transit. Copies of the text and around 200 maps were sent in France and abroad to his numerous correspondants.

His assistant J.-J. Lalande (1732-1807) presented a « mémoire » related to the following transit of Venus and an improved map of the best observing places. Discussions started and went on after the 1761 transit, taking into account the results from the completed observations.

The role of Delisle and Lalande in the preparation of the international collaborations related to these two transits will be detailed.

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PAPER 6: De Bitche à Tobolsk ou de la planète Terre à Vénus.

Jean-Pierre Martin, chercheur indépendant Turlaville, France

L'accent de cette présentation sera mis sur la mission qui eut pour but de lever les plans de la ville de Bitche et des environs en 1753. Les travaux exécutés au cours de la période connurent un prolongement avec la publication de la feuille N° 161 de la carte de France de Cassini.

Cette présentation va inclure tout ce qui concernait la préparation des voyages prévus, en France, pour 1761.



PAPER 7: “The Jesuit observatories of Central Europe and their role in the Venus transit observations of 1761”

Thomas Posch, Institut für Astronomie der Universität Wien, Austria

In the period in which the two 18th century transits of Venus took place – i.e. in the 1760s –, scientific research in Central Europe was dominated by the Society of Jesus. The Jesuits of the "Provincia Austriae" built and ran several astronomical observatories in the third quarter of the 18th century. I shall give an overview of these astronomical observatories. They were located in Vienna, Graz, Trnava and Cluj-Napoca.

Specific questions that I am going address are the following: Which kind of equipment did those observatories possess? Who were the key figures and which contributions to research did they achieve? (Among them, of course, is Maximilian Hell, 1720-92, who played a central role for more than one of these observatories.) And what was the fate of the observatories after the suppression of the Society of Jesus?

In addition, the role that these observatories played during the transit of Venus in 1761 will be elucidated. This transit took place on June 6th 1761, and it was observed by many astronomers around the world. Among them was the director of the Paris Observatory, C.-F. Cassini de Thury (1714-1784), who came to Vienna to observe the celestial event together with M. Hell. Did he succeed? And how about the other observatories mentioned above? Did they also contribute observations? My talk will try to shed light on this question as well.



PAPER 8: "Observation of Venus and Mercury transits from the Pic-du-Midi Observatory"

Guy Ratier

The Pic-du-Midi, on the French side of the Pyrenees, became a state observatory in summer 1882. The first major astronomical event to be observed was the Venus transit on 6 December 1882. Unfortunately this attempt made by the well-known Henry brothers was unsuccessful due to bad weather conditions. During the 20th century, the Pic-du-Midi became famous for the quality of its solar and planetary observations. In the sixties, Jean Rösch decided to use this experience to monitor the transits of Mercury. The objective was not to measure the parallax but the diameter of the planet to confirm its high density. Observations were made using a photometric method, the Hertzsprung method, during the transits of 1960, 1970 and 1973.

Venus transit was finally observed on 8 June 2004, but the main interest was more on the technical side to "calibrate" the amount of straylight left in the solar instruments of the observatory.

This paper will present an overview of the transit observations made at the Pic-du-Midi, including pictures recorded with the Lyot coronagraph where transits of the planets can be seen over the sun corona.



PAPER 9: “Jean-Charles Houzeau and the 1882 Transits”

Christiaan Sterken

Jean-Charles Houzeau de Lehaie (1820-1888) was a prodigious writer on scientific and social topics already at an early age. His life as an observer covered astronomy, geography, geodesy and natural sciences -- not only in Belgium but also abroad. He designed one particular type of heliometer -- the heliometer with unequal focal lengths for the 1882 transit of Venus, of which two identical copies were made: one for use in San Antonio (Texas), and one in Santiago (Chile). These expeditions were the only ones that involved identical instruments, observing methods, and centralised data reduction and analysis. This paper describes the expeditions, gives some biographical information about the team members, and clarifies the principal instrument and its present-day whereabouts.



PAPER 10: “A Quest for Renown – Venus passages and the Image of the Northern Regions in Eighteenth-Century Scholarly Networks”

Päivi Maria Pihlaja, Department of History, University of Helsinki, Finland

In this paper will discuss the Venus passages from the point of view of the scientific image of the North. The observation projects of 1760's placed the northernmost regions of Europe to the centre of learned attention throughout Europe. It has been said that the Venus passages marked the beginning of international scientific cooperation. The joint project was characterized by both cooperation and competition. Different countries participated in coordinated tasks and struggled also over the right to lead the operation. As the phenomenon could in Europe be seen only high latitudes, many academies sought to send there their own representatives.

The case will be here studied from the point of view of the challenges and expectations were experienced in Nordic countries with regard to the potential “PR-value” of the event. Scientific renown played an important role behind the motivation of scholars, but also for the financiers of the expeditions. In the eighteenth-century, science had become a scene where the glory of states and rulers was increasingly measured. The scholars of the North, however, experienced challenges in securing their position – not so much due the current achievement, but long traditions of prejudices concerning to the North as a stage for scientific activity. The astronomical potential bestowed on the North introduced in the 18th century a significant change. These discourses will be studied here as they were articulated in connection to the activities regarding the Venus passage (in particular in Sweden).



PAPER 11: “Transit observations as means to re-establish the reputation of the Academy of Sciences”

Gudrun Bucher

This paper explores how Catherine II used the worldwide attention given to observations of the transit of Venus to bring back the Russian Academy of Sciences to international recognition. Starting from the planned observations of the transit of Venus at various locations of the Russian Empire the expeditions became more complex because naturalists were added to the astronomical detachments. As the naturalists got separate instructions their expeditions became more and more independent from the astronomers and in the result became the famous Academic Expeditions with a tremendous output of publications. This was the second huge effort made by Russia during the 18th Century to explore scientifically parts of its empire.

In a Second part the paper will focus on the transit observations of the southern detachment visiting places in the southern Ural and the Northcoast of the Caspian Sea.



PAPER 12: “Denmark-Norway, 1761-1769: two missed opportunities?”

Per Pippin Aspaas, University Library of Tromsø, Norway

The three North-European powers of the eighteenth century – Denmark-Norway, Russia and Sweden (including Finland) – were all advantageously situated in order to contribute to the international quest to determine the solar parallax by means of the transits of Venus in 1761 and 1769. The outcome was that Sweden provided the international community of astronomers with numerous high-quality observations in both 1761 and 1769; Russia participated on a limited scale in 1761 but far more extensively in 1769; whereas the Kingdom of Denmark and Norway produced only a very small number of observations that even were – with one exception – associated with little or no publicity. Thanks to a stroke of luck – good weather in Vardø on the night between 3 and 4 June – the observations of the specially invited Jesuit Father Maximilian Hell became an issue high on the agenda in 1769. Nonetheless, the history of Danish-Norwegian participation in the Venus Transit Enterprise of the 1760s is largely one of missed opportunities. In my paper I will discuss some reasons behind



PAPER 13: "The amateur astronomer Anders Hellant and the plight of his observations of the transits of Venus in Tornio, 1761 and 1769"

Osmo Pekonen, University of Jyväskylä, Finland

Anders Hellant (1717-1789) was a Swedish scientist who was born in Pello and who lived in Tornio (both places are in today's Finland). As a young man, he participated as a local guide in the famous expedition of Maupertuis to the river valley of Tornio to measure the shape of the Earth in 1736-1737. The expedition left him one of its telescopes, and he became an important amateur astronomer who set up an observatory of his own in Tornio. He had studied in Uppsala as a student of the astronomer Anders Celsius, and he was in correspondence with the astronomer Pehr Wilhelm Wargentin, secretary of the Swedish Royal Academy of Sciences. He observed the passages of Venus both in 1761 and in 1769 using as many as four telescopes. We review his life and his scientific achievements.

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PAPER 14: “Travelling to Russia for the Transit of Venus”

Ulrich Dornsiepen

Catherine II invited European scholars to come to Russia in 1769 to observe the transit of Venus. Due to the published description of his travels to Siberia in 1761 by Chappe d’Auteroche in which he gave a quite negative picture of Russia there was no response in France. But the German Jesuit Christian Mayer agreed to come to St. Petersburg and the two Swiss Astronomers Jacques-André Mallet and Jean-Louis Pictet travelled to the Kola Peninsula to observe the transit. The paper will focus on the experiences Mallet and Pictet made while travelling through Russia and observing the transit.



PAPER 15: “The expeditions of William Bayly and Jeremiah Dixon to Hammerfest and Honningsvåg, 1769”

Nils Voje Johansen, Department of Mathematics, University of Oslo

The Royal Society in London organized several expeditions to observe the transit of Venus over the Sun on June 6th 1769. Among the less famous is the expedition of William Bayly and Jeremiah Dixon. The two astronomers were to be landed on the northernmost part of Europe, in Northern-Norway, to observe the transit that took place at nighttime. HMS Emerald sailed them and their prefabricated observatories to Honningsvåg near North Cape and to Hammerfest. The ship sailed into Honningsvåg Bay at the end of April and some weeks later both observatories were in place, in due time before the transit. Bayly and Dixon were equipped with instructions by Astronomer Royal Nevil Maskelyne, and there they were told in detail what to look for and what kind of observations to perform. Like many of the other expeditions to Northern Europe also this one experienced cloudy weather during the transit. We will however look into what kind of observations they managed to perform.



PAPER 16: “Politicians, patriots and plotters: unlikely debates occasioned by the Venus Transit expedition of 1769”

László Kontler, Central European University, Budapest

My paper will discuss the cultural and political contexts and reception of the most important by-product of Maximilian Hell’s famous Venus Transit expedition of 1768-69, the *Demonstratio. Idioma Ungarorum et Lapponum idem esse* (1770) by Hell’s associate János Sajnovics. Now considered a landmark in Finno-Ugrian historical linguistics, the *Demonstratio* addressed an academic subject which was at that time almost destined to be caught up in an ideological battlefield defined by the shifting relationship between the Habsburg government, the Society of Jesus, and the Hungarian nobility. The “enlightened absolutist” policies of the former aimed at consolidating the Habsburg monarchy as an empire, at the expense of privileged groups, including religious orders as well as the noble estates. In the situation created by the 1773 suppression of the Jesuit order (a signal of declining patronage from the dynasty), the growing preoccupation on the part of ex-Jesuits like Hell and Sajnovics with “things Hungarian” could have been part of an attempt to re-situate themselves on the Central European map of learning. At the same time, the founding document of this interest, the *Demonstratio*, evoked violent protests from the other target of Habsburg policies, the Hungarian nobility, because its basic assumptions – the kinship of the Hungarian and the Sámi (Lappian) language – potentially undermined the noble ideology of social exclusiveness, established on the alleged “Scythian” ancestry of Hungarians. By exploring the complex motives, intentions, reactions and responses of the chief agents in this story, it is possible to highlight the extra-scientific constraints and facilitators for the practice of knowledge in late 18th century Central Europe.



PAPER 17: “Anders Johan Lexell’s role in the determination of the solar parallax”

Johan Carl-Erik Sten, Esbo, Finland

Anders Johan Lexell (1740 – 1784) was enrolled at the St. Petersburg Academy of Sciences in 1768, in the middle of the hectic preparations for the Venus-transit expeditions. Originally a mathematician, born and educated in Åbo (Turku), Finland, he had made a favourable impression on Leonhard Euler by two mathematical memoirs he had communicated to the Academy. Although being inexperienced with observational astronomy, he was assigned an important role in the Venus-transit project. He immediately started to acquaint himself with the instruments and observations under Jesuit Father Christian Mayer in the Kunstkammer-observatory. His real vocation was nevertheless mathematics, and so he was instrumental in the post-processing and editing of the data from the Russian measurement stations and in the ensuing calculations of the solar parallax using an innovative method devised by Euler. During the five years Lexell was occupied with the parallax question, he was reluctantly involved in a fierce correspondence with the chief players in the parallax-dispute; Maximilian Hell, Joseph-Jérôme de Lalande and Anders Planman. Having a rather fiery temperament, he took the dispute rather badly, as he explains in his letters to his chief collaborator and mentor Pehr Wilhelm Wargentin in Stockholm. Lexell had in fact at his disposal a very advanced method to compute the parallax from a large amount of observational data. Along with Euler, Lexell recognised that, since all measurements were lacking in precision due to a large number of error sources, the weight of a single measurement was not as large as the astronomers generally seemed to believe. Instead of juxtaposing two measurements at a time and taking a mean value of the resulting parallaxes, Lexell used a theoretical a priori estimate for the parallax and compared it indirectly with all available (and sufficiently reliable) measurements made of the Venus transit. The value that gave the best fit with the measured data (with respect to some unspecified norm) was the final parallax value.

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Popularizing the Venus Transits of 2004/12 for the public

Knut Jørgen Røed Ødegaard, University of Oslo

In 2004 there was a major national effort to inform and engage people during the transit of Venus. A live webcast had 54 million page hits and was mirrored in several countries. About 30 000 did visit the public event and festival in the Frognerparken that offered many activities related to technology and the natural sciences.

For this transit many local events will take place as well a national public event in Tromsø. A new webcast is organized and several activities for the schools have been produced. These activities and the preliminary results will be presented.