

Observations of the 1761 and 1769 transits of Venus from Batavia (Dutch East Indies)

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Abstract. This paper discusses the observations of the 1761 and 1769 transits of Venus by the Dutch-German clergyman Johan Maurits Mohr (1716–1775) from Batavia (Dutch East Indies). We will investigate how Mohr became interested in observing this phenomenon and how he made the necessary preparations. Finally, the fate of his observatory and his instruments will be discussed.

1. Introduction

In 1761 and 1769, the Dutch-German clergyman Johan Maurits Mohr (1716–1775) made successful observations of the transits of Venus from Batavia (Dutch East Indies). Earlier research, notably by van der Bilt (1940) and Zuidervaart (1999), has already supplied a very detailed picture of Mohr's scientific activities in Batavia, but until now this has only been available in Dutch. More recent research by Zuidervaart & van Gent 2004 has uncovered more information on Mohr's instruments and on his motivation for observing the transits of 1761 and 1769.

2. Mohr's education and early years in Batavia

Johan Maurits Mohr was born in 1716 in Eppingen, Germany, and enrolled at the University of Groningen as a student in theology in August 1733. Three years later he completed his studies with a public disputation on the role of visions in the Bible.

After successfully passing an examination by the Amsterdam board of the Dutch United East India Company (Verenigde Oostindische Compagnie [VOC]) in December 1736, Mohr was appointed as minister for the Dutch East India Church in Batavia (present-day Jakarta in Indonesia) with a monthly allowance of 90 Dutch guilders. In the following year, Mohr set sail for Batavia on the Dutch East Indiaman *Oostrust* and, after a brief call at the Dutch provisioning station at the Cape of Good Hope, arrived at Batavia in October 1737.

After a brief service as a vicar in Batavia, Mohr was commissioned to lead the Portuguese community at the Dutch settlement at Galle in Ceylon. However, he requested permission to stay in Batavia to perfect his knowledge of the Portuguese language and, after his marriage with Johanna Cornelia van der Sluys, he was appointed in February 1739 to lead the Portuguese community in Batavia instead.

In 1743 Mohr was appointed as rector of the newly founded Theological Seminary of Batavia on account of being a "man of learning and of good qualities who is dearly beloved in the Indies". So, already after a few years in Batavia he had acquired the reputation of a scholar. During his tenure as rector, Mohr published several theological works, including translations of the Bible into the Portuguese and Malay languages.

Mohr resigned as rector in February 1753. Shortly before, in April 1752, Mohr had married again (his first wife died in September 1750). His new wife was Anna Elisabeth van 't Hoff, the Asian-raised daughter and principal heiress of Jan van 't Hoff, a very wealthy VOC official. Anna Elisabeth also had money of her own as she had been married twice before to wealthy men.

Up to the late 1750s, we have no evidence of Mohr's interests in astronomy and the related sciences but that was to change as the 1761 transit of Venus approached.

3. The Venus transit of 1761

In May 1760, the French astronomer Joseph-Nicholas Delisle wrote to the Dutch astronomer Dirk Klinkenberg, inquiring on behalf of the *Académie des Sciences* whether the Dutch authorities would be able to assist in transporting and stationing a French astronomer in Batavia to observe the transit of Venus. However, when Delisle subsequently learned that the Royal Society of London was planning to send the astronomers Charles Mason and Jeremiah Dixon to observe the transit from Sumatra, he decided that a French observer would not be necessary in the Dutch East Indies. On the other hand, as Delisle later wrote to Klinkenberg, it would be a pity if the transit went unobserved at Batavia and he urged Klinkenberg to contact the VOC authorities at Batavia so that perhaps a local observer could make measurements with the modest instruments that happened to be available there.

The transit of Venus of was indeed observed from Batavia on 6 June 1761, and not by a professional astronomer. It was in fact observed by Gerrit de Haan, the head of the department of mapmakers in Batavia, who was assisted by Pieter Jan Soele, a skipper employed by the VOC.

Their observations were made from a beach, just outside of Batavia, on the estate "Kliphoff" owned by Johan Maurits Mohr, who apparently also supplied a few of the used instruments. The measurements were made with the help of two Gregorian reflectors (with focal lengths of 18 and 27 inches), an octant made by the London instrument maker George Adams and some accurate pocket watches. Both the beginning and the end of the transit were successfully observed and Mohr also made measurements of the progress of Venus across the Sun's disk during the transit. Although the observations were mostly made by de Haan and Soele, it was Mohr who prepared a detailed account (in Dutch) that was sent to the *Hollandsche Maatschappij der Weetenschappen* in Haarlem and which was published in their *Verhandelingen* (Mohr 1763).

4. Preparing for the Venus transit of 1769

Although the next transit (of 1769) would only be partially visible from Batavia, Mohr decided that it should be observed as completely as possible with the best instruments that were available. With the death of his father-in-law Jan van 't Hoff in April 1763, Mohr's wife had inherited a large fortune and with this money they had been able to acquire a large plot of land to the south of Batavia along the Molenvlietse dike on which a luxurious building was erected with an observatory in the uppermost storey.

The construction of the 80-foot high edifice started in 1765 and it was completed in 1768. According to contemporary records, the costs of Mohr's observatory had been estimated at 80 000 "ryksdaalders" (200 000 Dutch florins) and it outranked nearby "Buitenzorg" (present-day "Bogor"), the residence of the governor-general of Batavia, in magnificence.



Figure 1. View of Mohr's observatory with a Chinese temple in the foreground. Drawing in ink made around 1770 by the Danish artist Johannes Rach. (National Library, Jakarta)

In the mean time, Mohr had sent letters to the Leiden professor of mathematics and philosophy Johan Lulofs, commissioning him to select and purchase astronomical and mathematical instruments and books for equipping his observatory. According to the VOC archives, shipments were sent to Batavia in 1765 and 1767 containing various (unspecified) astronomical instruments.

Fortunately, we have a few depictions of Mohr's observatory (see Figs 1 and 2) and descriptions by foreign visitors such as from the French naturalist Louis-Antoine de Bougainville when he made a call at Batavia in October 1768 during a 28-month journey around the world:

“We could never be tired with walking in the environs of Batavia. Every European, though he be used to live in the greatest capitals, must be struck with the magnificence of the country around it. This is adorned with houses and elegant gardens, which are kept in order, in that taste and with that neatness which is peculiarly observable in all the Dutch possessions. I can venture to assert that these environs surpass those of the greatest cities in France, and approach the magnificence of those of Paris. I ought not to omit mentioning a monument, which a private person has there erected to the Muses. Mr. Mohr, the first clergyman at Batavia, a man of immense riches, but more valuable on account of his knowledge and taste for the sciences, has built an observatory, in a garden belonging to one of his country-houses, which would be an ornament to any royal palace. This building, which is scarce completed, has cost prodigious sums. Its owner now does something still better, he makes observations in it. He has got the best instruments of all kinds from Europe, necessary for the nicest observations, and he is capable of making use of them. This astronomer, who is doubtless the richest of all the children of Urania, was charmed to see M. Verron. He desired he should pass the nights in his

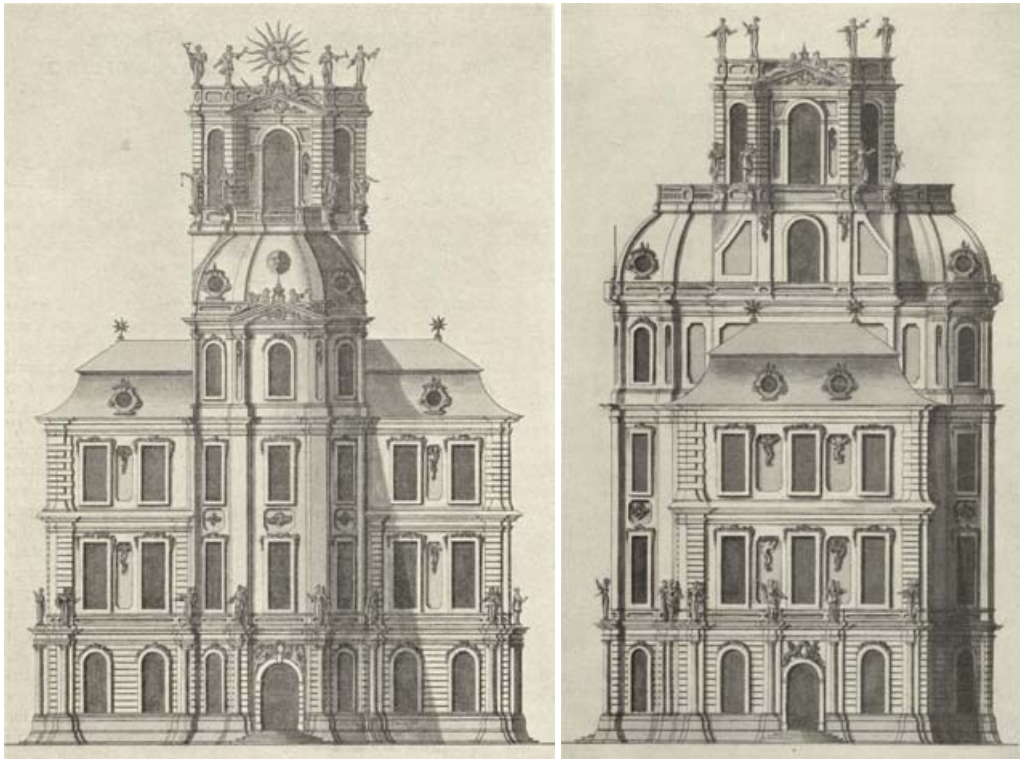


Figure 2. Left: Front view (eastern face) of Mohr's observatory; Right: Side view (northern face) of Mohr's observatory. Architectural drawings by J. Clement (*Hollandsche Maatschappij der Wetenschappen*, Haarlem)

observatory; unluckily, not a single one has been favourable to their purposes. M. Mohr has observed the last transit of Venus [of 1761], and has communicated his observations to the society of Harlem; they will serve to determine the longitude of Batavia with precision.” †

De Bougainville's favourable description of Batavia is noteworthy, as the Dutch settlement on Java was generally thought of as an insalubrious place and was much feared by seamen and visitors, who knew it as the “graveyard of the Europeans”.

5. The Venus transit of 1769

On the morning of 4 June 1769, Mohr was ready to observe the long-awaited transit of Venus. Compared to 1761, he was now much better equipped and could make use of the facilities of his new observatory and far superior instruments. During the past year he had also made several observations to determine the precise geographical co-ordinates of his observatory. Nevertheless, despite his long and careful preparations, his observations of the transit were nearly a failure.

The transit started nearly four hours before sunrise at Batavia and during the first two hours the Sun was hidden by clouds. However, around 8 o'clock the sky cleared and

† L.-A. de Bougainville, *Voyage autour du monde, par la frégate du roi La Boudeuse, et la flûte L'Étoile; en 1766, 1767, 1768 & 1769* (Paris, 1771). Quoted from the English translation by John Reinhold Forster published in 1772 (pp. 425–426).

Mohr could observe Venus on the solar disk with his 3½-foot focal length, Dollond-made Gregorian reflector. When Venus was near to the solar limb he also made observations with a heliometer. Mohr timed his observations with an astronomical pendulum clock with a Graham-type escapement made by the London clockmaker John Shelton. A 2½-foot astronomical quadrant made by the London instrument maker John Bird served to determine the errors of Mohr's clock.

Mohr did not prepare a detailed report of his observations until the end of the year, as he also wanted to include his observations of the transit of Mercury across the Sun's disk on 10 November. A Dutch account of his observations of both transits was sent to the *Hollandsche Maatschappij der Weetenschappen* in Haarlem and were duly printed in the society's *Verhandelingen* of 1770 (Mohr 1770a, 1770b).

Mohr also prepared a Latin translation of his report which he delivered into the hands of the British explorer James Cook when his ship the *Endeavour* made a call at Batavia in December 1770 for repairs and victualling. On his arrival in England in July 1771, Cook sent Mohr's report with his own report on the transit of Venus to the Royal Society and both reports were published in the same year's issue of the *Philosophical Transactions* (Mohr 1771).

6. Mohr's last years

After the Venus transit of 1769, Mohr continued to improve his observatory and several more shipments of astronomical and meteorological instruments to Batavia are recorded in the VOC archives. Mohr also made daily observations of the weather and the compass variation at Batavia, but these observations were never published.

Mohr's last-known publication dates from 1773 and gives a vivid description of the volcanic eruption and subsequent collapse of the nearly 3000-m mountain Gunung Papandajan, located some 165 km southeast of Batavia, that had occurred in August 1772 (Mohr 1773).

Mohr died in October 1775, only a few years before the founding of the first scientific society in the Dutch East Indies, the "*Bataviaasch Genootschap van Kunsten en Wetenschappen*" (Batavian Society of Arts and Sciences).

7. The fate of Mohr's observatory

In 1780, only five years after the death of its founder, Mohr's observatory was severely damaged by a heavy earthquake. Mohr's widow, Anna Elisabeth van 't Hoff, passed away in May 1782 and shortly afterwards permission was granted to the future owner of Mohr's estate to "modify, lower or demolish" the building. However, this was not done until several decades later as the building was used until 1809 to house company clerks and for some time afterwards it was used as army barracks.

Evidence of the rapid speed in which the observatory was falling into ruin is found in the correspondence of the young Francis Beaufort, who at a later date would become famous as an admiral and hydrographer. Signed on as a 15-year old captain's servant he visited Batavia in the summer of 1789 and described the abandoned observatory built by a certain 'M. de More' in a letter to his parents as follows:

"Such an Observatory I never saw. There is but one room in the house calculated to observe in, which is at the top of the house, near one hundred feet from the ground, affording only the most awkward viewing and so built that if you just stamp in any one part of the house it shakes the Observation room. Indeed we find that a person walking about on the stairs or in any [...] room of the house shakes

the Horizon and makes the objects turn about in the Equatorial Telescopes [...] In short, I never saw or heard of such a place in my life.”†

Exactly when Mohr’s observatory was completely demolished is not known, but in 1844 only its foundation stones were reported to be visible.

8. The fate of Mohr’s instruments

For a long time it was believed that Mohr’s astronomical and meteorological instruments had all been lost. Recent work, however, has revealed that some of his astronomical instruments have in fact survived and are preserved in various Dutch museum collections.

Mohr’s astronomical and meteorological instruments were bought from his widow in 1776 by the clergyman Johannes Hooijman, who would become one of the most active members of the subsequently founded *Bataviaasch Genootschap*. However, Hooijman rapidly realized that many of Mohr’s instruments had suffered from the hot and humid climate of Batavia and were unusable. As there were no good instrument makers in Batavia, he had no other option but to ship them back to Amsterdam for repairs.

For as yet unknown reasons, the instruments were not repaired and for many years they lay forgotten in the attic of an Amsterdam storehouse. When they resurfaced again in 1789, their origin was largely forgotten, and they were offered to the newly founded scientific society, *Felix Meritis*, for their observatory. From then on, the whereabouts of several of Mohr’s instruments can be followed up to the present day (for more details, see Zuidervaart & van Gent 2004).

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† Quoted from A. Friendly, *Beaufort of the Admiralty: The Life of Sir Francis Beaufort* 1977, 31.

Discussion

FRITZ BENEDICT: How is it the Dutch remained healthy and every time an Englishman stopped at Batavia he dropped dead?

ROBERT VAN GENT: Well, not all the Dutch were healthy – you either acquired a resistance or you died young there. That also applied for the Dutch.

WAYNE ORCHISTON: Very, very interesting paper, and it's nice to get a different perspective other than just the Cook or the American versions of transits. My question though is: What would be the outcomes of the analysis of those observations in 1761 and '69 in terms of values for the solar parallax?

ROBERT VAN GENT: Well, the first ones – the 1761 observations – were not used because they were published in the Dutch language, so outside the Netherlands they were unknown. Furthermore, van der Bilt – the Dutch astronomer who researched these observations in the 1940s – already came to the conclusion that the observations of the 1761 transit had been flawed in some way because the times and the solar altitudes didn't match, so there was something definitely wrong with those observations. The other observations which Mohr made himself in '69 appeared to be alright, but in the subsequent analysis Encke did not use them, but there was also, of course, the problem of the longitude of Batavia. Now Mohr did determine his longitude and he did publish it in the *Philosophical Transactions*, and even Cook reports that the longitude determination by Mohr was fairly useful for him on the last leg of his voyage, because he could correct his maps. But for some reason I think people still considered that Mohr's determination of longitude was not precise enough, and so that's why Mohr's observations were rather neglected afterwards.

NICK KOLLERSTROM: Just about the fate of Captain Cook: Did you say he or his crew perished from malnutrition?

ROBERT VAN GENT: No, it was dysentery – not all of his crew, but it was quite a number of his crew.

NICK KOLLERSTROM: I'd heard that it was on Hawaii he was stabbed.

ROBERT VAN GENT: That's a later voyage. This is Cook's first voyage.

MARY BRÜCK: I'd like to thank you very much for a fascinating talk, because it's such an interesting story from the human, as well as the astronomical point of view, on how somebody could do all this on his own on the other side of the world, when it took a whole year to get your instruments ordered and delivered. But it was very useful to have plenty of money, and also he may not have been the only one who wedded a wealthy wife in order to help his career, but that's another story!

[general laughter]