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Transit Observations as Means to Re-establish the Reputation of the Russian Academy of Sciences

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Abstract. 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 into 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 expeditions. As the naturalists got separate instructions, their expeditions became more and more independent of the astronomers and eventually became known as the famous Academic Expeditions with a tremendous output of publications. This was the second huge effort made by Russia during the eighteenth century to explore scientifically remote parts of its empire.

As far as individual Venus transit expeditions are concerned, this paper focuses on those that visited places in the southern parts of the Ural Mountains and the northern shores of the Caspian Sea.

1. Russia and the 1761 transit of Venus

When the calculated date of the first transit of Venus of the eighteenth century approached (June 6, 1761), the Russian Imperial Academy of Sciences (Fig. 1) was in a difficult situation. With the beginning of the reign of Elisabeth Petrovna (Tsarina 1741–1761) and her "pro-Russian" policies, open suspicion was cast on foreign scholars as possible clandestine informers of various Western powers, and the decline of the Academy began. Many of the non-Russian scholars left the country and the Academy's scientific achievements and number of publications were poor. Meanwhile, many conflicts between the remaining scholars disturbed the work in the Academy. When Peter I had founded the Academy in 1724, he had entrusted to it an important political and diplomatic role: the Academy should prove to the West that the Russians were not barbarians, were not lacking in appreciation of the intellectual accomplishments of modern Europe, and had contributions of their own to make. This was the reason why the Russian government and academic authorities were alarmed when reports from diplomatic posts began to indicate how widely known was the plight of the Academy in Western Europe (Vucinich 1963, p. 86). This was the case during the last years of the reign of Elisabeth Petrovna when the transit of 1761 approached, and there were no plans to send out major expeditions to observe the transit.

At first there were no special Russian activities at all, but then when France decided to send an observer to Siberia, the Russian Academy promised some support and allowed the foreign astronomer to travel through the country.

The French *Académie des Sciences* decided to send the astronomer Abbé Jean-Baptiste Chappe d'Auteroche to Siberia to observe the transit of Venus. Chappe d'Auteroche had already some experience because he had observed the transit of Mercury in the year 1753 from the observatory in Paris. Tobolsk was at the time the capital of Western Siberia. This place was chosen as location for the observation

Figure 1. The *Kunstkamera* in Saint Petersburg, formerly the main building of the Imperial (Russian) Academy of Sciences (founded 1724), with the observatory tower on top of it. Photo: Per Pippin Aspaas.

because there the duration of the transit would be the shortest observable in 1761. And according to Halley's method of durations, this would be an important location for the observations.[1]

The fact that the French astronomer was on his way to Russia for the transit observation also kindled Russian activities. While waiting for him to arrive in St. Petersburg two Russian observers were sent to different places in Siberia to watch the transit of 1761. These were Nikita Ivanovich Popov (1720–1782) and Stepan Iakovlevich Rumovskii (1734–1812). Popov traveled to Irkutsk and Rumovskii should have gone to Nerchinsk. But he stopped in Selenginsk about 600 to 700 km further west, which is – taking in consideration the vast distances within Siberia – not such a big difference. But a disadvantage of his choice was that it was not very far away from Irkutsk. The results of Popov's observations were not published and it is not quite clear whether they were successful or not. Rumovskii's report was not included in the official *Novi Commentarii* of the Russian Academy until six years after the transit (Aspaas 2012, p. 229).

Chappe d'Auteroche made excellent observations in Tobolsk. He published his results already the next winter when he visited St. Petersburg during his return voyage (Chappe 1762). The oral version was presented on January 8 during the session of the Academy and he sent a copy to Paris where it was read on May 5, 1762. In addition to this publication, his results had been sent already in manuscript form to the Académie des Sciences in Paris, because the mathematicians were eager to get the data as quickly as possible to start their time-consuming and complicated calculations. During the winter 1761/1762 Chappe was offered to stay in St. Petersburg and to take over the position the astronomer and geographer Joseph Nicolas Delisle

[1]That is why Chappe d'Auteroche was eager to reach this place even though he nearly ran out of time, arriving in Saint Petersburg in February and reaching his destination as the winter roads were melting in late April (Chappe 2004). In Russia, traveling took place either on sledge on the snow or along the rivers in the summer season.

used to have while he was in Russia. But Chappe did not want so stay in Russia and returned to Paris in spring 1762.

In addition to these observations in Siberia, several scholars had observed the transit from their private homes in St. Petersburg or from the observatory of the Academy. The most famed of them was Michail Vasil'evich Lomonosov. Decades later, he became famous for his description and interpretation of the luminous ring around Venus shortly before she entered the Sun entirely. Lomonosov also discussed the phenomenon of the so called black drop (Bucher 2011, pp. 102–104). Other scholars who observed from St. Petersburg were Franz Ulrich Theodosius Aepinus (1724–1802) and Joseph Adam Braun (1812–1768). From the observatory of the Academy, Andrei Dmitrievich Krasil'nikov (1705–1772) and Nikolai Gavrilovich Kurganov (1726–1796) made their observations. The results of Braun, Krasil'nikov and Kurganov found their way into the *Ephemerides Astronomicae* of Hell, through which they became available to the international community of astronomers (Aspaas 2012, p. 230).

As a result one can say that Russia took only a weak part in the observations of 1761 compared to other nations like France, Sweden and Great Britain. This changed considerably for the next transit. In the year 1762 Catherine II became Tsarina and she took the opportunity.

2. Catherine II and the 1769 transit of Venus

The transit of Venus was widely discussed in the famous Academies of the world. It was a point of general interest, not only to scholars but also to the highest statesmen. This situation and the high esteem scholars and statesmen had for the event was used by Catherine II to re-establish the reputation of the Academy of Sciences and of Russia in general. There were many prejudices against Russia and these were promoted once more when Chappe d'Auteroche published his travel journal. After he had returned to Paris he started to write his detailed travel account and published it in the year 1768 during the preparations for the observations of the second transit of Venus. The title was *Voyage en Sibérie fait par ordre du roi en 1761, contenant les moeurs, les usages des russes et l'état actuel de cette puissance; la description géographique et le nivellement de la route de Paris à Tobolsk; l'histoire naturelle de la meme route; des observations astronomiques, et des experiences sur l'électricité naturelle, enrichi de cartes géographiques, de plans, de profiles du terrain, de gravures qui représentent les Russes, leurs moeurs, leurs habillements, les divinités des Calmouks, et plusieurs morceaux d'histoire naturelle.* In this account Chappe writes frankly what he disliked in Russia. He openly criticised the bondage-system in Russia and the backwardness of the country. With some detail he describes the times after the death of Elisabeth Petrovna until the enthronement of Peter III, who was Tsar only briefly in 1761/62. Chappe expressed the opinion that art and science were extremely underdeveloped in Russia, and that only non-Russians did good work in the field of science, but even they got worse in the bleak light of the Russian Academy at the time.

Catherine II understandably did not like this account. She made sure that an extensive answer was published in the year 1770 (anonymously) with the title *Antidote, ou examen du mauvais livre superbement imprimé intitulé, Voyage au Sibérie.*[2]

[2]According to a widespread hypothesis, Catherine II had actually written the *Antidote* herself (see Michel Mervaud's introduction in Chappe 2004, Vol. I, pp. 86–103).

Possibly the bad picture Chappe's book had created of Russia was responsible for the fact that no French astronomer decided to answer Catherine's invitation to come to Russia in 1769 to observe the transit from there.

In 1769 the visibility of the transit would be quite good in many parts of the huge Russian empire, and there were lengthy discussions where to send the observers. There were several places in Russia from where the entire transit would be visible and these locations could be reached by travelling over land. The use of sledges on snow and ice was considered safer and more reliable than sea voyages. In 1761, some observers using ships had failed to reach their destinations in time. Whatever was seen from the deck of a moving ship was useless for the delicate process of calculating the solar parallax, whereas the coordinates of any site on land could be measured accurately. Thanks to the activities of Catherine II the famous Swiss mathematician Leonhard Euler returned to St. Petersburg and she also managed to contract the naturalist Peter Simon Pallas from Berlin. Catherine II became personally involved in the preparations for the transit observations. In a widely circulated letter dated March 3, 1767, she urged the Academic Conference to point out suitable locations for Venus transit observations and to indicate the resources needed to accomplish successful expeditions. The Academic Conference responded by pointing out four suitable sites. However, the Tsarina was not satisfied and promptly doubled the number of Venus transit expeditions, adding at the same time a programme for naturalist expeditions that were partly to accompany the astronomers on their expeditions, partly operate on their own. As for the Venus transit, four destinations were finally singled out on or near the Kola Peninsula (three of which were reached in the end), along with four sites in eastern and southern parts of Russia. In addition, the transit was to be observed from the Academy Observatory in Saint Petersburg (Aspaas 2012, pp. 230–233). Catherine wanted that the observers would have the best and most modern instruments available for their observations. And Catherine II proposed to instruct officers of the Russian navy how to observe the transit, in case there would not be enough astronomers available to achieve the task.

In addition Catherine II decided to follow up the famous achievements of the Academy from 1733–1743 when the scholars of the Academy took part in the Second Kamchatka Expedition and did intense research all over Siberia in different fields, like geography, geodesy, history, archaeology, mineralogy, botany, zoology, cartography, ethnography, statistics. Peter Simon Pallas was entrusted to write instructions for different scientists who had to travel together with the astronomers – and in some regions independently – to do general research in different parts of Siberia. The output of these natural history expeditions was immense. Many monographs were published while the scientists were still traveling. They had to send their manuscripts back home where they were prepared for publication immediately. In the field of ethnography, linguistics and history (including historical biology and geography) these publications have still today a great value for scientific research and are highly estimated as sources.

These natural history expeditions, which came into being as a result of the Venus transit, turned out to be the most lasting outcome of the Russian Venus transit enterprise of 1769 (Mumenthaler 1997). On the longer term, it was the output of these surveys of the natural history of Russia that fulfilled Catherine's aim and helped improve the international reputation of the Academy. On the shorter term, however, the Russian Venus transit observations and the ensuing calculations of the solar parallax were equally important (see Stén & Aspaas, these Proceedings).

Below, we shall have a look at some of the individuals involved with the Russian-sponsored Venus transit observations in the year 1769.

3. Various Russian-sponsored Venus transit observations in 1769

The Jesuit Christian Mayer (1719–1783), professor of mathematics and experimental physics in Heidelberg and astronomer royal of the elector Karl Theodor in Mannheim followed the invitation to Russia and observed from St. Petersburg. He had observed the transit of 1761 in Schwetzingen in Germany, therefore he was regarded as an experienced observer. He arrived quite late on May 7 in St. Petersburg and had brought his own (that means the elector's) instruments with him. First this had caused irritations because he needed more money than planned for the transport of the instruments, but it turned out that it was a wise decision to have brought own instruments, because the newly ordered instruments had been given to the astronomers going on expedition and the instruments in the observatory in St. Petersburg were in bad shape or entirely broken and therefore could not be used. And he was lucky to have gone to St. Petersburg because the observations in Schwetzingen failed this time due to thick clouds. Mayer observed the transit together with Gottfried Stahl, Anders Johan Lexell, the above-mentioned Krasil'nikov and Johann Albrecht Euler. Shortly afterwards they also documented an eclipse of the Sun; all with fine weather conditions. Catherine II watched the transit herself from her summer residence near Oranienbaum (Moutchnik 2006).

In the southern part of Russia Orenburg and Orsk in the Ural Mountains and Gur'ev at the northern shore of the Caspian Sea were chosen as locations for the transit observations. Wolfgang Ludwig Krafft, Professor of astronomy in St. Petersburg from 1767 traveled together with Christoph Euler (son of Leonhard Euler) to Orenburg. Krafft stayed there whereas Euler continued to Orsk.

Georg Moritz Lowitz (1722–1774) used to be the director of the observatory in Göttingen before he went to Russia. He was appointed professor of astronomy in the Russian Academy in the year 1767. He traveled together with the Russian adjunct P. B. Inochods'ev to Gur'ev. The results of Lowitz's excellent observations were published 1770 in German *Auszug aus den Beobachtungen welche zu Gurjef bey Gelegenheit des Durchgangs der Venus overbey der Sonnenscheibe angestellt worden sind durch Georg Moritz Lowitz, Professor und Mitglied der Kayserlichen Akademie der Wissenschaften zu St. Petersburg*.

At length he describes the problems he faced while preparing for the observation. But he also mentions that he got a lot of help from the officials to protect his observatory. Even the cattle was not allowed on their normal pasture near the observatory the day of the transit to minimize any disturbances of the observations. He also included a comparison he had made with Inochods'ev regarding the pendulum clocks they had brought with them, one was from France, the other one from England.

The southern expeditions are a good example of what happened generally with the transit observations in the eighteenth century. The focus was not only on the transit observations, once an astronomer had reached far off destinations he was asked to do more general examinations. And many of the expeditions had a huge output in natural history, geology, hydrology and ethnography. The transit expeditions largely contributed to the augmentation of general knowledge in the eighteenth century.

4. The outcome: The Russian Academy's reputation re-established

This was the same with the Russian transit observations. Not only that the natural history part – with Peter Simon Pallas as a leading figure – was added to the transit observations of 1769 also the astronomers at various stations got additional tasks. They had to do cartography and they collected data for the geographical department of the Academy in St. Petersburg. In addition, Euler and Inochods'ev were involved in prospection work for the planned channel from the river Don to the river Volga. But some of the scholars had to face severe conditions and got in political trouble. Lowitz was murdered by rebels of the Pugachev uprising. This and other unlucky incidents were the reason for the termination of the Academic Expeditions in the year 1774. But at least five years after the transit observations the scientists were still in the field and at work for the glory of the Academy.

One can conclude that Catherine II was successful in re-establishing the reputation of the Academy using the transit observations as a starting point. Once the focus was on the expeditions, it were the extensions that made them valuable at the time and even today.

References

Anonymous 1770–1772, *Antidote ou examen du mauvais livre superbement imprimé intitulé 'Voyage en Sibérie. . . '*, Amsterdam

Aspaas, P. P. 2012, *Maximilianus Hell (1720–1792) and the eighteenth-century transits of Venus. A study of jesuit science in Nordic and Central European contexts*, A dissertation for the degree of Philosophiae Doctor, University of Tromsø. `http://hdl.handle.net/10037/4178`

Bucher, G. 2011, *Die Spur des Abendsterns. Die abenteuerliche Erforschung des Venustransits,* Darmstadt

Chappe d'Auteroche, J.-B. 1762, *Memoire du passage de Venus sur le Soleil; Contenant aussi quelques autres Observations sur l'Astronomie, et la Declinaison de la Boussole, faites à Tobolsk en Siberie l'Année 1761*, Lû à l'Academie Impériale de St. Petersbourg le 8 Janvier 1762, St. Petersbourg: l'Imprimerie de l'Academie Impériale des Sciences

Chappe d'Auteroche, J.-B. 2004, *Voyage en Sibérie fait par ordre du Roi en 1761*, 2 vols., I: Introduction et apparat critique, by Michel Mervaud and Le Prince et les dessinateurs et graveurs du 'Voyage en Sibérie', by Madeleine Pinault Sørensen, II: Édition critique, by Michel Mervaud, Studies on Voltaire and the Eighteenth Century 2004:03 & 2004:04, Oxford: Voltaire Foundation

Lowitz, G. M. 1770, *Auszug aus den Beobachtungen welche zu Gurjef bey Gelegenheit des Durchgangs der Venus vorbey der Sonnenscheibe angestellt worden sind durch Hrn. Georg Moritz Lowitz, Professor und Mitglieder der Kayserlichen Academie der Wissenschaften zu St. Petersburg,* St. Petersburg

Moutchnik, A. 2006, *Forschung und Lehre in der zweiten Hälfte des 18. Jahrhunderts. Der Naturwissenschaftler und Universitätsprofessor Christian Mayer SJ (1719–1783).* Algorismus. Studien zur Geschichte der Mathematik und der Naturwissenschaften herausgegeben von Menso Folkerts Heft 54. Augsburg

Mumenthaler, R. 1997, *Der Blick von Außen. Das Rußland Katharinas II. in Reiseberichten.* In: Katharina die Große. Staatliche Museen Kassel, pp. 25–32

Vucinich, A. 1963, *Science in Russian Culture. A History to 1860,* Stanford, California