

## Denmark–Norway, 1761–1769: Two Missed Opportunities?

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**Abstract.** Despite a promising start in the sixteenth and seventeenth centuries, Denmark–Norway was not a Great Power of Astronomy any longer when the eighteenth-century transits of Venus occurred. Official activity relating to the transit of 1761 was very limited; in this respect, Denmark–Norway was completely overshadowed by Sweden and Russia. In 1769 steps were taken to invite an astronomer of international reputation, the Jesuit Father Maximilianus Hell. He arrived in 1768 and left the country two years later, having published an elaborate report in the name of the King Christian VII. Although Hell's observations from Vardøhus were successful, Denmark–Norway failed to re-establish itself as a country capable of delivering noteworthy contributions to the European community of astronomers. Sweden and Russia displayed a higher level of activity, both quantitatively and qualitatively, making the impression of Denmark–Norway's lagging behind even stronger.

### 1. Introduction

Throughout the eighteenth century, the northernmost part of Europe was divided between three powers: Denmark–Norway, Sweden, and Russia. They all encompassed territories with very similar advantages as far as the transits of Venus were concerned. However, the history of Venus transit activity in the three countries mentioned is far from uniform. Other contributions to these Proceedings analyze Venus transit activities in Sweden (Widmalm) and Russia (Bucher). There are also case studies on individual astronomers active in these parts (Pekonen, Stén & Aspaas, Voje Johansen, Kontler). This article describes the eighteenth-century Venus transit enterprise of Denmark–Norway as a whole, with side-glances at its neighboring countries.<sup>1</sup>

In the middle of the eighteenth century, the *Runde Tårn* (or Round Tower, *Turris rotunda*) in the center of Copenhagen epitomized Denmark's proud traditions in astronomy (Fig. 1). Inaugurated in 1642, the Round Tower antedated all major observatories of Europe. Even the famous observatories of Paris (functioning since 1671) and Greenwich (1676), not to speak of Saint Petersburg (1727), Uppsala (1741) and Stockholm (1753) were far younger institutions. At an even earlier date, Denmark had been the host of Tycho Brahe, whose observations from the island of Hven (now Ven) had served as foundations for Kepler's Laws. However, for all its glorious past, the reputation of Danish–Norwegian astronomy had dropped considerably by the time of the transits of Venus.

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<sup>1</sup>This paper is in essence a shorter version of materials that have already been presented in my doctoral thesis, which is freely available as a PDF file on the internet. Unless otherwise stated, Aspaas (2012) serves as an implicit reference throughout this article. Reference to primary sources and literature has deliberately been kept to a minimum.

TAB. XC.

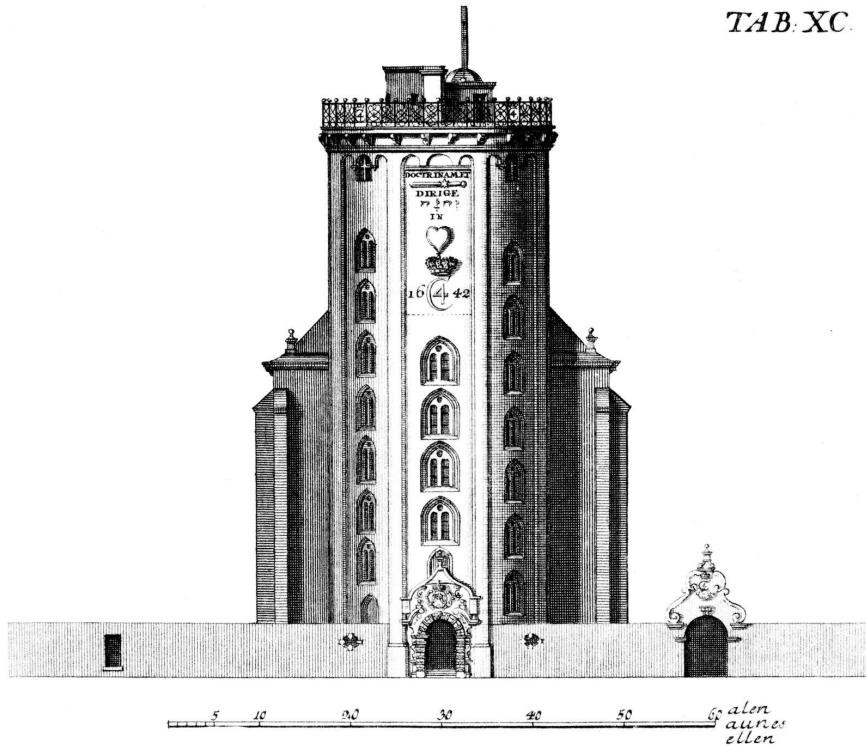


Figure 1. Copenhagen's *Runde Tårn*, erected in the 1640s. Christian Horrebow presided over observations from this tower in 1761 and 1769. From Laurids de Thurah, *Hafnia hodierna* (1748), Wikimedia Commons.

## 2. The Moltke–Bernstorff–Thott Triumvirate and the Horrebow Clan

During the first half of the eighteenth century, the Kingdom of Denmark and Norway had undergone a gradual “transformation from a personal to a bureaucratic absolutism” (Barton 1986, p. 28). In the run-up to the Venus transit of 1761, all major decision making in Copenhagen involved the head of the German Chancellery (i.e., ministry of foreign affairs) and *de facto* prime minister Baron Johan Hartwig Ernst Bernstorff and the favorite of King Frederik V (ruler 1746–1766), Overhofmarskalk (lord chamberlain) Count Adam Gottlob Moltke. Formally, the minister Count Johan Ludvig Holstein (1694–1763) presided over the entire field of education, science and church affairs in the Kingdom. Among his many offices, Holstein held the Presidency of the Royal Danish Society of Sciences (founded 1742), whose assemblies were held at his residence (Lomholt 1942). By the year 1761, however, Holstein had passed his zenith. Neither he, nor the other high-level decision makers appears to have perceived the importance of the 1761 transit of Venus before too late.

That is not to say that the natural sciences were not cultivated in Denmark at the time. Sumptuous projects including an illustrated inventory of all plants growing in the Danish–Norwegian Kingdom (the *Flora Danica* project) and general land surveys (of Denmark proper, Iceland and the border between Norway and Sweden), were begun under the supervision of Copenhagen's Royal Society in this period. Moreover, in January 1761, a Danish-sponsored team headed by a naturalist (Peter Forsskål), an expert on oriental languages (Frederik Christian von Haven) and a

surveyor (Carsten Niebuhr), set out to undertake a grandiose expedition to *Arabia felix* (present-day Yemen and its surroundings). Nearly all participants perished; Niebuhr returned as the sole surviving scientist in 1767. Among the many tasks allotted to the *Arabia felix* expedition were observations of the Venus transit. These failed, however, as the ship was in the middle of the Mediterranean when the transit took place. Another, more modest expedition to Trondheim in Norway will be described below.

By the ascendancy of the young Christian VII in 1766, the responsibility for education, science and church affairs had passed onto the hands of Count Otto Thott (1703–1785), who served as the head of the Danish Chancellery (ministry of the interior) from 1763. The Danish Society of Sciences from now on held its assemblies at Thott's residence. "He was everything but a man of initiative", a biographer of his concludes.<sup>2</sup> All the same, in collaboration with Bernstorff and Moltke, Count Thott did try to use the Venus transit of 1769 as a means to bolster Danish–Norwegian reputation in astronomy. The "Moltke–Bernstorff–Thott Triumvirate" was short-lived, however. King Christian VII soon lapsed into the mentally ill and dysfunctional marionette of influential characters at court. Moltke, Bernstorff and Thott found themselves in a precarious position; by the time the royal physician Johann Friedrich Struensee seized power (from December 1770 to January 1772), they had all been stripped of political power. Whatever increase in astronomical activity that took place in conjunction with the transit of 1769, was put to a halt due to Struensee's coup.

Academic clans are a well known phenomenon in the history of science. Historians of early-modern astronomy will be familiar with the "Cassini clan", consisting of four generations of fathers and sons that led the *Observatoire de Paris* from 1671 to 1793. A less conspicuous example is the "Horrebow clan" in Copenhagen. Peder Horrebow the Elder (1679–1764) served as Astronomer Royal and director of the Round Tower from 1714 to 1753. He then retired to let one of his sons, professor Christian Horrebow (1718–1776) inherit this post. When Christian died, his brother Peder Horrebow the Younger (1728–1812) briefly kept the title until he was forced to retire with a generous pension in 1778. The history of the eighteenth-century transits of Venus in Denmark–Norway is neatly bound up with the Horrebow clan, and with Christian Horrebow in particular.

### 3. Denmark–Norway, 1761: the observations

Christian Horrebow, along with Peder the Younger, presided over the observations of the 1761 transit from the Round Tower. The weather was good, and the egress (end stage) was distinctly visible from Copenhagen in the morning hours of June 6, 1761. According to the historically oriented astronomer Axel Vilfred Nielsen, who has investigated the official report on the Horrebow brothers' observations, the two did well with the equipment they had (Nielsen 1957). However, eighteenth-century astronomy was about more than actual skills in observing and calculating. Equally important was the ability to position oneself on the map of the European Republic of Letters. Astronomers lived of "corresponding observations", as they were called. They exchanged data sets, they catered for collaboration, they engaged in "networking" on a transnational level (Widmalm 1992). This is where the Horrebows failed.

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<sup>2</sup>"Initiativets Mand var han mindst af alt." (Holm 1903, p. 338).

In the run-up to 1761, the Horrebows' attention seems to have been fixed on the Round Tower alone. Nor were they particularly eager to disseminate knowledge on the phenomenon. Although a member of the Royal Society of Sciences, Christian Horrebow delivered no speech on this long-awaited event. It was Christian Gottlieb Kratzenstein (1723–1795), a German-born professor of medicine and experimental physics that had been recruited to Copenhagen University in 1753, who presented that speech.<sup>3</sup> In the printed version of his lecture, Kratzenstein displays a keen awareness of the global dimensions of the Venus transit (Kratzenstein 1765). Furthermore, perceiving the potential of the Kingdom's northern territories to provide valuable data for the calculation of the solar parallax, he took the initiative to dispatch two students from the university, Thomas Bugge (1740–1815) and Urban Bruun Aaskow (1742–1806), to Trondheim in the middle part of Norway. They arrived in time, but had their observations partly spoiled by bad weather. A summary account of their expedition was published in the *Mémoires* of the *Académie des Sciences* of Paris (Lalande 1763). Despite his young age, Bugge was already a veteran of the survey of Denmark, where he had acquired a keen knowledge of practical astronomy. He was later to emerge as the Astronomer Royal and director of the Round Tower, and proved himself to be a man with good technical as well as networking capabilities. Little is known about further attempts to observe the 1761 transit in Denmark–Norway. A surveyor engaged for the boundary surveying of Sweden and Norway, Jørgen Nicolai Holm (1727–1769) happened to observe the transit from somewhere in Trondheim independently from Bugge and Aaskow. Holm kept a low profile; his observation was only mentioned anonymously as “from a private letter” in an article in the *Philosophical Transactions* of the Royal Society of London (Short 1763). Another surveyor, Christopher Hammer (1720–1804) observed from his private home at Hadeland in southern Norway, seemingly without publishing his report on the observation (Aspaas 2011).

Scientific publications were all-important then as now. However, despite the existence of a periodical with printed Transactions (*Skrifter*) of the Royal Danish Society of Sciences, no effort was made to collect and publish whatever observations were made throughout the Kingdom. As a result, Denmark–Norway came out with a very poor contribution in terms of the number and geographical distribution of its observers. In this sense, it was completely overshadowed by its eastern neighbors Sweden and Russia.

In 1761, Sweden could boast of 25 individual observations from nine sites widely distributed over Sweden (including modern Finland). Two of these sites were located in northern parts of the kingdom, where the entire duration of the transit had been visible. Russia had delivered a handful of observations from Saint Petersburg and organized two expeditions into Siberia, in addition to the French-sponsored expedition of Chappe d'Auteroche. Denmark–Norway's contribution consisted in two dubious reports from Trondheim and one not very impressive observation from the Round Tower. Given Horrebow's non-communicative mode of behavior, his reputation abroad was far lower than his Swedish counterpart Wargentin. Little wonder that the secretary of the *Académie des Sciences* of Paris wrote of the coming transit with barely concealed scepticism (de Fouchy 1762, p. 106):<sup>4</sup>

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<sup>3</sup>Kratzenstein was also the one who had instructed Niebuhr to attempt to observe the transit from “Arabia felix” (see above).

<sup>4</sup>“The King of Denmark, who has likewise demonstrated his sense for the sciences by dispatching astronomers to Norway to observe the transit of 1761, will be in a position to provide us with the same advantage as Russia, if there are, in his Estates, Observers sufficiently experienced, and

Le roi de Danemarck qui a signalé de même son goût pour les Sciences, en envoyant des Astronomes en Norvège pour le passage de 1761, sera à portée de nous procurer le même avantage que la Russie, s'il se trouve dans ses États des Observateurs assez bien exercés, & munis d'assez bons instrumens pour faire cette grande observation avec une précision suffisante.

#### 4. Denmark–Norway, 1769: the observations

The transit of 1769 was set to take place during the middle of the European night, giving Denmark–Norway, Sweden and Russia obvious advantages because of the Midnight Sun. Early in the year 1767, the scientific academies of Sweden and Russia both positioned themselves by securing funding for expeditions to the High North as well as the East (in Russia's case). Profiled academics from the *Académie des Sciences* in Paris and the Royal Society of London pointed to far-northern Norway as an ideal region for observations. In this situation, Moltke, Bernstorff and Thott took action. First and foremost, they made sure that the Imperial and Royal Astronomer of Vienna, the Jesuit Maximilianus Hell (1720–1792) was invited to undertake an expedition to Vardøhus (now Vardø) in the northeasternmost part of the Kingdom. Secondly, they tried to mobilize various able astronomers to undertake similar expeditions to secure a broader participation than the expedition of Father Hell.

As a result, the above-mentioned Kratzenstein went to Trondheim on a private mission to observe the transit. His attempt failed due to bad weather, however. The same fate befell Peder Horrebow the Younger and his assistant Ole Nicolai Bützow (1742–1794), who traveled northwards from Copenhagen in the winter 1768/1769 with the intention of reaching Tromsø. However, they only made it to Dønnes, where the weather was bad during both ingress and egress. The surveyor Holm planned this time to go to Alta in Finnmark, but died suddenly in April 1769. Further observations were made from several locations in the south of Norway, Denmark (including the Round Tower) and Danish possessions in present-day North Germany, but for unknown reasons these were never published. The lack of interest in communication that characterizes Christian Horrebow's career may have been influential here. Or it may be the case that the chaotic situation in the government hindered attempts at systematizing and publishing Venus transit observations. Be that as it may, in terms of publication Denmark–Norway could boast of no more than one single Venus transit observation from 1769: that of Hell and his assistants at Vardøhus.

Again, the contrast to Sweden and Russia was stark. Sweden's participation remained at the same high level as the previous occasion. 18 individual observations from seven sites were published in the Royal Swedish Academy's Transactions (*Handlingar*) in 1769. In the northern parts of the Realm, where the entire transit would have been visible if it were not for clouds, Sweden had manned three stations. Only one of these far northern stations (Cajaneborg, now Kajaani) had a certain degree of success with the weather. The publicity of all Swedish activity was kept very high, however. It is hardly an exaggeration to say that Sweden set all this activity in

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equipped with instruments of sufficient quality to make this grand observation with adequate precision."

motion – and published the reports promptly both at home and in summaries abroad – thanks to the extraordinary networking capabilities of Pehr Wilhelm Wargentin.

In Russia, Catherine II had taken over the power and persuaded the respected mathematician Leonhard Euler to return to the Imperial Academy of Sciences. His oldest son, Johann Albrecht Euler became the secretary of the Academy. Along with other prominent members of this institution they developed an impressive programme for observations of the transit throughout the Russian Empire. The Kola Peninsula was considered particularly important. Of the four expeditions to this area not far from Vardøhus, only three reached their intended destination. At one of the sites (Kola town) a team of Russian astronomers actually managed to record the entire transit, but only through a layer of cloud. Like in Sweden, the publicity surrounding the Russian expeditions was kept very high; reports were printed and distributed throughout the Republic of Letters as soon as the data sets reached the capital. Nonetheless, Denmark–Norway managed to keep the astronomical community in suspense: rumors had it that the weather in Vardø had been good and that Father Hell had made excellent observations. But where were these data?

## 5. A Jesuit in the service of a Lutheran Court

It is a paradox that a Lutheran Kingdom recruited a Catholic to undertake this prestigious expedition on His Majesty's behalf, especially since the laws of the Monarchy forbade the presence of Jesuits.<sup>5</sup> Maximilianus Hell had other assets, however. Denmark–Norway needed to recruit an astronomer of international reputation from abroad, but not just from any nation. A French or a British astronomer would all too easily be reckoned as a representative of those Great Powers. That might put the already dubious reputation of Danish–Norwegian astronomy at risk. A Jesuit would be more likely to remain loyal to his sponsor. And as for international reputation, Father Hell was the editor of the widely distributed *Ephemerides Astronomicae ad Meridianum Vindobonensem* – an almanac/journal with articles on astronomy and related topics. In 1761, he had coordinated observations from the Habsburg territories and produced a lengthy report summarizing observations from all over Europe, a strong manifestation of how well connected he was.

Maximilianus Hell was presented with the invitation from the Danish ambassador to Vienna in September 1767. He immediately said yes. As soon as the necessary permissions had been granted by the Viennese rulers as well as the General of the Society of Jesus, all was set for an ambitious expedition. Maximilianus Hell prepared himself for an encyclopedic programme, where a whole range of scientific questions pertaining to the High North were to be placed under scrutiny. Among these were a new method to determine the shape of the Earth by means of barometers; the ebb and flow of the tides; the refraction of the atmosphere in the High North; the declination of the magnetic needle from true north; the cause and nature of the Aurora Borealis; the language and customs of the Samis (see Kontler, these Proceedings; Lynne Hansen & Aspaas 2005; Aspaas 2008).

Father Hell set forth from Vienna in April 1768. At Travemünde in Holstein he met Bernstorff and had an audience with King Christian VII, who was then about to embark on a “tour of Europe”. Most of June was spent in Copenhagen, where Moltke was his principal host. Hell also met the notable natural scientists of the capital, such as Niebuhr and Christian Horrebow. The journey continued overland

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<sup>5</sup>Not until 1956 was this paragraph removed from the Constitution of Norway.

via southwestern Sweden and southern Norway to Trondheim, where they arrived in late July. In this city there flourished a young Society of Sciences centered around the Bishop Johann Ernst Gunnerus. Although no astronomer lived in the city, other forms of collaboration with the expedition were initiated. Notably, Hell got the Bishop's *amanuensis*, Jens Finne Borchgrevink (1737–1819), a former student of Carl von Linné (Linnaeus), attached to the company (Voje Johansen 2004). Along with Borchgrevink and Joannes Sajnovics, who had accompanied him all the way from Vienna, Hell sailed north to Vardøhus in the autumn, reaching his destination after seven weeks at sea, in October 1768. Then began the construction of the first state-funded observatory on Norwegian soil (Fig. 2). It was ready by Christmas, and the ambitious programme of research began. If Father Hell had missed the transit because of bad weather, as so many other crews in the High North of Europe did, he would still have had ample materials to build a reputation as an expert on virtually everything pertaining to this region. But Hell also succeeded to observe the transit of Venus. He returned from Vardøhus with heaps of scientific data, the most prominent of which being the timing of the moments of contact of Venus with the limb of the Sun by the three observers Hell, Sajnovics and Borchgrevink. The return voyage brought them to Copenhagen in October 1769. They now stayed there the entire winter, leaving the country in May 1770.

Little trace of the political problems of contemporary Copenhagen is detectable in the diary and letters written by Hell and Sajnovics during their stay. They paid numerous visits to Thott and presented lectures at the Royal Society of Sciences. Everything suggests that they were met with a collegial, collaborative spirit despite their Jesuit background. Thott is praised throughout. Even Horrebow did what he could to make them feel comfortable. One point proved problematic, however. The publication of Hell's report was delayed. Not until February 1770 it was circulated throughout Europe. This led to suspicions of fraud, an accusation Hell was not freed from until the next transits of Venus had taken place in the nineteenth century.

In an article on Danish scientific expeditions during the eighteenth century, Allan Sortkær points to the importance of the printed book as a symbolic manifestation of

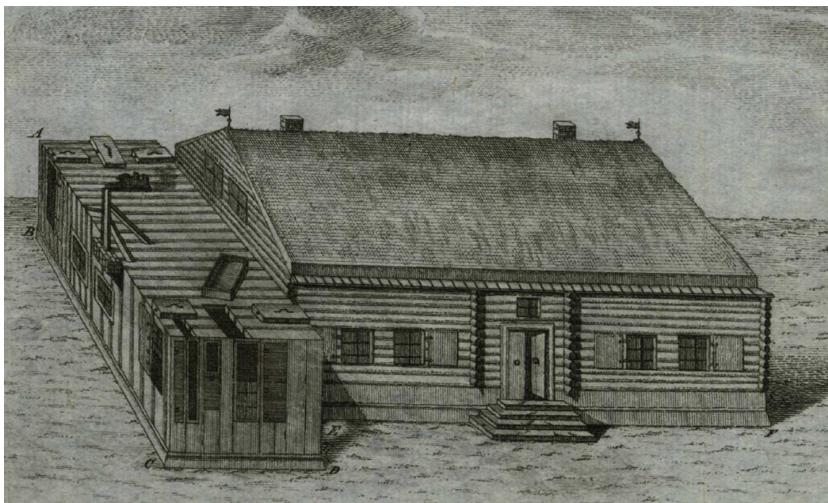


Figure 2. The first state-funded observatory on Norwegian soil was constructed by Maximilianus Hell at Vardøhus. It was built as an annex to the house Hell disposed during his stay on Vardø Island in 1768/69. From Hell's *Ephemerides Astronomicae ad Meridianum Vindobonensem 1791* (1790).

Royal power in the field of science. In a certain sense, a de luxe edition could serve as a replacement for the physical presence of the King. “Without the written word in the book, no event”, he concludes.<sup>6</sup> In early modern Europe, royal sponsorship and scientific prestige went hand in hand, with the printed publication as its primary medium.

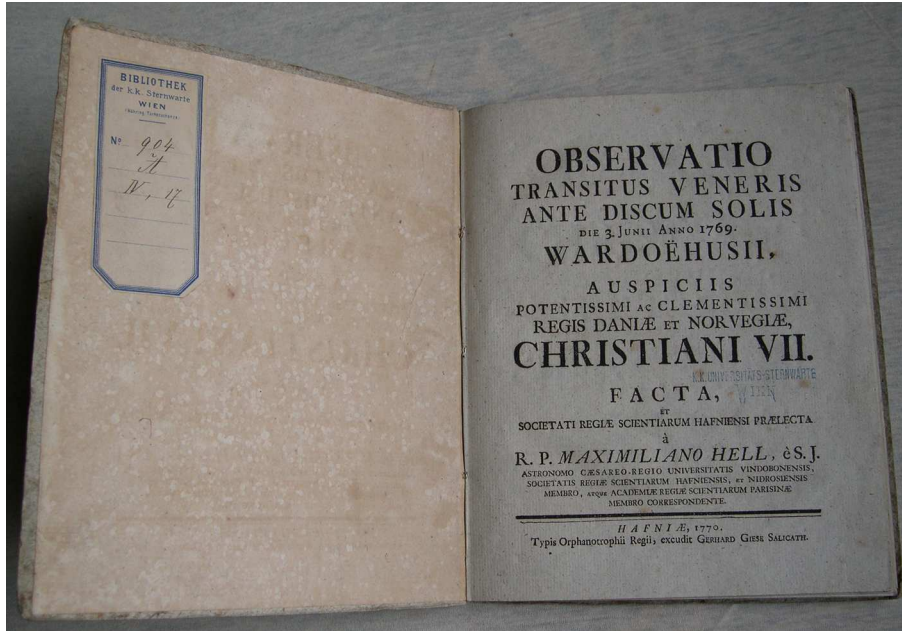


Figure 3. Title page of Hell's Venus transit report from Vardøhus. The most conspicuous information on the entire page is the name of the King, Christian VII. Photo Per Pippin Aspaas.

The first publication from the Vardøhus expedition was an 80-page report in *grand quarto*, with an impressive title page whose most conspicuous element is the name Christian VII (Fig. 3). The original Latin edition was also translated into Danish and included in the Transactions of the Royal Danish Society of Sciences later in the year 1770. The same volume of the Transactions included a treatise arguing for the existence of a linguistic link between Hungarian and Sami by Hell's assistant Sajnovics (first published separately in Latin) and a series of latitude determinations made by Hell during his journey between Copenhagen and Vardøhus. Noteworthy as well is the call for subscriptions for an even larger work, the three-volume, richly illustrated *Expeditio litteraria ad Polum arcticum*. Although that work would be published in Vienna, not Copenhagen, it would still strongly emphasize the sponsorship of Christian VII – if it had ever been finished. The Society of Jesus was dissolved by the Pope in the summer of 1773, bringing Hell's working pace in disarray. Parts of the *Expeditio litteraria* were, however, published in the *Ephemerides Astronomicae ad Meridianum Vindobonensem* in the years that followed. Most prominent of these are determinations of the solar parallax based on all observations made in the year 1769, and a treatise on the Aurora Borealis (Lynne Hansen & Aspaas 2005).

To trace the rest of the career of Maximilianus Hell up to his death in 1792 would be to exceed the limits of this paper. Suffice it to say that although he found himself

<sup>6</sup>“Uden det skrevne ord i bogen ingen begivenhed.” (Sortkær 2008: 7).



under heavy attack, both scientifically and spiritually after his return to Vienna, he always defended the honor of Denmark–Norway. When confronted with the fact that it took eight months from the Venus transit observation was made until the report was published, he claimed that it was his duty to deliver a printed copy to His Majesty before anyone else was allowed to see his data. As an ex-Jesuit, he remained a staunch defender of conservative Catholicism for the rest of his days, but never changed his opinion about his Lutheran hosts in the north. In this sense, one may conclude that he remained in the service of Denmark–Norway for the rest of his life.

## 6. Conclusion: two missed opportunities?

The transits of Venus were highlights of eighteenth-century science, attracting attention and funding from all “nations of science”. Nor did they pass unnoticed in Denmark–Norway. However, whereas the Swedish Academy of Sciences managed to muster activity in all parts of the country and gain recognition worldwide, Denmark–Norway was left in the backwaters in 1761. Further east, the Russian Academy of Sciences was riddled by internal conflicts in 1761, but still managed to dispatch two expeditions into Siberia to compete with the attention aroused by the French expedition led by Chappe d’Auteroche. By 1769, a major change had taken place in Russia, with a new Tsarina in place and a set of influential academics imported from abroad. The Petersburg Academy now considered the northwestern part of the country especially important, sending four Venus transit expeditions to the Kola Peninsula. Sweden again delivered a strong contribution, with three astronomers stationed in the far north. In this situation, Denmark–Norway invited the court astronomer Maximilianus Hell to observe the transit from the scientifically and strategically important site of Vardøhus. The government was clearly convinced that only by importing an astronomer of international reputation would it be possible to deliver a noteworthy contribution to the quest to determine the solar parallax.

Sven Widmalm argues elsewhere in these Proceedings that mid-eighteenth century Sweden was marked by a development towards professionalisation in the field of science. One may add that alongside this professionalisation there came a useful alliance with persons outside academia, the so-called *dilettanti*. When Wargentin organized the Swedish observations, he welcomed observations by gymnasium teachers, surveyors, military officials and noblemen. These were included in the Transactions (*Handlingar*) alongside the observations from university professors and observatory directors like Wargentin himself. No such alliance is detectable in Denmark–Norway. In 1761, the Astronomer Royal Horrebow did his duty at the Round Tower, but failed to include non-professional observers in the project. Professor Kratzenstein was behind two other attempts to observe the transit – the surveyor Niebuhr’s from “Arabia felix” and the students Bugge and Aaskow from Trondheim. The 1769 effort with Maximilianus Hell was again marked by a strong element of elitism. It is not unlikely that the observations of the professors Peder Horrebow the Younger (Dønnes) and Kratzenstein (Trondheim) would have been published, if not bad weather had spoiled their attempts. However, primary sources demonstrate that the egress of the transit was recorded from several places further south, but this data was never presented to the international community of astronomers.<sup>7</sup> Similarly, the ban against sharing the data sets from Vardø until the King had seen them was also in breach with

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<sup>7</sup>For a complete list of known observations of the 1761 and 1769 transits in the Scandinavian countries, see the synoptic paper by Sterken & Aspaas, these Proceedings.

practices followed elsewhere in Europe. As a result, Denmark–Norway was regarded as a country lacking in able astronomers and Maximilianus Hell was suspected of fraud.

In retrospect, Denmark–Norway may indeed be considered to have missed two golden opportunities to rebuild its reputation in astronomy.

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