

From the *Expeditio Litteraria* of Maximilian Hell (1768-1770) to *La Recherche* of Paul Gaimard (1838-1840): Northernmost Fennoscandia in the encyclopædic tradition of science

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ABSTRACT

How are we, as historians of science, to deal with the history of scientific expeditions whose aims and scope covered multiple branches of research? Should we content ourselves to study the underlying, socio-political contexts motivating the expeditions, and give examples of what impression the local population, the nature, climate, etc. of the region made on the visiting scientists? Or should we attempt to bring our analysis one step further, and study also the scientific activities and achievements themselves? If yes, how? In my paper, I will use two arctic expeditions to illustrate the challenges posed to the historian of science by such many-sided material.

In 1768-1770, the court astronomer of Vienna, Maximilian Hell travelled to Vardø in North Norway. The principal aim of the expedition was to observe a transit of Venus, thereby providing data for computation of the size of the solar system. However, the Vienna astronomer had much broader ambitions, and he and his assistants also made substantial research in fields today known as geophysics, marine biology, meteorology, ethnography, and finno-ugric linguistics, to name a few.

70 years later, a multinational team led by the French natural historian Paul Gaimard visited North Norway and other parts of northernmost Europe. The story and chief results of this expedition were subsequently published in 16 volumes of text and two volumes of illustrations, covering geology, astronomy, geophysics, meteorology, history, etc.

Arguably, given the encyclopaedic nature of the material, both expeditions call for a cross-disciplinary approach from the modern historian as well.

PAPER

In the story of eighteenth-century science, the passages, or transits of Venus in front of the sun in 1761 and 1769 constitute two highlights. The idea was that by means of these events, the distance between Sun and Earth could be accurately measured. The only problem was that you needed observers to spread themselves across the entire surface of the planet, and this was no straightforward thing to achieve. The great powers Britain, France and Russia played leading roles in dispatching expeditions to remote regions like Siberia, the Pacific Ocean and North America. However, smaller powers like the kingdom of Denmark and Norway also wanted to participate, especially since Sweden succeeded to deliver a strong contribution to this international campaign in 1761 and was preparing for large-scale activities in 1769 as well. The international picture, therefore, seems to have been the principal reason for the government of Copenhagen to contact a Jesuit Father with the name Maximilian Hell, the court astronomer of Vienna, asking him to make an expedition to Vardø in northernmost Norway. Father Hell said yes, and prepared himself for quite a lot more than a Venus transit expedition alone. In keeping with the encyclopædic ideals of enlightenment science, he made sure to arrive at his destination of Vardø in the autumn of 1768, almost eight months before the transit of Venus was going to take place. In this way, Hell and his assistants had the occasion to undertake quite a lot of research on Norwegian soil.

Father Hell's assistants included another Jesuit astronomer of Hungarian descent and a Norwegian natural historian who had studied under Carl von Linné (or Linnæus) in Uppsala. The story of Maximilian Hell's expedition and its various results were supposed to be published in a three-volume work in folio, called *Expeditio litteraria ad Polum Arcticum* (or 'Scientific Expedition by the North

Pole’). This work was never finished, but bits and pieces were either published separately or are preserved as manuscripts in Vienna to this day.

Seventy years later, a similar – but much larger – expedition was financed by the French authorities, upon the initiative of Paul Gaimard, a medical doctor and natural historian who had already travelled around the world twice before he started lobbying for explorations in the arctic and sub-arctic parts of Europe. Of particular interest to the history of science in Norway is his success in bringing a team of scientists to northernmost Norway aboard a naval ship called ‘La Recherche’ in the years 1838-1840. The team of this expedition included nine French and ten Scandinavian scientists, historians and painters. The aims and scope of the expedition was to explore almost every aspect of nature, climate and human life in northernmost Europe, including Spitsbergen. The ‘hard sciences’ were particularly emphasised, although social sciences, literature, folklore, laws and constitutions etc. also received attention. Like in the case of Maximilian Hell’s expedition, parts of Gaimard’s expedition report were never published. Among the 26 volumes of text and several illustrations that were issued, however, one can find detailed information on geomagnetic research, astronomical observations, geological field work, and a wide range of other activities undertaken by the crew of Paul Gaimard over the years 1838-1840. If we supply the projected volumes which were never issued, we would get something reminiscent of Diderot’s *Encyclopédie* for northern Scandinavia and Spitsbergen. As far as the subject matter is concerned, however, the aims and scope would not be very different from that of Hell’s projected *Expeditio litteraria* of the 1760s, except that the number of scientists involved would be something like 19 against Hell’s 3. Arguably, such a many-sided undertaking would hardly have been projected for the more central regions of Europe, and certainly not as late as the 1830s. My hypothesis, therefore, is that the encyclopædic tradition of science survived longer as far as the Arctic regions are

concerned than in the more “civilised” parts of the old world. I must stress that this is just a hypothesis, and by no means a main point in my talk today.

What we may conclude, however, is that the material from both expeditions is many-sided and hard to study in depth for one person alone. That would require knowledge of the history – and historiography – of astronomy, geodesy, geology, ethnography, geophysics, linguistics, etc etc etc. The easiest way for the modern historian to come around this problem, would be to avoid the ‘hard science’ aspects of the expeditions in question, concentrating instead on the socio-cultural, political and other contexts. Such a choice may be very fruitful indeed. Since Einar-Arne Drivenes is here in the room, I should like to point to his article on the “La Recherche” expedition in *Historisk Tidsskrift* of 1992 as an excellent example of such an approach to the history of science. His article is History with a capital ‘H’; he analyses the political factors motivating the expedition, he presents new sources from the correspondence of Gaimard and other scientists involved, thus shedding light on the process of planning and obtaining funding for the expedition, and so on. He also discusses the historical situation making such an undertaking possible and has broader remarks on the history of scientific expeditions in the eighteenth and nineteenth centuries. Now, these are all important and *fundamental* elements for a proper understanding of any scientific expedition. The question is whether something *more* should be expected from History of Science as a field of research?

Of course, it is not difficult to legitimate the choice of Einar-Arne and others. One could argue that treatment of scientific data should be left to professional scientists, whereas the historians – as proper humanists – should take care of the historical contexts. A modern astronomer is for example capable of calculating the positions of stars and orbits of planets back in 1838 or 1769 and thus make assessments on the quality of the astronomical observations made in North

Norway at that time, something the average historian is not. So the solution might be to let modern scientists take care of the history of *Science* with a small 'h' and a capital 'S', and to let the historians handle the historical aspects, that is the *History* of Science, with an emphasis on the historical part.

This is where I disagree. I think one should aim at doing '*History of Science*' with an emphasis on both aspects. This implies that the history of science is not something which should be undertaken by one person alone, we need to combine the strengths of History and Science as modern disciplines in order to arrive at '*History of Science*'. The reason is that you risk missing out quite a lot unless you blend the two approaches.

I shall try to exemplify this, by using my own experience with historical research into the Aurora Borealis, or Northern Light. Without going too much into details, I shall make the very general remark that historical observations of the northern light constitute a kind of geophysical data sets that continue to be of value to the modern scientist. A modern geophysicist will often use past observations of Northern Lights in order to test models of solar activity over the centuries. A period when the aurora displays are frequent is a sign of a high level of solar activity in the same period. Reversely, a period when the aurora displays are rare means the solar activity is low. This modern scientific activity is in fact related to the current debate of climate change, that is, how great is the influence of human activity and how great is the influence of a natural factor like the sun upon the changing global temperature. In this debate, sources from an age before large-scale carbon emissions had started become highly relevant, from a scientific point of view. So this is where the modern scientist enters the field of history of science. And this is where I would argue that humanists, with our emphasis on source criticism and our abilities in using archival sources, digging out correspondence, unpublished manuscripts etc., can contribute quite a

lot. Not only by disclosing previously unknown scientific data, but also – and perhaps even more important – by testing the reliability of these data.

Now, what do I mean by this. I shall limit myself even further, to my own experience with Father Hell. He was stationed at Vardø in the period from October 1768 to June 1769, and as a matter of routine, he noted every display of northern lights quite consistently, adding in his notebooks theoretical deliberations on the cause of the phenomenon, on its shapes and colours, etc. He also published a theoretical treatise of some 120 pages in Latin, called *Aurorae Borealis Theoria Nova* (or ‘New Theory on the Northern Light’). In the process of compiling past observations of the northern light, scientists have visited these sources. Thus, the earliest catalogue of this kind covering observations from Norway, which was compiled by Sophus Tromholt and published in 1902, has 16 observations made by Maximilian Hell and his crew. My own investigation of the sources resulted in 29 observations, that is, nearly the double. But that is not the main problem. The main problem is that some of Hell’s observations are hard to believe in. Among his observations there are a few examples from May and June, when the Midnight Sun makes it totally impossible to see any Northern Light because the sky is so light, even in the middle of the night. Tromholt in his catalogue has nonetheless listed these observations of Hell, adding remarks like “sehr problematisches Nordlicht” (“a very problematic northern light”) or “cannot be reckoned as a northern light”. No such comment has been added, however, to the observations made at a time of year when any scientist knows that aurora outbreaks are likely to occur. It appears, then, that in their eagerness to compile catalogues and make statistical analyses, modern scientists tend to use historical sources in an eclectic manner, without attempting to assess past concepts of the phenomenon. If Maximilian Hell believed he saw real northern lights in the arctic daylight of May and June, can we then take for

granted that what he saw in January or February were real northern lights, or should we treat these observations as “sehr problematish” as well?

In order to assess this question, I have cooperated with a modern geophysicist in going through the various manuscripts and printed publications of Father Hell concerning the Northern Light. It turned out that his concept of the aurora borealis was quite different from the definition that is valid today. Thus, Father Hell would include observations of various optic phenomena like reflections of sun rays or moon rays through clouds or moisture in the atmosphere, and list them as aurorae.

Maximilian Hell is also known to have discarded the observations of other eighteenth-century natural philosophers concerning a connection between aurora outbreaks and disturbances of the magnetic needle. It is known that the magnetic needle will be disturbed when there is a sun storm going on, because the magnetic field of the earth is affected. During such sun storms, more solar particles than usual will hit the atmosphere of the earth, causing strong displays of northern lights. This is the modern explanation of simultaneous occurrences of aurora displays and disturbances of the magnetic needle which the eighteenth-century savant was lacking. Maximilian Hell did in fact bring high quality magnetic needles with him to Vardø, and he did use them, but he found no connection whatsoever between the northern light and disturbances of the needle. That is, he did see disturbances of the magnetic needle and he did see northern lights, but *never* at the same time.

This is where neither the scientist nor the historian is likely to find the explanation *alone*. One historian who has written an article on Maximilian Hell's geomagnetic research a few years back, concluded that the magnetic needle of Father Hell must have been injured during transport or testing. His

instruments did not work properly, and this is why his theories were wrong, he argues. Now, this historian – whom I have met – is Hungarian and has never in his life seen the phenomenon, or visited Vardø for that matter. His explanation is not all too far-fetched, however, since Father Hell in his manuscripts on some occasions expresses dissatisfaction with the way his instruments are working.

Now, together with my collaborator, the modern geophysicist – whose name is Truls Lynne Hansen by the way – I have found that Maximilian Hell in fact observed the magnetic needle quite extensively in Vardø, in the entire period from late April to early June 1769. He also used it during stops ashore on his return voyage along the coasts of North Norway, from June to August 1769. This is the period when he saw the disturbances of the magnetic needle, which – as we now know – *are* indications of sun storms. But because of the Midnight Sun, Maximilian Hell had no chance of seeing real displays of the aurora borealis in this time of year. So, where does this all bring us?

The historian can in fact get a lot of help from the modern scientist in interpreting scientific texts from the past. The source criticism and archival work of a historian can likewise serve as a corrective to the statistics of modern scientists trying to grapple with complex processes like climate change and solar activities in past centuries. Could it be that other natural philosophers than Maximilian Hell were operating with concepts of the aurora which do not fit the modern definition of the phenomenon? I think this is highly likely. But in order to check this hypothesis, one would need to go into theoretical works, journals of observations, letters exchanged between individual scientists, and so on. And one would need to have quite a lot of modern scientific knowledge in order to do so in a proper way.

The Research Council of Norway and the European Union's Framework Programmes tend to sponsor research projects lasting for three or four years only. In such a time I think it should be possible for a single historian to acquire rather detailed knowledge of one particular field of science, such as, say, the history of geophysics and the aurora borealis in a given period. But this hardly does justice to a complex, cross-disciplinary expedition like that of Maximilian Hell or Paul Gaimard. If both the historical context of a particular expedition, *and* all its various scientific aspects are to be studied properly by one individual only, this would require years and years, perhaps a whole career. This would mean that a doctoral candidate would not be able to finish his or her PhD until shortly before retirement... Now, the way to get around this problem would be to adopt another strategy than the usual way of one scholar writing one monograph. The possibility of submitting doctoral theses consisting of a series of articles instead of one long text has only recently started to become formalised in the humanistic disciplines of the Norwegian university system, and I think we will have to wait for some time for this new tradition to gain general acceptance. I would argue, however, that history of science as a research field may profit quite a lot from this new opportunity. Perhaps we should emulate the traditions of the sciences themselves? I think everybody in this room has noticed that nowadays, the majority of scientific articles are not authored by one researcher alone, but by at least two or three. This practice does not preclude a young scientist to acquire his or her PhD; a series of articles co-authored over a period of three years will simply be collected and submitted as one PhD treatise, even though this is not the work of one individual alone. If this practice could be employed by historians of science in the coming years, I think we can achieve quite a lot.

I must admit that I am not standing here as a representative of such a new tradition. I am now about to submit a rather traditional thesis of history, devoted

to a few selected aspects of Maximilian Hell's Venus transit expedition. My collaboration with people in other departments do not form part of my PhD, which is a work authored by myself. However, with hindsight I must confess that I should have liked to do my PhD in quite a different way. I would have contacted modern experts in several of the branches of science covered by Maximilian Hell and his crew – that is, ethnography, comparative linguistics, astronomy, geophysics, geology, meteorology and a few more – and I would have invited these to go through the sources assembled and translated by myself and to write articles together with me. These articles would then have had the potential to be of relevance *both* to historians *and* to scientists. When my PhD project was approaching its end, I would simply have collected these articles and made an introduction in which I discussed the aims and scope of the expedition as a whole and tried to analyse its socio-political context. I admit that this would not have been a very traditional PhD in history. But in my dreams, it would have been a real good one.

I am looking forward to hear your views on this matter. Thank for your attention!