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## 'The latest news about the heavens': The European contact- and correspondence-network of Dutch astronomers in mid-18th century

### (1) Introduction

In regard to the topic of the session R-18: 'Circulating Knowledge: A European perspective on communication of science', I will focus in this paper on the European correspondence network of Dutch astronomers in the mid-18<sup>th</sup> century. By Dutch astronomers I mean all scholars, university professors, mathematicians, practitioners and other enthusiasts in the Netherlands, who were seriously involved in astronomical practice in the period concerned.

What can the preserved astronomical correspondence of these men tell us about the way in which Dutch astronomical science operated in those days: within the Dutch Republic, as well as with contacts abroad? Who were the key figures? In what way was communication set up and maintained? How was the language barrier tackled? What strategies were followed to obtain support? In short: what were the parameters that determined the impact of the efforts made?

In an earlier study I have portrayed this community of 18<sup>th</sup>-century Dutch astronomers.<sup>1</sup> This study showed that in the 18<sup>th</sup>-century Dutch Republic astronomy was practised mostly by dilettantes working outside the universities, sometimes organized in informal local societies. These '*konstgenoten*' or 'fellows of the arts and sciences' — as they called themselves — exchanged their observations and calculations by correspondence, publications in periodicals, or by messages printed in local newspapers.

### (2) Periodisation

I have selected the period 1750–1770 to investigate the nature of the contacts because, from an astronomical point of view, these two decades are of special interest for a series of events which needed the cooperation of astronomers all over Europe. First, one of the main astronomical problems concerned the question of how to determine the average distance between the Earth and the Sun. This astronomical unit was a fundamental constant in both the Copernican and the Newtonian planetary systems. The simplest way to estimate this fundamental parameter (or the solar parallax, which is directly related to it) is by measuring a planetary parallax. However, a far more accurate method was developed by the English mathematician Edmund Halley in the years 1691–1716. According to Halley, data concerning coordinated observations of a transit of the planet Venus across the Sun could be used to determine the solar parallax. This rare astronomical event would take place twice in the eighteenth century, in 1761 and in 1769. A transit of Mercury, occurring in 1753, would provide a test of this method.<sup>2</sup>

Another important astronomical problem concerned the orbit of comets. According to Newtonian mechanics these celestial bodies moved in large ellipsoid orbits around the Sun. However, this hypothesis had never been confirmed by observation. Moreover according to a theory published by

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<sup>1</sup> H.J. Zuidervaart, *Van 'Konstgenoten' en Hemelse Fenomenen. Nederlandse Sterrenkunde in de Achttiende Eeuw* (Rotterdam, 1999). [With a summary in English]. The archival sources used or quoted in this paper are to be found in this book. Most of the cited letters can be found in the *Klinkenberg Correspondence* in the Noord-Hollands Archief at Haarlem or in the *De l'Isle correspondence* in the Observatoire de Paris and in the Archives Nationaux, both in Paris.

<sup>2</sup> Cf: H. Woolf, *The transits of Venus: a study of eighteenth-century science* (Princeton, 1959), pp. 35–40 and Zuidervaart (ref. 1).

Halley in 1705, comets observed in 1531, 1607 and 1682 were actually one and the same comet and this comet should return around the year 1758.<sup>3</sup>

A third major problem in 18<sup>th</sup> century astronomy was the precise determination of the latitude and longitude of any place on the globe. This was a problem that could be tackled by collecting data of, for instance, occultations and eclipses, measured from various places on Earth. In regard to this problem some important Solar Eclipses — in 1764 and 1765 — provided opportunities for useful observation.<sup>4</sup>

All these problems required combined and coordinated efforts of the European astronomical community.

In résumé, in the years 1750–1770, the following remarkable astronomical events occurred, which stimulated international astronomical correspondence:

- In 1751 a fortuitous conjunction of Mars and Venus created the possibility to deduce the solar parallax from coordinated measurements of the planetary parallax observed from various places around the globe.
- In 1753 a transit of Mercury occurred.
- In the years 1757–1759 the first return of Halley’s Comet was expected.
- In 1761 and 1769 the transits of Venus took place.
- In 1764 and 1765 two full eclipses of the Sun occurred.

### (3) Theory: ‘weak ties’ and ‘strong bonds’

Following work on correspondence networks by David S. Lux and Harold J. Cook, I have chosen to investigate the nature of the contacts of Dutch astronomers, by looking at the so called ‘weak ties’, a concept introduced as a theoretical tool by the American sociologist Mark Granovetter. The basic argument in Granovetter’s theory is that a relationship to family members and close friends (the so-called ‘strong bonds’ or ‘strong ties’) will not supply as much diversity of knowledge as a relationship to geographically distant acquaintances, and the like (the so-called ‘weak ties’). Although it is undoubtedly true that serious knowledge accumulation has been achieved within a small group of insiders, working closely together in so-called ‘closed circles’, it is also undoubtedly true that the development of natural knowledge is an international movement, in which various local players take part, exchanging information and ideas from ‘the local to the global’, and the other way around. Or as Lux and Cook have put it: “hosts of people, of many different social and geographical locations, were involved in the establishment of matters of fact”.<sup>5</sup>

Their most eye-catching finding — based on an analysis of a selection of the Oldenburg correspondence — was that, in the early modern period, travel more than any other activity, established the conditions by which knowledge could be exchanged. The travels of scholars helped to shape three things: learning, experience and judgement. The personal meetings that resulted from travel established multiple ‘weak ties’ that provided the foundation for later correspondence. In these personal visits the social rank and educational credentials — and thus the trustworthiness — of the other party could be established and the credibility of the persons involved could be judged. This judgement could be expanded to others of whom favourable testimonies were given by the persons visited. On this second- or third-hand information correspondence could also be built.

### (4) Method

From this perspective I have studied the contacts and correspondence of the twelve most important Dutch astronomers in the selected years of my investigation (1750–1770), drawing on more than 500 known letters (= c. 25 per year), which have actually survived or are mentioned elsewhere (*See Table I*). In addition I have searched for accounts of scholarly visits to these selected astronomers.

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<sup>3</sup> Cf. Schaffer, “Halley, De l’Isle and the Making of the Comet”, in: Norman J.W. Throver [ed.], *Standing on the shoulders of giants* (Berkeley, 1990), pp. 254–298.

<sup>4</sup> Cf. R.H. van Gent, ‘Mapping the Lunar Shadow: The Earliest Solar Eclipse Maps’, in: A.D. Wittmann, G. Wolfschmidt & H.W. Duerbeck (eds.), *Development of Solar Research* (Frankfurt am Main, 2005), pp. 103–127.

<sup>5</sup> David S. Lux & Harold J. Cook, “Closed Circles or Open Networks? Communicating at a distance during the Scientific Revolution”, in: *History of Science*, 36 (1998), pp. 179–211.

Table 1. Selected Dutch Astronomers (1750–1770)				
No.	Name	Profession	City	Active Period
<b>OOSTFRIESLAND</b>				
1	Panser	School teacher	Emden	1736 – 1754
<b>FRIESLAND</b>				
2	Ypey	Academic Professor of Mathematics	Franeker	1743 – 1780
3	Foppes	Surveyor	Leeuwarden	1753 – 1770
<b>UTRECHT</b>				
4	Back	Surveyor	Utrecht	1736 – 1770
5	Hennert	Mathematician / Academic Professor (1764 onwards)	[Leiden] / Utrecht	1759 – 1810
<b>HOLLAND</b>				
6	Martens	Lecturer in Physics & Astronomy	Amsterdam	1735 – 1761
7	Struyck	Mathematician	Amsterdam	1722 – 1765
8	Van de Wall	Merchant	Amsterdam	1745 – 1775
9	Lulofs	Academic Professor of Astronomy	Leiden	1743–1768
10	Gabry	Gentleman / J.U.D.	The Hague	1744 – 1768
11	Klinkenberg	Surveyor	Haarlem / [Leiden] / The Hague	1742 – 1782
<b>ZEELAND</b>				
12	De Munck	Surveyor & Architect	Middelburg	1724 – 1761

Looking at the selection, it can be concluded that these twelve Dutch astronomers participated actively in some 61 % of the major astronomical activities of this period (*Table 2*).

Table 2: Activities of Dutch Astronomers (1750–1770)												
No.	From	La Caille	Mercury Transit	Comet	Comet Halley	Comet	Venus Transit	Comet	Solar Eclipse	Solar Eclipse	Venus Transit	Great Comet
		1751	1753	1757	1759	1760	1761	1762	1764	1765	1769	1769
		1	2	3	4	5	6	7	8	9	10	11
1	Panser	█										
2	Ypey				█	█	█		█		█	█
3	Foppes	█	█	█					█		█	█
4	Back			█	█	█					█	█
5	Hennert				█	█					█	█
6	Martens				█	█					█	█
7	Struyck	█	█	█								
8	Van de Wall								█			
9	Lulofs	█	█	█	█	█	█			█		█
10	Gabry	█		█	█	█	█					
11	Klinkenberg	█	█	█	█	█	█				█	█
12	De Munck	█			█	█	█					

Evidence of relevant activity  
 Not Yet Active or disabled/deceased

At least seven (= 58 %) of them received visits from foreign astronomers (*Table 3*).<sup>6</sup> As far as we know, in this period only one Dutch astronomer paid a visit to an observatory outside the Netherlands.<sup>7</sup>

**Table 3: Known international astronomical visitors to the Netherlands (1740–1780)**

No	1744 De la Conda- mine	1759 Ferner	1762 Chappe d'Auteroche	1767 De Courtan- vaux	1767 Pingré / Messier	1768 Mallet	1770 Lichten- berg	1774 Lalande	1777 Bugge	
	1	2	3	4	5	6	7	8	9	
<b>OOSTFRIESLAND</b>										
1	Panser	Emden								
<b>FRIESLAND</b>										
2	Ypey	Franeker								
3	Foppes	Leeuwarden								
<b>UTRECHT</b>										
4	Back	Utrecht								
5	Hennert	Utrecht								
*	Observatory	Utrecht								
<b>HOLLAND</b>										
6	Martens	Amsterdam								
7	Struyck	Amsterdam								
8	Van de Wall	Amsterdam								
9	Lulofs	Leiden								
10	Gabry	The Hague								
11	Klinkenberg	The Hague								
<b>ZEELAND</b>										
12	De Munck	Middelburg								

Evidence of visit
  Deceased or disabled

Curiously enough, the person who observed the least, received the most foreign visitors. This was the Amsterdam merchant Van de Wall, who owned a private astronomical observatory in which he had placed the largest reflecting telescope then available in the Netherlands. However, Van de Wall

<sup>6</sup> The visit of De la Condamine to Amsterdam in 1744 (1) is mentioned in N. Struyck, *Vervolg van de beschrijving der staartsterren* (Amsterdam, 1753), p. 140. His contact with Martens and Struyck is mentioned in: Struyck to the Académie Royale des Sciences, 15 May 1752 (ADS, dossier personnelles). (2) Bengt Ferner's travel journal has been published by G.W. Kernkamp in *Bijdragen en mededelingen van het Historisch Genootschap*, 31 (1910), pp. 314–509; (3) The visit to Amsterdam in 1762 by Jean-Baptiste Chappe d'Auteroche, on his way from St Petersburg to Paris, is mentioned in the *Uitgezochte Verhandelingen*, 7 (1762), pp. 422–454; (4) The account of De Courtanvaux's astronomical expedition has been published by Pingré, *Journal du voyage* (Paris, 1768); Pingré's own — unpublished — account is preserved in Paris, in the library St Geneviève; (5) The visit by the Swedish astronomer Mallet to The Hague is recorded in a letter of Gabry to Wargentín, 10 January 1769; (6) Lichtenberg's travel journal to Holland (1770) has been published by H.W. Gumbert, *Lichtenberg und Holland* (Utrecht, 1973). (7) Lalande's travel journal to Holland (1774) is preserved in the Library of the Institute in Paris, and (8) Thomas Bugge's travel journal (1777) has been published by Karl Moller Pederson & Mette Dybdahl, *Thomas Bugge. Journal of a voyage through Holland and England, 1777* (Aarhus, 1997). During the years under investigation the Dutch Republic was visited by other astronomers of whose whereabouts and meetings nothing is known, such as De l'Isle in 1747 (passing on his way home from St Peterburg); J.H. Lambert in 1758; Boscovich in 1761 (he visited Rotterdam, Delft, The Hague, Leiden, Amsterdam & Utrecht); Paolo Frisi in 1766.

<sup>7</sup> L. Duynewey de Munck visited the Observatoire de Paris in 1753. See: Zuidervaart (ref. 1).

regarded optics as his main interest — which was the sole reason why he had constructed such a large telescope. Contemporary astronomers even complained about the fact that ‘such a pretty machine, of which all astronomers recognised the quality, was not in more able hands’.<sup>8</sup> It is therefore not very surprising that Van de Wall did not engage in any astronomical correspondence.

However, others did. In the period under investigation at least six of the twelve Dutch scholars (or 50%) maintained a foreign correspondence of some substance (*Table 4*). Especially active in this respect was the Amsterdam mathematician Nicolaas Struyck, who corresponded with at least 23 scholars outside the Netherlands.<sup>9</sup>

**Table 4: International correspondence by selected Dutch Astronomers (1750–1770)**

No.	Name	City	France	England	Germany	Italy	Other
<b>OOSTFRIESLAND</b>							
1	Panser	Emden					
<b>FRIESLAND</b>							
2	Ypey	Franeker					
3	Foppes	Leeuwarden					
<b>UTRECHT</b>							
4	Back	Utrecht					
5	Hennert	Leiden / Utrecht	■		■		
<b>HOLLAND</b>							
6	Martens	Amsterdam					
7	Struyck	Amsterdam	■	■	■	■	■
8	Van de Wall	Amsterdam					
9	Lulofs	Leiden	■	■	■		■
10	Gabry	The Hague	■	■	■		■
11	Klinkenberg	Haarl. / The Hague	■	■	■		■
<b>ZEELAND</b>							
12	De Munck	Middelburg	■	■	■		

■ Evidence of international correspondence

As an example of the way in which the Dutch astronomical contacts functioned — internally and abroad — I will focus on astronomical activities in the years 1750–1753, when an attempt was made to deduce the solar parallax from coordinated measurements of the planetary parallaxes of Mars and Venus, observed from various places around the globe. After the presentation of this case, I will present some conclusions based on the whole period under investigation.

### (5) Lacaille’s expedition of 1750–1753

The idea to deduce the solar parallax from measurements of the planetary parallaxes of Mars and Venus, was proposed by some French astronomers at the end of the 1740’s. A rare planetary constellation in 1751 would facilitate a more accurate determination of the solar parallax. This attempt needed coordinated measurements, to be carried out at a number of places on Earth, both in Europe and in Southern Africa. The French astronomer Nicolas Louis de Lacaille was selected to lead an expedition to the Cape Colony. A request for observational cooperation was published and distributed throughout

<sup>8</sup> H.J. Zuidervaart, “Reflecting ‘Popular Culture’. The Introduction, Diffusion and Construction of the Reflecting Telescope in the Netherlands”, in: *Annals of Science* (2004), pp. 407–452, esp. p. 426.

<sup>9</sup> See the lists of Struyck’s correspondents, in: H.J. Zuidervaart, “Early Quantification of Scientific Knowledge: Nicolaas Struyck (1686–1769) as Collector of Empirical Gathered Data”, in: Paul M. M. Klep and Ida H. Stamhuis (eds.), *The Statistical Mind in a Pre-statistical Era: The Netherlands, 1750–1850* (Amsterdam, 2002), pp. 125–148.

Europe. The response was not overwhelming, but sufficient to proceed. Observational cooperation was promised by (1) Bradley, the English Astronomer Royal, in Greenwich; (2) by Grischow, the secretary of the Russian Academy of Sciences in St. Petersburg; (3) by Wargentín, the secretary of the Swedish Academy of Sciences in Stockholm and (4) by the French astronomer De Lalande, who would travel especially from Paris to Berlin, in order to make observations there from almost the same latitude as his colleague Lacaille at the Cape.<sup>10</sup>

Although Lacaille's expedition was financed by the French King, its success depended largely on the kind cooperation of the Dutch authorities, who at that time administered the Cape Colony. How was this cooperation from the Low Countries organized? At first the French used diplomatic channels. In August 1750, at a meeting at the Royal Court in Versailles, the French 'Ministre d'État', Marquis de Puisieulx<sup>11</sup> got in touch with the Dutch diplomat Lestevenon van Berkenrode, assessing the Dutch willingness to back the French astronomical initiative. Ambassador Lestevenon conveyed this request, accompanied by Lacaille's plan for the expedition, to his superiors in The Hague.<sup>12</sup> As the Dutch Republic had been at war with France quite recently, it was not obvious that approval of the Dutch officials would be received. Through the influential Dutch-British aristocrat Count Willem Bentinck, the Dutch Stadtholder was personally approached, requesting Dutch cooperation with the French expedition.<sup>13</sup> This approach was quite remarkable, as in 1747, after the French attack on the Low Countries, a change in the organisation of government had taken place in the Dutch Republic, restoring the function of 'Stadtholder' as the highest office of state. This office had been suspended since the death, in 1702, of the last Stadtholder, William III of Orange, King of England.

With this initiative the French astronomers had made a lucky move. The newly appointed Stadtholder, Prince William IV, was a well-known patron of the mathematical and physical sciences. He personally possessed a fine collection of scientific instruments and in 1748 he had even created the honorary position of 'Stadholderly Astronomer'.<sup>14</sup> In October 1750 the Stadtholder wrote a personal letter of recommendation to Governor Tulbagh of the Cape Colony.<sup>15</sup> Consequently, other Dutch authorities felt obliged to support the French initiative. At the end of November 1750 all officials involved (including the States General and the Dutch East India Company) gave their blessing to the French expedition.<sup>16</sup> Having received the Prince's consent, Lacaille immediately left Paris to board the vessel *Le Glorieux* in the harbour of Lorient.<sup>17</sup> However, the consent of the Dutch authorities did not imply any active support for the French expedition. Therefore, Dutch co-operation with the required observations had to be organized otherwise. How was this done?

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<sup>10</sup> Davis S. Evans, *Lacaille: Astronomer, Traveler. With a new translation of his journal* (Tucson, 1992). A better review of the project is given by Angus Armitage, "The astronomical work of Nicolas-Louis de la Caille", in: *Annals of Science*, 12 (1956), pp. 163–191. See also: Woolf (ref. 2), pp. 35–40.

<sup>11</sup> His full name was Louis Philogène Brûlart de Sillery, Marquis de Puisieulx.

<sup>12</sup> Lestevenon to the States General, 20 August 1750. Cited in: Evans (ref. 10), p. 297. The text of several documents relating to Lacaille's expedition has been published by T. Maclear, *Verification and extension of Lacaille's Arc of Meridian*, London, 1866. These are partly reprinted in Evans.

<sup>13</sup> The role of Count Bentinck at this occasion is revealed in a letter by Klinkenberg to De l'Isle, 6 June 1760. See also: N.L. Lacaille, "Sur plusieurs observations Astronomiques, Géographiques & Physiques, faites au Cape de Bonne-Espérance", in: *Histoire [et Mémoires] de l'Académie Royale des Sciences pour l'An 1751* (Paris 1755), pp. 158–169, esp. 160.

<sup>14</sup> Cf. P.R. de Clercq, "Science at Court: the Eighteenth-century Cabinet of Scientific Instruments and Models of the Dutch Stadholders", in: *Annals of Science*, 45 (1988), pp. 113–152. For the first Stadholderly Astronomer, see: H.J. Zuidervaart, "Astronomische waarnemingen en wetenschappelijke contacten van Jan de Munck (1687–1768), stadsarchitect van Middelburg", in: *Archief. Mededelingen van het Koninklijk Zeeuws Genootschap der Wetenschappen*, 1987, pp. 103–170.

<sup>15</sup> Willem IV to Tulbagh, 17 October 1750. Text reproduced in: Evans (ref. 10), pp. 201; 299–300.

<sup>16</sup> Evans (ref. 10), pp. 297–299.

<sup>17</sup> Evans (ref. 10), pp., 192.

At that time one of the key-figures in French astronomy was Joseph-Nicolas De l'Isle (1688–1768).<sup>18</sup> With Lacaille already at sea, De l'Isle had taken up the task of informing the other European astronomers. De l'Isle was a passionate astronomer who had worked for more than two decades at the Russian Academy of Sciences in St Petersburg; in 1747 he had returned to Paris, visiting the Netherlands on his way home. Throughout the years he had built an enormous network of correspondents, including some contacts in the Netherlands.

The first Dutch astronomer De l'Isle ever contacted had been Nicolaas Struyck, an Amsterdam mathematician. This contact was indeed a result of travel and a personal meeting. An acquaintance of De l'Isle, a certain De Mondoteguy, had met Struyck in Amsterdam in about 1720.<sup>19</sup> After this meeting he had reported quite enthusiastically to De l'Isle about Struyck's skills in astronomy. So after a while the two men started to exchange letters. This correspondence intensified after 1745, when Struyck was working on a critical cometography, seeking information from all over Europe. When De l'Isle was seeking support for Lacaille's expedition, Struyck was therefore a logical contact. In the following years Struyck indeed functioned as an important intermediate between the French *Académie Royale des Sciences* and the Dutch East India Company. Struyck provided Lacaille at the Cape with letters from his fellow academicians and he also organized other logistic support, for instance by shipping spare parts of scientific instruments from Amsterdam to Southern Africa.<sup>20</sup>

However, more help was required. Especially needed were skilled astronomers, who would contribute in the scheduled observations. For this purpose De l'Isle approached another Dutch astronomer, Dirk Klinkenberg at Haarlem. This contact had been established in 1744, when a Russian diplomat in The Hague, Heinzelmann, had informed De l'Isle about this young surveyor, who had published in the Dutch newspapers about a large comet.<sup>21</sup> In his letter the diplomat had included Klinkenberg's tract about the scheduled transits of Mercury and Venus.<sup>22</sup> In this booklet Klinkenberg argued that the transit of Mercury of 1753 also provided an excellent opportunity to establish the solar parallax. So here too a 'weak tie' was involved in the establishment of the contact: in this case the recommendation of a trusted acquaintance provided the trust needed for a scholarly correspondence. In 1744 De l'Isle's letter in French had presented Klinkenberg with quite a problem, as he could only read Dutch. He had therefore shown the letter to a group of friends, with whom he had formed a small scientific society: the Haarlem *Natuur- en Sterrekundig Collegie*. This local society possessed a building, on the roof of which a small astronomical observatory had been installed. In Granovetter's terminology this circle of friends formed a 'strong tie'. In this community an answer to De l'Isle's letter was formulated, written in Dutch. This '*curieuse et savante lettre*' — in De l'Isle's own words — opened a correspondence that would last until at least 1761.<sup>23</sup>

In January 1751 De l'Isle contacted Klinkenberg with a letter accompanying the *Avis aux Astronomes*, which Lacaille had prepared shortly before his departure.<sup>24</sup> In this letter he asked Klinkenberg to take part in the observers network that would support Lacaille's expedition.<sup>25</sup> Right from the start it was obvious that some members of the Haarlem *Collegie* would cooperate in the scheduled observational programme, although most members were too busy with their daily jobs.

<sup>18</sup> Nina I. Nevskaja, «Joseph-Nicolas Delisle (1688–1768) und seine Russische astronomische Schule», in: *Revue d'Histoire des sciences*, (1973), pp. 289–313.

<sup>19</sup> De l'Isle to Struyck, 4 March 1722.

<sup>20</sup> See Struyck to the Secretary of the Académie Royale des Sciences, in Paris, 15 May 1752 (concerns *inter alia* the distribution of mail to the Cape Colony and other packets, by Du Hamel du Monceau, Trudaine and Furgault. Spare parts and other equipment were ordered from the Widow Jan Verhoeven, "Mathematical instrument maker at Amsterdam". (Archive Académie des Sciences, Paris, *dossiers personnels*).

<sup>21</sup> De l'Isle to Klinkenberg, 1 Oktober 1744; De l'Isle to Heinzelmann, 12 Oktober 1744.

<sup>22</sup> D. Klinkenberg, *Verhandeling over het vinden van de Parallaxis der Zon* (Haarlem, 1743).

<sup>23</sup> De l'Isle to Klinkenberg, 7 June 1748 in response to K's letter of 18 January 1745 (!)

<sup>24</sup> N.L. de la Caille, *Avis aux astronomes, à l'occasion des observations qu'il va faire par ordre du Roi dans l'Hémisphère austral*, [s.l.; s.d. = Paris, 1750], 4 pp. Copy present in the Klinkenberg correspondence. See also Woolf (ref. 2), pp. 38–39.

<sup>25</sup> De l'Isle to Klinkenberg, 31 January 1751 (K. 30 & OdP, Corr. De l'Isle, X, 67). Klinkenberg received the letter through Struyck. Cf. Woolf, (ref. 2), p. 40.

Adriaan Spinder, for instance, one of the astronomical celebrities of the Haarlem *Collegie*, had refused cooperation, being too involved with his brewery. Nevertheless, preparations were made and new astronomical tables — recommended by Lacaille — were purchased.<sup>26</sup>

For Klinkenberg personally the French request came at a very inconvenient time. He had accepted a new job as a hydraulic engineer at Leiden and was in the process of moving to that city. In his new residence Klinkenberg could no longer use the astronomical instruments of the Haarlem observatory. From his draft letter of June 1751 Klinkenberg's disappointment can be discerned. After praising the French initiative, he crossed out a paragraph, in which he promised full cooperation and in which he even described the instruments he would use. In the letter actually sent to De l'Isle, Klinkenberg wrote a completely different paragraph, in which he expressed his great regret not to be able to make any contribution to the French observations. He was not wealthy enough to buy any instruments of his own. Moreover his new job would hinder any substantial contribution to the requested observations. He only was able to support the French initiative by asking others to cooperate in the project.<sup>27</sup> And so Klinkenberg did, with great zeal and enthusiasm. One of the members of the Haarlem Society translated De l'Isle's letter and the accompanying *Avis aux Astronomes*, into Dutch. This translation was published in a periodical, owned by one of the members of the Haarlem *Collegie*.<sup>28</sup> With reprints of these translations Klinkenberg then approached his own network of contacts.<sup>29</sup>

The first response was very promising. At Middelburg, in the southern part of the Netherlands, Jan de Munck, 'Stadholderly Astronomer' since 1747, reacted with great enthusiasm. He promised full cooperation with the scheduled observations. For this purpose De Munck even purchased a new astronomical clock. De Munck had been active as an astronomical observer since 1724 and in 1735 he had built a private observatory at his own expense. This facility was used by a group of acquaintances, constituting a local Scientific Society, just like the Haarlem *Collegie*, thus forming a 'strong bond' in Granovetter's terminology. About the observations made at this Middelburg observatory they had already corresponded — in Dutch — with, for instance the *Observatoire Royale* in Paris and the *Royal Society* in London.<sup>30</sup>

However, other reactions were more negative: like the one of Wartman, a surveyor working at Namur in the Austrian Netherlands (now Belgium). Wartman, who had met Klinkenberg a year before in Haarlem — thus forming a 'weak tie' — declared that he lacked the necessary skills, and that more competent people were not available in his neighbourhood.<sup>31</sup> A similar negative response was given by Gerrit Spinder at Krommenie, a brother of one of the Haarlem '*konstgenoten*' (thus obviously a 'strong tie'). Although this surveyor had been an ardent observer of the heavens since 1719 and had published some astronomical tables, he lacked the required spare time to participate.<sup>32</sup> Another response was given by Simon Panser, living at Emden, then a Dutch-speaking territory in Northern Germany. Panser replied that, although Klinkenberg had been correct in his assumption that he and his

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<sup>26</sup> W. Barnaart at Haarlem to Klinkenberg, 3 September 1751; 30 September 1751; 3 January 1752; 10 January 1752.

<sup>27</sup> Klinkenberg to De l'Isle, draft letter 20 June 1751 (RANH, *Corr. Klinkenberg*, 33. See for the sent letter OdP, *Corr. De l'Isle* X, 117-a & -b).

<sup>28</sup> De la Caille, "Bericht aan de Sterrekundigen, [...], ter gelegenheit der waarneemingen, welke hij op bevel van de koning staat te doen aan 't Zuidelijk Hemelrond'", in: *Hollandsch Magazijn* I, derde stuk (1751), pp. 423–435; See also De l'Isle's letter: "Brief van den Heer de l'Isle, lid van de Koninglijke Academie der Wetenschappen te Parijs, gevoegd bij het vorig Bericht en gezonden aan Dirk Klinkenberg, te Haarlem, met verzoek om het zoveel mogelijk allen Sterrekundigen Mede te deelen", in: *Hollandsch Magazijn* I, derde stuk (1751), pp. 436–496. This translation concerns De l'Isle's general letter of 31 January 1751. See also: Klinkenberg to De l'Isle, 20 June 1751. (OdP, *Corr. De l'Isle* X, 117-a/b.)

<sup>29</sup> Several letters of Klinkenberg, dated 2 May 1751.

<sup>30</sup> Zuidervaart (ref. 1 & 14).

<sup>31</sup> Wartman to Klinkenberg, 7 July 1751.

<sup>32</sup> Klinkenberg to De l'Isle, 20 June 1751; Barnaart to Klinkenberg, 3 September 1751. A decade before Spinder had published a translation from the German of the astronomical tables of De la Hire. (Cf. his *Uytvoerige en duydelyke verklaringe over de astronomische tafelen van den heere De la Hire*, Amsterdam (J. van Keulen), 1737.

son were the only persons in their part of the country who had any experience in performing astronomical observations, he nevertheless had to decline the request. As a school teacher, Panser was too busy to be able to participate in the French initiative. But he had contacted the local government with the request to install for this purpose an astronomical observatory in Emden, 'like that of Mr. Wurtzelbauw'.<sup>33</sup> However, a visit by the King of Prussia had distracted the attention of the local officials, so that Panser was rather sceptical about the outcome of his request.

In June 1751 Klinkenberg travelled to Amsterdam to consult his friend and tutor Struyck about the project only to find that even Struyck was not able to participate actively in the requested observational programme. Struyck would confine himself to the logistic support of Lacaille's expedition.

The most disappointing reaction, however, was given by Johan Lulofs, the Leiden Professor of Astronomy. Lulofs had already received a printed copy of De Lacaille's *Avis des Astronomes*, and although he told Klinkenberg that he was very sympathetic towards Lacaille's objectives, his duties in his second job as the 'Inspector of the Rivers of the Netherlands' would prevent him from participating in the observations. Besides, Lulofs stated, his observatory was not equipped with instruments of sufficient quality and accuracy.<sup>34</sup> Lulofs's negative answer was received at Haarlem with disbelief. Where in the Netherlands was there a better-equipped astronomical observatory than at Leiden University? Lulofs was cheating, was the opinion of some of the Haarlem enthusiasts.<sup>35</sup>

And Klinkenberg? His new residence was Leiden! As he was a very experienced astronomical observer, would not it be possible for him to get access to the university instruments? But even this suggestion appeared a bridge too far. Lulofs refused to admit Klinkenberg to the observatory, even after Klinkenberg's official matriculation in August 1751 as a student of mathematics and astronomy at Leiden University.<sup>36</sup> Klinkenberg had no option but to report these refusals to De l'Isle, requesting him to write to Lulofs personally. Being asked directly by De l'Isle, Lulofs was eventually prepared to make some of the scheduled observations, but according to Klinkenberg he only observed an occultation of Jupiter by the Moon. Far more important observations of the positions of Mars and Venus were not executed.<sup>37</sup> It was only in 1753, far too late for the French project, that Klinkenberg was at last granted permission to assist Lulofs with observations at the Leiden Observatory.<sup>38</sup>

In conclusion, apart from observations made at Haarlem and Middelburg, and some scanty observation at the Leiden Observatory, Dutch astronomers made no contribution to Lacaille's observational programme. However, thanks to Struyck's logistic support to Lacaille's expedition, he was well informed about the French undertaking. Thanks to his efforts, Struyck could arrange that the first account of the expedition was published in a Dutch periodical edited by one of his close friends.<sup>39</sup>

In 1760, in the final process of calculation of the solar parallax, Lacaille was, ironically, forced to omit some European observations, including the few Dutch ones. His result for the value of the solar parallax had to be published before the Venus transit of 1761, so that he simply had not time enough to include all the data he had received in his calculations. In the end it appeared that his results were not conclusive, so that in this respect Lacaille's expedition had failed to meet its original objective.<sup>40</sup>

<sup>33</sup> Panser to Klinkenberg, 3 July 1751. Panser refers here to the private observatory of the German astronomer Johann Philipp Wurzelbau (1651–1725) at Neurenberg.

<sup>34</sup> Lulofs to Klinkenberg, 9 May 1751.

<sup>35</sup> Barnaart to Klinkenberg, 3 September 1751.

<sup>36</sup> Th. J. Molhuysen, *Bronnen tot de geschiedenis der Leidsche Universiteit*, V (1921): 23 August 1751.

<sup>37</sup> Klinkenberg to De l'Isle, 13 February 1752.

<sup>38</sup> Klinkenberg to Struyck, 27 May 1753.

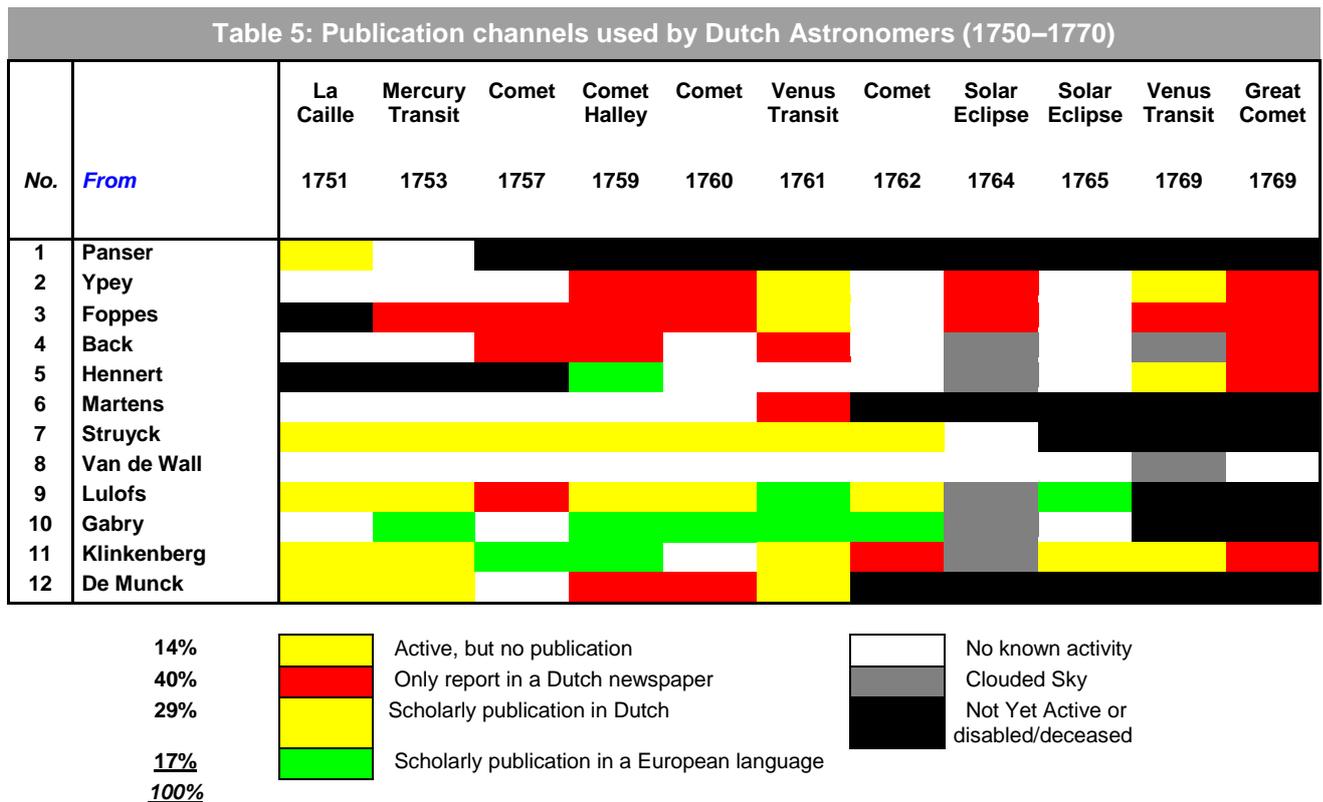
<sup>39</sup> N.L. de Lacaille, "Kort berigt van de Reize, op order van den Koning van Vrankryk gedaan naar de Kaap de Goede Hoop", in: *Uitgezogte Verhandelingen*, 1 (1758), pp. 333–364. See also: 'Meteorologische ofte weerkundige waarneemingen, genomen aan de Kaap de Goede Hoop in de Jaaren 1751 en 1752' in: *Verhandelingen uitgegeven door de Hollandsche Maatschappij der Wetenschappen*, 2 (1755), pp. 93–116.

<sup>40</sup> N.L. Lacaille, "Sur le parallax du Soleil, qui resulte de la comparaison des observations simultanées de Mars & de Venus, faite de l'annee 1751 au Cap de Bon-Esperance", in: *Histoire [et Mémoires] de l'Académie Royale des Sciences pour l'An 1760* (Paris, 1766), pp. 108–110. Lacaille used for his calculation of the Solar parallax only the observations of the following European astronomers: (1) Bradley in Greenwich; (2–3) Cassini de Thury and Le Gentil at Paris; (4) Maraldi at Thury and (5) Zanotti at Bologna. Other contributors mentioned

However, as far as the cartography of the constellations in the Southern Hemisphere was concerned, the expedition was a great success. Lacaille had measured the positions of some 10.000 stars, which achievement had earned him the nickname of ‘Father of Southern Astronomy’. As a token of gratitude for the hospitality received during his stay in the Cape Colony, Lacaille offered a manuscript of his new star catalogue to the Dutch government. The Curators of Leiden University commissioned professor Lulofs to write him a letter of thanks.<sup>41</sup>

## (6) The performance and foreign network of the Dutch astronomers

What can be learned from this micro-history and from the other events mentioned in the introduction? First that the performance of the Dutch internal network, through cooperation, exchange of findings, and observations published in scholarly journals, was rather poor. If they published anything at all, most Dutch astronomers did not produce more than a minor report in the local newspaper (*See Table 5*).



The (relatively) best results were achieved in the informal local societies, depending on the so-called ‘strong bonds’. This is confirmed by the fact that of the 34 comets that were observed globally in the period 1735–1770, eighteen were observed independently by these Dutch *konstgenoten*, eleven of whom were the first registered observers.

Secondly, from our investigation into the nature of these contacts the picture arises that ‘weak ties’ did indeed lay the foundations for foreign correspondence and the exchange of information. However, in contrast to the findings of Lux and Cook, these ‘weak ties’ were mostly not established by travel. As Rusnock has noted in her study of the correspondence network of the Royal Society, by mid 18<sup>th</sup> century other means of establishing the credibility of possible correspondents had emerged: the membership of a scientific society for instance, or scholarly publications which circulated throughout

in his tract were (6) Wargentin at Stockholm; (7) Strommer at Upsalla; (8) Schenmark at Hernosand; (9) Gadolin at Abo; (10) Hellant at Tornea; (11) De l’Isle at Paris; (12–13) Garipuy and d’Arquier at Toulouse; (14) Béraud at Lyon; (15–16) Carcani and Sabatelli at Naples; (17) Bose at Wurtemberg.

<sup>41</sup> Molhuysen (ref. 34), d.d. 21 May 1753. Lacaille’s manuscript can be consulted in the Leiden University Library.

Europe.<sup>42</sup> In 1744 De l'Isle for instance had contacted Dutch astronomers like Klinkenberg and Martens because he had read in the newspapers about their astronomical activities.<sup>43</sup> Oral transmission of credibility, exchanged between scholars abroad, also provided confidence that contacting a potential correspondent would be worthwhile. Striking is the example of Struyck, who after his logistic assistance to Lacaille's expedition, was contacted by at least five French academicians, seeking relevant information. The credibility he had achieved with his logistic support, created in these cases the 'weak ties' which established the conditions for a trustworthy correspondence.

When we investigate the way in which first contacts between Dutch and foreign astronomers were established (See Table 6), we can conclude that in the 56 contacts of which we have any knowledge, 50% were the result of a direct letter, without an obvious preceding contact or noticeable recommendation, but based on trust, based on scholarly publications or other achievements. Some 20% of the first correspondence were the result of a recommendation, and only 11% were the outcome of a direct meeting established by travel. In some 20% the circumstances of the first contact are unknown.

Table 6: Establishment of first known correspondence

No	Astronomer	Place	Number of foreign contacts		Result of			
					Meeting	Recommendation	Direct mail	Unknown
1	<i>Struyck</i>	Amsterdam	23	41%	1	2	11	9
2	<i>De Munck</i>	Middelburg	5	9%	1	0	4	0
3	<i>Lulofs</i>	Leiden	7	13%	0	3	4	0
4	<i>Klinkenberg</i>	Haarlem / The Hague	8	14%	0	4	3	1
5	<i>Gabry</i>	The Hague	9	16%	0	2	6	1
6	<i>Hennert</i>	Leiden / Utrecht	4	7%	4	0	0	0
<b>Total</b>			<b>56</b>	100%	<b>6</b>	<b>11</b>	<b>28</b>	<b>11</b>
					11%	20%	50%	20%

## (7) The language barrier

In addition to the findings of the authors mentioned before, we have established that the language barrier was another important parameter that determined the Dutch foreign correspondence. In the transmission of astronomical data between Dutch astronomers and foreign contacts language was an awkward obstacle. How was this problem tackled? Academics, like Lulofs, Hennert, Gabry or Vosmaer had sufficient knowledge of Latin or French, but most other Dutch astronomers mastered only their Dutch mother tongue. So they had to seek a translator for understanding the content of the letters they received. But finding a competent translator sometimes was not at all easy. Klinkenberg's translator experienced many difficulties in grasping the content of De l'Isle's letters.<sup>44</sup> And in 1758 three Dutch translators were needed to make sense of a letter received from the German comet searcher Gärtner. This astronomer had been approached by Klinkenberg with a letter that, exceptionally, had been translated into French.<sup>45</sup>

Similar problems were experienced by European astronomers who received letters in Dutch, sent for instance by Struyck, Klinkenberg, De Munck or Spinder. In his letters Klinkenberg apologized several times for not using 'French, now almost the European language'.<sup>46</sup> Even his learned colleague Struyck had only a passive knowledge of French, so that he too wrote his letters in his mother tongue.

<sup>42</sup> Andrea Rusnock, "Correspondence networks and the Royal Society, 1700–1750", in: *British Journal for the History of Science* 32 (1999), pp. 155–169.

<sup>43</sup> De l'Isle to Klinkenberg, 1 October 1744. Martinus Martens never took up any foreign correspondence.

<sup>44</sup> Helm de Jonge to Klinkenberg, 2 October 1744.

<sup>45</sup> Klinkenberg to Gärtner, 2 October 1758; Struyck to Klinkenberg, 21 December 1758.

<sup>46</sup> Klinkenberg to Lacaille, 19 May 1758; See also: Klinkenberg to Bradley, 13 December 1757 and Vosmaer to De l'Isle, 20 August 1759.

Sometimes Struyck even used a double spacing to allow his foreign correspondents to write their translations between the lines.<sup>47</sup> In St Petersburg, where the Russian navy was being organized by Dutch naval officers, De l'Isle never had a problem finding a Dutch translator, but this was more difficult in Paris.<sup>48</sup> Eventually he succeeded in finding a permanent translator, in the person of Godfried Sellius, a former professor of physics who had gone bankrupt and who in his youth had lived in Holland.<sup>49</sup> In England the Royal Society mostly used Dutch merchants or ministers for preparing translations.<sup>50</sup>

Sometimes the language barrier was partly overcome by an accompanying letter, written in the language of the addressee.<sup>51</sup> On other occasions messages were communicated by means of the international network of Dutch publishers, like Reynard, Gosse, Enschedé, Bosch or Van Daalen.

However, even though some texts were translated, the Dutch language remained a barrier. This circumstance was one of the reasons why scholarly contributions made by the Dutch astronomers were hardly recognized elsewhere in Europe. For most foreign scholars the language barrier was prohibitive: not only were the letters sent abroad mostly written in Dutch, so too were the publications. For instance Struyck's two impressive books on geography and astronomy (published in 1740 and 1753) were noticed only sporadically in other countries. Not until more than five years after the publication of Struyck's first book *Inleiding tot de Algemeene Geographie* (introduction to general geography), this work on mixed mathematics and astronomy was studied for the first time by a scholar outside the Netherlands, even though Struyck had made sure that his work had been distributed far and wide throughout Europe. Already in 1749 De la Condamine had remarked that Struyck's 'merits could not have failed of being known to all men of learning if his works had been published in a language more generally understood'.<sup>52</sup> This complaint about the inaccessibility of the Dutch language was repeated many times during the eighteenth century by foreign scholars, such as Du Séjour, Pingré, Lalande, Montucla and Olbers. As a result the Dutch astronomers were at best referred to, but they were not really read.

## (8) Conclusions

From this investigation into the nature of the contacts of Dutch astronomers from the mid 18<sup>th</sup> century the picture arises that indeed 'weak ties' were the foundations for foreign correspondence. But in contrast to the study of Lux and Cook, these 'weak ties' were not established by travel, but by other means, such as scholarly publications, second- or third-hand recommendations, or a connection with a scientific society.

Further we can conclude that 'strong bonds' between circles of close friends generated the best observational achievements. Only a few individuals — such as Struyck and Klinkenberg — were able to raise some contributions of substance from a local to a more global level. However, even the impact of their achievements elsewhere in Europe was reduced as a result of the language barrier, which separated these Dutch astronomers from their foreign colleagues.

After the failure in 1751 to establish a cooperative Dutch observational network on behalf of Lacaille's expedition, no similar attempts for a coordination of Dutch astronomy were made. The founding in 1752 of an official Dutch scientific society did not alter that situation. The Republic of the

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<sup>47</sup> Cf. Struyck to Pingré, 17 January 1760 (Bibliothèque St. Geneviève, Paris, Coll. Pingré, no. 2337).

<sup>48</sup> De l'Isle to Struyck, 24 June 1749; De l'Isle to Vosmaer, 7 June 1759.

<sup>49</sup> Cf. Klinkenberg to De la Caille, 19 May 1758 (AN, Corr. De l'Isle XIV, 47) and Hennert to De l'Isle, 5 February 1759 (AN, Corr. De l'Isle XIV, 79). Cf. L. Palm, "Sellius and his Newtonian teaching of physics in Halle", *Janus* 64 (1977), 15–24.

<sup>50</sup> For instance the merchants John van Rixtel (Arch. RSL, L&P I, 254) and John Beerens (EL.: M3, f. 64 / 65), or the Reverend C. Wetstein (L&P 23, 157). See for an earlier period: R.H. Vermij & L.C. Palm, "John Chamberlayne als vertaler van Antoni van Leeuwenhoek" in: *Gewina: tijdschrift voor de geschiedenis der geneeskunde, natuurwetenschappen, wiskunde en techniek*, 15 (1992), pp. 234–242.

<sup>51</sup> Aernout Vosmaer did this for Dirk Klinkenberg; the merchant John May did it for Nicolaas Struyck and the merchant John Rixtel for Adriaan Spinder.

<sup>52</sup> Cf. The recommendation of Nicolaas Struyck as a Fellow of the Royal Society of London (RSL, Register Books, 412, 23 November 1749).

Seven United Netherlands was politically divided in character, and the lack of a sense of unity did not stimulate a cooperative attitude. Only some individuals, and some closed groups with strong ties (localized in cities all over the country), were active in making observations of the transits of Mercury and Venus in 1753, 1761 and 1769, as well as during the years 1757–1759 in the search for Halley's Comet. And it was precisely these events that occasioned the glorious expeditions to which many other European astronomers contributed, in a European cooperation on a scale never witnessed before.

To add insult to injury, as a result of a language barrier, the few Dutch contributions made in these cases were hardly noticed outside the Netherlands. So in the end Dutch astronomers did not contribute much to the scholarly discourse in the European astronomical community.