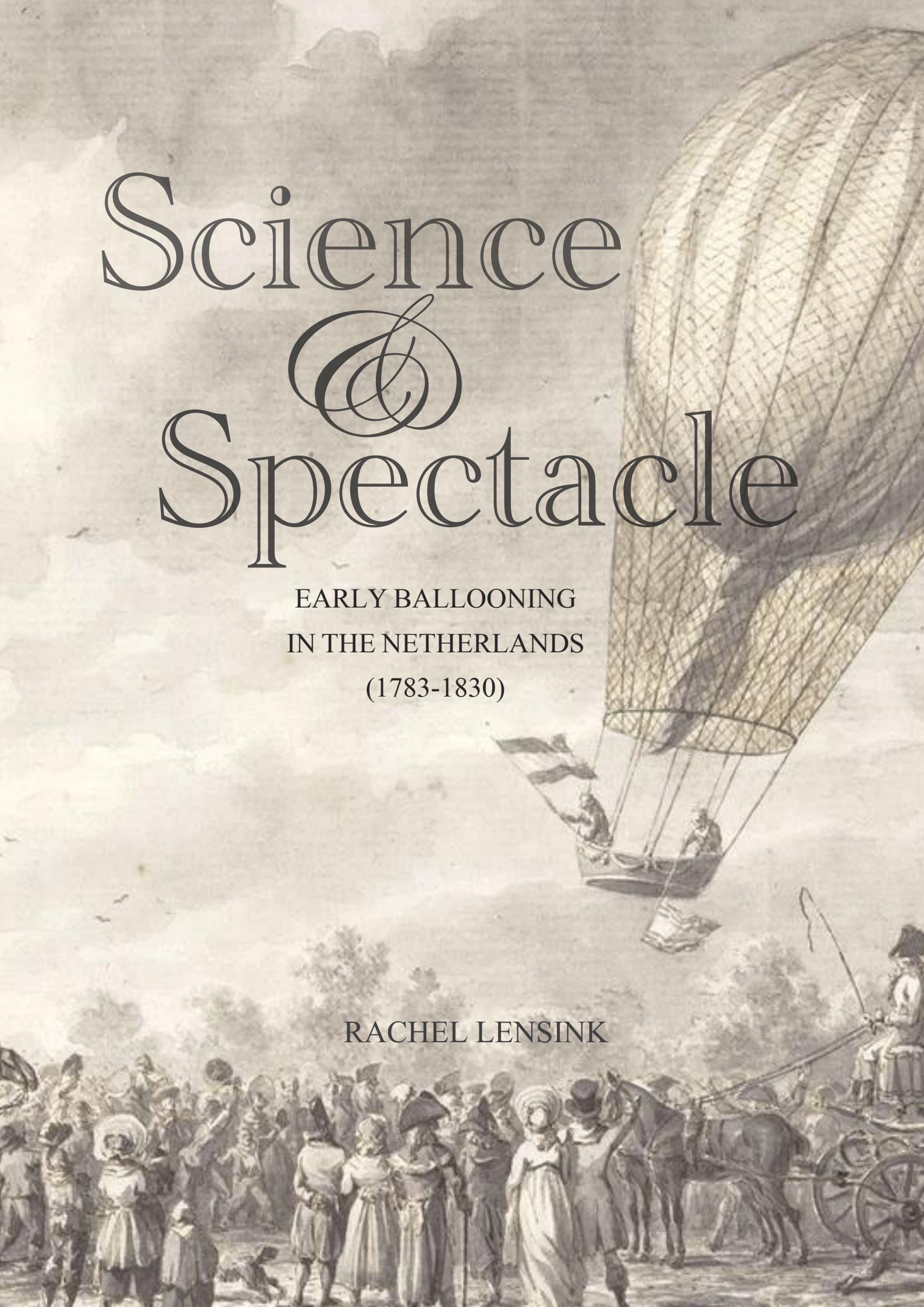


Science & Spectacle

EARLY BALLOONING
IN THE NETHERLANDS
(1783-1830)

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Image on frontpage:

Lucht ('Air') as part of a series on the four elements, 1798

by Dirk Langendijk (1748-1805)

Teylers Museum, Haarlem

CONTENTS

1	'If only I had wings'	5
2	Ballooning in the Netherlands	11
2.1	Analyzing newspapers and yearbooks	11
2.2	Number of experiments	12
2.3	Location	15
2.4	Dutch balloonists	17
3	Scientific debates.....	22
3.1	Knowledge.....	22
3.2	The inventors letter	23
3.3	Books and authors.....	24
3.4	Scientific debates	28
3.4.1	Montgolfière versus Charlière	28
3.4.2	Nature of airs	32
3.4.3	Usefulness	33
4	Cultural reception	37
4.1	Audiences at launches	37
4.2	Initial enthusiasm and optimism	42
4.3	Disappointment.....	45
4.4	Criticism	50
4.5	Popular science.....	54
5	Thinking about the future.....	57
5.1	Expectations and desires.....	57

5.2	The problem of steering.....	60
6	Entertaining business.....	62
6.1	Continued public interest.....	63
6.2	Balloon entrepreneurs	65
6.3	Moneymaking.....	69
6.4	Entertainment and spectacle	74
7	Conclusion.....	77
8	Bibliography.....	81

1 'IF ONLY I HAD WINGS'

Flight has fascinated many people throughout history. Before men was able to enter and explore the realm of birds, people already fantasised about it. An early example is the Greek myth about Icarus and Daedalus which tells the story of how Icarus made wings to escape Minos' prison. The psalmist David only wished he had wings. He too would use them as a means of escape. 'If only I had wings like a dove! I would fly away and find rest', he cries out.¹ Thinking about and longing for flight went beyond the realm of dreams, fantasies and stories. In the course of time, people actually started thinking about ways to make these dreams come true. Several men worked up their ideas into all kinds of devices. In the 13th century, the Englishman Roger Bacon for example described a thin-walled copper sphere that could float. Famous are the designs by the Italian Leonardo Da Vinci more than a century later. He designed various devices to make flight possible such as mechanical wings and an aerial screw. In the seventeenth century, the Italian Francesco Lana de Terzi had ideas and designs for an airship with vacuum spheres. Despite all the ideas, designs and efforts, none of these men succeeded in lifting off.

This changed in the summer of the year 1783. The centuries-old dream of flying became reality by means of the efforts of Joseph and Etienne Montgolfier. These brothers were interested in the new field of study of air and gases and had started experimenting with the expansive power of heat. Joseph designed a model of a machine that would be made lighter than air. Together with his brother, he began working on larger models. After some experimenting, the first successful public launch of a balloon filled with hot air was made on the 4th of June in Annonay.² The spectacular news of a flying machine travelled throughout France. The Montgolfier brothers initially withheld all information on how they had floated their machine, only revealing that they made use of a gas with only half the density of ordinary air. The well-known public lecturer of physics, Jacques-Alexandre-César Charles, overheard this news and started creating a balloon himself. He decided to use a gas which he had used in

¹ Psalm 55:7 (Holman Christian Standard Bible).

² Charles Coulston Gillispie, *The Montgolfier Brothers and the Invention of Aviation 1783-1784* (Princeton 1783) 16, 17.

some of his experiments. This was inflammable air, also known as hydrogen, which has a considerably lesser density than air.³ This resulted in the construction of the first gas balloon, a Charlière, which was publicly launched for the first time on 27 August that same year in Paris.⁴

The fact that two flying machines using the same principle, were invented in the second half of the eighteenth century caused rivalry. Etienne Montgolfier wanted to outdo Charles and only a few months later, on 21 November, he send off the first living beings: a duck, a rooster and a sheep.⁵ With this successful voyage, the animals had proven that the sky was safe for mankind. This set way for the first manned flight which happened in a Charlière, only ten days hereafter. The first human air travellers were Charles himself and Nicolas-Louis Robert, an instrument maker who had helped him manufacturing the balloon.

The first launched unmanned balloon already attracted an audience of thousands of people. The curiosity and enthusiasm for this invention was only even more enhanced when the first living beings left the earth. The audiences were enormous. Ballooning became the talk of the day. This did not just happen in France. The news of an actual flying machine spread like a wildfire throughout Europe. In many countries, people started experimenting with this fascinating invention and everywhere a balloon was launched, immense audiences gathered to witness it.

Although the balloon 'initiated a massive cultural phenomenon', it has received little scholarly attention.⁶ For a long time, historians mainly narrated it chronology. In these chronological overviews, the lighter-than-air machine is often treated as a cul-de-sac and as a predecessor of the heavier-than-air machines which had proven to have a more promising future. Other scholars have only mentioned this machine casually or anecdotic.⁷ This does not do justice to its rich and stirring history which deserves more and profound attention. The

³ Michael R. Lynn, 'Selling Science. Balloons, Commerce and Mass Culture in Eighteenth-Century France', *Proceedings of the Western Society for French History* 30 (2002) 213.

⁴ Gillispie, *The Montgolfier Brothers*, 28, 29; Mi Gyung Kim, 'Balloon mania: news in the air', *Endeavour* 28, no. 4 (December 2004) 150.

⁵ Gillispie, *The Montgolfier Brothers*, 39-40.

⁶ Michael R. Lynn, *The Sublime Invention: Ballooning in Europe (1783-1820)* (London 2010) 3.

⁷ *Ibidem*, 3.

early history of ballooning offers important insights in the relationships between science and culture. The balloon 'enabled mankind virtually to take possession of atmospheric regions which had for centuries since the creation of the world in fact, seemed for ever closed to human audacity' and generated a mass culture.⁸ Despite the fact that this aerial vehicle did not live up to the hopes and expectations because it could not be steered, it became a successful means of entertainment and 'has proved extraordinarily tenacious of life'.⁹

The invention of the balloon and its early history does have received some attention by scholars from the end of the twentieth century onwards. One of the most elaborate and detailed works on the first years of ballooning is written by Charles Coulston Gillispie. In 'The Montgolfier Brothers and the Invention of Aviation 1783-1784', published in 1983, Gillispie describes the first two years of the invention in France by focusing on the inventors: the Montgolfier brothers. Another important and extensive work on early ballooning is 'The Sublime Invention, Ballooning in Europe, 1783-1820' and was published in 2010 as part of a series on the Enlightenment World. This book, written by the professor of history Michael R. Lynn, offers a cultural and social analysis of early ballooning in Europe. Lynn emphasizes the importance of research on this much ignored topic. We need to understand 'how and why the balloon entered and stayed in the public consciousness' in order to fully understand importance of science in the Enlightenment.¹⁰

Some historians emphasize the role of the balloon in the development of science. Mi Gyung Kim for example explores ballooning by means of Antoine-Laurent Lavoisier's ideas and experiments regarding decomposition of water in the article 'Public' Science; Hydrogen Balloons and Lavoisier's decomposition of water'. Kim also explores the relation between eighteenth century science and the public. The audience for science became massive and also changed fundamentally in composition, she states.¹¹ Michael R. Lynn too focusses on the way ballooning as a pursuit of science became object of intense public scrutiny in his article

⁸ E. Seton Valentine and F.L. Tomlinson, *Travels in Space. A History of Aerial Navigation* (London 1902) 321.

⁹ L.T.C. Rolt, *The Aeronauts, The History of Ballooning 1783-1903* (London 1966) 18.

¹⁰ Lynn, *The Sublime Invention*, back flap.

¹¹ Mi Gyung Kim, "Public' Science: Hydrogen Balloons and Lavoisier's Decomposition of Water', *Annals of Science* 63, no.3 (July 2006) 294, 295.

'Selling Science, Balloons, Commerce and Mass Science in 18th Century France'. He did this by looking at France.¹² Paul Keen did the same for England in the article 'The "Balloonmania": Science and Spectacle in 1780s England'.¹³ Gillespie's article 'Ballooning in France and Britain, 1783-1786' is a somewhat rare example of comparative research.¹⁴ It explores the differences between the development of ballooning in France and England. Ballooning in France was dominated by scientists and engineers, but adventurers looking for fame took up the invention in England. According to Gillespie, this difference is due to the differences in the social organisation of science in those countries.¹⁵

France and England have been the focus of many articles and books about early ballooning, but the balloon got great attention in every country where the news of Montgolfier's invention arrived. John T. Alexander for example describes the reception of the balloon in Russia in his article 'Aeromania, "Fire-Balloons" and Catherine the Great's Ban of 1784' from 1996. Empress Catharine II saw no benefits in the balloon, but only regarded it 'a dangerous, costly and faddish toy'.¹⁶ Therefore, she banned ballooning already in April 1784, which makes the early history of ballooning in Russia a short one.¹⁷ The balloon even became popular outside of Europe as Matthew Pethers shows in his article on ballooning in America; "'Balloon Madness": Politics, Public Entertainment, the Transatlantic Science of Flight, and Late Eighteenth-Century America'. There too, it got massive attention by the large public which was one of the reasons why scientists distanced themselves, he argues.¹⁸

Still, the history of ballooning in many countries has not been the subject of research yet. The first quarter century of ballooning in the Netherlands for example is almost unexplored by scholars. Only a few books and articles have been written on the subject, mainly

¹² Lynn, 'Selling Science', 212-221.

¹³ Paul Keen, 'The "Balloonmania": Science and Spectacle in 1780s England', *Eighteenth-Century Studies* 39, no. 4 (Summer 2006) 530.

¹⁴ Lynn, *The Sublime Invention*, 2.

¹⁵ Richard Gillespie, 'Ballooning in France and Britain, 1783-1786: Aerostation and Adventurism', *Isis* 75, no. 2 (June 1784) 268.

¹⁶ John T. Alexander, 'Aeromania, "Fire-Balloons," and Catherine the Great's ban of 1784', *The Historian* 58, no. 3 (March 1996) 516.

¹⁷ *Ibidem*, 497.

¹⁸ Matthew Pethers, "'Balloon Madness": Politics, public entertainment, the transatlantic science of flight, and late eighteenth-century America', *History of Science* 48 (2010) 216.

with a local focus. In 1915 for example, the yearbook of The Hague published the article 'Achtttiende-Eeuwsche Luchtvaartproeven in Den Haag' ('Eighteenth-Century Aviation Experiments in The Hague') in which J. Smit gives an overview of the experiments with the balloon in this city.¹⁹ The same is true for the article 'Ballonvaart in Groningen' ('Ballooning in Groningen') which was published in 1985 in the historical yearbook of the city of Groningen. Hanneke Boonstra and D.F. Kuiken give a chronological overview of ballooning in Groningen until the second half of the twentieth century.²⁰ Some research which deals with early Dutch ballooning has an even more specific focus, such as the articles by Peter Altena who wrote about poems on the balloon by Jacob van Dijk²¹ and Dirk Kuipers.²² More recently, two books on the history of the balloon in the Netherlands have been published: 'Lichter dan Lucht, Los van de Aarde' ('Lighter than Air, Free of the Earth') by Han Nabben²³ and 'De Wereld vanuit een Luchtballon' ('The World From a Balloon') by Robert Verhoogt.²⁴ Both works offer a chronological overview, wonderful examples and detailed narratives from the early history of ballooning but do not directly offer a deeper understanding of eighteenth and nineteenth century science, culture and society.

While the balloon has received more scholarly attention in the recent decades, research on early ballooning in the Netherlands lags behind. International research has already shown that studying the history of this aerial machine offers interesting and important insights in the relationship between science and culture in the decades around the turn of the nineteenth century. This research makes a start in filling the gap in scholarly research on the early history of ballooning in the Netherlands. By analysing who started launching balloons and for what purposes, how the general public responded to it and in what way ballooning

¹⁹ J. Smit, 'Achtttiende-eeuwse luchtvaartproeven in Den Haag' in: H.E. van Gelder, *Die Haghe Jaarboek 1914/15* (The Hague 1915) 338-353.

²⁰ H. Boonstra and D.F. Kuiken, 'Ballonvaart in Groningen' in: *Groningen toen* (Groningen 1985) 25-41.

²¹ Peter Altena, *Het nut der luchtballen / Dichtstuk door Jacob van Dyk* (Amsterdam 1993) 20-35.

²² Peter Altena, 'Geen Stervling deed ooit zulk een'smak'. Dirk Kuipers en 'de Historie en het Einde der Luchtballen (1786)', *Mededelingen van de Stichting Jacob Campo Weyerman* 21 (Amsterdam 1998) 86-94.

²³ Han Nabben, *Lichter dan Lucht, Los van de Aarde. Geschiedenis van de ballon- en scheepsvaart in Nederland* (Barneveld 2011).

²⁴ Robert Verhoogt, *De Wereld vanuit een Luchtballon. Een Nieuw Perspectief op de Negentiende Eeuw* (Amsterdam 2013).

developed over the years, I aim at providing more in-depth knowledge of how science and culture were related. In the following chapters, I will show that the balloon started out as a means of gathering scientific knowledge and that the withdrawal of scientists and the continuing public interest in ballooning was cause for entrepreneurs to make ballooning into a form of pure entertainment.

The first chapter will offer an overview of early Dutch ballooning on the basis of an analysis of newspapers and yearbooks, showing how many balloons were launched, who carried out the experiments and where these took place. This will serve as a basis for the following chapters. The second chapter shows why scientists were interested in the balloon and what their main concerns were. Chapter three focusses the cultural reception and impact of the balloon, explaining why people were interested and how this manifested itself. Chapter four looks at the ideas with regard to the future of the balloon and the most important hindrance; steering. The fifth chapter will explain that scientists withdraw from ballooning and explores why balloons continued to be launched by people with different backgrounds and aims. All of this will be wrapped up in a concluding chapter.

2 BALLOONING IN THE NETHERLANDS

2.1 ANALYZING NEWSPAPERS AND YEARBOOKS

The news about the first ever balloon launch on 4 June 1783 by the Montgolfier brothers quickly travelled throughout Europe and also reached the Netherlands. In early August, an extract of a letter which was sent to the Royal Academy of Science in Paris on the 3th of July was published in the *Nieuwe Haarlemsche Courant*. This letter recounts the invention of a rare and unparalleled machine: a hot air balloon.²⁵ Soon hereafter, Dutch newspapers started reporting on balloon launches. The first reports mainly dealt with experiments in France. In November 1783, the flying machine had set foot on Dutch soil and from that time on, also many reports on Dutch balloon launches were published. Both national and local newspapers announced planned launches, gave reports on experiments and informed readers of retrieved balloons. Also yearbooks reported about launched balloons in the past year.

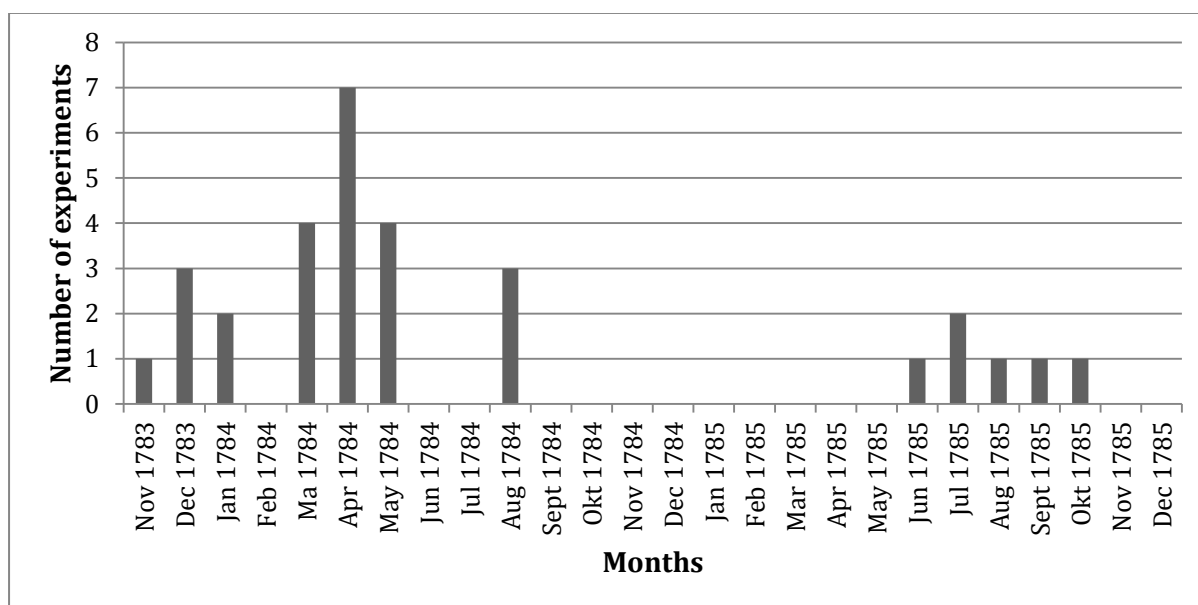
On the basis of Dutch newspapers and yearbooks, it is possible to determine how many balloons were launched in the Netherlands, who conducted these experiments and where they took place. Therefore I have analysed digitalized yearbooks and Dutch digitalized newspapers from the historical newspaper databank from the Royal Library, Delpher.²⁶ Not all Dutch newspapers from that time are digitalized yet so I cannot state with certainty that I have been able to map all balloon flights that were made. Still, the digital databank does include many large national and local newspapers which are fairly representative for what happened around the end of the eighteenth and beginning of the nineteenth century. Although we do not know if all launched balloons were featured in any newspaper, it was a very popular and a newsworthy invention. It received much attention and it is reasonable to assume that almost all experiments were at least recorded in one newspaper. This particularly applies to the first years. This is why I chose to cover the years 1783 until 1785 more extensively.

²⁵ 'Frankryk' (9 August 1783) *Oprechte Haarlemsche Courant*, 1.

²⁶ The dataset I created on the basis of this analysis can be downloaded via: <http://hdl.handle.net/11304/fdc743c8-8300-11e5-9bb4-2b0aad496318>

2.2 NUMBER OF EXPERIMENTS

The history of Dutch ballooning starts in November 1783. From that moment on, until the end of 1785, newspapers and yearbooks reported about thirty experiments with the balloon in the Netherlands. The following graph shows how these are distributed over time.



Graph 1 | The number of balloon launches in the Netherlands per month (1783-1785)

Four experiments took place in the year 1783. This happened in the last two months, five months after the first launch by the Montgolfier brothers in France. Twenty experiments were conducted in 1784 and six in 1785. This means that in the first two years, four times more experiments were conducted than in 1785. It could be that the media was less likely to report on balloon because its news value had reduced by then. Nevertheless, it is more probable to assume that indeed fewer experiments were conducted. As will become clear by the following chapters, the public interest in the balloon remained strong and therefore, it is plausible to assume that most launches would have been featured in the media if there were any.

Not all of the experiments were successful. Three of them during these years failed. The balloon did not go up or crashed due to technical issues, miscalculations or bad weather.²⁷ Three other experiments partly failed. In these experiments, the conductor successfully launched one or two small balloons but failed to ascend a larger balloon.²⁸ Apparently, it was harder to launch a balloon with more volume.

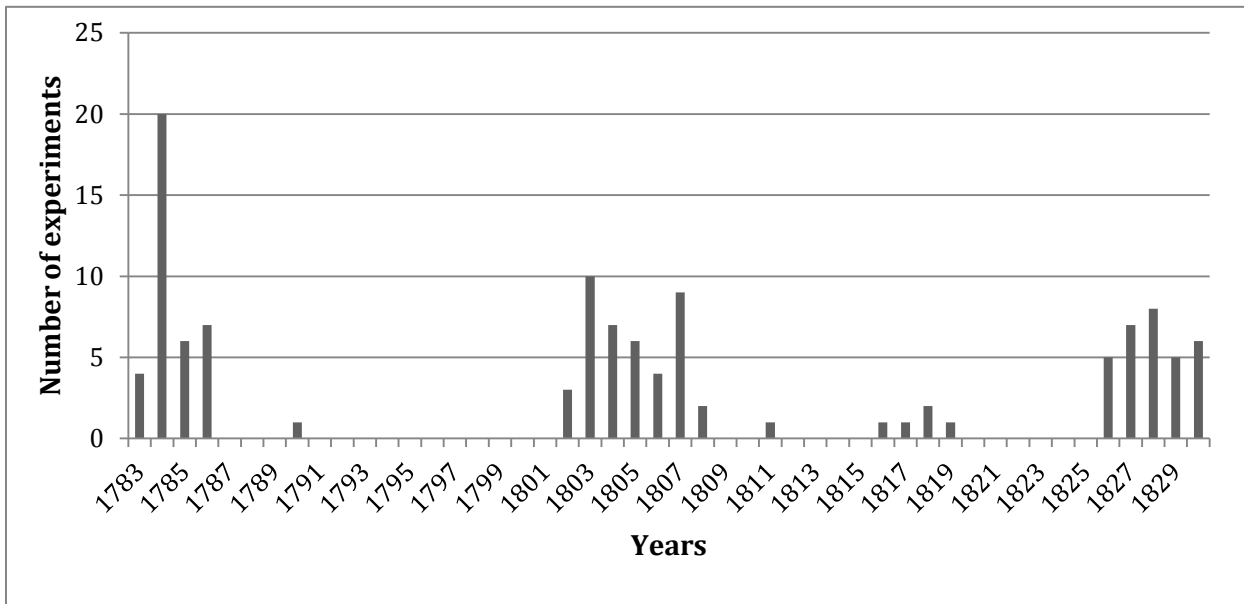
The total number of thirty experiments does not include the announced flights which were cancelled. Sometimes, launches did not take place due to a shortage of entries resulting in too little income which made it impossible to cover the expenses.²⁹ Another reason for cancelling an announced flight had to do with predictions of bad weather. This explains why experiments with balloons were mostly planned in the spring and summer months as can be seen from the graph. These months would have the least chance of precipitation, cold and strong winds and therefore providing the best weather for the most successful ascending. The very first experiments are an exception to this because these took place in November, December and January.

The following graph shows all the announced launches at the end of the eighteenth and beginning of the nineteenth century. It is difficult to say if all of these launches were actually carried out. Most of them were only announced and in only a few cases, reports were published afterwards.

²⁷ One of these failed experiments was executed by the Dutch Diller. This happened on 9 April 1784 in the Hague. After this balloon ascended, it caught fire and crashed (*Hollandsche Historische Courant*, 13 April 1784). Two other failures happened in 1785. On 10 August, the balloon of the Frenchman Romain did not ascend because he was not in possession of the right materials to produce the gas to fill his balloon (*Groninger Courant*, 16 August 1785). The inclement weather and strong winds caused troubles filling the balloon of the Frenchman Blanchard. He eventually succeeded in filling it, but gusts caused the balloon to rip open whereby all gas escaped. It became impossible to continue the flight (*Hollandsche Historische Courant*, 8 October 1785).

²⁸ On 5 May 1784, Diller launched a small balloon successfully. His second large balloon would not ascend for it turned out to be too cumbersome. One of the workman even ended up in hospital because he fell after the balloon collapsed. (*Hollandsche Historische Courant*, 8 May 1784). The gentleman of the society Felix Meritis and Bianchi also succeeded in launching a small balloon in May 1784 but failed in launching a larger one ('Het boek der luchtballen ofte de Zotternyen der Menschen' (s.l. 1784) 3; *Nederlandsche Courant*, 19 May 1784).

²⁹ An example is the announced experiment by H. Aeneae; Han Nabben, *Lichter dan Lucht, Los van de Aarde. Geschiedenis van de ballon- en luchtscheepvaart in Nederland* (Barneveld 2011) 43.



Graph II | The number of balloon experiments in the Netherlands per year (1783-1830)

Graph II shows that in 1786, still a few balloons were launched. Thereafter, however, none of the digitalized newspapers and yearbooks mentions any experiment with the balloon in the Netherlands until the year 1790. In July that year, one experiment is featured in a newspaper. This was executed by watchmaker Dirk Jonker from the Society of Mathematical Sciences. He successfully launched a balloon in the village Wormerveer.³⁰

After this experiment, it took twelve years before any of the newspapers started reporting on launches again. It could be that some reports on launches only appeared in small, local newspapers that have not been digitalized yet. However this is possible, it seems likely that the number of launched balloon was truly reduced. It was a turbulent time in the Netherlands, also referred to as a ‘revolution period’.³¹ The Dutch republic underwent changes and became under French rule. More necessary and important matters required attention. Also the fact that these newspapers did publish news items on launched balloons abroad, such as in France, Germany, Italy and Turkey during those years indicates that lesser balloons were launched in the Netherlands. People had not lost interest in the invention but there simply seemed to have been nothing to report on.

³⁰ ‘Nederlanden’ (7 August 1790) *Oprechte Haarlemsche Courant*, 2.

³¹ J.J. Kloek and W.W. Mijnhardt, 1800. *Blauwdrukken voor een samenleving* (The Hague 2001) 20.

The years 1802 until 1808, ballooning in the Netherlands seemed to have made a comeback. At least forty times during those seven years, newspapers announce a planned balloon launch. Not all of them actually took place and several launches failed, but it does show that people started planning working with the balloon again.

After this peak of several years, it was again very quiet around the balloon as graph 2 shows. Until the year 1826, newspapers only report on six launches: one in the years 1811, 1816, 1817 and 1819, and two in the year 1818. At least four of them were executed by the same man; P.J. Thumas from Brabant. We come across his name again in 1826 and 1827. In the interim period, between 1820 and 1826, again no reports on balloon launches from Dutch soil appear in newspapers. After these six years ballooning returned again. From that time on, at least five balloons every year appeared on the Dutch skyline according to the media. This happened mainly in the spring and summer months.

2.3 LOCATION

The first two experiments took place in the hometown of the first Dutch balloonist Johannes van Noorden, in Rotterdam. The experiments in the following two years were conducted throughout the entire country. Table I shows how much experiments were conducted per city in the first two years of Dutch ballooning. It becomes apparent that most balloons ascended, in case the experiment was successful, from The Hague. Together with Amsterdam and Rotterdam, The

City	Experiments
The Hague	7
Amsterdam	5
Rotterdam	4
Middelburg	3
Delft	3
Groningen	2
Utrecht	2
Hoorn	1
Leeuwarden	1
Leiden	1
Purmerend	1

Table I | Number of experiments per city until 1785

Hague stood in the top three major cities in the Netherlands. This means that most experiments during the first years of ballooning were done in the largest Dutch cities around that

time.³² This is particularly true for the first half of 1784. Over time, experiments were also conducted in smaller towns, such as Middelburg, Hoorn and Purmerend.

Often, a public or at least larger place was chosen such as a drill ground or a meadow. This is not surprising since a lot of the newspaper articles mention the presence of immense crowds, with sometimes thousands of people. Some sources claim that almost the entire city was gathered around the location of ascension.³³ Launches in larger cities such as Amsterdam therefore mostly took place outside the city, for example on a country estate behind the Inn *De Beerebyt*, along the river the Amstel. Occasionally, an experiment was located at a private location or at least a lesser place. Examples are the experiments of Van de Perre on 5 April 1784 in Middelburg and the announced experiment of Willem May on 26 March 1784 in Amsterdam which both were planned in a courtyard behind their house.³⁴

All experiments that were conducted in The Hague were located in the garden (and once in the yard before the building) of the *Oude Hof*. Nowadays, this is called palace *Noordeinde*, a central place in the city with space to accommodate many people. Nevertheless, this was not always big enough for the interest of many people that came to see the incredible French invention.

After 1785, several balloons were launched in smaller towns such as Aduard in 1786, Wormerveer in 1790 and Franeker in 1803. Still, most balloons ascended from cities with more inhabitants. The Hague, Amsterdam and Rotterdam continued to be used a lot, but Groningen, Leeuwarden and Middelburg also became commonly used, especially from 1826. From that time on, balloons were often launched near taverns or at fairgrounds and became frequently accompanied with other activities such as a ball or buffet. These larger cities were used and the launches were combined with these other activities so it would attract as many paying people as possible.

³² Centraal Bureau voor de Statistiek, 'Tabellen in jaar 1785. Noord-Holland, Zuid-Holland', <http://www.volkstellingen.nl/nl/volkstelling/jaartellingdeelview/VT179502/index.html> (7 March 2015).

³³ *Het boek der luchtballen ofte de Zotternyen der menschen*, 3.

³⁴ 'Nederlanden' (15 April 1784) *Hollandsche Historische Courant*, 1; 'Nederlanden' (26 March 1784) *Nederlandsche Courant*, 1.

2.4 DUTCH BALLOONISTS

The first Dutch balloonist was medical doctor Johannes van Noorden. Van Noorden was a man with great interest in the natural sciences and had a vast collection of books in several languages about topics such as medicine, surgery, chemistry and botany. He also owned some physical instruments such as an electrifying machine and air pump which he used to for experiments. Right after Van Noorden heard the news from the invention of a flying machine in France, he was eager to become the first Dutchman that experimented with this important French invention.³⁵ Because no one in the Netherlands had launched a balloon before, Van Noorden had no sufficient information or manual on creating, and the process of filling a balloon. He presumably received a letter from one of the brothers Montgolfier, as will be explained in chapter 3.1, but this contained little and only very basic information. This meant that he had to figure out a lot by himself. He wrote the process of calculating and manufacturing his Charlière down in his book 'Korte verhandeling over de Lugtweegkundige Bol' ('Short dissertation about the Aerostatic Sphere') which was published in 1784. This book also includes information on the experiment he undertook together with the *Natuurkundig Gezelschap* ('Physical Society') of Rotterdam in which he held a leading position³⁶

This first Dutch balloon launch took place on 26 November 1783. At six o'clock in the evening, pharmacist Van Groeneveld and Perk, two members of the society, started filling the egg-shaped bag made of very thin taffeta, with inflammable air. This was done in the coach house at the country estate *Rosenhof* just outside Rotterdam.³⁷ At one o'clock in the middle of the night, the men stopped filling the balloon because the process went quicker than expected and the balloon would have ascended too early. The next morning, they continued inflating the balloon until it was filled completely. Van Noorden brought the balloon outside the building and launched it under the eyes of the gentlemen of the *Natuurkundig Gezelschap*. The bal-

³⁵ Johannes van Noorden, *Korte Verhandeling over de Lugtweegkundige Bol of Aëristaticq Werktuig* (Rotterdam 1784) 4.

³⁶ M.J. van Lieburg, 'De Geneeskunde en Natuurwetenschappen binnen de Rotterdamse Genootschappen uit de 18^e eeuw', *Tijdschrift voor de Geschiedenis der Geneeskunde, Natuurwetenschappen, Wiskunde en Techniek I* (1978) 137; Wielema, 'Tussen Newton en Wolff', 179, 197.

³⁷ 'Nederlanden' (5 December 1783) *Leydse Courant*, 1; Noorden, *Korte Verhandeling over de Lugtweegkundige Bol*, 32, 33.

loon was attached to a rope and rose to the height of 2000 feet. After some time, the balloon began to decline again. When the machine reached earth, it was brought back to the coach house. Van Noorden and the society were content because the experiment was successful and went mostly as planned.

The society, under direction of Van Noorden, decided to repeat the experiment in public on Monday 1 December. This way, all curious people would be able to attend. There was a lot of wind and fog that day. While these were not the ideal circumstances, the society decided to continue the launch, mainly because several people from outside of Rotterdam had come to see the balloon. Unfortunately, this time the experiment was not so successful. The fog had made the balloon heavier and therefor rose poorly.³⁸ Furthermore, the strong wind pushed the balloon down and the rope that was attached to the aerial machine got entangled in a tree. The balloon was retrieved and replenished with gas to attempt a second launch. The wind had not subsided by then and again, the rope turned out to impede the balloon in ascending. To prevent further failure and to meet the interest of the curious audience, Van Noorden, decided to detach the balloon. Within minutes it disappeared from sight.³⁹

Soon after these experiments in Rotterdam, others followed. In the first years, several people throughout the country started experimenting with the aerial machine. Besides Van Noorden, the Dutch physicist and engineer Diller also launched two balloons at the end of the year 1783. These four experiments were persecuted by twenty other experiments in 1784 which were executed by twelve different people or groups of people. Except for one balloonist whose name is not mentioned in any newspaper report, the other men - no women are mentioned in any balloon launch - are known to have been involved in scientific societies or to have great interest in physics or related subjects. For some of them, physics was a hobby, something for their leisure time. An example is Boudewyn Peereboom from Purmerend. In his daily life, Peereboom was an alderman, but also had a great interest in mathematics.⁴⁰ His name emerges on the list of members of the mathematics society of Amsterdam in the begin-

³⁸ 'Nederlanden' (5 December 1783) *Leydse Courant*, 1.

³⁹ Noorden, *Korte Verhandeling over de Lugtweegkundige Bol*, 39, 40.

⁴⁰ 'Veranderingen onder de hooge en lage amtenaers, enz.', *Nieuwe Nederlandsche Jaerboeken 10*, part 1 (Amsterdam 1775) 301.

ning of 1800.⁴¹ Another example is Johan Adriaen van de Perre de Nieuwerve. He was a regent in Zeeland, but was also interested in meteorology and performed all kinds of experiments. Although many of these experiments were an extension of the 'physique amusante', the playful physics with amazement as its main objective, Huib Zuidervaart explains that Van de Perre developed a more serious interest for pneumatic chemistry; research on gas.⁴²

Van de Perre was not the only one interested in the study on gas and air around that time. In fact, it constituted a fashionable topic in the 1770s. Soon it became a general subject of investigation by physicists.⁴³ This is mainly due to the work of the British chemists Joseph Priestly and Henry Cavendish. In the 1770s, these English chemists discovered that the air in the atmosphere was composed of 'different kinds of airs'.⁴⁴ According to Kim, this discovery, together with the steam engine, probably heightened the public interest in the properties of air and stimulated research on this topic.⁴⁵ The Montgolfier brothers, inventors of the hot air balloon, also became acquainted with the studies of air and were in possession of Priestley's work 'Expériences et observations sur différentes espèces d'air' ('Experiments and observations on different kinds of air'). They had already experimented with air by means of a vacuum pump. Later on, Joseph became interested in and started experimenting with air to obtain levitation. Together with his brother, he began burning paper inside a sphere made of taffeta, a light-weight fabric, in order to create heat that would make it rise. The story goes that Joseph got his inspiration for this from seeing drying lingerie billowing and lifting over a blaze.⁴⁶ The brothers continued experimenting with this idea, which eventually led to the

⁴¹ Wiskundig Genootschap onder de spreuk "Een onvermoeide arbeid komt alles te boven", *Wiskunstige oefeningen in eene aaneenschakeling van uitgelezene voorstellen, benevens een mengelwerk van uitgelezene en andere wiskundige verhandelingen* (Amsterdam 1809) 4.

⁴² H.J. Zuidervaart, *Mr. Johan Adriaen van de Perre (1783-1790). Portret van een Zeeuws Regent, mecenas en liefhebber van nuttige wetenschappen* (Middelburg 1983) 91, 92.

⁴³ Helperus Ritzema van Lier, *Verhandeling over het algemeen en bijzonder gebruik der aërostatische machines en de verschijnselen, die dezelve ons kunnen opleveren* (Groningen 1784) 4.

⁴⁴ Kim, 'Public' Science', 296; H.J. Zuidervaart, 'An eighteenth-century medical-meteorological society in the Netherlands', *The British Journal for the History of Science* 38, no. 4, (December 2005) 383; Richard Holmes, *De Tijd van Verwondering. De ontdekking van de modern wetenschap* (Amsterdam 2009) 167.

⁴⁵ Kim, 'Public' Science', 296, 297.

⁴⁶ Gillispie, *The Montgolfier Brothers*, 15.

creation of the aerostatic machine.⁴⁷ The invention of the balloon thus stemmed from the interest in and the desire to learn more about nature of air.

From this perspective, it is not surprising that some of the people who launched a balloon in 1784 in the Netherlands were instrument makers. Several techniques and instruments had already been developed to research and demonstrate the properties of different kinds of air, and the balloon was a new interesting means of studying the behaviour of air.⁴⁸ During the first year, three instrument makers launched a balloon, the two Dutchmen Jan Spinelli and David Reghter and the Italian Bianchi. Medics too became interested in this field of research. The discovery of airs revitalized the old issue of a possible relationship between the composition of the atmosphere and the occurrence of diseases and therefore captured the attention of the medical world.⁴⁹ This explains why some of the first balloonists were doctors, such as the aforementioned Van Noorden and the three men Willem van Barneveld, Dirk Waandert Engert and Abraham van Moerbeek who launched a balloon in Amsterdam.

Manufacturing a balloon and filling it with just enough air or gas in relation to the weight was not an easy matter. It required for example knowledge of mechanics, mathematics and aerodynamics. Only people with enough knowledge of these subjects qualified, especially because constructing a balloon could be a dangerous affair. The inflammable air with which a gas balloon was filled could easily ignite. Therefore, Lestevenon van Berkenroode, the Dutch ambassador in France, expressed the hope that all balloonists are careful and experienced physicists.⁵⁰ Nevertheless, not all men who launched a balloon in the year 1784 were (amateur-) scientists. An exception to this is Henri-Louis de Bosset colonel and captain under the Swiss Guard.⁵¹ The *Nederlandsche Courant* of 13 August reports that he launched a balloon on 9 August in private company. He did this in honour of the birthday of the princes of

⁴⁷ Kim, 'Public' Science', 298.

⁴⁸ Jan Golinski, *Science as Public Culture: Chemistry and Enlightenment in Britain, 1760-1820* (Cambridge 1992) 86-88, 105-128.

⁴⁹ Zuidervaart, 'An eighteenth-century medical-meteorological society in the Netherlands', 383.

⁵⁰ Zuidervaart, *Mr. Johan Adriaen van de Perre*, 2.

⁵¹ Jacques Petitpierre, 'Relations entre Neuchâtel et la Hollande', in: id. (ed.) *Patrie neuchâteloise. Recueil illustré de chroniques d'histoire régionale vol. 4* (Neuchâtel 1955) 327.

Orange with an illuminated balloon in The Hague. This happening was followed by the lighting of fireworks.

The second year of Dutch ballooning was quite different then the first. Only one experiment that was mentioned in news reports was conducted by a Dutchman. The other five were executed by French balloonists one of which was Romain, the brother of Pierre Jules Romain who died two months earlier in a balloon crash.⁵² The rest of the balloons that took to the air came from the famous French balloonist Jean Pierre François Blanchard who travelled throughout Europe to give demonstrations with the balloon.

The amount of balloons that rose from the Netherlands in the year 1786 can be counted on two hands too. Three reports of these ascensions do not mention who the experimenter was. We do know that at least one of them was a Frenchman. The other launches during that year in which the experimenter is named, were executed by Dutchmen. All these men did had an interest in science and experimental physics. Hartog van Laun for example, who launched a balloon in March in Amsterdam, was a teacher in mathematics and experimental physics. He also made and sold physics instruments.⁵³ J.C. de Jongh was a merchant and had a universal interest in the sciences of his days, especially for experimental physics.⁵⁴ Together with H.G. Rouppe and N.J. Rouppe who shared his interest, De Jongh launched a balloon in June 1786 in Rotterdam.⁵⁵ One year earlier, he already launched one with the medical doctor Hendrik Willem Rouppe, who was also interested in experiments with air.⁵⁶

While some scientists were still involved in ballooning after the first year, it was considerably lesser than the first year. Especially from the nineteenth century, hardly any of the Dutch balloonists had a physics background or was interested and motivated by science and doing research. Ballooning in the Netherlands became dominated by foreigners with an entrepreneurial spirit as will become apparent in chapter 6.

⁵² Nabben, *Lichter dan Lucht, Los van de Aarde*, 53.

⁵³ Hans Hooijmaijers, 'Het planetarium van Hartog Laun', *Studium* 4 (2009) 216.

⁵⁴ H.C. Hazewinkel, 'Vergeten figuren IV; Johannes Cornelis de Jongh', *Rotterdams Jaarboekje* 8 (1960) 130.

⁵⁵ *Nieuwe Nederlandsche Jaarboeken* 21 (Leiden and Amsterdam 1786) 568, 569.

⁵⁶ *Nieuwe Nederlandsche Jaarboeken* 20, part 1 (Leiden and Amsterdam 1785) 857; H.A.M. Snelders, 'Het fysisch-chemisch werk van de Rotterdamse arts Hendrik Willem Rouppe (1765-1816)', *Tijdschrift voor de Geschiedenis der Geneeskunde, Natuurwetenschappen, Wiskunde en Techniek* 4 (1981) 26-32.

3 SCIENTIFIC DEBATES

3.1 KNOWLEDGE

During the first year of Dutch ballooning, almost only scientists and people with an interest in science performed experiments with this machine. In that time, it was not uncommon for scientists to be involved in experimentation. In fact, conducting physics experiments was characteristic for physics research and societies from mid-eighteenth century.⁵⁷ Besides the fact that the interest of many early balloonists for the balloon mostly stemmed from an interest in air and gases, there is another reason why these scientists and 'lovers of physics' dominated the first year of flight in the Netherlands. It was a time when the invention was still in its infancy and few people had actually built and launched a balloon. In the first months, there was no set of instructions available to manufacture this machine. In order to successfully launch a balloon, one needed to know enough about the physical principles that underlie the working of the aerial machine.⁵⁸ In his work on the knowledge economy, Joel Mokyr calls this kind of knowledge propositional *knowledge*, the "what" about natural phenomena and regularities. Only when enough is known about the natural laws regarding a new technique, it becomes possible to produce another form of knowledge: *prescriptive or instructional knowledge*. This is the "how" of knowledge. It concerns practical instructions that, if executed well, will enable a successful experiment, something hitherto impossible.⁵⁹

Because the natural laws underlying a discovery or new technique are by no means always known, which was also the case with the balloon, people started discussing its exact working.⁶⁰ These discussions appeared in the five books concerning the French invention that were written and published in the first year of aerostation. Besides discussions about propositional knowledge, all of the books also contain reports on conducted experiments and re-

⁵⁷ M.R. Wielema, 'Tussen Newton en Wolff: Het Rotterdamse Genootschap *Verscheidenheid en Overeenstemming*, 1760-1790', *Tijdschrift voor de Geschiedenis der Geneeskunde, Natuurwetenschappen, Wetkunde en Techniek* 13, no. 3 (1990) 196, 197; Ad Maas, 'Civil Scientists: Dutch scientists between 1750 and 1875', *History of Science* 48 (2010) 82.

⁵⁸ Joël Mokyr, *The Gifts of Athena. Historical origins of the knowledge economy* (Princeton and Oxford 2002) 13.

⁵⁹ *Ibidem*, 12.

⁶⁰ *Ibid.*, 50, 12.

flect on practical issues such as safety and usage. Most books also included some prescriptive knowledge, practical information to successfully manufacture, fill and launch a balloon, but only summarily. The authors seem to be most concerned with exploring the theoretical side of the invention.

The fact that intellectuals not only experimented with the balloon but also started writing popularizing books about it was not uncommon in that time. Across enlightened Europe, there was a pursuit of popularization of science; the dissemination of scientific knowledge among all sections of the population. From the mid-eighteenth century, several magazines appeared and more and more books on scientific topics were written, published and purchased.⁶¹

Looking at the way these authors approach the new invention and which questions and discussions they had, gives insight in the invention and the advancement of science. To do so, I will first explain where the first knowledge regarding the balloon came from. Thereafter, I will introduce the five books and their authors before expanding upon the three main subjects of discussion in these books. The first issue is about the differences between a hot air balloon and gas balloon and which of both is most preferable. Secondly, all authors discuss the nature of the air or gas that causes a hot air balloon to rise. The last main discussed subject is on the usefulness of the balloon.

3.2 THE INVENTORS LETTER

In December 1783, a few months after the Montgolfier brothers invented the hot air balloon, a letter on balloons from one of them was published in the *Groninger Courant*, a Dutch newspaper. This letter was intended for a 'lover of the natural sciences' in Rotterdam. Although no name is mentioned, it is likely that this concerns the Rotterdam doctor Johannes van Noorden who became the first Dutch balloonist. How the letter ended up in a newspaper from Groningen cannot be said with certainty. If Van Noorden was the recipient of the letter, it is conceivable that Helperus Ritzema van Lier was responsible for this. This man from Groningen

⁶¹ Kloek and Mijnhardt, 1800, 88, 95; Maas, 'Civil Scientists', 78.

was friends with Van Noorden. Both men were broadly interested in arts and sciences.⁶² In the year 1784, Van Lier even wrote a book on ballooning.

This translated, half-page long letter was one of first public pieces of information on manufacturing and launching balloons in the Netherlands. At the time Montgolfier wrote it, no balloon had left Dutch soil yet. His intention was to change this because he was convinced that scholars who work on improving the aerostatic machine would make advantageous and considerable progress. He therefore expresses the hope that the receiver will start experimenting with the flying machine.⁶³

After this introduction, Montgolfier continues explaining how he manufactured his balloon. He does this so people would benefit from his knowledge in creating and launching hot air balloons and not face undue difficulties. His sphere was made out of several fabrics that do not let air and heat through like dyed linen, paper and taffeta. These fabrics were sewn together until it resembled 'a very large bag'. At the bottom, he left an opening of a quarter of the diameter of the balloon open. Next, Montgolfier describes the process of filling the machine. He ignited a little fuming fire underneath the opening of the balloon. The air expelled by the heat rose up due to its 'relative lightness' and caused the sphere to expand, he explains. In a few words he calculates how much air is needed in relation to the weight of the machine, to let it properly rise. Montgolfier concludes his letter by expressing the hope that his report will be useful in making this machine and to promote its science. He believes that experimenting is the only way in which people will obtain useful skills and make important discoveries with regard to this new field of research.

3.3 BOOKS AND AUTHORS

Being the first balloonist in the Netherlands with no manual on ballooning available, Van Noorden had to figure out a lot by himself. By his own account, he had received several letters and requests by people who were interested in the balloon as well.⁶⁴ They too had no guidebook on so they hoped to learn from the only Dutch 'hands-on' expert by then. In order

⁶² Boonstra and Kuiken, 'Ballonvaart in Groningen', 27.

⁶³ 'Nederlanden' (12 December 1783) *Groninger Courant*, 1.

⁶⁴ Noorden, *Korte Verhandeling over de Lugtweegkundige Bol*, 5.

to let others share in his acquired knowledge, Van Noorden decided to write a book about it. This became the first published Dutch book on ballooning. It includes information of the first experiments in France, the differences between two kinds of balloons, information on how he created and filled his balloon, calculations of the costs and weight with what the balloon can be loaded with and ideas on the probable use of the balloon.

Van Noorden was not the first author of a work on ballooning. That honour belongs to Barthélemy Faujas de Saint-Fond. Faujas was a wide-ranging, well-born naturalist whose career, according to Gillispie, was animated rather by enthusiasm than by professionalism.⁶⁵ He was very interested in ballooning and in 1783, he published his 'Description des expériences de la machine aérostatique de MM. Montgolfier' ('Description of the experiences of the aerial machine by MM. Montgolfier'). This work contains detailed reports of the first balloon experiments in France, various theories and calculations on the nature and quantity inflammable air and vapour that was needed for the launch of a balloon, the costs, comments on the material for manufacturing a balloon, a received letter about the steering of the balloon and what use can be expected from it. We owe much of what we know about the first months of flight to this work.

Natural philosophy in general and experiments and scientific instruments in particular had become 'a booming topic', as Zuidervaart explains in his article on translations of popular texts on experimental philosophy into the Dutch language. Therefore, there was a demand for literature on these topics.⁶⁶ In order to meet this demand, several Dutch translations of books on physico-theology, natural philosophy and experimental physics appeared from the first half of the eighteenth century.⁶⁷ This popularisation of experimental philosophy persevered throughout the eighteenth century.⁶⁸

⁶⁵ Gillispie, *The Montgolfier Brothers*, 27; *The Encyclopaedia Britannica (Eleventh Edition)*, Volume X, (Cambridge 1910) 205.

⁶⁶ H.J. Zuidervaart, 'Science for the Public: the translation of popular texts on experimental philosophy into the Dutch language in mid-eighteenth century' in: Stefanie Stockhorst (ed.), *Cultural Transfer Through Translation: The Circulation of Enlightened Thought in Europe by Means of Translation* (Amsterdam and New York 2010) 231, 232.

⁶⁷ *Ibidem*, 241.

⁶⁸ *Ibid.*, 261.

In line with this, Faujas work on the balloon was also translated into Dutch and was published very shortly after Van Noorden's book. This translation was made by the Dutch medical doctor Martinus Houuttuyn. Houuttuyn was a respected scientist and became member of *Het Zeeuwsch Genootschap der Wetenschappen* ('The Zeeland Society of Sciences') in 1775 and of *De Hollandsche Maatschappij der Weetenschappen* ('The Dutch Society of Sciences') in 1780.⁶⁹ He had a broad interest and knowledge and issued several papers and books on a wide variety of subjects. His life was marked by the advancement and dissemination of natural knowledge in the Netherlands.⁷⁰ Houuttuyn often added and altered to the works he translated. In the translation of the work by Faujas too, he made no attempt to disguise his own ideas and knowledge with regard to the book in particular and the invention in general. The long preface and numerous comments and annotations in the work itself demonstrate this.

These two books did not meet everyone's expectations. Christiaan Hendrik Damen, member of the *Provinciaal Utrechtsch Genootschap van Konsten en Wetenschappen* ('Provincial Utrecht Society of the Arts and Sciences') and since 1785 appointed as professor in mathematics, architecture, hydrostatics and physics at the university of Leiden, received a request from a friend to write about the balloon.⁷¹ Damen believed that the previously published books were more suitable to extract rules for manufacturing a balloon than to explain the operation and characteristics of this machine. He wanted to close this gap by considering the balloon from a physical point of view. This is why he decided to comply with the request of his friend and wrote a book 'Natuur- en Wiskundige beschouwing van den Lugtbol, Tot eene betere Kennis en Beoordeling dier berugte Ontdekking' ('Physical and Mathematical consideration of the balloon, to a better knowledge and assessment of this famous Discovery').⁷² In the preface, he jestingly notes that he hopes his books serves the needs of the enthusiasts of physics who not only want to see, but also want to think.⁷³

⁶⁹ M. Boeseman and W. de Ligny, 'Martinus Houuttuyn (1720-1798) and his contributions to the natural sciences, with emphasis on zoology', *Zoologische Verhandelingen Leiden* 349 (2004) 15.

⁷⁰ Zuidervaart, 'Science for the Public', 246.

⁷¹ A.J. van der Aa, *Biographisch Woordenboek der Nederlanden*, part 4 (Haarlem 1858) 39.

⁷² Christiaan Hendrik Damen, *Natuur- en Wiskundige beschouwing van den Lugtbol, Tot eene betere Kennis en Beoordeling dier berugte Ontdekking* (Utrecht 1784) XIV.

⁷³ Damen, *Natuur- en Wiskundige beschouwing van den Lugtbol*, XIV.

The fourth Dutch book on ballooning is derived from a friend of the first Dutch balloonist Johannes van Noorden.⁷⁴ Helperus Ritzema van Lier, ‘master of liberal arts, doctor of philosophy and theology student’ from Groningen, was interested in the sciences and became fascinated by ballooning. Van Lier was an upcoming pastor.⁷⁵ It was not unusual for theologians to be engaged in natural philosophy and experimental physics in that time. Many Dutch translators of foreign books on experimental philosophy were actually related to dissident theological circles.⁷⁶ Van Lier however did not translate, but actually wrote an original work on ballooning. This book, ‘Verhandeling over het algemeen en bijzonder gebruik der aërostatische machines en de verschijnselen, die dezelve ons kunnen opleveren’ (‘Treatise on the general and specific use of aerostatic machines and the phenomena that they may, provide us’), was published in 1784 in Groningen.⁷⁷ Van Lier structured this work into three chapters. In the first chapter, he explains to his readers why he believes that this century excels all others in the progress of science. He also wrote about the discoveries in the study of air and how this has led to the invention of the hot air balloon, which he saw as an emblem of the Enlightenment and progress.⁷⁸ The second chapter contains information on the functioning of the balloon and in the last chapter he gives an account of the dangers and utilities of the aerostatic machine.

In the meantime, Martinus Houttuyn had not been idle. During 1784, he published the translation of the second part of the work by Faujas, called ‘Vervolg der proefneemingen met konstige lugtbollen’ (‘Sequel of the experiments with balloons’). This was the fifth and last book in Dutch on the balloon that appeared in that year. Like the first part, this work too was a collection of various documents like reports about air travels, letters of aeronauts and others, physical observations, new ways to fill this aerostatic machine, obtaining inflammable air and steer the balloon, and the ideas of the Académie des Sciences of Paris in relation to the

⁷⁴ Boonstra and Kuiken, ‘Ballonvaart in Groningen’, 27.

⁷⁵ Jan Pieter de Bie, Johannes Lindeboom and D. Nauta, *Biographisch woordenboek van protestantsche godgeleerden in Nederland*, part 6 (The Hague 1949) 19.

⁷⁶ Zuidervaart, ‘Science for the Public’, 261.

⁷⁷ Helperus Ritzema van Lier, *Verhandeling over het algemeen en bijzonder gebruik der aërostatische machines en de verschijnselen, die dezelve ons kunnen opleveren* (Groningen 1784).

⁷⁸ Altena, ‘Geen Stervling deed ooit zulk een’smak’, 87.

balloon. This second volume also begins with an extensive preface by Houttuyn in which he expresses his conviction that this work too will be received with eagerness.

3.4 SCIENTIFIC DEBATES

3.4.1 MONTGOLFIÈRE VERSUS CHARLIÈRE

Soon after its invention, there were two types of balloons in circulation. The first type of balloon was filled with hot air produced by fire (figure I). This hot air balloon is also called a Montgolfière. The second type of balloon was filled with hydrogen gas (figure II). Because this gas is lighter than hot air, it had more lifting power and could be much smaller.⁷⁹ This balloon was invented by Charles and also known as a Charlière. These two kinds of balloons used the same principle; a sphere filled with a lighter-than-air substance. Nevertheless, the design,



Figure I | The filling and launch of a Montgolfière in the summer of 1783 in Paris

⁷⁹ Barthélemy Faujas de Saint-Fond, *Beschrijving der Proefneemingen met konstige Lugtbollen* (translated by Martinus Houttuyn)(Amsterdam 1784) 47.

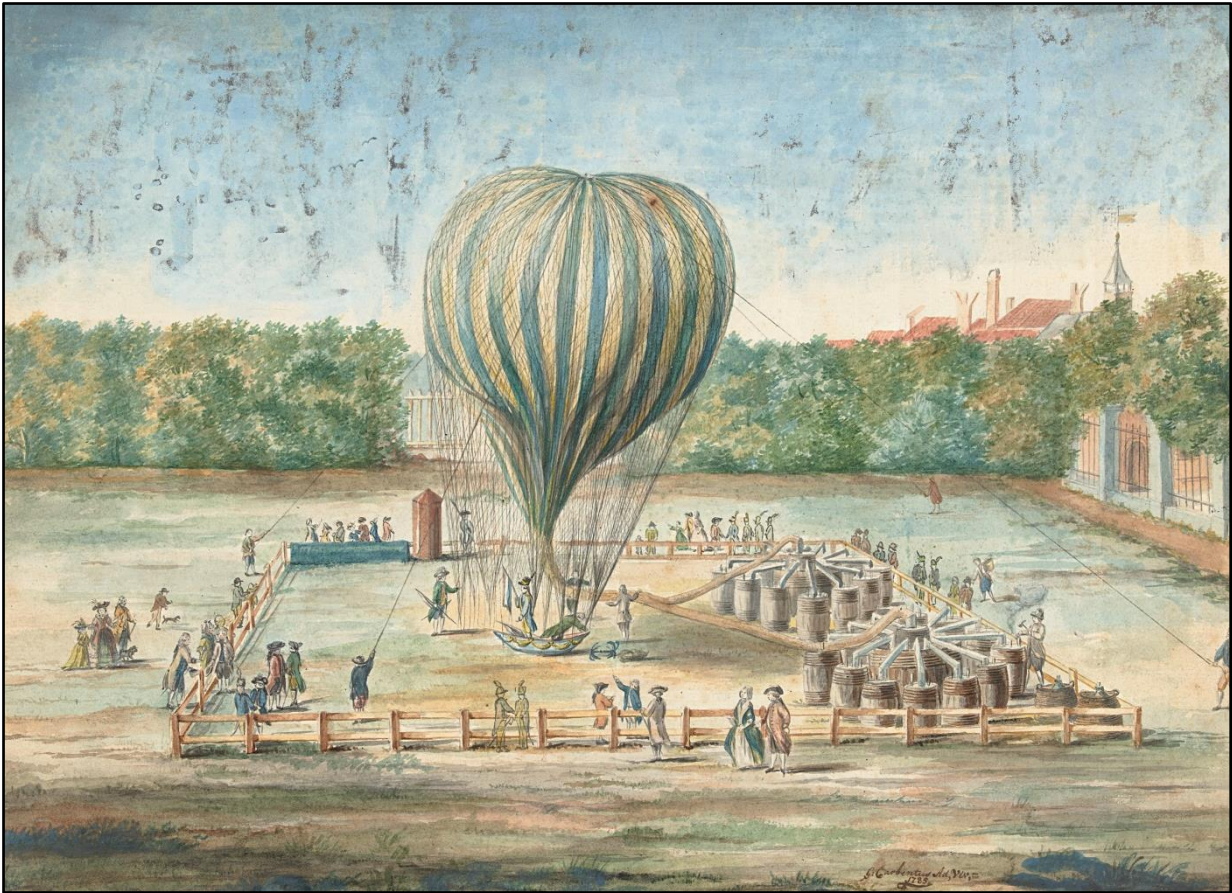


Figure II | The filling of a Charlière by Blanchard on 12 July 1785 in The Hague with hydrogen out of barrels

construction, materials, process of filling, costs and risks could differ. Very soon discussions started on which kind of balloon, the hot-air balloon or the hydrogen balloon, was the best option. According to Gillispie, the competition between these two kinds of balloons dominated the first year of the history of flight.⁸⁰ We also see this discussion in the Dutch books that appear in 1784. Every author discusses and compares them.

Van Noorden expresses a clear opinion in this matter. After his analysis on the working of both balloons, he compares them and comes to the conclusion that the Montgolfière is reckless and unsuitable to do any experiment of importance. He wonders how anyone could make observations and do experiments in a machine where they always needed to be aware of their self-preservation, continually has to kindle fire, give heed to the movements of the machine and use instruments such as barometers and thermometers in the presence of fire.⁸¹ The success with this kind of balloon is also highly dependent on the season and state of the atmosphere. On the other hand, the machine of Charles is subject to none of these circum-

⁸⁰ Gillispie, *The Montgolfier Brothers*, 16.

⁸¹ Noorden, *Korte Verhandeling over de Lugtweegkundige Bol*, 30, 31.

stances. Cold, heat, clouds and wind cannot cause any detriment.⁸² Therefore, Van Noorden considers Charles' balloon the safest and most fit for scientific experimentation and in general. If Van Noorden was the actual recipient of the letter by Montgolfier as I have suggested, this is an interesting conclusion. This would mean that, despite his correspondence with Montgolfier who made and explained a hot air balloon, he chose to manufacture a gas balloon in imitation of Charles.

Houttuyn disagrees with Van Noorden and expresses his criticisms in the preface of the translation of the work by Faujas. He states that Van Noorden's judgement of the aerostatic machine by the Montgolfier brothers is too biased. Houttuyn believed that that Van Noorden calls the hot air balloon dangerous and useless solely to exalt his own way, balloons filled with inflammable air in the style of Charles, above those of others.⁸³ According to Houttuyn, several successful experiments in the Netherlands by than had proven that the Montgolfière was not dangerous and useless. He is even convinced that the Charlière may be more dangerous for he had heard the news of the death of four men in a gas balloon who died because of the cold. This would never happen with a Montgolfière because there is a constant fire to produce hot air.⁸⁴ Houttuyn is also convinced that a Charlière deters people because of the costliness whereas a Montgolfière has lot of potential to further improve the invention with little cost and effort.⁸⁵ Faujas too emphasizes the high costs of inflammable air and states that it is not easy to obtain. To him, this is no reason to reject it because he sees a lot of potential and possibilities for improvement.⁸⁶ Faujas, the original writer of this translated work, does not explicitly express any preference for one of two types of balloon.

Damen's work contains the most elaborate explanations and calculations regarding both balloons. At first glance it seems as if he only want to analyse the two balloons as good and complete as possible and does not prefer either one of them. He nevertheless seems to have more faults with the Charlière and prefers a Montgolfière.⁸⁷ The inflammable air in a

⁸² Ibidem, 29, 30.

⁸³ Faujas de Saint-Fond, *Beschrijving der Proefneemingen met konstige Lugtbollen*, X.

⁸⁴ Ibidem, XVI, XVII.

⁸⁵ Ibid., XVIII.

⁸⁶ Faujas de Saint-Fond, *Beschrijving der Proefneemingen met konstige Lugtbollen*, 78.

⁸⁷ Damen, *Natuur- en Wiskundige beschouwing van den Lugtbol*, 107.

Charlière can easily dissipate and evaporate through the pores of the fabric.⁸⁸ In addition, it can be dangerous when the filled balloon comes in touch with temperature changes in the atmosphere because it could cause the balloon to swell and burst, he explains.

Van Lier joined the fierce debate between Van Noorden and Houttuyn. He argues that Houttuyn could have responded more decently and moderately to Van Noorden. Yet, Van Lier agrees with Houttuyn and Damen that it is probable that the Montgolfière deserves priority. He gives two reasons. Firstly, manufacturing a Montgolfière requires less accuracy without having to fear the failure of the experiment. It simply costs less effort and time. Secondly, a hot air balloon can be filled with lesser cost than the Charlière. The argument of proponents of the gas balloon, that balloonists have more freedom in a Charlière to run tests because they are less exposed to hazards, does not impress Van Lier. A balloon can carry several people, so if someone is held responsible for the fire, others may simply run their tests. He does admit that, when the fire in a Montgolfière prevents carrying out certain experiments successfully, for example with a thermometer, it might be useful to use a Charlière for that.

In brief, each author compares the two kinds of balloons. This particularly happens on the following aspects: its construction, the required size of the balloon in relation to the optimal lift and weight to bear, the duration and ease of filling the balloon, safety, the ability to use it for doing experiments and making observations and the costs of making and filling the balloons. They do not all come to the same conclusion. Van Noorden favours the balloon filled with inflammable air in the style of Charles, and the other authors, Houttuyn, Damen and Van Lier prefer the machine by the French inventors, a Montgolfière. These different preferences are also visible in the fact that approximately the same amount of both kinds of balloons were launched during the first year.⁸⁹

⁸⁸ *Ibidem*, 48.

⁸⁹ Two-third of the reports in newspapers and yearbooks in the first year mention the type of the launched balloon. Almost an equal amount of both balloons were launched, but slightly more with slightly more Charlières. with a very slight majority for the Charlière.

3.4.2 NATURE OF AIRS

All the authors of the Dutch books about the balloon were mainly interested in the natural principles underlying the working of the balloon. One important issue was the nature of the air that causes a Montgolfière to rise. Knowledge of air was not very elaborate at that time because it was a fairly new field of research.⁹⁰ The authors therefore are not all in agreement with each other on this issue.

Faujas, the French writer of the first ever work on the balloon dedicates a chapter to the vapour that emerges from combustion and is used to fill a Montgolfière. He deems accurate knowledge of this gas not an easy matter. Firstly because it depends on a number of additional conditions, and secondly because there still were only a few studies and experiments done at that time since the field of study was fairly new. Nevertheless, he does give his own thoughts on the nature of this gas. He believes that the vapour consists of combined gasses.⁹¹ This particular mixture is lighter than air. Still, he states that the exact nature of this gas is yet unknown.⁹² He does believe that the knowledge of this matter will increase because chemistry is so far advanced that it will procure the right resources for further research. This will contribute to the perfection of the aerostatic machine, is his expectation.⁹³

From the preface of the translation of this work becomes apparent that the translator, Houttuyn, agrees with Faujas' assessment that the vapours from combustion are combined gasses. In this matter too, he criticizes Van Noorden. Van Noorden has stated that the air which is produced by fire and causes a Montgolfière to rise is nothing but plain air. Houttuyn refutes this by referring to the stench and smoke emitted during combustion which should indicate that the vapour consists of water and oil. Also the closeness that can occur in a closed space by burning coals is a clue that the vapour which rises from burning materials is completely different than plain expanded air, Houttuyn argues.⁹⁴

⁹⁰ Faujas de Saint-Fond, *Beschrijving der Proefneemingen met konstige Lugtbollen*, 138.

⁹¹ *Ibidem*, 94.

⁹² Noorden, *Korte Verhandeling over de Lugtweegkundige Bol*, 28; Faujas de Saint-Fond, *Beschrijving der Proefneemingen met konstige Lugtbollen*, 101.

⁹³ Faujas de Saint-Fond, *Beschrijving der Proefneemingen met konstige Lugtbollen*, 109.

⁹⁴ *Ibidem*, XIV.

Damen expresses his amazement about the assertion of Faujas and even more about the fact that Houttuyn defends him. Damen himself agrees with Van Noorden in stating that the gas that fills a Montgolfière is rarefied air. He believes that Faujas reasoning on this issue stems from a desire to idolize the Montgolfier brothers.⁹⁵ To support his view, he adds a part of the translation of remarks on Faujas book from 'The Appendix of the Monthly Review, Vol. LXIX'. This article also states that the Montgolfière was filled with ordinary air, and that it rises just because of the rarefaction of it.⁹⁶

Van Lier appears to have yet another view on this matter in which he combines the ideas of Van Noorden, Damen, Houttuyn and Faujas. He argues that the 'liquid' released by combustion is a combination between rarefied air and vapour of phlogiston. So, the lightness of the gas is due to the expulsion of ordinary air and the operation of phlogiston, which, according to Van Lier, plays a significant role in the severity of different types of air.

This discussion shows that inventions do not always have a wide epistemic base. There was no overall agreement among the involved experts about the science behind ballooning. The invention of the balloon initiated research regarding the underlying natural principles of ballooning such as the nature of air, the propositional knowledge, and offered ground for discussion.

3.4.3 USEFULNESS

A third issue in all the books is of a slightly different nature. It concerns the future of the balloon. Each authors deals with the question how useful the balloon was and could become. This question was not uncommon for scientists in that time. The notion of usefulness played an important role in the Enlightenment.⁹⁷ The Republic too was in the grip of this utilitarian thought.⁹⁸ Dutch scientists between the years 1750 and 1875 had a strikingly outward-oriented attitude. In the spirit of the Enlightenment, they ideally aimed at working for the

⁹⁵ Damen, *Natuur- en Wiskundige beschouwing van den Lugtbol*, 149.

⁹⁶ *Ibidem*, 160, 168.

⁹⁷ Lynn, *The Sublime Invention*, 35.

⁹⁸ Altena, *Het nut der luchtballen*, 22.

direct benefit of their fellow citizens and to be useful members of society.⁹⁹ It is therefore not surprising that the authors pay much attention to this aspect in their books.

Van Noorden starts in his book by stating a distinction between three kinds of inventions or discoveries. The first are inventions or discoveries of which it is directly clear for what purpose it will be used and how useful it is, such as the printing press and magnifiers. These inventions quickly reached a state of perfection. The second are inventions with unexpected benefits, such as electricity of which people would have not anticipated that it could explain the cause of thunder and could help to cure diseases, Van Noorden explains. Last are inventions that promise a lot but cannot live up to it. According to Van Noorden, the balloon is an invention of the first category and certainly not of the last one. Every author seems to agree with him, for they all believe that big steps will be made to reach a state of perfection and that the balloon will prove itself very useful.

What is the expected usefulness? Van Noorden, the French Faujas and Damen make a distinction between the usefulness of the balloon in its current state and when it will be fully developed. In its then-current state, the authors claim that the aerial machine already offered several useful possibilities. Several of these uses are described, such as spying on the enemy in warfare, learning about the atmosphere, helping ships in bad weather, signalling over long distances, perfecting maps, creating new maps and lightening fireworks for entertainment.¹⁰⁰

These uses do not amount to what the balloon would be able to do in the future. In order for this to happen, the balloon should continue to be developed and some important issues had to be resolved. One issue concerned a Charlière and had to do with finding a way to maintain inflammable air unchanged during a flight and to ensure that it does not fly away on the way.¹⁰¹ According to Van Noorden and Damen, who raised this problem, this is no insurmountable matter. They believed that means for achieving this would be developed in the future.

⁹⁹ Maas, 'Civil Scientists', 75, 86.

¹⁰⁰ Damen, *Natuur- en Wiskundige beschouwing van den Lugtbol*, 108, 109; Noorden, *Korte Verhandeling over de Lugtweegkundige Bol*, 70-74.

¹⁰¹ Noorden, *Korte Verhandeling over de Lugtweegkundige Bol*, 74; Damen, *Natuur- en Wiskundige beschouwing van den Lugtbol*, 67.

Besides this, every author discusses an even bigger issue; making the balloon steerable. According to Damen, the balloon will remain nothing more than a subject of barren curiosity if one is not able to make it possible to steer it.¹⁰² The fact that this is seen as a necessary condition for the balloon to really be useful, explains why each author spend so much attention to describing the possibilities and techniques to make the balloon independent of the directions and force the wind. Examples are to attach wings to the balloon, deflating and inflating balloons on the go and attaching soars to the basket under the balloon.

If we are to believe the authors, the objections and necessary problems to overcome are way less than the possibilities a perfected balloon could bring. In the description of these possibilities, hardly any author makes a distinction between the two types of balloons, a hot air and a gas balloon. The only difference is that a Charlière can bear the same kind of weight as a Montgolfière with a significant smaller balloon because the gas is lighter than the hot air. In describing the future possibilities of the balloon, every author presumably had the balloon in mind which he believes to be the best and safest.

The many uses that are described can be divided into at least three categories. The first category is transport. Transport through air was considered to be an important aspect that would open new possibilities. It could enable people to travel to places that are hard to reach, for example because the roads are bad or because war or diseases make it unsafe to travel over land. It would even enable people to reach places that are unreachable without a balloon, for example high mountains. In this way, the balloon can for example function as a means of communication between people who are separated from each other by mountains. This also offers opportunities for a more simple and rapid dissemination of mail and parcels, and opens the possibility for merchants and traders to collect new and unknown merchandise and expand their trading business. The second category is warfare. A steerable balloon can be beneficial by relocating soldiers, spying on the enemy, passing messages and give signals. Finally, the balloon will be useful for gaining knowledge by doing experiments and observation from the balloon. Balloonists can take a manometer, thermometer and barometer

¹⁰² Damen, *Natuur- en Wiskundige beschouwing van den Lugtbol*, 108.

with them on their trip through the air. In this way they are able to obtain knowledge about the atmosphere, attraction and shape of the earth, cloud formation, precipitation and electricity. Physics, the study of air, meteorology, astronomy and mechanics could benefit from this.¹⁰³

In addition to these main categories, each author also proposes some other future utilities. The balloon could for example be used for the benefit of missionaries so they would have a simpler way of spreading Christian faith and for the interested in natural history and antiquity for example in using it to find the arc of Noah on the Ararat. Although some of the predictions of expectations differ between the authors, they all agree that the balloon has a lot of potential and that it is one of the most important inventions of their time, or even of all times.¹⁰⁴

The only author that really takes time to discuss the potential danger of the balloon is Van Lier. He discusses dangers like the cracking or bursting of a balloon, landing on water and drowning, being struck by lightning and being tossed back and forth by storms. He puts all these dangers in perspective for both the Charlière and Montgolfière, and finally concludes that they are not insurmountable.

¹⁰³ Lier, *Verhandeling over het algemeen en bijzonder gebruik der aërostatische machines*, 88.

¹⁰⁴ Damen, *Natuur- en Wiskundige beschouwing van den Lugtbol*, XV.

4 CULTURAL RECEPTION

The invention of a flying machine was not just noted by scientists. In fact, it captured the attention of thousands and thousands of people throughout Europe.¹⁰⁵ The balloon soon engrossed public conversation.¹⁰⁶ This chapter is about the cultural reception and impact of the aerostatic machine. First, it will give an overview of the size and nature of the audiences that were present at launches. Secondly, it will show what the general feelings towards this machine were by looking at how audience reacted to launches, how people spoke and discussed about balloons and how the media reported on the invention. This chapter ends by exploring where this interest came from by analysing of the balloon as a form of popular science.

4.1 AUDIENCES AT LAUNCHES

Ballooning in France attracted many people. Sometimes even ten to hundreds of thousands of spectators were present at a launch. The first manned flight for example was extremely popular. Various sources cite different numbers of witnesses, but in most cases it comes down to half of the city of Paris, which would mean an estimated 400.000 people.¹⁰⁷ In the Netherlands too, many people gathered at and around the place of a launch. Reports in newspapers and yearbooks, advertisements and descriptions of eyewitnesses give insight into the size and social and cultural make-up of the audiences in the Netherlands.¹⁰⁸

Only the first balloon launch was conducted in private company with the presence of a select group of people. Already when this first experiment was resumed in public a few days later, it attracted an ‘amazing crowd of spectators’.¹⁰⁹ Many other reports too describe the size of the audience by conveying their amazement and explaining what the vast group of

¹⁰⁵ ‘Vrankryk’ (10 February 1784) *Hollandsche Historische Courant*, 2.

¹⁰⁶ This was for example noticed by the British *Morning Herald* in October 1783 ‘the balloon, or aerostatic globe now engrosses the public conversation’ and by French commentators who for example state that the balloon ‘became the unique object of conversation in all assemblies’ as quoted in: Lynn, *The Sublime Invention*, 35; ‘Nederlanden’ (29 October 1784) *Nederlandsche Courant*, 1.

¹⁰⁷ Lynn, *The Sublime Invention*, 68. (footnote 58)

¹⁰⁸ Lynn, *The Sublime Invention*, 68.

¹⁰⁹ ‘verbazende menigte aanschouwers’ in: *Nieuwe Nederlandsche Jaarboeken 18*, part 3 (Leiden and Amsterdam 1783) 2099.

people looked like to them. There was for example ‘an astounding crowd of eyewitnesses’¹¹⁰ in Leiden in April 1784, and in June 1785 ‘spectators from all corners and many cities coalesced into large crowds’.¹¹¹ Very few people made estimations on the number of people who came to witness an ascension. Many of them considered the ‘influx of spectators indescribably large’ and the amount of people innumerable.¹¹² Others speak of ‘an uncountable crowd’, for example at the launch of the balloon by Jan Modderman and Gerrit van Olst in Groningen in 1784.¹¹³

Yet in a few cases, people did make estimations about the amount of people that were present. A letter about the failed experiment by members of the society *Felix Meritis* of Amsterdam in May 1784 describes the presence of fifty to sixty thousand people.¹¹⁴ Another publication on the same event even speaks of seventy to eighty thousand people.¹¹⁵ An eyewitness report of an experiment one year later claims that at least eighty to ninety thousand people were out and about, maybe even a hundred thousand.¹¹⁶ Other descriptions provide some rougher estimation. The *Hollandsche Historische Courant* of 27 May 1784 for example describes the presence of thousands of inhabitants of Amsterdam at the launch of three balloons by the Bianchi brothers.¹¹⁷ The report on the balloon launch by Romain on 30 July 1785 also speaks of the presence of thousands of people.¹¹⁸

To be able to harbour these large crowds, most launches took place on fields just outside the city or in large gardens. These locations were not always sufficient. Several reports on experiments describe how the roads were crammed and how the houses, towers and

¹¹⁰ ‘eene verbazende menigte van aanschouwers’ in: *Nieuwe Nederlandsche Jaarboeken* 19, part 1 (Leiden and Amsterdam 1784) 791.

¹¹¹ ‘aanschouwers, die van alle kanten, en veele Steden in groote menigte waren zaamgevloeid’ in *Nieuwe Nederlandsche Jaarboeken* 20, 857.

¹¹² ‘De toevloed van aanschouwers was onbeschyflyk groot’ in: ‘Nederlanden’ (27 March 1784) *Hollandsche Historische Courant*, 1.

¹¹³ ‘eener ontallige menigte’ in: ‘Nederlanden’ (27 March 1784) *Haarlemse Courant*, 1.

¹¹⁴ *Brief van Joris Cullarius in ‘s Gravenhaage aan Justus Ironicius in Amsterdam* (s.l. s.d.[1784]) 2.

¹¹⁵ *Zaamenspraak tusschen de luchtbol van den Heere Duivené en die van ‘t Genootschap Felix Meritis* (s.l. s.a.[1784]) 4.

¹¹⁶ ‘Een echt en omstandig Verhaal van een Fransman en zijn Windbol, welk op den 10 Augustus 1785, te Amsterdam op ‘t Drilveld, na de laagte is neder, en weg gegaan. Opgesteld in een brief door een heer aan zijn Vriend’, *Amsterdamsche en Leydsche Post-Waagen* 2, 3 (1785) 15, 19.

¹¹⁷ ‘Nederlanden’ (27 March 1784) *Hollandsche Historische Courant*, 1

¹¹⁸ ‘Nederlanden’ (16 August 1785) *Groninger Courant*, 1.

church steeples of the city were full of people.¹¹⁹ Every possible location was used to be able to view the flying machine.¹²⁰ A majority of these audiences came from the city where the launch took place and neighbouring towns.¹²¹ Some reports even state that people from all directions and many towns were present.¹²² With the balloon launch by Romain in Rotterdam on 20 July 1785 for example, 'the number of carriages from outside the city were innumerable'.¹²³

This large influx of people was not always accompanied by order.¹²⁴ One of the first experiments with the balloon in the Netherlands, in The Hague on 11 December 1783, caused unruliness. The yearbook of 1783 describes that the boisterous crowd destroyed a big powerful new fence because they all wanted to be present at the place where the balloon would take off.¹²⁵ A similar hustle and disorder happened on 15 March 1785. That experiment even failed partly due to the great rush.¹²⁶ Besides this, the eager to see the balloon sometimes even caused 'sad accidents' because some people fell of their roofs in attempting to get a good glimpse of the happening.¹²⁷

These estimations and descriptions do give indications about the size of the audiences, but it is not possible to retrieve how many people actually came to see the balloon launches. It is not unlikely people exaggerated their descriptions to convey their amazement over the crowd and the invention. Many of them had never seen so many people in one place before and were impressed by it.¹²⁸ Ballooning generated unparalleled gatherings and according to Lynn, it is one of the first examples of a truly mass culture.¹²⁹

¹¹⁹ *Nieuwe Nederlandsche Jaarboeken 19*, part 1, 791; 'Bataafsche Republyk' (2 October 1804) *Rotterdamsche Courant*, 2.

¹²⁰ Lynn, *The Sublime Invention*, 69.

¹²¹ 'Nederlanden' (2 September 1784) *Hollandsche Historische Courant*, 1.

¹²² *Nieuwe Nederlandsche Jaarboeken 19*, part 1, 857.

¹²³ 'Nederlanden' (16 August 1785) *Groninger Courant*, 1.

¹²⁴ 'Holland' (6 June 1807) *Amsterdamsche Courant*, 4.

¹²⁵ *Nederlandsche Jaarboeken 18*, 2064.

¹²⁶ 'Nederlanden' (20 May 1786) *Hollandsche Historische Courant*, 2.

¹²⁷ 'Holland' (9 June 1807) *Vriesche Courant*, 2.

¹²⁸ J. Roos and son, *Nieuwe almanach voor het volk van Nederland, voor den jaare 1787* (Amsterdam 1787) 55; 'Nederlanden' (12 August 1785) *Zuid-Hollandsche Courant*, 1.

¹²⁹ Michael R. Lynn, *Popular Science and Public Opinion in Eighteenth-Century France* (Manchester and New York 2006) 136.

After these first years, there was a period of almost twenty years in which hardly any balloon was launched. After this period of inactivity, articles on balloon launches describe the size of the audience almost identically. Newspapers speak of ‘many thousands of spectators’¹³⁰, ‘large crowds’¹³¹ and ‘an uncountable rush of curious onlookers’.¹³² People again climbed on roofs and chimneys to be assured of a good view which sometimes led to accidents of people falling from their houses or other buildings.¹³³ When Augustin launched a balloon in June 1807, he went to the parade ground, just outside Amsterdam. One newspaper describes the presence of an immense amount of spectators and notes that the streets of Amsterdam were almost empty and silent since everyone went to see the aerostatic machine.¹³⁴ Even when the author of this article exaggerated this, and he probably did because more than 200.000 people lived in Amsterdam at that time, it does suggest that thousands of people turned out to see the balloon.¹³⁵ This means that the interest in balloons does not seem to have declined much after several years. Lynn comes to the same conclusion when he states that audiences in the nineteenth century could still be quite large.¹³⁶

It is difficult to say if this also applies to the balloon launches after 1825. From that time, launches are only announced and there were hardly any reports afterwards that could give insights into the size of audiences by then. Still, it is reasonable to assume that these launches were attended by many people. Each year, an equal amount of balloons throughout the Netherlands went up. This would only have been possible if there was enough public interest. Only then, launching balloons would have been profitable and therefore interesting for balloonists at that time who aimed at making ballooning profitable, as we will see in chapter 6.

¹³⁰ ‘veele duizenden, van aanschouwers’ in: ‘Holland’ (9 June 1807) *Vriensche Courant*, 1.

¹³¹ ‘grootte menigte aanschouwers’ in: ‘Holland’ (8 August 1807) *Amsterdamsche Courant*, 4. ‘Holland’ (10 September 1807) *Opregte Haarlemsche Courant*, 2.

¹³² ‘een ontelbaren toevloed van aanschouwers’ in: ‘De zestigste Luchtzeize van den Heer Blanchard en de tienden van dezelfs Echtgenootte gelukkiglijk volbragt’ (11 July 1807) *Koninklijke Courant*, 2.

¹³³ ‘Holland’ (24 May 1808) *Ommelander Courant*, 1; ‘Holland’ (9 June 1807) *Vriensche Courant*, 1.

¹³⁴ ‘Holland’ (9 June 1807) *Vriensche Courant*, 1.

¹³⁵ Centraal Bureau voor de Statistiek, ‘Tabellen in jaar 1785. Noord-Holland, Zuid-Holland’, <http://www.volkstellingen.nl/nl/volkstelling/jaartellingdeelview/VT179502/index.html> (2 May 2015).

¹³⁶ Lynn, *The Sublime Invention*, 69.

There was a great social diversity among the spectators. Many descriptions of the audiences mention the presence of people 'of all ranks and respects'.¹³⁷ Men and women 'from all corners and neighbourhoods of the city were coalesced'¹³⁸ People from various trades of life were brought together by a shared curiosity for this flying phenomenon.¹³⁹ This happened throughout Europe.¹⁴⁰ As Brant puts it: 'aeronautic spectacle was inevitably sprawling: anyone might see it.'¹⁴¹ This means that also aristocratic elite was part of this public.¹⁴² Several reports explicitly mention that there was a 'numerous crowd, including men and women from the first rank'.¹⁴³ Sometimes, an entrance fee was required. If one paid to get access to the place of filling and ascending the balloon, one sat between the 'decent people', according to an eyewitness. These were people with enough money and willingness to pay, such as physicists, alderman and sometimes even ministers and priests.¹⁴⁴

Sometimes members of the royal family were among these notables. One day before the first experiment by Diller, the second Dutch balloonist, his Serene Highness had already visited the balloon.¹⁴⁵ Also 'his illustrious and her royal highnesses' were present on the fifth of May 1784 at another launch of balloon by Diller.¹⁴⁶ A few months later, De Bosset, colonel and captain under the Swiss Guard, graduated her royal highness the princess of Orange on her birthday with a special illuminated balloon that was dedicated to her by which she was extraordinarily amused, as a news item reports.¹⁴⁷

¹³⁷ 'van allerlei rang en aanzien' in: *Nieuwe Nederlandsche Jaarboeken* 19, part 1, 810. Other examples: 'Byzonderheden' (20 July 1785) *Leeuwarder Courant*, 1 and *Nieuwe Nederlandsche Jaarboeken* 18, 2064.

¹³⁸ 'uit alle de hoeken en buurten dezer stad waren zamengevloeid' in: 'Holland' (9 June 1807) *Vriesche Courant*, 1.

¹³⁹ *Nieuwe Nederlandsche Jaarboeken* 18, 2099.

¹⁴⁰ Lynn, *The Sublime Invention*, 79-81.

¹⁴¹ Clare Brant, "'I Will Carry You with Me on the Wings of Imagination": Aerial Letters and Eighteenth-Century Ballooning', *Eighteenth Century Life* 35, no. 1 (2011) 183.

¹⁴² This also happened in other countries: Cf. Lynn, *The Sublime Invention*, 81.

¹⁴³ 'eene talryke menigte, waaronder Heeren en Dames van den eersten rang' in: 'Nederlanden' (13 April 1784) *Hollandsche Historische Courant*, 1.

¹⁴⁴ 'Een echt en omstandig Verhaal van een Fransman en zijn Windbol', 16.

¹⁴⁵ 'Nederlanden' (12 December 1783) *Nederlandsche Courant*, 1.

¹⁴⁶ 'Zyne Doorl. en Haar Kon. Hoogheden' in: 'Nederlanden' (8 May 1784) *Hollandsche Historische Courant*, 2.

¹⁴⁷ 'Nederlanden' (13 August 1784) *Nederlandsche Courant*, 1.

Also in later years, prominent men and royal highnesses were present.¹⁴⁸ In the case of the seventh air voyage by Augustin in October 1806 for example, an alderman, the governor of Amsterdam, Consul General of France and various constituted powers were present.¹⁴⁹ Two other launches by Augustin, in Amsterdam in April and May 1808, were visited by the king of the Netherlands, Louis Napoleon. Apparently, making a flight was something to be proud of and was done in honour of the king, because one of these balloons bore the inscription 'Dedicated to His Majesty Louis Napoleon, King of Holland, by Augustin, first Air Traveler of his Kingdom'.¹⁵⁰

4.2 INITIAL ENTHUSIASM AND OPTIMISM

This great interest for the balloon was accompanied with enthusiasm and positive valuation of the invention, especially during the first months of flight. Lynn even speaks of a 'universal enthusiasm' which knew no bounds.¹⁵¹ In the first place, this can be seen by the way the large audiences reacted to a launch. Several reports describe loud cheering, hooray-shouting and applauses when a balloon was filled or when it ascended.¹⁵² This enthusiasm was sometimes stimulated and enhanced by other activities around the filling and launching of a balloon. In Groningen for example, during the launch of the balloon by Modderman and Van Olst, musicians were present with kettledrum and trumpets who played during the event. Also cannon shots were fired and people waved with flags during the ascension of the balloon.¹⁵³ Herald-ing the filling of a balloon or the cutting of ropes was more often announced or combined with cannon shots.¹⁵⁴ These were special moments that were to be marked.

Secondly, also the way people wrote about the balloon shows that many were full of praise about the balloon. This is for example apparent from sources such as poems, stories,

¹⁴⁸ *Nieuwe Nederlandsche Jaarboeken* 21, 568.

¹⁴⁹ 'Beschrijving der 7de luchtzeize van den heer Augustin' (7 October 1806) *Amsterdamsche Courant*, 1.

¹⁵⁰ 'Toegewyd aan zyne Majesteit LOUIS NAPOLEON, Koning van Holland, door Augustin, eersten Luchtreiziger van zyn Koninkryk' in: 'Holland' (23 April 1808) *Vriesche Courant*, 2.

¹⁵¹ Lynn, *The Sublime Invention*, 5.

¹⁵² 'Nederlanden' (23 April 1784) *Nederlandsche Courant*, 1; 'Nederlanden' (2 September 1784) *Hollandsche Historische Courant*, 1.

¹⁵³ 'Nederlanden' (27 March 1784) *Oprechte Haarlemse Courant*, 1.

¹⁵⁴ 'Nederlanden' (16 December 1783) *Groninger Courant*, 1.

plays and pamphlets which often celebrated the art of flying. At the end of the eighteenth century, songbooks with songs about the balloon were published. An example of a song which glorifies the French invention comes from the compilation 'De Gelukkige Visser of de Amsterdamse Losbol' ('The Happy Fisherman or the Amsterdam Profligate'). A lady who made a trip with a balloon from a court in Amsterdam is praised because she has freed man 'from many obstacles'. She is without an equal and her ingenuity is precious to all people, the song states. Therefore, the song makes an appeal to the citizens of Amsterdam to praise this woman. The *Amsterdamsch Bagynehof*, the court where the launch took place, deserves eternal commendation. It is the place where 'man is made into bird'.¹⁵⁵ Not just single songs but entire volumes were dedicated to the invention, for example 'De Nieuwe Lugtbol' ('The New Balloon') and 'De Vernieuwde Lugt-bol' ('The Renewed Balloon'), which both contained approximately 80 pages of songs including a song about the balloon.¹⁵⁶ Ballooning was also featured and praised in poetry. An example of this is the seventeen-page poem by Jacob van Dijk from 1784 which conveys a similar enthusiasm and optimism. Van Dijk describes his satisfaction about the fact that the fabulous character of flying is refuted by the actual invention of this flying machine. Superstition is broken. According to the poet, this entails much good for humanity.¹⁵⁷

Also reports in newspapers and yearbooks about the first launches from all over Europe show some of this enthusiasm. Despite the fact that many articles in newspapers simply describe how a demonstration with the balloon went by giving factual information on the location, times and measurements, the overall tone during the first months of flight was positive and optimistic.

Many described the beauty of the balloon and its ascension and convey amazement and awe.¹⁵⁸ Repeatedly, the balloon is called an 'astonishing invention'.¹⁵⁹ Several reports also

¹⁵⁵ *De gelukkige visser of de Amsterdamsche Losbol. Zingende de nieuwste liederen en ariás die er gezongen worden* (Amsterdam s.a.) 65.

¹⁵⁶ *De Nieuwe Luchtbol* (Amsterdam s.a.); *De Vernieuwde Lugt-bol* (Amsterdam s.a.).

¹⁵⁷ Jacob van Dyk, *Het nut der Luchtbollen* (The Hague 1784) 5.

¹⁵⁸ 'Vrankryk' (11 December 1783) *Hollandsche Historische Courant*, 1.

¹⁵⁹ 'verwonderlijke uitvinding' e.g. in: 'Vrankryk' (4 December 1783) *Hollandsche Historische Courant*, 1.

emphasize the fact that a launch or flight was successful, and, when the report was on a manned flight, that the balloonists have experienced no discomfort.¹⁶⁰ Charles and Robert for example could sit at ease to eat and drink during their voyage while they appeared out of sight for the people on the surface.¹⁶¹

Yet, experiments did not always go as planned. Although the balloon could be brought negative to the notice due to these failures, many newspapers still continue to speak in defence of it in their reports. It seems that this medium is initially no place for mockery or negative valuation for this incredible invention. For example, when several newspapers reported on the cracking of a large balloon in Lyon on 16 January 1784, the *Hollandsche Historische Courant* quickly tempers this news in an article. The author acknowledges that there had been an accident, but claims that previous reports on this event are exaggerated and based on false rumours. The damage could be quickly repaired and the experiment eventually took place with good results.¹⁶² Falsehoods and negative notifications concerning the invention were not tolerated.

Something similar is found in the reports concerning a balloon experiment which also took place in Lyon, three days after this incident. Mr Fontain climbed up a rope which was attached to the balloon to be able to talk to the six travellers before they would take off. The account on this event reports that the rope was cut loose while Fontain was still hanging in the air and therefore ascended with it. The balloon fell down unexpectedly, and out of fear, Fontain would have fallen into a swoon. This French incident prompted several mocking works from 'enemies of the invention'. The author of the article calls these negative pieces pusillanimous and chooses to cite a short French poem (including a Dutch translation) in which a proponent of the balloon reacts to these scoffers: 'En vain, pour décrier le Globe Aérien'.¹⁶³

¹⁶⁰ 'Vrankryk' (30 October 1783) *Hollandsche Historische Courant*, 1.

¹⁶¹ 'Frankryk' (5 December 1783) *Groninger Courant*, 1; 'Vrankryk' (11 December 1783) *Hollandsche Historische Courant*, 1.

¹⁶² 'Vrankryk' (31 January 1784) *Hollandsche Historische Courant*, 2.

¹⁶³ 'In vain, the air globe is decried': 'Vrankryk' (5 February 1784) *Hollandsche Historische Courant*, 1.

The great enthusiasm for the balloon was accompanied by a great optimism with regard to science and humanity in general. Throughout history, mankind had dreamt of flying, but many did not believe that this would actually become reality. This is shown by the words of Joseph Banks, president of the Royal Society in London, which are cited in a Dutch newspaper of 24 December 1783. Banks had stated that the French are inventors of the art to visit and navigate an element, air, of which people always had believed that it is completely unsuitable to carry the unwieldy human body.¹⁶⁴ The invention of the Montgolfier brothers changed this conception. It showed the ability of mankind to conquer nature and the laws of physics.¹⁶⁵

The idea that the balloon was a perfect example or even proof of the great capabilities of man was shared by many. In his inaugural speech, the Dutch associate Professor Ysbrand van Hamelsveld speaks full of amazement and praise about how all arts and science have increased. He states that many inventions of his days come close to a miracle. When he heard that the French had travelled with the balloon to a height of 2000 feet, he was amazed and curious to what man will be able to do more in the future. 'Nothing is too hard for the mortal, he even tries to ascend to heaven'.¹⁶⁶ Another, who described the most wonderful developments of the arts and sciences, mentions the invention of the balloon as a perfect example for the inexhaustible ingenuity of mankind.¹⁶⁷ If man is even able to fly, the possibilities are limitless. According to Lynn, convictions like these make that the balloon became an emblem of the age of the Enlightenment and a symbol of scientific progress.¹⁶⁸

4.3 DISAPPOINTMENT

Some people, who started out praising this unparalleled invention, became sceptic and critical after a while. This often had to do with failed or cancelled experiments. Large amounts of

¹⁶⁴ 'Vrankryk' (25 December 1783) *Hollandsche Historische Courant*, 1.

¹⁶⁵ Lynn, *The Sublime Invention*, 3, 7.

¹⁶⁶ 'Niets is voor den sterveling te zwaar, Men poogt zelfs ten Hemel te stijgen' in: Ysbrand van Hamelsveld, *Inwydings-redvoering over den tegenwoordigen voor- of nadeeligen staat van het hristendom, en het geen omtrent denzelven in 't vervolg door on mag gehoopt, of moet gevreesd worden* (Utrecht 1784) 20.

¹⁶⁷ Maatschappij: Tot nut van 't algemeen, *Prijverhandelingen over den invloed der naarstigheit* (Amsterdam 1796) 62.

¹⁶⁸ Lynn, 'Selling Science', 212.

curious people could become quite frustrated and angry when the balloon failed to go up or prematurely returned to the earth. This disappointment is for example reflected in songs that were published around the turn of the century. One of these songs is 'Mislukte onderneeming, wegens het niet Opgaan van de lugtbol' ('Failed enterprise, for the balloon did not ascend') and is about an unsuccessful demonstration.¹⁶⁹ The song describes sadness among those who wanted to see the balloon rise. The maker had deceived everyone, it claims.

One specific unsuccessful experiment in the history of Dutch ballooning caused great disappointment. The event gave rise to many critical, mocking and facetious pamphlets, not only towards the balloonists, but also toward ballooning in general. This experiment took place on Wednesday 5 May 178 and was organised by four members of the Physics Department of the in 1777 founded organisation *Felix Meritis* of Amsterdam. These men were the pharmacists Willem van Barneveld and Dirk Waandert Engert, the medical doctor and theologian Abraham van Moerbeek and the merchant F. Weddik. They had created a large Montgolfière of more than 6 meters of height.¹⁷⁰

Just like all other balloon experiments at that time, the planned launch attracted a substantial audience. These people gathered just outside the *Weesperpoort*, a gate in the fortifications of Amsterdam, in the land of Hulst van Keulen. Some even climbed into a tree in order to be able to see everything.¹⁷¹ The anonymous writer of the publication 'Waare en onpartydige gedachten, over de mislukte proef van 't Genoodschap Felix Meritis' ('True and impartial thoughts on the failed experiment of the society *Felix Meritis*') explains why so many people were interested in this experiment. He states that it is organised by exceptionally competent man. Therefore, people could expect nothing but the best results. Besides that, these experimenters had sent many invitations.¹⁷²

¹⁶⁹ 'Mislukte onderneeming, wegens het niet Opgaan van de lugtbol' in: 'Het vermakelyke vrouwen-tuyntje' (Amsterdam 1786) 22, 23.

¹⁷⁰ '24 voeten hoogte'; *Waare en Onpartydige gedachten over de mislukte proef van 't Genoodschap Felix Meritis* (s.l. s.a. [1784]) 4.

¹⁷¹ *Het Boek der Dwaasheid of de Zotternye der Menschen in het oplaten hunner Lucht-bollen* (s.l. s.a.[1784]) 5.

¹⁷² *Waare en Onpartydige gedachten*, 8.

Despite these positive expectations, the launch did not go according plan. Firstly, the launch was postponed from eleven o'clock in the morning to one o'clock in the afternoon because of the weather. Eventually the balloon went up but its flight was of short duration. The balloon descended prematurely because the rope, which was attached to the balloon, snapped. After a new attempt, the balloon crashed and was seriously damaged. The experiment had failed dramatically.

The affair was ridiculed in several pamphlets. The pamphlet with the striking title; 'Het boek der luchtballen ofte de Zotternyen der menschen' ('The book of the air balloons or the foolishness of man'), describes that the audience was in shock when the experiment failed. According to the author, the crashing of the balloon is an example of the foolishness of man. He predicts that children will laugh when they hear of this incident and their descendants will ridicule them.

The men who carried out the experiment were often the centre of jokes and scoffing. The poetical pamphlet 'Raadgevingen aan de voornaamste bestuurders der aerostatische luchtmaschine' ('Advice to the principal directors of aerostatic air machine') for example states that they disgraced themselves and the people of Amsterdam. The author gives advice to these experimenters. Van Barneveld should stay a pharmacist and Van Moerbeek, who is 'too weak to be a doctor and too dumb to preach the Bible' should also discontinue participating in these balloon activities before he ends up in a madhouse.¹⁷³ Yet another jocular describes the four men as diabolic magicians who concern themselves with sorcery.¹⁷⁴ People had never imagined that just four people would have been able to disappoint and deceive so many people at once.¹⁷⁵ They had hoped to see something wonderful, but were left disillusioned. The incident proofed the pride and foolishness of men. Obviously, people with these convictions did not share the optimism about the great capacities of men of many others in that time.

¹⁷³ 'Te zwak als Doctor en te dom in 't bybelpreeken' in: *Raadgevingen aan de voornaamste bestuurders der aerostatische luchtmaschine. Van het Genoodschap onder de Zinspreuk: Felix Meritis, welke Zuchtend overleed* (s.l. s.a.[1784]) 2.

¹⁷⁴ *Het Boek der Dwaasheid*, 3.

¹⁷⁵ *Brief van Joris Cullarius*, 1, 2.

Another example of disappointment towards ballooning can be found in the on 5 May 1784 planned launch by Diller. This ascension failed because the balloon was too cumbersome and therefore did not climb. Reports on this event state that the displeasure and disappointment among the crowd was great. One complained about the time, the other about the money that has cost this failed experiment.¹⁷⁶ Besides complaining, people could scold at the balloonist. Hopman for example had to swallow hurtful accusations and insults in June 1804 when his balloon launch was unsuccessful.¹⁷⁷

Some other failed experiments were accompanied with more aggressive reactions. The French balloonist Romain even had to flee for his life after he cancelled his planned experiment with a Charlière in Amsterdam due to unsuitable weather. According to a probably exaggerated newspaper report, people started calling him a deceiver, began to curse and swear and even started throwing tiles and stones at him. Romain hid himself in a house but these disappointed fanatics threatened to take it down. The violence only subsided when the police arrived with weapons to restore order.¹⁷⁸

According to the *Groninger Courant*, another French balloonist, Blanchard, faced a similar aggression one month earlier. This time, it was not the audience who provoked a rage but farmers on whose land the balloon accidentally landed. The report describes that some farmers approached the balloon with sticks and pitchforks to damage the big aerial machine and steal valuable components. One farmer would even have threatened to destroy the whole balloon if he did not receive ten ducats to pay for the destruction of his land.¹⁷⁹ According to a pamphlet from the inhabitants of the village, this story is full of untruths and fostered by fantastic stories. This document even claims that the farmers have helped Blanchard in his landing. It is not possible to ascertain what exactly happened, but it is known that Blanchard often enlivened his stories by embroidering them.¹⁸⁰

¹⁷⁶ 'Nederlanden' (8 May 1784) *Hollandsche Historische Courant*, 2.

¹⁷⁷ 'Bataafsche Republyk' (2 October 1804) *Rotterdamsche Courant*, 2.

¹⁷⁸ 'Nederlanden' (16 August 1785) *Groninger Courant*, 1.

¹⁷⁹ 'Nederlanden' (19 July 1785) *Groninger Courant*, 1.

¹⁸⁰ Nabben, *Lichter dan Lucht, Los van de Aarde*, 50, 51.



Figure III | The hydrogen balloon by Charles is attacked by villagers in Gonesse

Whatever truly happened, this was not a unique story. Similar ones are found abroad. It is said that startled peasants from Gonesse destroyed a balloon by Charles (figure III).¹⁸¹ This would have taken place not long after the invention of the balloon. The *Nederlandsche Courant* of 15 March 1784 provides another example of disappointment and anger at an experiment abroad. On 16 February, a planned experiment in Saxen failed because the balloon did not rise. The author of this article describes the anger of a large group of attendees towards the balloonist. Some started throwing snowballs and other 'tried to allay their feelings of revenge with drinking a bottle of beer'.¹⁸² Although we have to bear in mind that, like Blanchard often did, these stories are sometimes exaggerated, it is conceivable that the balloon sometimes aroused fierce and emotional reactions. People had never seen and experienced anything similar before.

¹⁸¹ Gillispie, *The Montgolfier Brothers*, 33

¹⁸² '...hunne gramschap met een fles bier te drinken poogden te stillen' in: 'Duitschland en bygelegen landen' (15 March 1784) *Nederlandsche Courant*, 1.

4.4 CRITICISM

While some became sceptical at the balloon after they had been disappointed, mainly by failed launches, others had not been positive or optimistic about the balloon for other reasons. Some for example had practical objections. Making a balloon costed a lot of money which prevented many from making one themselves.¹⁸³ Other people were critical because they considered the enthusiasm for the balloon a stupidity of the time. Those people looked down on these kind novelties. Jacobus Bellamy for example states that the balloon is yet another novelty, like every age has some. Criticizing, he argues that the youth is addicted to these alternate novelties.¹⁸⁴ Also the Regent from Utrecht, De Perponcher, spoke condescending of the balloon as a 'children's toy'.¹⁸⁵

Criticism towards the balloon also was heard from politics and religion. In an eyewitness report, a patriot for example criticises the fact that the balloonist of an experiment in Amsterdam is a Frenchman. This eyewitness was interested in ballooning but did not buy a ticket to attend the launch. Instead, he climbed on a roof to see the event. He was rather a true patriot instead of paying for 'French wind', 'sluggards of the *la bon ton*'.¹⁸⁶ Other criticism stemmed from religion. Some saw the experiments as an adverse attempt to defy Gods power.¹⁸⁷ Yet others regarded the aerial machine a threat because flying had stopped being a miracle. Man did not had to turn to god for explanations anymore.¹⁸⁸ The most heard objection toward aerostation from religious circle however was that man is not made to fly. In a series of poems from 1786 called 'De historie en het einde der luchtballen' ('The history and the end of the air balloons'), the poet Dirk Kuipers for example states that God has placed us on earth, and we should not try to oppose his order. 'One should strive to heaven by piety, virtuousness

¹⁸³ *De lof der dwaasheid*, 3.

¹⁸⁴ Jacobus Bellamy, *Proeven voor het verstand, den smaak en het hart* (Dordrecht 1790) 54.

¹⁸⁵ 'kinderspeeltuig' in: Altena, 'Geen stervling deed ooit zulk een' smak', 89.

¹⁸⁶ 'Fransche Wind' and 'Luijaards van de *la bon ton* [good manners]' in: 'Een echt en omstandig Verhaal van een Fransman en zijn Windbol', 17.

¹⁸⁷ Johannes le Francq van Berkhey, *Op de roekeloze proefnemingen met de lugtbollen* (s.l.1783) 4.

¹⁸⁸ Thomas Paine, *Eeuw der Misleiding of tegenschrift tegen de eeuw der reden* (translated by Joannes Steenmeyer) (Utrecht 1798) 174, 175.

and honour,' not by means of a balloon.¹⁸⁹ Theologian Van Lier, proponent of the balloon, described this critical argument of his fellow-theologians in his book on the balloon as follows: 'God determined man on earth. He opposes the divine pleasure. He tries to rise above the clouds. What an atrocity!'¹⁹⁰ The sky is only meant for the birds because God did not give man wings, say these opponents of the balloon. Van Lier himself does not agree with these fellow believers. He objects that people also swim in the water while this is the realm of the fish. Why then would man not be allowed to enter the realm of the birds?¹⁹¹ Besides this, he is convinced that the balloon can be of service to humanity. One can glorify God with it, and admire his goodness for he provides recourse to expand the arts and the sciences.

The most heard point of criticism towards the balloon however had to do with safety. People asserted that the balloon was a dangerous machine, especially when it became possible to make trips with it. The first air travellers therefore had some difficulty to let the French king allow them to go. Initially, the king had forbidden the launch because he was 'concerned for the life of his nationals'.¹⁹² Luckily for the initiators, the king could be convinced and they could continue their voyage. Still, critics often had little trust in this invention. A minor failure could for example cause the balloon to catch fire or to crash down. This meant it could cause serious accidents, both for the passengers and the spectators.

This potential danger of the balloon was taken very seriously in some countries. In April 1784, a Dutch newspaper informed its readers that the balloon was banned in Italy. At that time, only one experiment was done in that country, which was successful. Leaders did not see the use of repeating it. It would only make it into a philosophical toy instead of beneficial to the sciences. A second important reason for this ban was that the balloon could cause serious accidents.¹⁹³ The invention was simply found to be too dangerous. This was only con-

¹⁸⁹ 'Men moet, door vroomheid, deugd en eer, ten Hemel streeven' in: Kuipers, *Mijne dichtoefeningen*, 91.

¹⁹⁰ 'God bepaalde den mensch aan de aarde. Hij kant zig aan teegen het Goddelyk welbehagen. Hy tragt zig booven de wolken te verheffen. Welk een gruweldaad!' in: Lier, *Verhandeling over het algemeen en bijzonder gebruik der aërostatische machines*, 64.

¹⁹¹ Lier, *Verhandeling over het algemeen en bijzonder gebruik der aërostatische machines*, 68.

¹⁹² 'bezorgdheid voor het leven zyner onderdaanen' in: 'Vrankryk' (11 December 1783) *Hollandsche Historische Courant*, 1.

¹⁹³ 'Italiën' (13 April 1784) *Hollandsche Historische Courant*, 1.

firmed when, shortly after the decree, a balloon in Avignon caught fire while being up in the air and crashed because of it.¹⁹⁴

People in the Netherlands were also well aware of the possible dangers and some feared accidents. Some reports about balloons for example stressed that no accidents had happened yet. The authors presumably had read the reports on accidents in other countries or had heard that also balloons in the Netherlands had caught fire.¹⁹⁵ Occasionally, a bailiff even requested to cease the experiment for fear of fire.¹⁹⁶ Johannes le Francq van Berkhey for example published the pamphlet 'Op de roekeloze proefnemingen met de lugtbollen' ('On the reckless experiments with balloons') in 1783 in which he explains some other hazards. The balloon could for example land on the water, be stuck by lightning and stray by the wind. Even learned Dutchmen like Boerhave, Huijgens and Gaubiussen knew that the gas in a gas balloon can be dangerous, he scoffingly notes. People should learn to curb their curiosity.¹⁹⁷

Such critical visions got more approval from June 1785 when newspapers informed their readers of a serious accident in France.¹⁹⁸ Something had happened which many had feared.¹⁹⁹ On 15 June, Jean-François Pilatre de Rozier planned to make a trip with a balloon. He had done this several times by then. In fact, he was the first man to ascend in a balloon which had brought him much praise. His next goal was to become the first man to cross the channel from France to Britain. Balloonist Blanchard however was first in undertaking a successful crossing. This did not stop Pilatre from trying it himself. Several attempts failed because the wind was not good and the balloon could not be steered. Out of impatience, he created a new kind of balloon. He did this together with his co-passenger Romain. This new balloon became a combination of a Charlière; the top was filled with gas, and a Montgolfière; the bottom contained hot air. Both men believed that this would give them better control over the movements of the balloon.²⁰⁰

¹⁹⁴ 'Vrankryk' (13 July 1784) *Hollandsche Historische Courant*, 1.

¹⁹⁵ 'Nederlanden' (13 April 1784) *Hollandsche Historische Courant*, 2.

¹⁹⁶ 'Nederlanden' (29 March 1784) *Nederlandsche Courant*, 1.

¹⁹⁷ Francq van Berkhey, *Op de roekeloze proefnemingen met de lugtbollen*, 4, 6.

¹⁹⁸ Altena, 'Geen Stervling deed ooit zulk een'smak', 89-91.

¹⁹⁹ *Nieuwe Nederlandsche Jaarboeken 20*, part 1, 836.

²⁰⁰ Lynn, *The Sublime Invention*, 21.



Figure IV | Accident with the balloon from Pilatre de Rozier on 15 June 1785

At five minutes past seven in the evening, both men got on board their balloon. This time, the wind was blowing in the right direction and they headed off towards England. Soon, onlookers saw smoke coming from the balloon. It had caught fire (figure IV). Not long thereafter, the machine which already had a height of a few hundred meters, crashed down. This happened at an hour traveling distance from the site where they ascended.²⁰¹ People rushed towards the location, but to no avail. They found both man 'dead, with shattered limbs'.²⁰² Everyone in Boulogne was in deep grief, the news reported.²⁰³ News reports were not

univocal as to how this could have happened. This incident made many people realize what dangers the flying machine could involve. And for others, it was a confirmation of what they already were convinced of. Ballooning was a perilous occupation.

After this incident, people often referred to it when they spoke about the dangers of the balloon. For Dirk Kuipers, it was one of the causes for criticising ballooning in verse. In 1786, he wrote the poem 'The unfortunate air voyage by the Messrs Pilatre de Rozier and Romain'. In this poem, he stresses the danger of flying. Lightning might strike the balloonist into the depths of the abyss. He also speaks in derision about the accident. What does man

²⁰¹ 'Vrankryk' (23 June 1785) *Hollandsche Historische Courant*, 1.

²⁰² 'dood, en met verbryzelde leden' in: 'Nederlanden' (24 June 1785) *Zuid-Hollandsche Courant*, 2.

²⁰³ Vrankryk' (23 June 1785) *Hollandsche Historische Courant*, 1.

seek in the air? That is the realm for poultry.²⁰⁴ This poem was the first in a series of poems called 'The history and the end of the air balloons'. Like the first, who set the tone for the rest, all of these poems were written on a specific air travel. They emphasize the ridiculousness and the blasphemous absurdity of ballooning in general. Voyages without a fatal fall are only putting off the evil hour. Serious accidents will happen. Kuipers wants nothing more than to see the whole pursuit of ballooning come to an end.²⁰⁵

4.5 POPULAR SCIENCE

Does the overall enthusiasm for the meant that the general audience was also interested in the science behind it and the possible scientific uses like the first balloonists or did they only wanted to be entertained? Public interest in science had grown strongly over the years. Especially from the second half of the eighteenth century, there was great and lively interest in science among Dutch citizens.²⁰⁶ Throughout the Netherlands, cultural and physical societies were established. Almost every Dutch city had at least one but often more of them. J.J. Kloek and W.W. Mijnhardt estimate that as much as three to five percent of the Dutch male population was involved in at least one society.²⁰⁷ These societies organised readings and exhibitions, published memoirs, held competitions and conducted experiments. Especially this latter activity, experimental philosophy, had won great popularity during the eighteenth century.²⁰⁸ Therefore, several scientists put physics experiments on the stage and these popularized demonstrations often attracted many people.²⁰⁹ For some of these scientists, popularizing even became an essential part of their existence.²¹⁰

Everywhere in the Netherlands, scientific instruments were used to perform all sorts of experiments in public.²¹¹ An example of a machine that was used both in exclusive spheres of natural philosophical inquiry and the popular realm of public display is the electrical ma-

²⁰⁴ Dirk Kuipers, *Mijne Dichtoefeningen* (Leiden 1786) 91.

²⁰⁵ Altena, 'Geen Stervling deed ooit zulk een'smak', 86.

²⁰⁶ Maas, 'Civil Scientists', 78.

²⁰⁷ Kloek and Mijnhardt, *1800*, 104.

²⁰⁸ Zuidervaart, 'Science for the Public', 231.

²⁰⁹ Lynn, 'Selling Science', 219.

²¹⁰ Maas, 'Civil Scientists', 84.

²¹¹ Zuidervaart, 'Science for the Public', 231, 323.

chine. Scientists used and developed this instrument to gain knowledge about electricity. Around the middle of the eighteenth century it was quickly deployed in public demonstrations to show its dramatic capacities. Besides the electrical machine, other instruments and inventions demonstrated the power of nature in front of large groups of interested people. This included for example animal magnetism or mesmerism, gases and divining rods. In this climate, where people were already fascinated by scientific debates and inventions the balloon went down well. According to Lynn, it 'capped a century-long growth in the public interest in science'.²¹²

Scientific experiments were not always accessible to everyone. Demonstrations could require an entrance fee, which often was too expensive for the lower-class.²¹³ The arrival of the balloon changed this. Although it was sometimes still required to buy a ticket to attend an experiment, the balloon was a product of science that could be seen by everyone, whether someone had a ticket or not. It made that people were exposed to science in a unique and unprecedented way.²¹⁴

Not everyone liked the fact that the balloon attracted lots of people from all walks of life. This criticism came from people who saw the balloon as an instrument to gather scientific knowledge. One of them was a witness of an experiment in the year 1784. To him, the launch was an experiment to test the balloon. He was annoyed by the 'large, dumb crowd' of people who had little regard for the scientific experimental nature.²¹⁵ The public only wanted to be gratified in their curiosity to see a flying globe. Someone else who also poses these kinds of criticisms was Damen. He regarded the balloon one of the major events in the history of mankind; a brilliant invention which makes it possible 'to know and explain the laws and functioning of the phenomena of nature'.²¹⁶ According to Damen, the machine was solely of value to scientists. This is why he was very critical about the great interest in the balloon of

²¹² Lynn, 'Selling Science', 219.

²¹³ Roberts, 'Science Becomes Electric', 690.

²¹⁴ Kim, 'Balloon mania; news in the air', 149.

²¹⁵ 'grote, domme menigte' in: *De lof der dwaasheid of het vermaak der proeven met de zogenaamde lugtbollen verdedigd* (Amsterdam 1784) 4.

²¹⁶ 'om de wetten en werking van de verschijnselen van de natuur te kennen en te verklaren' in: Damen, *Natuur- en Wiskundige beschouwing van den Lugtbol*, III.

people with no background in and knowledge of physics and philosophy. Their barren curiosity stems from an insignificant mind with lack of more important occupations, he claimed.

Not every balloonists saw the great attention for the balloon as something negative. Some even emphasized the dual nature of demonstrations.²¹⁷ An example of this is an advertisement from 1786 which states that Diller would launch several balloons, for both utility and entertainment.²¹⁸ Even the first balloonist, Van Noorden, already enthusiastically notes that the balloon was used to do 'useful and entertaining' experiments throughout Europe.²¹⁹

According to Lissa Roberts, in demonstrations of scientific instruments such as the balloon, it was not always clear where science ended and entertainment began.²²⁰ Many scientific activities were even focused on entertainment and amusement under the pretext of usefulness.²²¹ Balloonists for example were sometimes announced as 'physicists', but the launch itself seemed to have had little to do with science and experimental philosophy.²²² Under the guise of science, the balloon was used for entertainment.

Although the increased public interest in science played a part in in the popularity of the balloon, most people primarily wanted to be entertained. In the course of the nineteenth century, science was gradually not used anymore in advertisements on launches. Not only had scientists withdrawn from the field of ballooning and the balloon was hardly used anymore to do research and learn about scientific principles, there was no need to emphasize supposed scientific purposes. The major part of the audience was more interested in entertainment and spectacle. Most ordinary citizens only were impressed by what science brought forth but were not so much interested in the science behind it.²²³

²¹⁷ Michael R. Lynn, 'Consumerism and the Rise of Balloons in Europe at the End of the Eighteenth Century', *Science in Context* 21, no. 1 (March 2009) 79.

²¹⁸ S.t. (29 May 1786) *Leydse Courant*, 4.

²¹⁹ Noorden, *Korte Verhandeling over de Lugtweegkundige Bol*, 3.

²²⁰ Roberts, 'Science Becomes Electric', 682, 689.

²²¹ Maas, 'Civil Scientists', 81.

²²² 'Bataafsche Republiek' (30 May 1806) *Haagsche Courant*, 2.

²²³ Robert Darnton, *Mesmerism and the End of the Enlightenment in France* (Cambridge 1986) 22.

5 THINKING ABOUT THE FUTURE

Early scientists had already elaborated on what they considered the possible uses of the balloon in the future, as we saw in chapter 3.4.3. Very soon, more people started thinking about what use balloons served. In fact, it became the most frequently raised query regarding this new invention among people across Europe and in the Netherlands.²²⁴ Was everyone as optimistic and positive as the early scientists? What were the hopes and expectations for the future of the general audience and was the balloon able to live up this?

5.1 EXPECTATIONS AND DESIRES

In the early days, the question regarding the usefulness of the balloon was often answered with a question mark. These people believed that it was too early to say how the balloon would evolve. This did not mean that that invention should be rejected. ‘Of what use is a newborn baby?’ was the famous, by a Dutch newspaper in 1783 quoted answer of Benjamin Franklin to this question.²²⁵ One cannot say in advance how someone or something will develop. Just give it some time, was the advice.²²⁶ A Dutchman from Amsterdam even states that the much asked question for the use of the balloon is a question for the simple. He believes that it is derided and envied too quick. Only much later, the potential utility will become apparent. It should be given a fair chance, especially because he is convinced that it has potency.²²⁷ Others were even more enthusiastic about the aerial machine. They believed that the balloon could be regarded as the ultimate example of utility of science to society.²²⁸ These proponents had all sorts of ideas about the then-current and future uses. Some of them worked this up on the basis of physics and mathematics, but many gave their imagination free rein.

²²⁴ Lynn, *The Sublime Invention*, 34.

²²⁵ Quoted in: Lynn, *The Sublime Invention*, 34. The quote appeared in the *Haarlemse Courant* of 25 September 1783.

²²⁶ Lynn, *The Sublime Invention*, 34.

²²⁷ ‘De lof der dwaasheid of het vermaak der proeven met de zogenaamde lugtbollen verdedigd’ (Amsterdam 1784) 3.

²²⁸ Lynn, *The Sublime Invention*, 7.

People started talking and discussing about all the possibilities the balloon could serve. Newspapers soon reported on the ideas and applicability of the balloon from France. War for example could benefit from this invention. Balloons would be invented that could carry twenty up till forty people at once, was the conviction. In this way, man could ascent from a scone or fort to destroy everything below them. The machine might be even more useful in the discovery of a procession and the approach of an enemy army, to spy on the enemy and to map the land. The balloon could also be used to lift heavy weights at small costs, give signals and to cross a river. According to a Frenchman in the *Middelburgsche Courant*, there was no doubt about this.²²⁹

The author of an item in the de *Hollandsche Historische Courant* of 13 December 1783 states that Montgolfier would undertake even greater trips than he had already done. He even believes that Montgolfier will be able to cross the sea to England with his flying machine.²³⁰ All of these authors were convinced that the balloon has a glorious and promising future.

The Dutch themselves also began speaking and writing about the possibilities of the balloon. Many had lots of hopes and expectations. After the first experiments in the Netherlands, who were not always successful, people already fantasized: 'how easy would it not be to use it for a visit to the British?'²³¹ One author even states that the utility was extolled in the Netherlands.²³²

Jacob van Dijk is one of the optimists who saw a bright future for the balloon. Very soon after the first experiments in France, this poet submitted a poem about this invention to the poetry society in The Hague. It was called 'Het Nut der Luchtballen' ('The Use of Balloons'). It conveys Van Dijk's unfeigned enthusiasm for the balloon. As the title already suggests, he discusses the use of the balloon and praises 'the priceless benefits of the new invention'.²³³ Van Dijk too mentions the use of balloons for war purposes. It would for example be

²²⁹ 'Frankryk' (6 November 1783) *Middelburgsche Courant*, 1; 'Vrankryk' (8 January 1784) *Hollandsche Historische Courant*, 1.

²³⁰ 'Vrankryk' (13 December 1783) *Hollandsche Historische Courant*, 1.

²³¹ 'hoe gemakkelijke zou het dan niet zijn met denzelven eene visite bij de Engelsen te gaan afleggen?' in: 'Nederlanden' (7 May 1784) *Nederlandsche Courant*, 1.

²³² *Vaderlandsche historie, vervattende de geschiedenissen der Vereenigde Nederlanden* 31 (Amsterdam 1791) 161.

²³³ Dyk, *Het nut der luchtballen*, 1.

used to spy on the enemy, he versifies. It will also enable traders to continue their business when the roads are impassable due to the weather.²³⁴ The major part of the poem, however, takes place in a farther future and has a more fantastic feeling to it. Man will be able to travel to the moon. This will resolve the long discussion whether there is life on the moon. The problem of overpopulation too can be resolved by exploiting other planets where the balloon would take mankind in the future.

Fantasies about the future use of the aerostatic machine also appear in stories and books. This mainly happened after a few years. An example is the story 'Het toekomstend jaar drieduizend' ('The Future Year Three Thousand') by Arend Fokke Simonsz that was read in the society Felix Meritis of Amsterdam in 1792. In this story, which has place hundreds of years after it was written, an old man travels with a balloon to a shop. In the future, it has become a commonplace means of transportation.²³⁵ Almost ten years later, the balloon is once again featured in a reading. This time was read for members of the *Maatschappij tot Nut van 't Algemeen* ('Society for Public Welfare') in the department of Rotterdam. This story expresses a dream of the future. In this dream, ships are suspended from balloons to carry goods and passengers all over the world through the air. In this fantasy too, the balloon had become a common mode of transportation.

The fantastic fantasies by the poet Van Dijk are raised to a higher level in a small book from 1813 by Willem Bilderdijk. The central figure of this work makes a journey with his home-made balloon. After he rises higher and higher, he faints in his basket. When the man regains consciousness, he realises that he is at an unfamiliar place. Later in the story, it turns out that he had landed on a new and undiscovered planet between earth and the moon.²³⁶ The balloon is not only imagined as a common conveyance but even used to travel through outer space and discover and visit new planets and stars. Whether one actually believed that all of these things would become reality is hard to say but it does show that the balloon continued to appeal to the imagination.

²³⁴ Dyk, *Het nut der luchtballen*, 13.

²³⁵ Arend Fokke Simonsz, *Het toekomstend jaar drie duizend. Eene mijmering* (Amsterdam 1792) 36.

²³⁶ Willem Bilderdijk, *Kort verhaal van eene aanmerkelijke luchtreis, en nieuwe planeetontdekking* (Groningen 1813).

5.2 THE PROBLEM OF STEERING

Not everyone was unconditionally optimistic about the usefulness of the balloon. Many believed that the balloon needed to become steerable in order to be truly useful for a wide variety of purposes. This condition was already noted in the five works on the balloon of 1784, as already showed in chapter 3.4.3. Soon, people throughout Europe started experimenting with the ideas and inventions that were developed to make the balloon steerable. In the winter of 1783 for example, already reports appear on experiments in Paris to let the balloon ascent and descent at will. Everyone in Paris was very curious and a massive turnout was expected.²³⁷

It turned out to be possible to make the balloon ascend and descent. The next step was to make the balloon steerable in a horizontal movement. Many experiments were carried out. A Dutch newspaper of 11 March 1784 for example reports on an experiment by Blanchard. Unfortunately, his attempt failed because the balloon had become too heavy due to the heavy steering equipment and the corpulence of a Monk who should have gone along with the balloon.²³⁸ Blanchard did not give up. In June of that same year, the *Hollandsche Historische Courant* features a similar experiment by this French balloonist. According to this piece, Montgolfier believed that it was impossible to make the balloon navigable. If Blanchard succeeded in his experiments, his glory would come up to the level of the ingenious inventor. It would also make the balloon more interesting. According to the author, it was already interesting for physics but still seemed far from being useful to society.²³⁹

Not only people in France experimented with making the balloon controllable. Many people in Europe were concerned with this issue, as well as in the Netherlands. In 1784, the journal *Vaderlandsche Letteroefeningen*, published an article in which the Dutch Johannes Wigeri discusses his draft for making a Charlière steerable. He suggests using a *machina condensoria*, an instrument that compresses air and a construction of pipes to regulate this air.²⁴⁰

²³⁷ 'Byzonderheden' (3 December 1783) *Leeuwarder Courant*, 3.

²³⁸ 'Vrankryk' (11 March 1784) *Hollandsche Historische Courant*, 1.

²³⁹ 'Vrankryk' (5 June 1784) *Hollandsche Historische Courant*, 1.

²⁴⁰ Johannes Wigeri, 'Ontwerp van een middel, om lugtbollen, naar willekeur, te beweegen en te bestieren', *Vaderlandsche Letteroefeningen* 6, part 1 (Amsterdam 1784) 310, 311.

The ideas of Wigeri did not offer the ultimate solution. In 1788 another journal published an article on this issue because the means that had been devised until then all turned out to be insufficient. This time, Jan Rochussen describes his experiments. His solution had to do with igniting and cooling fuel as well as opening and closing grids. Carrying this out in the right way should make it possible to set a course. Although Rochussen is convinced this could work, the editors are less convinced.²⁴¹ This distrust turned out to be justly. This creative inventor was not successful in bringing the ultimate solution too.

Across Europe, people continued thinking about and experimenting on steering and propelling the balloon at will. Time and time again, these attempts failed, but some people refused to give up. In 1807, the *Koninklijke Courant* published an article about flying and steering the balloon. The author is rather optimistic. They just needed to do more research on the conditions and peculiarities under which a fish can swim in the water and a bird can fly in the air. He believed that this will make the ability to extract fundamental rules for swimming and flying which we then can apply to human flight.²⁴² Even forty years after the invention of the balloon, there were still people engaged with this dilemma, although it was not always taken very seriously. The *Arnhemsche Courant* informs its readers in the year 1823 of a new method for making the balloon controllable. The supposed solution came from a man from Marseilles. His idea was to harness fifty famished geese to a balloon like horses to a cart and hold a long stave with food attached to the end in front of them. This would make the geese fly in any desirable direction and bring the balloon wherever the balloonists wanted to go.²⁴³ It was certainly a creative idea, but not to be taken very seriously. The writer seem to mock with all the attempt failures. In all those years, no one had come up with a sustainable, long-term solution for the problem of the unmanageable balloon. The balloon and remained dependent on the direction and force of the wind. Controlling the balloon turned out to be outside the bounds of the possible.

²⁴¹ Jan Rochussen, 'Proeve ter bestiering van den Luchtbol', *Algemeen Magazyn van Wetenschap, Konst en Smaak* 3, part 2 (Amsterdam 1788) 615-621.

²⁴² 'Wetenschappen, letteren en kunsten. Over de kunst, van in de Lucht te vliegen' (11 July 1807) *Koninklijke Courant*, 2.

²⁴³ 'Uitvindingen' (12 August 1823) *Arnhemsche Courant*, 4.

6 ENTERTAINING BUSINESS

The men who initially started experimenting with the balloon, men with an interest in the sciences, only experimented once or at most a few times with this aerial machine. After the first years, scientists altogether had almost completely disappeared in the field of ballooning. Many of them had believed that this machine had a lot of potential and could be used for a wide variety of purposes. It soon turned out that it was not possible to make the balloon steerable which could have led scientists to dismiss the balloon as unproductive. There was no future in it.²⁴⁴ Besides this, many scientists got involved in ballooning because they were interested in the study of air and gas. After some time, this issue and the balloon itself were scientifically sorted out. There was no need to experiment with the balloon any further and many shifted their attention toward other scientific issues. Even if people stayed interested in this field of research, using the balloon to learn about air and physics was a somewhat laborious and expensive way to do so, especially because several other instruments and machines were available to study and experiment with air.²⁴⁵ Some scientists asked for an entrance fee, but it was not easy to gather enough money as will be explained in chapter 6.3. The political climate of that time presumably also played an important role in the withdrawal of scientists from the field of ballooning. Ad Maas calls the period of 1787 until 1813 one of the most turbulent in Dutch history.²⁴⁶ In a short period of time, power changes occurred in rapid succession and many scientists became involved in politics and got managerial functions and duties.²⁴⁷ Scientists soon had other important things on their mind.

The fact that the initiators of Dutch ballooning had almost completely disappeared in the field of ballooning after the first year, did not cause the pursuit to end. Especially from the beginning of the nineteenth century, after a period with very few balloon launches, the invention even becomes blooming again. Who took up the invention and why did they do this? How did this change the face of ballooning?

²⁴⁴ Pethers, 'Balloon Madness', 216.

²⁴⁵ See footnote 47.

²⁴⁶ Maas, 'Civil Scientific', 87.

²⁴⁷ Huib J. Zuidervaart (personal correspondence, June 25, 2015).

6.1 CONTINUED PUBLIC INTEREST

Ballooning had attracted the attention of many people. After several months, the initial enthusiasm was somewhat tempered. The tone of reports gradually became more moderate and the initial astonishment slowly faded. Ascending to great heights and making travels through the air was still worth mentioning and praised by many, but 'not something new nor surprising anymore'.²⁴⁸ People got used to the idea of a flying and seeing artificial objects in the sky and some had become sceptical or critical. Despite this, the invention could still reckon on lots of attention and enthusiasm. Even when there were hardly no balloons launched in the Netherlands for almost twenty years, the aerial machine stayed in the mind of the Dutch population and even became part of Dutch language and culture.

The continued public interest in the balloon can in the first place be seen in Dutch newspapers. Although the news value of the balloon had decreased and there were hardly any Dutch balloons to report on at the end of the eighteenth century, news items on this flying machine still appeared during those years. These reports were on experiments and demonstrations abroad. Mainly reports on balloons in Germany and Britain were featured. Sometimes because something exceptional had happened. In 1788 for example, Blanchard had launched a balloon with a sheep in Frankfurt. The animal unfortunately died on the go by suffocation.²⁴⁹ Another exceptional happening regarding the balloon which was featured in several Dutch newspapers took place at the end of the nineties of that century. The French André-Jacques Garnerin, student of the balloon pioneer Charles, used the balloon to test his own invention; the parachute. The balloon offered the perfect opportunity to experiment with it. In 1797 in France, Garnerin made a successful descent which made him the first human parachutist.²⁵⁰ Not all reports at the end of the eighteenth century were as special or

²⁴⁸ 'niets nieuws nog verwonderlijks meer' in: 'Vrankryk' (5 June 1784) *Hollandsche Historische Couant*, 1.

²⁴⁹ 'Duitschland' (15 November 1788) *Amsterdamsche Courant*, 1.

²⁵⁰ Lynn, *The Sublime Invention*, 26.

unusual as these two examples. Most foreign reports deal with common and successful launches.²⁵¹

Secondly, several publications and products on and about the balloon appeared on the Dutch market. In previous chapters, we saw that people wrote stories, songs and poems in which the balloon played a central or supporting role. Although considerably fewer than in the first two to three years, these sorts of cultural expressions were still made during the years in which hardly any balloon was launched in the Netherlands.²⁵² The balloon was part of several stories and plays as well.²⁵³ In 1802, the balloon was even featured in books about the most important inventions of that time, which shows that its invention was still considered to be a great achievement.²⁵⁴

In the third place, we can see that the balloon did not disappear out of sight by looking at the Dutch language. Just as quickly as the balloon became popular among the public, it took hold and became part of everyday language. The flying machine was used as figure of speech, in a metaphorical sense and in expressions. In particular, the ability to rise up appealed to the imagination. A poet described his frustration by stating that his breath has flown like a balloon from the earth to the court of the gods.²⁵⁵ Another author uses the image of a rising balloon to describe how a scale went up.²⁵⁶ Even increasingly higher hairdos were ridiculed by comparing them to rising balloons.²⁵⁷ Besides the fact that the balloon could ascend, also other aspects of this machine prompted the use of the balloon in comparisons.

²⁵¹ Some examples of articles about launches are: Prague, 1790 in the *Groninger Courant* of 16 November 1790, by Blanchard in Germany, 1791 in the *Oprechte Haarlemse Courant* of 11 June 1791, Brussels, 1793 in the *Oprechte Haarlemse Courant* of 13 June 1793, Mainz-Hechtsheim, 1795 in the *Groninger Courant* of 26 June 1795 and Coblenz, 1796 in the *Ommelander Courant* of 16 August 1796.

²⁵² An example of a poem about the balloon can be found in: Nicolaas Simon van Winter and Lucretia Wilhelmina van Winter, *De waare geluksbedeeling, brieven, en nagelaaten gedichten van Lucretia Wilhelmina van Winter, gebooren Van Merken en Gedichten en Fabelen, van Nicolaas Simon van Winter* (Amsterdam 1792) 420-423. An example song about the balloon can be found in: Goedbloed, *Hans Michel Goedbloed zingt de voornaamste en nieuwste liederen*, 22-24.

²⁵³ Examples are: *De staatkundige geschiedenis van het land der aapen en keeshonden of het koninkrijk Klipkrariko* (s.l. 1789) 62-62 in which the balloon was used as a means of transportation and in: Vrijheer van Knigge, *De reis naar Brunswijk* (Haarlem 1793) a roman in which the main character discuss the balloon several times.

²⁵⁴ S.t. (3 December 1802) *Ommelander Courant*, 3.

²⁵⁵ 'Ter XXX. Verjaring van de wel-edele jonkvrouwe Clara Haringman, ten huize van haar edele vriending jonkvrouwe D.F. Duvelaer' in: [Bundle occasional poems to different people] (s.l. s.a.).

²⁵⁶ *De antwoorder*, part 1 (Dordrecht 1792) 557.

²⁵⁷ E.J.B. Schonck, *Fabelen en Mengel-Poëzy*, part 3 (Nijmegen 1786) 153.

Something could be send off like a balloon²⁵⁸, disappear like a balloon²⁵⁹ and it sometimes looked like something was put down as by means of a balloon.²⁶⁰

6.2 BALLOON ENTREPRENEURS

After the first year, more people who became involved in launching balloons did not have a background in or elaborate knowledge of the sciences. This was a necessary condition for the first balloonists. Manufacturing a balloon and conducting a successful experiment was difficult. The exact working of the balloon and the underlying natural principles were not altogether clear and there was not yet a set of instruction available for making one during the first months of flight. This did change over time. More and more experiments were done, and more knowledge became available for making a successful flight. From this, instructions could become clearer and more univocal. Because using a set of instructions does not require evoking the epistemic base of a technique ballooning became available for a much larger public.

Already from the second year of ballooning, people without scientific background became involved in ballooning. The great public interest for the balloon was seen as opportunity to make ballooning into a profitable business. The most famous is the Frenchman Blanchard who travelled throughout Europe to do demonstrations. In 1785, he arrived in the Netherlands where he visited The Hague, Rotterdam and Delft. His fist demonstration took place in The Hague on the 12th of July 1785. Overall, it was his twelfth flight and the first manned flight from Dutch soil ever. Blanchard can be considered the first balloon entrepreneur and professional aeronaut. While the Dutch scientists in the previous year were only involved in ballooning once or for a short period of time, this French balloonist did demon-

²⁵⁸ Maria Geertruida de Cambon-van der Werken, *Adeline, of aangetekende byzonderheden eener jonge juffer; op haare driejarige reize door Frankryk. Door haar zelve beschreven*, part 2 (The Hague 1783) 134.

²⁵⁹ 'Geschiedenis der Vereenigde Nederlanden; nevens de voornaamste Gebeurtenissen in Europa. Door C. Zillesen. IIde Deel', *Algemeene Vaderlandsche Letteroefeningen* (Amsterdam 1799) 576.

²⁶⁰ *Processus in casu primæ revisionis tussen M.H. Vroom Schipper varende van de Nietap op Groningen en vice versa en de heer van Ulrum in deszelfs betrekking als heer van de Nienoort gerevideerde* (Groningen 1793) 22.

strations for at least twenty years.²⁶¹ His interest was not so much scientific but he hoped to make a living out of ballooning. Some even claim that he was a stranger in science. Sometimes, he could embarrass himself with his lack of knowledge, one newspaper states, but most of the time he dodged his way out of this by his undauntedness.²⁶²

When ballooning in the Netherlands revived in 1802, the field was dominated by foreigners. Mainly Germans and Frenchmen launched their balloons throughout the country. All of these itinerant balloonists did not care as much about science as the Dutchmen two decades earlier but were mainly motivated by entertaining the public whose minds were still captured by the balloon after all those years. In July 1802 the German Johan Kolter came to Groningen. He had prepared three performances; fireworks on Friday, a balloon launch on Saturday and a show on Monday. Kolter was director of a troop Prussian horse riders and the first equestrian who carried on his job on a large scale. He travelled with a famous circus of 30 people and 50 horses throughout Europe.²⁶³ The launch of this balloon in Groningen was part of his circus performances.²⁶⁴ In the next year too, Germans appear on the Dutch stage of ballooning. One of them is the mechanic Johann Mass. Newspapers announce that he was going to launch a balloon in Rotterdam. His plan was to hang mechanical figures underneath his flying machine. These kinds of figures were a form of entertainment and appeared for example also on fairs in those days.²⁶⁵ Taking them up into the air would have made it even more entertaining. Other Germans in the Netherlands concerned with ballooning were the German duo Schirmer and Scholl. Advertisements refer to them as 'Professors of Physics' but the men

²⁶¹ Lynn, 'Selling Science', 217, 218; Lynn, *The Sublime Invention*, 139.

²⁶² 'De Luchtballen', *Vaderlandsche Letteroefeningen* (Amsterdam 1816) 589.

²⁶³ Marta Kopji and Wojciech Kunicki, *Nietzsche und Schopenhauer. Rezeptionsphänomene der Wendezeiten* (Leipzig 2006) 229; 'Nieuwsberichten' (29 March 1884) *Haarlemsch Advertentieblad*, 2; Ioan Vasile, 'Un Român, Aeronaur în Polonia, la începutul secolului al XIX-lea: iordache cuparencu', *Noema* 6 (2007) 136.

²⁶⁴ 'Bataafsche Gemeenebest' (20 July 1802) *Ommelander Courant*, 2.

²⁶⁵ Henk Gras, Harry van Vliet and Bennie Pratasik, *'Een stad waar men zich koninklijk kan vervelen?': de modernisering van de theatrale vermakelijkheden buiten de schouwburg in Rotterdam, circa 1770-1860* (Hilversum 2009) 234.

had more in common with showman.²⁶⁶ They travelled throughout Europa and showed all kinds of amusing spectacles. The balloon was one of these entertaining performances.

Besides these eastern neighbours, also two Frenchmen were active in the Netherlands. Most balloons that appeared in the Dutch sky during that time came from the French aeronaut Augustin. The entrepreneur Blanchard, who had already come to the Netherlands in the eighties of the previous century as we saw, made a comeback in 1807. This time, his wife, also balloonist, came along and they went to The Hague and Rotterdam. This time, Blanchard was less successful than two decades earlier. Two of the three planned launches failed, one

because of the weather and the other due to the lack of skill or inattention of one of the workmen who helped him, according to the newspaper reports.²⁶⁷

There was also at least one Dutchman involved in ballooning during these years: Abraham Hopman. In 1803, he met with Louis Samuel Loude at one of Loude's exhibitions. Loude was a physics teacher and travelled with a cabinet of physical instruments. Both men were enthusiast and practitioners

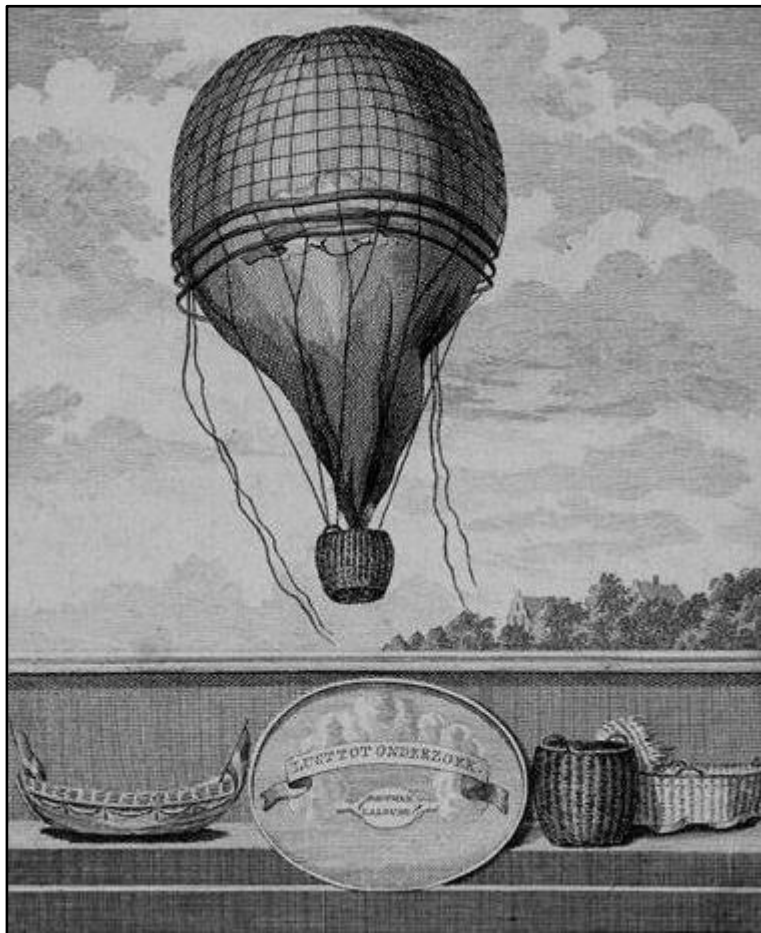


Figure V | The balloon by Hopman and Loude entitled: 'Lust tot onderzoek' ('Lust for Research').

²⁶⁶ Schirmer and Scholl, *Sketch of the performances at the large theatre, Lyceum* (London 1805) 6; Isabelle van den Broeke, 'Visions of Death. Robertson's Phantasmagoria as a Visual Paradigm for Goya and Blake', *Journal of the Lucas Graduate conference* 2 (2014) 65.

²⁶⁷ 'De Luchtzeize van den Heer Blanchard en deszelfs Echtgenoot, buiten hunne schuld, door een ongelukkig toeval uitgesteld' (6 July 1807) *Koninklijke Courant*, 3.

of physics and mechanics. Together, they manufactured a balloon for a manned flight because they both desired to explore the air. The fact that Hopman owned a factory for fabrics and that he was a physical instrument maker would have been useful in doing creating one. They wanted to use the balloon for doing scientific research and even named their machine 'Lust tot Onderzoek' ('Lust for Research') (figure V). This turned out to be more difficult than expected. The first launches failed which costed the men a great amount of money.²⁶⁸ In September 1804, the flight with Hopman on board succeeded for the first time. Unfortunately, the experiments in the balloon with the instruments he brought along failed.²⁶⁹ Although Hopman was praised for being the first Dutch air traveller, the voyage had not contributed much to scientific research as the men had hoped. In contrast to most other launched balloons during those years, these endeavours were mainly scientifically motivated.

After 1807, it remained quite silent around practising ballooning for about ten years. The political and social climate in that time was anything but favourable. It was still an unsettling time. Many large Dutch cities were impoverished and desolated and the country had great financial troubles. Besides, the French had annexed the Netherlands and introduced conscription. Approximately 15.000 Dutchmen were send into war of which only a few hundred returned.²⁷⁰ The first Dutch aviation law also could have played a role in the fact that there was again a period of inactivity in the field of Dutch. In 1808, Lodewijk Napoleon issued a prohibition against launching balloons with lamps, torches and other burning materials attached to it. The penalty for breaking this regulation was a sum of a thousand guilders. Besides all kinds of spectacles such as lightening firework from a balloon, the use of a Montgolfière was hereby also forbidden since this type of balloon made use of fire. Although the gas balloon, a Charlière, did not fall under this law, this type of balloon too was not used for a long time in the Netherlands.²⁷¹

²⁶⁸ Abraham Hopman, *Verhaal en bericht zyner luchtzeize, ondernomen te Rotterdam den 29 september 1804* (Rotterdam 1804) 10.

²⁶⁹ Anton J. Bicker Caarten, 'Abraham Hopman, de eerste Nederlandsche luchtzeiziger', *Leidsch Jaarboekje* 34 (Leiden 1942) 174; Hopman, *Verhaal en bericht zyner luchtzeize*, 20.

²⁷⁰ Kloek and Mijnhardt, *1800*, 32, 34.

²⁷¹ J. van de Poll, *Vaderlandsche Wetten en Besluiten* (Amsterdam 1840) 415; Nabben, *Lichter dan Lucht, Los van de Aarde*, 87.

Between the years 1816 and 1819, there was again a small peak in ballooning in the Netherlands. In this period, the name of only one man in relation to balloon launches comes up: P.J. Thumas. He came from Brussels and was often announced as being 'widely known for his art performances'.²⁷² After a small period where it once more remained silent around the balloon, Thumas entered the stage again in 1826. He then could be seen in various places in the Netherlands. From that time, also J. Krümmel was active. This German travelled throughout the Netherlands as well. He launched balloons on various locations, often in relation to a fairground. According to advertisements, his activities were aimed at 'art lovers'.²⁷³ While some of the balloonists that intended to entertain their public in the beginning the nineteenth century were still announced as physicists or scientists, this changed after a while. These examples show that announcements and advertisements started referring to balloonists as artists. This shows how these men and ballooning in general were regarded in the course of the nineteenth century. The association with science disappeared and balloons had become a form of entertainment.

6.3 MONEYMAKING

Entrepreneurs saw the great and continuing public interest as an opportunity for making money. This turned out to be not so easy at first. Manufacturing balloons was expensive, especially during the first years of flight. We will first take a look at how the early balloonists were able to finance their balloons before looking at the way these entrepreneurs made use of the onrush of people and tried to make profit.

Johannes van Noorden, the first Dutch balloonist, calculated the costs of manufacturing a large gas balloon with a circumference of 30 feet on a thousand guilder. This sum included the material; silk, sewing, paper and paste, varnish, barrels, hoses with taps, wages and small expenses.²⁷⁴ Thereupon, in case of a Charlière, there were also costs for the gas with which the balloon should be filled. Van Noorden calculated these costs, in the case of the

²⁷² 'Allomme bekend wegens zijn kunstverrichtingen' in 'Bekendmakingen' (20 April 1816) *Bredasche Courant*, 2.

²⁷³ S.t. (14 June 1828) *Rotterdamsche Courant*, 4.

²⁷⁴ Noorden, *Korte Verhandeling over de Lugtweegkundige Bol*, 59.

balloon from his example, on 1414 guilder. This makes the total costs of this large balloon 2414 guilder. Van Noorden did believe that the inflammable air would become cheaper in the future, which would make the filling of balloons more affordable. He also states that is relatively cheap to build a small balloon. Also a balloon in the style of Montgolfier, filled with hot air instead of inflammable air, could be created with lower costs. In both cases, he does not go into the financial details. Assuming that the daily income of labourers lied between one to three guilders, ballooning was far too expensive for the majority of people.²⁷⁵

Few reports on launches reveal how the balloon was financed. In two of these cases the balloonists paid for it themselves. This is true for Modderman and Van Olst. The *Groninger Courant* explains that these gentlemen made their Montgolfière, which they launched in May 1783, on their own expenses.²⁷⁶ They owned a paper mill which presumably came in useful constructing their balloon made of paper²⁷⁷ Dentzel and Duyvené, who conducted an experiment on the 23th of March 1784 and 21 April, too manufactured their balloon at their own costs.²⁷⁸ Once, a report explained that a society of which the balloon experimenter was member defrayed the expenses. This is the case for the merchant and instrument maker Spinelli who launched three different sized balloons in Hoorn in the afternoon on 10 April 1784. These balloons were manufactured at the expense of the members of the Society of Hoorn.²⁷⁹ The local physics or mathematics society was more often present but reports do not mention a possible financial involvement.

Not everyone had a sponsor or was able or willing to pay for the balloon themselves. This is why several balloonists relied on other ways to fund their experiment, namely through subscriptions. Only the people who bought a ticket in advance were welcome to watch the experiment at close quarters. This already started with Diller, the second Dutch balloonist. In order to create a balloon with a diameter of 30 feet, he opened a subscription of six guilders. Half of this money had to be played in advance, and the rest of the money could be paid at the

²⁷⁵ I.J. Brugmans, *Paardenkracht en Mensenmacht. Sociaal-economische geschiedenis van Nederland 1795-1940* (The Hague 1969) 61, 62.

²⁷⁶ 'Nederlanden' (5 March 1784) *Groninger Courant*, 1.

²⁷⁷ J.K.H. van der Meer, *Patriotten in Groningen 1780-1795* (Assen 1996) 91, 92.

²⁷⁸ 'Nederlanden' (26 March 1784) *Nederlandsche Courant*, 1.

²⁷⁹ 'Nederlanden' (13 April 1784) *Hollandsche Historische Courant*, 1

day of the experiment. While this was a large amount of money for many people, the registration was fully subscribed. This was partly due to the interest of the governor.²⁸⁰ Diller started working and created a hexagonal machine which represented a temple, which was launched at 11 December 1783.²⁸¹

Diller also opened subscriptions to finance his next experiments, which all took place in the year 1784. He always needed new money because his experiments failed several times whereby his machines were damaged. He also experimented with several kinds of balloon, a Montgolfière as well as a Charlière.²⁸² For his ambitious plan to make a flight with two people, he needed a gigantic balloon. This called for even greater financial sacrifices. The admission was two ducats, which equals about ten to eleven guilder. Although not all the cards were sold, he proceeded with the experiment.²⁸³ Unfortunately, the wind at the day of the ascension was quite strong making the experiment into a failure. The paying audience was disappointed, and Diller promised to do a new experiment.²⁸⁴ This time too, the experiment was unsuccessful. Hereafter, Diller distanced himself from ballooning and became engaged with other physics experiments.²⁸⁵

Another early example of crowd funding for experiments with the French invention is the experiment by Bianchi and his companion on 15 March 1784. The men sold tickets and hoped that the raised money was enough to cover the costs for the balloon and the experiment.²⁸⁶ To be sure that there was enough money to cover the costs, some experimenters set a minimum for the amount of subscriptions. The demonstration with a balloon by Blanchard on 30 July 1785 for example, would only take place when at least a thousand people payed two-and-a-half guilder.²⁸⁷

²⁸⁰ Smit, 'Achttiende-eeuwse luchtvaartproeven in Den Haag', 339, 340.

²⁸¹ *Nieuwe Nederlandsche Jaarboeken* 18, 2064.

²⁸² 'Nederlanden' (7 May 1784) *Nederlandsche Courant*, 1.

²⁸³ Smit, 'Achttiende-eeuwse luchtvaartproeven in Den Haag', 343.

²⁸⁴ 'Nederlanden' (29 May 1784) *Hollandsche Historische Courant*, 2.

²⁸⁵ Experiments with light and colours; advertisements like the one in the *Amsterdamsche Courant*:

'Nederlanden' (28 April 1785) *Amsterdamsche Courant*, 1.

²⁸⁶ 'Nederlanden' (19 May 1784) *Nederlandsche Courant*, 1.

²⁸⁷ 'Nederlanden' (19 July 1785) *Rotterdamsche Courant*, 2.

Not every scientist must have been a fan of financing experiments through popular subscriptions. This can at least be seen abroad. One of the inventors of the balloon, Etienne Montgolfier, for example detested this already. He saw this happening with the construction of gas balloons by Charles, and warned his brother not to engage with subscriptions and thereby 'subjecting himself to the whim of the public', as Gillispie explains.²⁸⁸

Some balloonists, who experimented more than once, were able to use the same balloon multiple times. This was of course a cost-reducing measure, but only possible when they found their balloon back in a fair condition. This explains why balloonists were eager to find their balloon back. In the early years, several balloonists placed advertisements in newspapers in which they asked to return the balloon to them. Sometimes, they even set out a reward for the true finder.²⁸⁹

The collected money through subscriptions in the early launches was almost exclusively used to finance the manufacture of the balloon and other costs surrounding a launch. There are two exceptions to this. The entrance fee for the experiment by Modderman and Van Olst in Groningen in March 1784 was not invested in the balloon but intended for the poor.²⁹⁰ Two years later, another man from Groningen, Mr Rate, launched a balloon in this city too. The tickets for attending the launch were obtainable at the 'father of the orphanage' and the balloon ascended from their courtyard which indicates that the raised money was destined for this orphanage.²⁹¹

Asking entrance fee became more common as the years progressed. From the nineteenth century it is even the rule rather than the exception, not just to cover the costs, but also hoping to make profit. In contrast to the first years, in which the prizes of the tickets could differ considerably, anything between 82,5 cents and six guilder, the prices of the tickets from the nineteenth century lie somewhat closer together. Most prices in the first decade of that century lie between one and three guilder.

²⁸⁸ Gillispie, *The Montgolfier Brothers*, 35.

²⁸⁹ See for example: 'Nederlanden' (1 May 1784) *Hollandsche Historische Courant*, 1; and: 'Nederlanden' (7 August 1790) *Haarlemse Courant*, 2.

²⁹⁰ 'Nederlanden' (19 March 1784) *Groninger Courant*, 1.

²⁹¹ 'Bekentmakingen' (16 May 1786) *Groninger Courant*, 2; Boonstra and Kuiken, 'Ballonvaart in Groningen', 32.

While there was a great interest and fascination for the balloon among Dutch citizen, it was not always easy to make profit or even to cover the costs. Augustin had planned to make an air travel on 5 December 1807 with a Charlière. Only a small number of people had come to behold the event. This is why he delayed the launch for six hours. Unfortunately for him, not much new people had come in the meantime. An article on this event explains that Augustin only had earned a little over 200 guilders. Despite this little income, he did ascend with his balloon. After a trip, he returned to earth. His balloon was still sufficiently filled by then, so he decided to store it overnight to ascend again the next day. Again, he had not much luck. The net that was spun over his balloon had ripped and the balloon was left to its own devices. Augustin claimed to have suffered a loss of 900 guilders during the launch and lost his balloon which had costed him another 3000 guilders.²⁹²

Even after several decades, it was still quite expensive to make and fill a balloon as this example shows. It also shows that it was not always easy go attracted a large paying public. This is not surprising. A rising balloon could be seen from any location, also without paying for a ticket to get access to the location of the launch. This explains something of why ballooning became increasingly combined with other activities during the nineteenth century. Balloonists sought for ways to make people want to attend their performances. The next chapter will explain how they did this. Also other kinds of marketing techniques were deployed like offering special offers. It could sometimes for example be economical for a man to bring a woman. A man who went to the ascension by Schirmer and Scholl in The Hague on 20 May 1806 had to pay 55 cents, but 100 cents if he brought a woman.²⁹³ People sometimes also had the choice between different types of tickets with different prizes. To see Hopman and his balloon in a seat at ringside costed three guilder, upperside two guilder and one guilder for a third-class place.²⁹⁴ Yet another way for balloonists to sell their balloons to the pub-

²⁹² 'Holland' (10 September 1807) *Oprechte Haarlemsche Courant*, 2.

²⁹³ 'Haagsche Schouwburg' (30 May 1806) *Haagsche Courant*, 2.

²⁹⁴ 'Holland' (23 June 1807) *Rotterdamsche Courant*, 2.

lic and increase their income was to exhibit the machine before or after a launch at surcharge of a small sum.²⁹⁵

It is difficult to say if these early entrepreneurs made much profit. Clear it is that it was not easy to do so. Several ran up debts, as we already saw with Augustin.²⁹⁶ Many of them were only involved for one or a few years, indicating that ballooning was not interesting enough in the long run. The French Blanchard is an exception. He travelled for more than twenty years to do spectacular demonstrations throughout Europe. Although he was sometimes charged with greed, he was actually not very successful in making money.²⁹⁷

A truly working concept seems to appear from 1825. From that time on, every year around an equal amount of balloons went up. Almost all of these launched balloons were part of a larger event, combining ballooning with dinners, fireworks and dancing's. The prices for tickets for these events were lower than in previous years. Often, the ticket price was under half a guilder. Only one to two names come up more often, indicating that only very few had made the flying machine into a profitable and sustainable entertaining business.

6.4 ENTERTAINMENT AND SPECTACLE

Entrepreneurs thought of ways to make money out of the immensely popular machine. Simply launching a balloon turned out to be not very successful. It was after all an invention that could be seen from any nearby location. Balloonists came up with all sorts of ideas and activities to increase the attendance and with that, their income. Selling balloons became an elaborate process.²⁹⁸

One way to make a launch more spectacular was by using animals. The first animals were sent up for example to test the suitability of the air in the atmosphere, but soon they were deployed to make a launch more entertaining. Blanchard for example repeatedly took an animal with him on a flight. He even sometimes used a parachute, which was invented in the

²⁹⁵ This happened both in the early years as during the nineteenth century. The balloon from Hopman and Loude for example, could be viewed at a charge of 30 cents in an inn in Amsterdam: S.t. (12 April 1804) *Amsterdamsche Courant*, 4.

²⁹⁶ Nabben, *Lichter dan Lucht, Los van de Aarde*, 84.

²⁹⁷ Lynn, 'Selling science', 218.

²⁹⁸ Lynn, 'Consumerism', 89.

last decade of the eighteenth century, to descend an animal from his balloon for example a dog or a rabbit.²⁹⁹ This was not always an easy or successful undertaking. In 1785 for example, Blanchard wanted to bring a sheep with him during a demonstration in Rotterdam. His plan was to descend this animal from the balloon with a parachute. This failed because Blanchard and the sheep together were too heavy for the balloon. The sheep remained on earth while Blanchard went up alone.³⁰⁰

Balloonists also varied with the shape of their balloons. The first balloonists did this to experiment with it, but especially from the nineteenth century, this was done for entertainment purposes. More and more odd shaped balloon appeared in the sky. The German entertainment duo Schirmer and Scholl were known for having and showing a large collection of 'air figures' which they sometimes exhibited.³⁰¹ Examples are balloons shaped like a tiger or dog.³⁰²

Balloonists also started organising more activities around the launch. This starts, in particular, in the course of the nineteenth century. A good example of this is Augustin. His demonstrations with the balloon were embedded in elaborate programs. Take for example the 27th of May 1807. Augustin started his program with canon shots in the morning. At one o'clock, he launched a small balloon. An hour later, some women had the opportunity to go up with a leashed balloon. At three o'clock, a balloon in the form of a temple rose while the military orchestra played music. A balloon with a flag with the Dutch coat of arms went up half an hour later. A few minutes before the clock of four, the orchestra played to herald the upcoming air voyage. Finally, at half past four, Augustin got onto his balloon, together with a lady and some animals, and rose to the height of 1800 feet. From there, he descended the animals with parachutes.³⁰³

²⁹⁹ Dog: 'Nederlanden' (11 October 1785) *Hollandsche Historische Courant*, 2. Rabbit: 'Holland' (9 September 1806) *Ommelander Courant*, 1; and 'Holland' (8 August 1807) *Amsterdamsche Couant*, 4.

³⁰⁰ 'Byzonderheden', (6 August 1785) *Leeuwarder Courant*, 2.

³⁰¹ 'Lugt figuren' in: 'Holland' (20 July 1807) *Utechtsche Courant*, 2.

³⁰² 'Bataafsche Republyk' (26 July 1803) *Rotterdamsche Courant*, 2; 'Bataafsche Republiek' (16 August 1803) *Leeuwarder Courant*, 2.

³⁰³ 'Lucht-reize op het Drilveld' (23 May 1807) *Amsterdamsche Courant*, 4.

Other balloonists combined the filling and launch of their balloon with a dancing³⁰⁴, musical performances³⁰⁵, lights³⁰⁶ or firework.³⁰⁷ While the balloon was the main act in many of these events, over the years, it became less central. It became increasingly part of a larger set of activities, for example as a conclusion of a programme or evening. The balloon continued to fascinate people, but the novelty of it was gone. The scientific aspect of ballooning had disappeared and the focus lay on amusement and spectacle. It had become just another form of entertainment. Ballooning by then bearded remote likeness to how it once started out.

³⁰⁴ S.t. (27 December 1803) *Rotterdamsche Courant*, 3.

³⁰⁵ 'Advertenties' (5 August 1826) *Middelburgsche Courant*, 2.

³⁰⁶ S.t. (18 September 1830) *Rotterdamsche Courant*, 4.

³⁰⁷ S.t. (14 May 1829) *Rotterdamsche Courant*, 2.

7 CONCLUSION

Ballooning has a chequered history. It attracted the attention of many people of all walks of life throughout Europe. These flying spheres became the talk of the day. This great attention contrasts with the little attention scholars have paid to this invention that literally offered a new perspective on the world. In this research, I have made a start exploring and analysing the first years of ballooning in the Netherlands, a country which has received very little scholarly attention. How did the field of ballooning and the balloon itself develop after it was introduced in 1783? What does this learn us about the relationship between late-eighteenth and early-nineteenth century science and culture?

At the end of 1783, the Rotterdam medical doctor Johannes van Noorden became the first Dutch balloonist. Soon, other scientists and people who were interested in the sciences such as physicists, instrument makers and medical doctors followed in experimenting with the French invention. Their interest in the balloon mainly stemmed from an interest in air and gases, a field of research which was increased from the 1770s with the discovery of 'different kind of airs' and conducting physics experiments was a popular and common way to learn about science in that time. Scientists dominated the early history of ballooning due to the fact that it was hard to manufacture a successful working balloon. It required for example knowledge of physics, mathematics and mechanics. Also, the natural principles underlying the working of a balloon were not altogether clear from the beginning which made it impossible to create a simple set of instructions. Several scientists started discussing and thinking about these matters which can be seen in the five books that were published during the first year of Dutch ballooning, 1784. These works show that they were mainly concerned with the differences and preferences for a hot air balloon, a Montgolfière, and a gas balloon, a Charlière and the nature of the air that was used to fill a Montgolfière. The scientists, who strove at being useful and beneficial to society, also discussed the usefulness of the balloon. All of them were very optimistic about its future applications, but saw making the balloon steerable a necessity.

Not only scientists and physics enthusiasts became involved in ballooning. Very soon, it attracted the attention of the Dutch society. There was a general enthusiasm and optimism among Dutch citizens about this new and incredible invention. Newspapers started giving weekly reports on inland and foreign balloon launches, thousands of curious people gathered to witness this French machine and several praising stories, poems and songs were published. The optimism sometimes led to great disappointment whenever a launch was cancelled or failed. Not everyone was undividedly enthusiastic. Also other critical sounds towards this flying machine were heard. Most of these objections had to do with the safety of the balloon. This was enhanced after the news of the first fatal accident in 1785 in France reached the Netherlands.

This does not alter the fact that ballooning overall remained popular among all strata of society. In this respect, ballooning is an interesting example of popular science. Public interest in science had grown strongly over the years, but physics demonstrations had never generated such large audiences before. Nevertheless, most people were more interested in being entertained than in the science behind it. Already after the first year, the balloon was hardly used by scientists anymore, and after a while, they completely disappeared from the scene. Attempts to make the balloon steerable had all failed. Since most people considered this a necessary condition for its usefulness, it lost the interest of the initial optimistic Dutch initiators. The high costs and changing research interest also played a role in scientists opting out of aerostation. Besides, many scientists focused their attention on politics and got managerial functions because it was a turbulent time in the Netherlands. This also explains why hardly any balloon was used for almost twenty years at the end of the eighteenth century.

This was not the end of the balloon in the Netherlands. In fact, ballooning became blooming again from the beginning of the nineteenth century. Instead of scientists, people with an entrepreneurial spirit dominated the field of ballooning. The great public interest, which had not disappeared after years of little ballooning activity in the Netherlands, was seen as a profitable opportunity. Despite the popularity of the aerial machine, it was not at all always easy to make money. Why buying a ticket when the balloon can be seen from every location near the launch? So, in order to attract more people and increase their income, bal-

loonists started combining the launch with other spectacle performances such as descending animals from the balloon with a parachute and entertaining activities like fairgrounds, circuses and a ball.

Only from the mid-twenties of the nineteenth century, ballooning in the Netherlands became more consistent. After a few years of again very little activity, a few entrepreneurs seem to have found a sustainable way to make the balloon into a profitable business. Every year, about the same amount of advertisements on events with a balloon launch appear in Dutch newspapers. In most events, the balloon has been shifted from being the central performance, to an entertaining side act or bonus.

There are still several questions left open which I was unable to address here which could provide a deeper and more elaborate understanding of the development of the balloon and its impact on science and culture. Considering the fact that Gillispie has stated that aërostation in France and England developed so differently because of the organisation of science, research into the involvement of the societies where many early balloonists were part of may provide further insight into the way Dutch ballooning evolved and how its scientific value was regarded. Another interesting topic for further research is about the finances. Ballooning was very expensive. Not much is known on how the early balloonists were able to finance their balloons and experiments. Who were willing to invest their own capital, how sufficient was the income by the subscriptions and to what extent were scientific societies financially involved?

Also interesting would be to compare the results of this study to studies about other countries. In particular, it would be interesting to see whether for example France and England also saw a strong decrease in launched balloons. Foreign reports show at least some activities in the field of ballooning abroad, but investigating the amount of launches and comparing them to the Netherlands could also provide us with more insights in the reasons for the periods of silence surrounding demonstrations with the balloon. This research has already provided several explanations for the inactive period at the end of the eighteenth century, but the period of very little activity in the field of ballooning in the beginning of the nineteenth century, from 1808, is somewhat more puzzling. An explanation could involve entre-

preneurs being unsuccessful in making ballooning into a lucrative business which could have led them to abandon the machine. More research into the costs surrounding these events, the amount of earned money and the reasons of the public to whether or not willing to invest in ballooning can shed more light upon this matter.

The balloon thus offers interesting insights in the history of popular science and the relation between science and the public and deserves more scholarly attention and appreciation. It is a unique example of popular science, because it made the wonders of science accessible for people from all strata of society and generated unprecedented audiences. Because of this, the early history of ballooning is able to show unique wide-ranging expectations with regard to science and the capabilities of humanity. The fact that the development of the balloon quickly ran up against its limits did not mean its downfall. In fact, entrepreneurs transformed this scientific instrument into a successful entertaining spectacle that even lasts to this very day.

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IMAGES

Figure I: 'Vue et perspective du jardin de Mr. Réveillon fabricant de papiers, Fauxbourg St Antoine, à l'ancien Hôtel de Titon, où se sont faites les expériences de la Machine Aërostatique de M.M. Montgolfier frères, dans le courant de l'Eté, en l'année 1783, à la

satisfaction d'un concours immense d'amateurs - Dédiée à Mrs. les Physiciens' (s.l. S.a. [1783]), drawing, , Claude-Louis Desrais, *Bibliothèque nationale, Cabinet des Estampes, Ib-1 - Ib-4, Gilbert Mondin, 1977, 71* (Mondin, 71).

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Figure II: 'Aërostatische Machine van d'Heer Blanchard, opgelaaten in de Tuin van 't Oude Hof in s'Hage den 12^e July 1785' (The Hague 1785) drawing, G. Carbentus, *Rijksmuseum, RP-T-00-1512*.

(via: <http://hdl.handle.net/10934/RM0001.COLLECT.174231>)

Figure III: 'Allarme générale des habitants de Gonesse, occasionnée par la chute du Ballon Aréostatique de Mr. De Montgolfier' (s.l. s.a. [1783]), engraving, *Collection Michel Hennin. Estampes relatives à l'Histoire de France. Volume 115, 9990-10091, period: 1784-1785, 9926* (Hennin, 9926).

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Figure IV: 'Accident arrivé au ballon monté par Pilatre de Rosier et Romain qui brule au-dessus de la garenne du Roi à Vimereux' (s.l. s.a. [1785]), engraving, *Collection Michel Hennin. Estampes relatives à l'Histoire de France. Volume 115, 9990-10091, period: 1784-1785, 10046* (Hennin, 10046).

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Figure V, 'Lust tot onderzoek - A. Hopman. L.S. Loude' (Amsterdam 1804), engraving, *Collection Atlas van Stolk*, inventory no. 12088.

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