

Chapter 1

Introduction

1.1 General

Why should one write a history of radio astronomy in *the Netherlands*? In a time when transnational history is the order of the day, this may seem a bit old fashioned. However, in this particular case, the choice for a national perspective can be justified. From an institutional point of view, the Dutch radio astronomers have been united in the National Foundation for Radio Astronomy ('Stichting Radiostraling van Zon en Melkweg' or SRZM) since 1948. SRZM was not merely a collection of radio astronomers who happened to live within the borders of the same country. It was on the contrary a coherent group of scientists with a specific research programme. Moreover, early Dutch radio astronomy developed in a very different way from radio astronomy in other countries. The main difference was that the initiative was taken by 'real' astronomers—i.e. optical astronomers—while in other countries it was mostly taken by engineers and physicists with a background in war industry, especially radar. This anomalous beginning had profound short-run and long-run impacts on the field. At the same time, it means that the history of Dutch radio astronomy does not 'fit' traditional histories of radio astronomy in Britain, Australia and the USA. This is also one of the reasons why in historiography, on early radio astronomy, the Dutch story is often treated rather cursorily. In his book *Cosmic Noise*, for example, the American radio astronomer W. Sullivan ranks the Dutch radio astronomical group amongst the 'five major groups in the post-war decade'. He also recognises that the story of early Dutch radio astronomy 'is anomalous in that it was not driven by radar veterans and in fact was directed by (optical) astronomers' (Sullivan 2009, 8). In the rest of the book, however, he hardly pays any attention to the Netherlands. On the other hand—and in a way related to the anomalous beginning—Dutch radio astronomy in the earliest years focused on only a small range of topics, especially on 21-cm

hydrogen line research, as will be explained. This can also be a reason why it does not occupy a prominent place in historiography.

Another striking feature of Dutch radio astronomy is that it remained a very small scale, nationally oriented undertaking for quite a long time. At the same time, Dutch national science policy too was in the 1950s and 1960s still very new and in a certain way underdeveloped in comparison with science policy in most other European countries. National organisations for the stimulation of ‘pure science’, for example, were a typical interwar product. In the Netherlands, however, the Organisation for Pure Scientific Research (‘Zuiver Wetenschappelijk Onderzoek’ or ZWO) was only founded in 1950. Paradoxically, the embryonic stage of Dutch science policy *furthered* rather than hampered the quick and successful development of radio astronomy. On the other hand, however, it was an obstacle in the international cooperation with Belgium, which was set up in the late 1950s.

Our story starts in 1940. Although all historical delineation has a certain degree of arbitrariness and the pinpointing of a ‘beginning’ may seem ahistorical, there is good reason to choose 1940 as a starting point. For Dutch radio astronomy, this was a crucial year. On the other side of the Atlantic, an electronic engineer from Chicago, Grote Reber, had just been able to detect radio radiation from the Galaxy with a self-made telescope and he had studied how the intensity of radio emission changed with position in the sky and wavelength. He recognised that his findings could be important for astronomical research and therefore he wanted to publish them in astronomical literature. After some serious resistance from the astronomical community—after all, Reber was no professional astronomer—he got his findings published in the *Astrophysical Journal* of June 1940, in an article entitled *Cosmic static*.

This happened at a time when the Second World War was raging and the international exchange of scientific information became more and more hampered. However, at the instigation of Bart Bok, a Dutch astronomer who had migrated to the USA, the American Astronomical Society appointed in September 1940 a *Committee for the Distribution of Astronomical Literature* that tried to secure the worldwide flow of astronomical literature. Thanks to the efforts of this committee, Reber’s article reached the Leiden astronomer Jan Hendrik Oort on 24 December 1940. Oort’s reading of this article would change the course of Dutch astronomy forever.

Oort immediately realised that radio radiation could be vital for astronomical research: as radio waves were not hindered by earthly clouds, radio radiation was particularly suitable for observation in the Dutch cloudy climate. Moreover, radio waves were an ideal means to answer a question Dutch astronomers had been trying to answer for decades, namely What is the structure of the Milky Way? Under the impetus of the Groningen astronomer J.C. Kapteyn (1851–1922), unravelling the structure of the Milky Way had become one of the main objectives of Dutch astronomy since the beginning of the twentieth century. During the last part of Kapteyn’s life, it became clear that the biggest part of the Milky Way was inaccessible to observations at optical wavelengths because of the extinction of the

light by interstellar dust (Oort 1981, 24). Astronomers had already put up with the fact that they could only have indirect knowledge about a large part of the Milky Way. This changed with the emergence of radio astronomy.

Our book ends in 1970. In 1970, the radio telescope in Westerbork was inaugurated, Oort retired and his Utrecht colleague Marcel Minnaert died. In the history of Dutch radio astronomy, this year was a major turning point. Huge reorganisations took place both in the radio astronomical community and in Dutch science policy.

The existing literature on the history of (Dutch) radio astronomy consists of mainly internalist—rather triumphalist—accounts, focussing on the content of the research without paying much attention to political and strategic aspects. Rather than writing yet another such story, we chose to focus on three key events in the period 1940–1970, namely on the construction of the radio telescopes in Kootwijk (1948), in Dwingeloo (1956) and in Westerbork (1970). It was in the processes of planning, designing and constructing these instruments that the interests of the astronomers, industrial partners, politicians and lobby groups merged. Studying the role of Dutch radio astronomers as strategic lobbyists, networkers and organisers in a specific political and economic context allows us to best answer the following questions. How can the rapid and remarkable success of Dutch radio astronomy be explained? How did the astronomers manage to raise the necessary funds for these expensive projects? What strategic alliances did they forge in order to safeguard their projects? How did they deal with the new and unfamiliar kind of instrumentation? To what extent did they collaborate or interact with other groups abroad? Why did the Dutch focus on *Galactic* radio astronomy, whereas in most other countries the focus was on *solar* radio astronomy?

Although it seems odd that a new and expensive field could develop in a war-stricken country like the Netherlands, Chap. 2 explains that the Dutch post-war context was remarkably favourable: it was precisely science and scientific applications the Dutch government considered to be a key factor in the rebuilding of the country.

The first radio telescope in Kootwijk was an adapted ‘Würzburg Riese’ a radar reflector the Germans had used during the war. As will become clear, it was thanks to the good relations with the Dutch Post, Telegraph and Telephone Service that the Dutch radio astronomers received this telescope. In spite of its modest scale, it produced some groundbreaking results. In May 1951, for example, the 21-cm hydrogen line was detected. Two months earlier, the same line was detected at Harvard. As will be shown, the different ways in which Harvard and the Netherlands dealt with this detection epitomised the different background—physicists versus astronomers—of the researchers. At Harvard, the detection was an opportunity to explore the physics of the hydrogen atom, while in the Netherlands it was a crucial step in answering the question of the structure of the Milky Way.

Notwithstanding the important research that was done with this telescope, a better and more sensitive one had to be built to keep up with international developments. This would be the radio telescope in Dwingeloo, inaugurated in April 1956. Chapter 3 explains how the radio astronomers convinced ZWO

and the Dutch government that this expensive telescope was worth the effort. Furthermore, it explains how they came to choose Dwingeloo as the most suitable location. Finding a suitable location for a radio telescope was not an easy job. First of all, the area had to be free from possible sources of interference, and environmental conditions had to be optimal. And once they had finally found a suitable area near the village of Dwingeloo, they had to deal with resistance from local governments and lobby groups.

As soon as the first observations with the radio telescope in Dwingeloo were made, ideas came up to build an even larger and better instrument. This would become the radio telescope in Westerbork, inaugurated on 24 June 1970. While the construction of the Dwingeloo telescope was a truly Dutch affair—it was done by Dutch astronomers, engineers and construction companies and only Dutch money was used—for the new telescope, the Dutch started looking over the border. It was estimated that this instrument would be very expensive. By finding a partner, the cost of the project could be shared and that would make the project more acceptable for the Dutch government, so the astronomers thought. When the Dutch approached the Belgians in 1958, the idea of jointly constructing a large radio telescope was enthusiastically received by several Belgian astronomers. Nevertheless, the cooperation ultimately failed in 1966. In Chap. 4, it will be explained why this was the case. Several reasons were to account for this: it had to do with the diverging astronomical traditions in both countries after the Second World War, with different science policies since the late 1950s, the different political cultures, and—more general—different ‘mentalities’.

While the design of the Dwingeloo telescope was a rather straightforward operation, this was not the case with the Westerbork telescope. The first elaborate design was presented in 1961. Later, at least four other designs followed. The final telescope differed strongly from the initial design. Where in the beginning the intention was to build a cross-shaped interferometer, the telescope would end up to be a linear array. Chapter 5 explores the reasons why the Dutch changed the design several times. Sometimes these reasons were scientific, but often they were also practical, political or economic. A persistent problem was the continuous struggle to find competent engineers. Special attention is devoted to the developments abroad and to the hiring of foreigners for the project, as these factors truly ‘shaped’ the eventual design as well as the observational programme of the telescope.

As a location, the area of the former concentration camp Westerbork was chosen. It had consecutively served as a refugee camp for (German) Jews at the beginning of the Second World War, as a transit camp for Jews, Gypsies, homosexuals, etc. during the war—when the Netherlands was occupied by Germany—and as an internment camp for members of the Dutch National Socialist Movement after the war. After the independence of Indonesia, it became a residence for the Ambonese who had fought in the Royal Dutch Indian Army against the Indonesian nationalists. In hindsight, building a telescope in such a place seems to be a strange way of dealing with the camp heritage. Nevertheless, after their dark past the inhabitants of the village of Westerbork were now very happy to see their name connected to

something positive. But again, before construction could take off some problems had to be solved. For example, a military shooting range had to be closed and several remaining Ambonese families who were still living on the premises had to be moved. The relative ease with which Oort managed to get all this done is telling for his influence and the prestige of radio astronomy in general in the late 1960s.

With a construction cost of 25 million Dutch guilders, the telescope in Westerbork was one of the most expensive Dutch scientific projects at that time. At the same time, financial problems had to be faced. Firstly, the Belgians paid their share only after years of delay, and secondly, from the mid-1960s onwards, Dutch government budgets were tightening. In particular, the latter was a serious problem. It made application procedures more rigorous. As a dominant and stubborn person who was used to always getting his own way, a conflict arose between him and Bannier, the director of ZWO. Bannier blamed Oort for the authoritarian way he led SRZM and Oort in turn blamed Bannier for treating him as a ‘school boy’. This conflict was illustrative for the radical changes that took place around 1970 and for Oort’s inability to deal with them.

1.2 Sources

A lot of archival materials were available for this research. In the first place, there are the *Oort Archives* which are kept at the University Library in Leiden. It is thanks to the efforts of Oort’s former student Dr. Jet Katgert that the University Library now safely harbours this extensive collection of papers and letters. At the same time, Dr. Katgert provided a detailed and comprehensive catalogue (Katgert-Merkelijn 1997).

The archives of SRZM were another very valuable source, though its content is rather scattered. Most of it is kept at ASTRON, the Netherlands Institute for Radio Astronomy and successor of SRZM. Duplicates could be found at NWO (the successor of ZWO) in The Hague. A small part of the archives of SRZM is also kept at Leiden Observatory.

The archives of Henk van de Hulst—who played a key role in the detection of the 21-cm hydrogen line—the *Van de Hulst Papers*, are kept at Leiden Observatory. They were especially useful to find out more about this famous 21-cm hydrogen line.

The archives of Oort’s Utrecht colleague Marcel Minnaert—the other protagonist of early Dutch radio astronomy, although to a lesser extent than Oort—are kept at the Noord-Hollands Archief in Haarlem. More than Oort, Minnaert was concerned to bring (radio) astronomy closer to the general public. His archives are especially revealing for the initiatives that were undertaken for the popularisation of astronomy.

In the *Dutch National Archives*, some interesting information could be found about the contacts between Oort and the Dutch post-war Prime Minister Schermerhorn.

Attempts were made to consult the archives of the Dutch company Philips, as this company, the *NatLab*, in the first place was an important player in early Dutch radio astronomy. Unfortunately, these repeated attempts remained unsuccessful.

To study the cooperation with Belgium, the archives of the Belgian National Council for Science Policy (‘Nationale Raad voor Wetenschapsbeleid’ or NRW) in Brussels were used.

Besides the archival materials, the Annual reports of ZWO and the database with historical newspapers at the National Library of the Netherlands were consulted.

Last but not least, there were various invaluable oral sources. In the first place, we were very grateful to be able to talk to the radio astronomer Hugo van Woerden—who was involved in Dutch radio astronomy from its very beginnings—and to Jean Casse, the Belgian engineer for the Westerbork project. Furthermore, we spoke to several people who were themselves not involved in Dutch radio astronomy in this period, but who have known Oort and/or some of his colleagues quite well, for example former ASTRON radio astronomer Richard Strom, Leiden astronomer Frank Israel, emeritus professor of computer science and guest professor of astronomy at Leiden University Alexander Ollongren and former project manager at the Netherlands Institute for Space Research (SRON) Klaas Wildeman.

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