

The cloth of the universe

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In this time, what was always called Beauty,
beauty has burned her face
She no longer comforts people
She comforts the larvae, the reptiles, the rats
But she frightens humans
And strikes them with the realization
Of being a bread crumb on the cloth of the universe

(From Lucebert, I try in a poetic way, Collected poems, Amsterdam 2002,
page 52)

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Prologue

Marcel Minnaert (1893-1970):

Heir to the Great Dutch civilization

There are many people for whom the name Minnaert still resonates dearly. This certainly applies to science teachers who love observations in the open field. My first acquaintance with him, therefore, took place via the Minnaert: these are the three volumes of *The Physics of the Open Field* that I acquired around 1970. The first edition of this book appeared in the late 1930s. In the 1990s, new illustrated editions of the first part of Minnaert's trilogy, *Light and Color in the Landscape*, were published in English and German, alongside the reprint of Minnaert in Dutch. It is therefore a unique book. Minnaert had observed natural phenomena for twenty-five years, made notes, and conducted research into physical explanations.

He had also sought descriptions in prose and poetry to establish connections between natural science and literature. He had created a personal compilation of hundreds of natural phenomena, where romance and rationality come together. Especially in the United States, **Light and Color in the Outdoors** has become a classic book. It inspired artists such as the American James Turrell, who would design the landscape project **The Hemels Gewelf** (1996) in Kijkduin based on an idea from Minnaert.

However, **The Physics of the Open Field** was not the reason for this biography. My fascination with the astronomer Marcel Minnaert (1893-1970) stemmed from my dissertation on the Association of Scientific Researchers. Minnaert was the chairman of this club of pioneers in the field of Science and Society at the outbreak of the Cold War. I wanted to go through 'the century of Minnaert' with him. How had a Dutch representative of the left-wing, scientifically-oriented intelligentsia, akin to J. Desmond Bernal, Leo Szilard, and Irène Curie, experienced the issues of the 20th century? I knew that he was a celebrated astrophysicist in the late 1930s. Why did he no longer want to leave the development of science to politicians? At the time, I let the interviews with the founders of this Association extend into conversations about Minnaert. On the occasion of his 100th birthday, I wrote biographical sketches for **Natuur & Techniek** and **Zenit** (1993). When the Board of Directors of Utrecht University decided to name the new building for scientific education and research after Minnaert, I was commissioned to write the brochure **Marcel Minnaert: een leven lang leraar** (1998). I met his closest family members, interviewed his colleagues and PhD students, and explored the terrain for a biography.

During this exploration, my motivation changed. This had several reasons. Minnaert's youngest son, Boudewijn, presented me with a stack of his grandparents' diaries in Sydney. Marcel's father had started a notebook about him at his birth, and after his death, his mother had taken over the writing: 1,300 handwritten pages testified to the attention that two Flemish professional educators had devoted to their favorite child. These Diaries describe the upbringing and education of young Minnaert.

In 1909, he was Belgium's top student and graduated cum laude in biology in the summer of 1914. Inspired by some teachers, he emerged as a fanatic Flemish nationalist: an activist for whom, during World War I, the independence of Flanders outweighed the German occupation of Belgium. At the age of 23, he would teach physics at the Dutchified University. It became clear to me that to understand his life and work, I would have to pay much attention to his Flemish upbringing. A closer examination of his actions during the occupation revealed that Minnaert's political movement, Jong Vlaanderen (Young Flanders), was the most notorious. In studies such as **Het Aktivistisch Avontuur** (1991) by historian Daniel Vanacker, he plays a leading role. Minnaert even wrote a defense against personal attacks: **De verdeeling van den arbeid en het nationaliteitenbeginsel** (1916). (I have modernized this archaic spelling for readability, consistently and drastically: after this foreword, there will be no mention of 'Dietsch,' 'verdeeling,' or 'sterrekunde,' but simply 'Diets,' 'verdeling,' and 'sterrenkunde'.)

At the end of October 1918, Marcel fled to the Netherlands with his mother to escape a long prison sentence or worse. By then, he had already written numerous articles and lectures in addition to his dissertation. Part I of the biography deals with Minnaert in Flanders and requires some empathy from the Dutch reader for the issues surrounding the Flemish Movement. At a meeting of Dutch and Flemish astronomers in De Haan (1993), where Minnaert's centenary was a theme, Vanacker presented a lecture on **De jonge Minnaert** (**The Young Minnaert**). It was the first serious attempt to place him within his Flemish context. Vanacker has provided commentary for my **Minnaert in Vlaanderen** on two occasions, and I am deeply grateful to him. Minnaert's dedication to Flemish nationalism would not diminish in the Netherlands.

His scientific career also held surprises for me. Minnaert immediately received a position at the Heliophysical Institute of Utrecht University. Four years later, he introduced the astronomical community to a unit for the intensity of absorbed starlight: the equivalent width, which indeed became the international standard a quarter-century later. Before becoming a professor in Utrecht, he had already been appointed in Chicago. He received

the highest honors in astronomy: the British Gold Medal and the American Bruce Medal. Minnaert's team produced, following in the footsteps of illustrious predecessors such as the German Kirchhoff and the American Rowland, an Atlas (1940) and a Table (1966) of the Solar Spectrum that are still consulted today. He proved to be a pioneer in the spectroscopic branch of modern astrophysics and a prominent member of the International Astronomical Union.

Minnaert was not only prominently present in the Encyclopedia of the Flemish Movement but also in the Encyclopaedia Britannica. His name was given to an asteroid between Mars and Jupiter and a crater on the far side of the moon. Therefore, Part II of the biography focuses on the development of this scientist. The astrophysical chapter calls upon the reader's diligence and capacity for comprehension. Minnaert believed that any problem, no matter how difficult it seemed, could be explained to an interested person in five minutes. I hope to have worked in his spirit. The astrophysicist Kees de Jager, a student of Minnaert and founder of space research in the Netherlands, read two versions of this book and also acquainted me with Minnaert's work and his astrophysical equipment.

During the Interbellum, Minnaert was fully engaged with Flanders but not with the position of science in society. That issue only grasped him during and after World War II. The war also formed a watershed in other respects with the final part of his life, in which he tried to connect issues of worldview, science, and society. After 1945, he emphasized the socio-political context of science so strongly that it had to become the guiding principle for Part III. At Utrecht University, during the height of the Cold War, they were so wary of Minnaert, a supposed 'fellow traveller' and 'friend of communists,' that they imposed a professional ban on him. Minnaert's life spontaneously divided into three equal parts of a quarter century, separated by the end of a World War. In his childhood, the Boer War (1899) still played a role, while death claimed him as coordinator of Books for Hanoi. His life and thinking were therefore profoundly influenced by the political and military events of the 20th century. Each part consists of chapters. Each chapter begins with a characteristic quote from Minnaert. In Chapter 1, the prophetic motto of his parents is cited:

"I am a lover of pure joy, of the beautiful and true, art and virtue.'

For 35 years, I have taught natural sciences with great enthusiasm. I lectured on 'dangerous substances' in adult vocational education, physics at the Pedagogical Academy, and chemistry and General Natural Sciences at Erasmus Gymnasium. I was surprised to discover that Minnaert, more so than Ph. Kohnstamm, was the pioneer of physics didactics in the Nether-

lands. As an adolescent, he already felt connected to the work of pedagogues like Ellen Key, Jan Ligthart, and Tatiana Ehrenfest-Afanasjeva. In 1917, he tried out a first practical experiment for children at several Flemish primary schools, and in 1924, he wrote the first Dutch-language publication on student experiments. Together with physicist Leonard Ornstein, he designed a university teacher training program in the 1930s. After 1945, along with mathematician Hans Freudenthal, he advocated for a reform of education in mathematics, natural sciences, and astronomy. From its founding in 1950, he was a member of the Natural Science Didactics Working Group, which laid the foundation for the Woudschoten conferences for physics teachers. Throughout his life, he emphasized the importance of astronomy in secondary education: he hoped in 1951 that this wonderful subject could be taught as part of a new subject, General Natural Sciences. I could fully relate to this aspect of Minnaert's life and gave it the space I believe it deserves.

The person of Minnaert was thus more multifaceted than I had imagined. He didn't deserve a biography because he fit into my framework, but turned out to be, in the wake of Simon Stevin, his fellow townsman and kindred spirit, a heritage bearer of Dutch civilization. His son Boudewijn and daughter-in-law Els Hondius provided me with material that could give me a better picture of the flesh-and-blood man. They wanted to review the processing beforehand. This led to friendly communication that resulted in a refinement and further enlivenment of the texts. I thank them both for this collaboration. The primary and secondary sources are accounted for in the Notes section for each respective part.

Writing this biography was a monumental task. In 1999, I applied for a replacement grant from the Dutch Organization for Scientific Research (NWO), which was supported by five professors: The historians Piet de Rooy and Albert Kersten, my former promoters; the science historian Anne Kox; and the astronomers Ed van den Heuvel and Max Kuperus. The application stated that the interplay of scientific, didactic, and societal issues would be the specific angle of the biography. Kox indicated that if the grant were awarded, he wanted to secure a place for me at the Center for History of Science of the Institute for Theoretical Physics at the University of Amsterdam, so I could work in a 'prepared environment.' The subsidy was indeed granted, allowing me to be exempt from teaching duties during the 2000-2001 academic year to complete this book. Additional funding from the Pieter Zeeman Fund, the Special Journalism Projects Fund, and the Advisory Board of my school supplemented my usual part-time salary during that year and the next. Without this financial support, I would have been

able to complete this book only with great difficulty and much later.

Starting in May 2000, Kox and I discussed all draft texts, both from the research work and the concepts for the later chapters and sections. His comments and suggestions stimulated and motivated my work. He helped me through depressions by trusting in the final result. In the summer of 2001, an extensive version of the book was completed, which I submitted to several readers. During the following academic year, when I resumed my work, I created a second version, which was reviewed by a wider circle of people. Here, I would like to thank journalist Max van den Berg, columnist Dik de Boef, science journalist Frank Biesboer, publisher Jan Geurt Gaarlandt, Flemish teacher Rudolf Mahy, publisher and my neighbor Herman Masthoff, writer and science journalist Marianne Offereins, Dutch studies scholar Hans Overheul, my promoter Piet de Rooy, physics didactics expert Greet Smit-Miessen, and my wife and discussion partner Rieme Wouters. The astrophysics chapter was intensively discussed with my physics colleagues Leen Bongers and Jan van den Koppel and also presented to the members of the advisory committee. The interviews and consultations with dozens of experts, as well as friends, colleagues, family members, and acquaintances of Minnaert, are accounted for in the Notes section of part III. The final version was discussed only with Anne Kox and Marianne Offereins. The publisher provided the inspiring suggestion for the title, **De Rok van het Universum** (The Robe of the Universe), referencing a quote by Lucebert. In my view, this title aligns with the spirit of Minnaert, who in 1949 translated and compiled the anthology **Dichters over Sterren** (*Poets on Stars*).

Marcel Minnaert has no reason to complain about the extent to which he continues to be remembered today in various circles. The remarkable Minnaert Building (1998) has been mentioned. In recent years, no fewer than two prizes have been named after him: a biennial Minnaert Prize for the best contribution to physics education in secondary education (since 1987) and a Minnaert Prize for young researchers and authors who contribute to cultural and political cooperation between the Netherlands and Flanders (1995-2002). Yet, he has remained relatively unknown. Often, natural scientists remain anonymous greats for an audience that seems to take more interest in poets, writers, historians, heads of state, film stars, and politicians. Apparently, the work of scholars is difficult to understand. Many biographers also shy away from this. For example, the historian Vanacker ended his biographical sketch at the point when Minnaert's astrophysical career began. I am glad that my triple education and profession as a chemist, educator, and historian do not present me with such a dilemma.

Moreover, my education failed on a crucial point. The biographer must

understand the main character in their development so that they can provide an insight into the portrayed person. Minnaert's personality turned out to be more complicated than I had thought possible. The Diaries of his parents added a dimension but also required interpretation. I occasionally sought the help of psychologist friends, presenting them with characteristic events. Their comments made me realize that I needed expert assistance. Ultimately, I systematically discussed the draft texts in a series of evening-long sessions with clinical psychologist and psychotherapist Gijs van der Zalm. He taught me to read between the lines and provided me with comments on primary sources. In addition to ongoing comments, at the end of each section (1919; 1945; 1970), I present an explicit psychological commentary in a snapshot. The apparent influence of upbringing on Minnaert's life and work confronted me with insights that were previously closed off to me. By delving into Minnaert, I learned to know myself better.

Endnotes:

1 James Turrell, *Kijkduin, Celestial Vault in the Dunes, Stroom; The Hague Centre for Visual Arts, Den Haag 1996.*"

"In this, among other things, Gerrit Willems: *The Sensory Splendor of Light: Turrell and Minnaert*, 61-65, and from Minnaert's **Natuurkunde van 't Vrije Veld**: *The Apparent Flattening of the Sky Dome*, 67-102.

2 Leo Molenaar, *We Can No Longer Leave It to the Politicians; The History of the Union of Scientific Researchers (1946-1980)*, Rijswijk 1994.

Part I

(1893-1919) Minnaert in
Flanders
A Youth in Obligatory
Resistance

The dawn drove away the nocturnal darkness, the swallows flew chattering closely over the meadow, and the sun colored the horizon fiery red. Klaas opened the window and spoke to Uilenspiegel:

Child with the helmet, behold, there is Mother Sun, who comes to greet Flanders. Behold her when your eyes will be open; if you ever doubt later, do not know what to do to act well, go then for advice to the Sun; she is warm and bright; be as good as she is warm, as honest as she is bright.

Charles De Coster, *Tijl Uilenspiegel*, 1868

Chapter 1

The Fire Under the Ashes

'I am Minnaer of pure joy, Of the beautiful and true, art and virtue.'

Marcel's World

In February of the year 1893, Marcel was born in Bruges, the son of Jozef Minnaert and Jozefina van Overberge. He was the child of two educators. Jozef was a teacher and Jozefina a teacher at a Normal School. Jozef, who had to commute to Ledeganckstraat in Ghent, walked around quarter past six through the Beenhouwersstraat to the station on 't Zand. Jozefina, who only needed to leave home at eight o'clock, walked in ten minutes to the rear entrance of the State Normal School for Girls on Sint-Jorisstraat. Sometimes they only saw each other again around half past ten in the evening. People talked about the coldest days of the 19th century. On Friday, February 10th, Jozefina wanted to go to work when the contractions began. On Sunday, February 12th, at noon sharp, Marcel was born: 'You were very skinny and tall, but your voice was strong.' He had large, dark eyes that amazed people. This was written by Father Jozef in his Diary. He designed a family crest for Marcel with the motto: 'I am a lover of pure joy, / Of beauty and truth, art and virtue,' and wrote:

'How we have longed for you,
dear, only, precious child!
How we have thought about you,
how we have always loved you.'

Jozefina had knitted Marcel's clothes herself. The delivery had been difficult, and Marcel would remain her only child. She had looked forward to breastfeeding him when she came home at noon. But even though Jozefina drank grain water until it disgusted her, she couldn't produce a single drop of milk. The baker and doctor forbade bottle feeding. Only after a week, when Marcel was visibly deteriorating, did the doctor allow them to seek a wet nurse. The child was baptized on February 26th in the stately Sint Salvator. The godfather was Jozef's brother Gillis Desideer Minnaert, and the godmother was Jozefina's mother Catharina Dondt. Marcel was content with the carriage ride, but 'as soon as you arrived, you began to wail so loudly that neither the pastor, sacristan, relatives, nor midwife could hear or see anything. The sacristan's Latin became completely confused.' Jozef's Diary has a twofold character. Besides observations of his child, it contains many reflections. His child evoked feelings of regret and resentment in him. Regret for marrying late at 44 years old and resentment over missing out on medical studies as a working-class child. Everything would be different with Marcel. Jozef would teach him about plants, animals, and anatomy in a playful way. For Marcel was to become a children's doctor. Not a physician for bread, but a selfless scholar: 'Comforting deeply grieving parents, poor mothers and fathers; uplifting them; saving where possible, alleviating the suffering and pain of the sick little ones, dedicating oneself entirely to the happiness of others, to the salvation of mankind, creating progeny, By caring for the child, healing it, and strengthening it.'

Father cherished the ideal of a nearly priestly dedication to science. The child would sometimes feel downcast later on because it would refrain from worldly pleasures, but what a field of work would open up, 'what material for character formation, for self-denial or rather self-abandonment, involving fear and courage simultaneously, relentless patience, expressions of love, and compassion.' This is how Jozef fantasized and tried to steer the upbringing: 'Our child is a book in which we continuously read and study, but also write what we think is best preserved.' In such sentences, the message follows the objection. The child was there for the father, not the other way around.

Marcel's parents had rented the house on Guldenvlieslaan from Jozefina's mother after their marriage in 1890. This avenue is part of the western section of the belt of boulevards along the city walls. Gardens and some workers' cottages were located on the boulevard. At that time, a series of stately, sometimes kitschy buildings appeared. Number 22 was a simple house with identical buildings on either side. The house was six meters wide and ten meters deep, had two floors above ground level, and a small backyard. In front of the house lay a wide sidewalk leading to a row of young trees,

behind which was an unpaved road used by horses, dogs, carriages, and carts. This road transitioned into a second row of trees with benches for residents and passersby behind them. The avenue was enclosed by a wire fence with a dense hedge to screen off the embankment. In a lowered area, audible but not visible from the house, the train to Blankenberge ran. The other side of the railway was sparsely built in the direction of the Ezelspoort. The sun set over open fields in front of the house. Playing on the avenue was heavenly. The parents' fear of infection with fatal diseases ensured that Marcel did not come into contact with neighborhood children for the first three and a half years. Marcel's uncles, aunts, cousins, and other relatives lived in Ghent or farther away. His environment consisted of adults.

The child grew up prosperously. At nine months old, he was a kilogram heavier and ten centimeters taller than the average child. Apart from his parents, nanny Leonie Sippens and the maid Reinilde Jamees were at his disposal. On the twelfth of each month, this community celebrated the small child's remembrance day. For fifteen months, Joseph slept in the guest room, while Josephine, the maid, and Marcel used the bedroom. The housemaid had her own room. Marcel's daily routine was strict. His bath water was at a temperature of 27.1 degrees. When Joseph measured the child on September 29, 1893, it was 833.5 millimeters long, and the distance from wrist to fingertips was 9.3 centimeters.

Whatever Marcel desired was immediately available. Both parents had already led frugal and industrious lives, earned a decent salary as teachers, while the rent must have been low. The domestic staff at the time worked for board, lodging, and a modest allowance. Joseph abstained from worldly pleasures. An occasional friend from Ghent would visit. He didn't make new acquaintances in Bruges. Joseph had previously dedicated his life to the Flemish Movement and now lived for his child.

Joseph: a devout, Flemish-minded liberal

Joseph was 46 years old when Marcel was born. His father, Petrus Judocus Minnaert (1796-1881), was a cotton printer, and his mother, Coleta Joanna den Dooven (1799-1873), was a bleacher. They had twelve children, two of whom went into education. The first was Gillis Desideer, born in 1836 as the seventh child, followed by Josephus Ludovicus, born in 1846 as the eleventh. The parents consistently referred to the years between 1815 and 1830 as 'the good Dutch times.' After Belgium's secession, the textile industry in Flanders declined: Judocus had to seek work in Wallonia and northern

France, and Coleta had to take up additional trades. Joseph, like his revered mother Coleta, was a hard worker; dedicated, self-sacrificing, and dutiful. Like his father Judocus, he could be hot-tempered, impatient, gruff, and authoritarian.

He was liberal and devout. Every morning he attended the first mass. In the respectable houses on the Guldenvlieslaan, the people of Bruges spoke French. In the working-class neighborhood behind, they spoke a Flemish dialect. Jozef Minnaert and his wife were part of a Gideon faction of Flemish-minded individuals who spoke refined Dutch at home. His life had been marked by the emancipation of Flanders. Jozef's brother, Gillis, was one of the leaders of that movement. Their efforts did not clash with their affection for the state: Flanders had to rise again within Belgium.

The Habsburgs had maintained Flemish as an administrative language in the Southern Netherlands for two centuries. During Napoleon's occupation, the vernacular disappeared from public life for a quarter of a century. In Vienna, the Kingdom of the United Netherlands (1815) was designed as a power block against France: the Netherlands, Belgium, and Luxembourg together under the Orange Prince William I. He had introduced Dutch as the unifying language in Flanders. He founded the Dutch-speaking State Normal School in Lier and the University of Ghent. The resistance to this language policy, both from Walloon and Flemish-Catholic sides, was one of the reasons for the 1830 uprising. Belgium was born and became a modern, French-speaking state. The Flemings were denied the right to continued and higher education in their native language. The flemishization during the 'good Dutch times' had contributed to the emergence of a Flemish Movement. The Flemish-minded adorned themselves, just like the *geuzen* of old, with the French derogatory name *flamingants*: they wanted to expel French from Flanders. This endeavor was romantic because it appealed to a glorious past. But it was also a legacy of the Enlightenment, as it promoted justice, equality, and the uplifting of the people. The *flamingants* had to confront an economic elite of frenchified Flemings: the *franskiljons*. Brussels, where the Belgian state exerted its pull on career makers, and Ghent, where the dominant groups used French as a class language, were their strongholds. In Bruges as well, language expressed a sharp class division. The dominance of French was also caused by the growth of the Walloon coal and steel conglomerate producing material for the European railway network. In contrast, the textile industry in Flanders faced declining economic fortunes. Moreover, the Netherlands did not lift a finger to help its 'ethnic kin.' There prevailed Protestant resentment toward the Catholic South, which had plunged unification into a civil war. Dutch songs celebrated the collective suicide of

Commander Van Speyk, 'rather die than surrender,' in the port of Antwerp.

The Flemings had to pull themselves out of the swamp by their own hair. Marcel's godfather, Gillis Minnaert, managed this wonderfully. He rose from being a working-class boy to inspector of municipal education in Ghent, writer and compiler of anthologies, Knight in the Order of Leopold (1880) and the Order of Orange-Nassau (1894), and chairman of the liberal Willemsfonds. He introduced Pestalozzi's and Fröbel's educational methods and brought Dutch books from the North into municipal schools.

Jozef was fond of his brother, became a teacher, later a professor at the Ghent Normal School, where he provided further French-language education. Together, the brothers wrote story collections, and Jozef also ventured independently into writing. They also did volunteer work. In the 1880s, the social question began to play a role. Their own social rise likely strengthened their belief in the progressive-liberal philosophy of Ghent professor François Laurent, who taught that the worker could take his fate into his own hands. Gillis wrote that for twelve years, they had spent their weekends giving lectures in associations for working girls and boys. They chose examples from life such as 'the benefits of saving' and alternated their lectures with songs, music, lantern slides, theater performances, and excursions. The unmarried Jozef married his ten-years-younger colleague, Jozefina, and moved to Bruges for her sake. His child became the excuse to put an end to his volunteer work. He kept a notebook of aphorisms on pedagogical matters. One of them reads: 'If one knows the passions of a child, one can control it, just as a fortress whose weak points have been discovered is usually lost.' Marcel was the test case. Jozef's life suddenly lay beyond his grave, 'like a sentence that is only ended by a comma.'

Jozefina: A brave, progressive teacher

Marcel's mother, Jozefina, was 36 years old at his birth. Her parents were from Ghent."

"Little is known about Joannes Benedictus Van Overberge (1822-1885) and Catharina Dondt (1823-1904). They must have achieved a certain prosperity through their own efforts, as they were able to fund Jozefina's education and purchase a house for her in Bruges. Jozefina's sisters, Emilie, Nathalie, and Clémence, spoke both French and the Ghent dialect in Ghent and Wallonia. Only Jozefina spoke refined Dutch. She was 34 years old when she married and was more liberal and less devout than her husband.

Jozefina was one of the first Belgian girls to pursue teacher training and

become a regentes (headmistress). In 1873, when she began her studies at the age of seventeen, there were no normal schools for girls. Some training programs existed at municipal institutions. A handful of boarding students followed a three-year French-language course there, paying high tuition fees of 400 francs per year, and took exams in reading, penmanship, Flemish, French, arithmetic, pedagogy, methodology, geography, national history, singing, Christian doctrine, and biblical history. The student had a weekly schedule of 70 hours: six days of eleven hours each and Sunday morning for four hours. At the time, liberal governments were trying to free Flanders from the yoke of independent, thus Catholic, schools. Liberalism and militant Catholicism clashed head-on. In the encyclical *Quanta cura* (1864), condemned modern ideas such as liberalism and socialism, freedom of religion and the press, and the separation of church and state. The confrontation in Flanders focused on education policy. Assistant pastor Guido Gezelle wrote in his West Flemish dialect in 1866: 'Rather than entrusting the young daughters of Flanders to the government, which is known as the most unchristian and disloyal among all governments in Europe, one would sooner send mouse cubs to cats for lessons or let lambs be devoured by wolves.'

Jozefina, as a liberal teacher and educator of 'she-wolves,' was the target of such scorn. Around 1878, when she graduated, the final round of this confrontation began. The liberals introduced a substantial majority in parliament from the elections. Minister Van Humbeeck decided in 1879 to establish a neutral Normal School in Bruges. The Catholic press sounded the alarm: freethinkers, nihilists, Protestants, Jews, and Freemasons would destroy the souls of children: 'The most dreadful disaster for Belgium' was indeed the transformation of community schools into 'gueux nurseries.' Catholic leaders called for a holy war 'against the pernicious law' and used the same rallying cry as the Crusaders: 'God wills it!' Starting from September 1, 1879, in accordance with the bishops' **Instructiones practicae pro confessariis**, absolution was denied to all students, teachers, and parents who would send their children to these Normal Schools.

Van Humbeeck instructed teachers to focus on moral education and science instead of religion. The teacher had to guide the instructors toward personal instruction and 'independent learning.' Instructors had to be able to set up scientific collections, design demonstration equipment, paint school charts, and create diagrams. The Frère-Van Humbeeck government (1878-1884) unleashed a school struggle that tore the state apart. As men's suffrage expanded, the electoral tide turned, while this school struggle harmed the liberals. The Catholics defeated them in 1884 and condemned them to thirty

years of opposition.

The Catholic authorities then halved the liberal decisions: in Bruges, only a Normal School for girls was established, while the one in Ghent would be limited to boys. The one in Bruges, completed in 1883 by architect Delacenserie, who also designed the government building on the Grand Market and the hospital near Minnewater, was in a style that Karel Van de Woestijne called 'monastic gothicizing.' The building still dominates the workers' neighborhood. The school looks like a lavish monastery complex with a secular, high-roofed garden in the center. This school struggle was fiercer in rural Bruges, where Guido Gezelle's hate campaign still lingered, than in bourgeois Ghent, where the church toned down its rhetoric. Jozefina had to defend herself professionally against press accusations and the fear of parents and students regarding excommunication. The language struggle also had significant consequences for her work.

The 1883 Coremans-De Vigne language law was the result of a Flemish lobby that united Catholics and liberals. That law imposed an obligation on teachers at state schools in secondary and normal education in Flanders to teach certain subjects in Dutch. Although there were no penalties for non-compliance, the law gave Flemish-minded individuals a sense of grounding. Jozefina, who was appointed to the Bruges Normal School in 1882, could now teach her geography and Flemish subjects in Dutch. After the transformation into a State Normal School for Girls, an all-female teaching staff emerged. When she married Jozef in 1891, she made it clear that she wanted to continue working. The opportunity to work at the same school had been missed. They settled in Bruges, and Jozef was condemned to his daily commute.

Jozefina envisioned a career for herself, even as a mother. Her lessons received positive responses, and she joined excursions and workweeks with her young female students. After receiving a pencil drawing of the Minnewater from one of her students—a prized possession for their elaborately decorated living room—her husband grumbled: 'It's lovely that young ladies are so kind to their teachers; we professors never receive such gestures.' Alongside her trainee teachers, she organized educational activities at the Brussels World's Fair and the Congo Free State Exhibition in Tervuren. Four-year-old Marcel and his father visited the exhibition, where real African people were displayed to a gaping audience. Around that time, Jozefina's young colleague, who was the headmistress of a Normal School in Antwerp, passed away. Jozefina applied for the director position, but Jozef's patient resistance was in vain. She went to Brussels to plead her case at the Ministry and organized a lobbying effort involving acquaintances and family members.

Ultimately, another woman was appointed. Jozef was delighted and even enjoyed the fresh air of Bruges' boulevard, which Marcel found very agreeable. Jozefina's life did not revolve around her child; she gave her husband the space to pursue his mission.

Jozef creates a researcher

Jozef aimed to nurture a nature researcher in Marcel. Every child has questions about nature and how things work at a young age. Jozef noticed and encouraged this curiosity. He engaged in numerous little conversations about it. Marcel, who was two years old at the time, asked, 'Daddy, could the sun burn me here?' Our future nature researcher wanted to know. His father replied, 'Oh, certainly not, it's far too far away from you.' Marcel pressed on, 'What if we get closer, Daddy?' His father answered, 'Well, then yes.' The little boy concluded, 'But we don't have wings to fly to the sun.' Jozef interpreted this as a sign that Marcel had an inquisitive mind and understood the limitations of human capabilities. The following year, he noted that Marcel asked thousands of questions about locks, steamboats, and lighthouses. At three years old, the toddler confidently explained the cause of rain: 'When Marie does the laundry, you see the hot water rising, the steam also flies out of the locomotive; later, the wind drives that vapor together, it becomes heavy and falls, and that's rain.' Jozef taught the child the names of dozens of flowers and plants and marveled at his memory. Marcel was restless, working 'tirelessly for hours,' switching from one game to another. Whenever his father picked up a hammer or pliers, the child couldn't be held back. Jozef wrote: 'I must have it, I will have it!' Marcel exclaimed excitedly, while Papa tried to calm him with a warning. Marcel stood firm. Mama asked Papa in French to let Marcel use the hammer to tap a nail into his toy horse, but Marcel was so enthusiastic that he struck the wheel in two and left the horse on its back for good. Then Marcel got scolded. Jozef noted that when Marcel didn't want to do something, he could become furious, stamping his feet, rolling around, and throwing himself on the ground. What is now seen as a phase of toddler stubbornness, Jozef viewed as a questionable character trait.

On May 23, 1896, Jozef turned fifty. No one visited, but he reflected on Marcel: 'A trait in your character already requires our attention: your determination. Whatever you desire or want, it must be! Such feelings can be for good or ill, depending on how they are guided. Cowardice and laziness are disgusting, while excessive boldness and stubbornness are equally harmful.

Oh, if only I could guide you as I wish.' One of his pedagogical aphorisms was: 'A small flaw is always the beginning of something great.' He feared that this stubbornness might eventually cause great harm.

Once, he showed Marcel 'views' of the Berner Oberland: 'Amazingly, the boy sees infinitely better than his father and talks about glaciers, snowfields, rocks, valleys, and many things his father didn't understand until he was eighteen. From time to time, I wonder if this isn't a case similar to the young man Goethe describes, who no longer recognized his father due to excessive book learning.' Joseph behaved in such situations like a wronged man afraid of losing his child. Nevertheless, he hoped Marcel would become his pride, a copy of his father—'his image, his entire person, but free from flaws (a revised and corrected edition!)'. The French addition seems both ironic and serious, succinctly expressing that Marcel had become the indispensable object of his father's affection.

Joseph observed that his wife interacted differently with Marcel. While he demanded obedience, Jozefina would ask, 'Would you like to make Mama sad?' Then Marcel would deny it and become obedient. Mother and son exchanged nicknames, such as 'kokootje' for Marcel and 'poes' for Jozefina. Their physical affection moved Joseph but felt foreign to him.

Together with Marcel, Joseph designed 'moral' stories. One of the tales, *Koolzwartje*, was meant to encourage cleanliness. This version of Snow White dealt with wetting one's pants, being dismissed from the army due to incontinence, and girls giggling while pinching their noses. The story was effective, noted Marie van Pamel, the new maid from Zeeuws-Vlaamse Retrenchement. Marie also told Joseph that Marcel refused to listen to Bluebeard and had no interest in stories about cannibals. He couldn't bear to hear about the evil queen wanting to kill Snow White. Joseph admonished her not to read such fairy tales. The parents wanted to shield Marcel from everything ugly and bad. They also found the fear of Sinterklaas and Zwarte Piet inappropriate, so Joseph explained the origin of this tradition to the child. He didn't realize that the Sinterklaas celebration plays a role in regulating children's fears. Gradually, the child detaches from the magical world and stops believing in Sinterklaas. When Marcel eventually faces real obstacles, will he be able to cope?

From his fourth year onward, Marcel played outside, where he learned to speak French with the neighborhood children. The child adored tools and drew them everywhere. The *Guldenvlieslaan* was filled with trains he had drawn in the sand with a stick. Joseph had to adjust his expectations for the future. The neighbors predicted that Marcel would become an engineer. In that case, he could go to a vocational school in Krefeld, Germany, Jozef

thought: 'If he doesn't understand something, he won't let you go until you've given him a sufficient explanation, and that explanation must be not only understandable for him but also very clear and complete.' His playtime with Marcel took on a scientific dimension. For example, when spinning tops under the same conditions, he would vary the thickness or length of the string, and they would both observe the result together. When Marcel hooped with his right hand, Jozef also had him use his left hand, so that he learned to handle both hands smoothly. This didactic approach worked perfectly. When the five-year-old saw fireworks for the first time, he asked: 'How do they get those different colors; how is fireworks made, and how can that spinner rotate?' Jozef had no doubt that his boy had an aptitude for natural science. Reflecting on the seven-year-old, he thought: 'Which profession or business does Marcel have a inclination toward? Lately, he keeps talking about being an electrical engineer; words without meaning for him; I merely feel that the word electricity holds a magical appeal. To know how it originates and works—that is what attracts him now. Many people say: Marcel is born to be a professor. Indeed, his methods of reasoning are clear; his enthusiasm and movements are captivating; he takes examples where necessary, draws comparisons or illustrates.' He found other qualities equally important, such as devoutness, dedication, cooperation, and love for peace. He taught the child to pray: 'May you be blessed, sweet evening rest, as I solemnly place my hands on his little head and give him a goodnight kiss, after which he reciprocally commends me to God's care—it is sanctifying to have such innocent little hands placed on you. And finally, that silvery voice innocently reciting the Lord's Prayer, wishing Christ and Mary a good night, and promising always to be sweet; that is the most beautiful hour of the day.' Jozef found his darling somewhat sickly: especially his airways gave problems. As an infant, he had undergone a tonsillectomy. At the age of five, that bloody procedure was repeated, which made the child deathly afraid of white coats and medical instruments. Marcel used an inhalation device for his daily dose of looizuur, had digestion issues, and displayed a yellowish complexion. A lighter menu might have helped... Jozef wrote that their 'daily bread' consisted of roast beef, veal, meatballs, plaice, sturgeon, ray, fried tongue, sunfish, and plaice. Marcel swallowed strengthening every day Fosfatinepap, a glass of red wine with sugar, two beers, and two tablespoons of steel syrup. The rich Flemish life, the land of Kokanje which most children could only dream of, was a reality in the Minnaert household.

Going to school in beautiful Bruges

Jozef's starting point was that education about nature should take place on-site, preferably in the open field: 'I draw his attention to where the sun rises daily and teach him to see how it appears more to the north every morning and moves much further west in the evening, how its path grows longer and longer, making the day longer too. I will therefore try to teach my boy to see well and to find out through experience himself! No, it's not enough to share knowledge with a child; they must seek it themselves, learn to exert themselves. The soul must work, suffer to become strong later, just like our body.' He knew from experience that teachers sinned against this principle of self-reliance. There was no compulsory education at the time. Home schooling seemed a desirable alternative for a child who could work independently.

The intensive interaction with adults encouraged Marcel to play with language, as evidenced by this pun. 'Marcel asks for chocolate. 'No, no,' says mama, 'that's not allowed! It will make you sick!' 'I find that very pleasant,' replies the scamp. 'What,' mama repeats, 'you find that pleasant? Like this!' 'Yes, little one,' says the rascal laughing, 'you say: to make music.' Jozef taught him how to play billiards at the liberal cooperative De Eendracht. He found billiards a noble and refined sport that exercises the body in all directions while the mind thinks and calculates. Additionally, Jozef gave him carpentry lessons every week. Marcel took up portrait drawing himself: the results pleased his father.

From Marcel's sixth birthday onward, the Minnaerts switched to systematic home education. Jozef took care of music notation, his wife handled reading and writing. Once he started reading, in Dutch and French, there was no stopping him. Marcel read 'Cudlago, or The History of the Young Eskimo' in two days, made harpoons, and went hunting with them. The child wanted to turn his thoughts into actions! That was in him. "Following this, Robinson Crusoe came along, which he devoured. They immediately purchased a bookcase for Marcel and bought the Dictionnaire universel par Larousse from Aunt Nathalie for 400 francs, which would be 2000 euros in today's currency. If something could promote Marcel's self-study, money played no role. Jozef had to urge the book lover to go play marbles and hopscotch with the neighborhood children.

At the start of the 1899-1900 school year, both parents coordinated their schedules. They reduced their workload so they could personally tutor Marcel for a few afternoons. The boy would start attending a municipal fee-paying school at Easter 1900, aged seven. The parents designed a prepara-

tory curriculum: 'In the afternoon, our guest learns division with two digits. He reads the book *Te kust en te keur*, draws and colors, plays the 74th piano lesson, reads *De geschiedenis van België*, and asks me about the attraction of the stars.' Singing and making music played a prominent role at home. Jozef found it hard to send Marcel to school. Wouldn't he develop a dislike for learning if he were forced? It also meant that the boy would enter a new environment and distance himself from his father. Jozef must have been apprehensive about that as well.

For the first day of school, Marcel needed a full satchel: 'A complete temple of knowledge for a 7-year-old toddler,' Jozef mocked. But Marcel was full of enthusiasm, and Jozef could see how eager he was to go to school. He didn't hesitate to help him with his homework. He urged Marcel to write more neatly, but Marcel couldn't finish on time at school if he wrote slower. Jozef was full of criticism: 'In the evenings, I spend a considerable amount of time correcting mistakes and handwriting, erasing stains. It's really unfortunate that our child learns so quickly. They tire his mind by memorizing; fortunately, his memory is good. We were told that the students wouldn't have any homework, yet... Every day he has lessons to learn.' He disapprovingly went through the weekly schedule: 'Our boy's subjects: Catechism, third question and answer of the 11th lesson, History, A monastery in the 7th century, French language, *le verbe* (radical and endings, 4 conjugations, present tense endings, imperfect and future tense), Calculating (divisions of five-digit numbers by divisors 2 and 3), Homework: Replace the underlined masculine nouns in sentences with given feminine substantives, etc. Unripe fruit is not healthy.' He found it nonsensical: 'The Influence of Monasteries was taught today, a subject for statesmen, philosophers, and seven-year-old boys. Oh science! What fools are being made in your name for future times.'

Marcel had his own world and thought it wonderful. The weekly proof notes consistently mentioned 'very good'. Jozef had told Marcel that if he ever got into trouble, he would immediately and permanently leave school. That was a bold threat from the jealous father towards a well-behaved child with strict teachers. For Marcel told stories like 'about Landman, who was called to the front of the class because he hadn't worked, and Mr. Verkest, who mockingly called out: "Yes, Ju!" and the class repeating it, making the boy turn bright red, and about Piette, who had forgotten his notebook and whom the teacher asked: "Piette, where is your notebook?"' Every student had to repeat: "Piette, where is your notebook?"' Jozef forbade Marcel from laughing at other children. The child had to carefully observe the differences between the pedagogy of his teachers and that of his father and learn in practice what he had to keep quiet about to stay on good terms with his

father.

Forty years later, he said: 'School was good, but not fun. Temperamental teachers who sometimes hit or scolded, little freedom, an old building.' Marcel played and misbehaved heartily: 'I remember how painters once were at work, so their ladders stood in the courtyard; and how a ladder was carefully placed against the classroom door, diagonally, so the door could no longer be opened. And in the classroom sat a teacher alone, correcting exams! And I also recall the carbide pellets we put in the inkwells, which produced acetylene gas that smelled terribly. Or how we stuck pens into the desks and strummed them to make music.' That's the only glimpse Marcel gave of himself, something he probably didn't grant his father at the time.

In December 1900, Marcel experienced his first prize-giving ceremony. He was dressed in white with yellow leather gloves and boots and a straw hat. He received the prize book: **La Basse-cour de Chaudine**. 'Good for girls,' his father sneered. From his aunt Nathalie in Ghent, he also received an expensive French book, which his father went to 20 exchange for Bertha Von Suttner's **The Weapons Laid Down!** Jozefina's headmistress gave her **Pol De Mont en Vertellingen van Andersen** on Saturday evening. For St. Nicholas, he had already received **Het boek van Tom Tit**, full of beautiful physics experiments, a soccer ball, a stereoscope with 50 cards, a book with 100 chemistry experiences plus his own stamp with sticks of ink in different colors.

At the end of the school year, Marcel could reap a richer harvest at the second prize-giving ceremony in the Boterhuis on the Sint Jacobstraat. He achieved a shared first place for behavior and diligence; he was the best in religion, and his average across all subjects was well over seven. Only one student in his class had as many distinctions. Jozef, who involved himself daily with the homework, added hypocritically: 'What makes us content, happy is not the number of books or rewards, but that he has been well-behaved and did his best.'

The child wandered through those years in the beautiful city so frequently sung about. There were no tourists yet; cars and bicycles were a sight to behold. The Flemish 'primitives' Van Eyck, Van der Goes, and Memlinck, of whom Bruges possesses an astonishing collection, still had to be rediscovered. For the Flemish poet Karel Ledeganck, the city was beautiful but dead. Around the turn of the century, Stijn Streuvels perceived an atmosphere of boredom over that city of deserted streets and quays. The fact that Bruges remained intact as a medieval city is due to the lack of industrial projects for which, in the sister cities, walls and monasteries were all too eagerly demolished. Karel Van de Woestijne chose the metaphor

of stagnant water: 'Against the walls of the weathered houses, gray, foul-smelling sludge accumulates.' Georges Rodenbach would portray the city in his morbid, French-language **Bruges-la-Morte** as a metaphor for rigidity and death drive. Contemporary people could only moderately appreciate Bruges' beauty.

For the children, the calm quays, romantic canals, slate, and cobblestones held many adventures. Marcel had enjoyed it: 'We usually went to school in small groups of friends, pumped water at all the pumps that still stood here and there, leaned over the old stone parapets along the canals, or slid down the rail of an inclined bridge, played marbles between the cobblestones... Remarkable how dear a city becomes when you've grown up in it in such a way!'

Jozef on education and pacifism.

Jozef's diary reveals a gloomy and serious man. One of his aphorisms goes: 'By their fruits you shall know the teacher.' The teacher had to ensure that 'unconditional obedience' reigned in the classroom, because without this outward discipline, nothing could be achieved.

He wrote quite charmingly about Marcel, his 'dear rascal' with 'that roguish look, that smile of happiness spreading across his entire face, those silken eyelashes and black velvet eyebrows, the dark blush (tanned by the sun) on his cheeks, dressed in that new suit which gives him a much smarter appearance: the wide sailor collar turned up, the trousers pulled up above the knee, the straw hat on his short-cut hair.' On another occasion, he described the child as a rose bud 'which I watch opening, observing how the sepals recede one by one as the crown swells, how it slowly unfolds, displays the liveliest and most glorious colors, and allows me a glimpse into the heart of the flower with its mysteries and wonders.' He struggled with conflicting views on education: 'Now they say, "Help the child with his studies"; over there, "Let him acquire independence"; this one prescribes, "Keep watch over your child"; and that one preaches, "Do not keep him in check"; "Measure and boundary, adapt to circumstances, reset the boundaries as the tide flows," another wisely suggests. True, people, but where is the boundary, what is the measure, when does the tide flow? That's the knot, and I'm confused.' He needed certainty, but raising Marcel shook his pedagogical principles thoroughly.

His wife often tried to cheer up her despondent husband. She persuaded him to accept his brother Gillis's proposal to participate together in a theater

competition. During the Christmas vacation of 1898, they wrote **Siddhârtha* or *The Star of India**, which indeed won first prize. The authors wrote about the origins of Buddhism, about the metamorphosis of the powerful prince of Kapilawastu into the vulnerable Buddha who tried to break through the Hindu caste system. They found much appeal in the doctrine of renunciation and self-denial. It was an impressive work that was not only published in Ghent but also, as a golden opportunity, in Amsterdam. Jozefina persuaded her husband to put on his gala suit and broke the rule barring women from attending the celebration by simply joining the crowd. She wasn't even removed.

On January 1, 1900, Jozef looked back on the Century of Enlightenment. England, he believed, was waging an unjust war against the kindred 'Boers. The British invented concentration camps for women and children. Jozef and Jozefina spoke at solidarity meetings and took Marcel along, who, already 28, had met his atheneum teacher Hippoliet Meert. The child would have internalized two lines of thought: a pacifist attitude of respect for life and the belief that in war there is always a 'good' side that has the right to resist injustice and oppression with arms. Jozef was an opponent of militarism. Many Flemish-minded people disliked the army, which in Belgium was a bastion of French-speaking conservatism and anti-Flemish sentiment. Jozef glorified Von Suttner's pacifism, who advocated that war expenditures could better be spent on social services. He gave Marcel her thick book, which would earn her the Nobel Peace Prize. If he had to take stock of the century, progress nonetheless tipped the scales. In the end, Jozef was optimistic.

Story book for Marcel

Marcel's parents became seriously ill when Marcel was about six years old. His mother recovered. At the end of January 1901, five out of six doctors she consulted said she needed surgery. From February onwards, she stayed home from school. On April 12, she was taken to La Sainte Famille on Fabrieksplaats in Ghent. Jozef wrote in her prayer book: 'A better future is already dawning, let us wait and endure. Lord God, we trust in Your Love and reverence your holy will. Yours, Jozef forever.' The operation was successful, and there were no complications. After two weeks, Marcel was allowed to see her briefly. Jozefina noted: 'Dag poes! is his sweet word, a name he often gave me laughing in his childlike love.' She stayed with her mother in Ghent for a few weeks to recover and prepare things.

Afterwards, Jozefina and Jozef made plans to move to Ghent and agreed

that Jozef would take early retirement. They felt Bruges did not offer Marcel sufficient prospects: the Royal Atheneum and the University of Ghent awaited him. That school year, Marcel had undeniably been the best in his class. He would attend a fee-paying school in Gent on Onderstraat. From their marriage onward, they had saved for this move to Ghent and even speculated. In 1900, they invested 4,165 francs to ensure Marcel would receive the maximum pension of 1,200 francs from his fiftieth year onward. In 1902, they suddenly lost 40,000 francs in investments. The fact that they retained a similar amount of capital was little consolation for Jozef, who directed bitter accusations in his Diary toward the king, ministers, parliament members, newspaper writers, and exchange agents, who even managed to deceive the educated bourgeoisie with their escapades. Nevertheless, they were able to convert a life of saving and investing into a construction project. The decision by Jozefina's mother to sell her house in Bruges and distribute the money among the four daughters was helpful. Marcel's parents decided to build two large neighboring houses on Parklaan.

Meanwhile, Jozef suffered from chronic stomach pain, which had plagued him since Marcel's early childhood and likely contributed to his melancholy. Yet he had never missed a day of school. On August 14, 1902, at the age of 56, Jozef retired. That same day marked Jozefina's last day of school; she went on leave to care for her husband in Ghent. In his beautiful new house, with an unobstructed view of the city park, Jozef was tormented by ailments. A few days after his retirement, he developed a sore, a 'seven-eye ulcer,' which he treated with phenol fumes. Doctors had to remove a cyst from his eye. Hemorrhoids bothered him as well. Jozef's last notes, dated July 7, 1902, concerned the visit of the Chinese crown prince: 'Marcel now sees real Chinese people in gala costumes, and our uncivilized public laughs openly at those yellow people, shouting, "What ugly creatures, how ridiculous!"' As they left the Vrijdagmarkt, they encountered Prince Albert's car. A spontaneous ovation followed, which Jozef found embarrassing: 'How the people admire those who have done nothing for their happiness so far! Oh, those titles, the dazzlement brought by birth, that idolization which seems to be an inheritance. Will humanity never learn to appreciate true greatness? Wait until there is reason to praise!' Jozef believed life had value only when a person had the courage to stake it on their principles if necessary. The best part Of a people who had a sense of freedom and noble ideas for which they were willing to make sacrifices, but 'that hope' wanted only to be left in peace.

Jozef walked around dejectedly among some quacks and described their perfidious practices. Finally, in response to Jozefina's questions, a doctor

stated that her husband had advanced stomach cancer and was doomed to die. This was followed by six months of suffering. During those months, Jozef, encouraged by his wife, edited old stories into the collection **Reality and Ideal**. He dedicated it to Marcel. A sentence from the introduction: 'To be happy, I needed a being to whom I could fully dedicate my love, and that was the child.'

On Tuesday evening, January 27, 1903, at half past seven, Jozef Minnaert passed away. On April 27, in the **Diary**, within mourning borders, instead of Jozef's calligraphic script, appeared Jozefina's faint and clumsy handwriting. With the help of Jozef's pious niece Elodie Pepijn, she had the sacraments administered to him: 'Two days before his death, he said, "My body consists of two parts: a lower part that is cold and dead and hangs as if on threads, and another that still lives and feels." Indeed, that lower part was cold as a corpse, and I tried in vain to warm it.'

Jozef had died in harness. That morning, he had begun dictating a story about Gerard Duivelsteen of Ghent to Jozefina: 'He made the sign of the cross with his emaciated hands... and blew out his last breath... A deliverance for him! But for us! For me!... My wonderful married life lay behind me, my good, brave man lay there like a corpse, and I could say nothing more to him... You remain with me.' When Jozef died, Jozefina was 46 years old.

Jozef's Farewell Letter

Jozef had realized that the role of guide toward Marcel's adulthood was not destined for him. He therefore wrote a farewell letter. On the envelope it read: 'To my dear son Marcel. To be opened after my death.' The letter was a will, full of instructions and commandments that must have made a great impression on the child.

Jozef commanded the boy to love the open field and wide spaces: 'Love nature; she knows to comfort, to move, and to educate towards something great and sacred; what is petty, musty, or impure is purified by her fresh breath of life; noble thoughts come to you on the breeze and penetrate deeply within you, rejuvenating the entire soul. There is something overwhelming in the sight of the infinite sky with its millions of suns, something that makes trivial worldly thoughts vanish, dispelling all worries. It would be right to say of life in nature: 'One feels closer to God.' These words Marcel would certainly take to heart. The main thing was Christian love; there was little elevation in materialism. The soul's inclination towards perfection must be

fulfilled: 'Remember that religion does not consist of words but of actions, and that there are only two commandments: to love God and your neighbor.' By fulfilling his duty, Marcel would find peace. Among these duties were justice, good faith, dedication, patience, self-denial, honesty, the expression of love, simplicity, industriousness—all 'jewels in the links of the chain that surrounds perfection, surrounding God.' Jozef warned against the impulsive nature of the Minnaerts: 'You have also inherited passions and tendencies. Keep your calm; on your father's side, you come from a hot-tempered family, although several relatives have tried to restrain this passion. Remain pure and honorable; our lineage has had a hard struggle against this ailment. Do not be blinded by the vain assurances of others that you are one of the calmest people; your mind will loudly teach you otherwise; in our family, the fire smolders under the ashes for both aforementioned passions.' Jozef also issued guidelines regarding chastity: 'Beware of the first step, it is dangerous and leads to a path from which it is difficult to return.' The most important thing was choosing a good partner: 'There will come a time when you—most likely—will choose a life companion. Do not do this too soon. Ideally, I think around 28 to 30 years old: then the body is fully formed and in its prime; the childhood shoes have been outgrown, and the time of maturity, of true seriousness, approaches.' Jozef warned against sexual passion: 'With what care one prepares for an exam, because life's existence often depends on it. But with what foolishness, genuine madness, people act when it comes to marriage. One sees a dear person once or a few times. Her charm delights (soon the senses and passions take over), reason and judgment are no longer exercised, one becomes entangled and believes oneself deeply in love, and... later the disasters come, irreversible consequences of foolishness.' Hence his recipe: 'When you are around 27 years old, look around, look around without being distracted; "

"Show some plan; choose between respectable girls (the proverb says, 'Once light, usually remains light'), take someone a few years younger than yourself, almost of your social standing and intellectual development (what could you say in your family where you could have a pleasant conversation with a woman who is not very intellectually formed and cannot grasp things), man and woman must have respect for each other and truly find their better half in each other, seeking to achieve perfection. Therefore, hold the woman in high esteem, never degrade her; beware of scolding. Should a misunderstanding ever arise between you two, never let the night pass with discord, but reconcile as soon as possible. Every disagreement must be resolved within the home and only between husband and wife; if you are still upset, seek calmness in nature and know that the greatest of the two is the

one who first speaks the word of reconciliation or offers their hand for it. Take such a spouse who sews well and knows useful crafts (mending, darning, making new children's clothing). Pray for such a woman and do not live with other people (in-laws or family) within.' Jozef poured his lessons into commandments about which no communication was possible. He had needed the child during his lifetime to stand firm. Now he wanted to determine Marcel's fate from beyond his grave. Marcel could rebel against his father's compulsion, but this would hurt his mother. She was subsequently shielded by what Jozef called the highest commandment: 'Be the support of your mother, for you can never realize how much she has loved you, what she has suffered for you, the fears and worries she has endured; how courageous she has been for your sake. Many children love their mothers, many esteem theirs as the best, but solemnly I can assure you, child, that yours is among the very best, that she equals my own mother and that is her highest praise. If there were a word powerful enough to express all her noble qualities, her self-denial, diligence, warm devotion to you and me, then I would speak it, and write this word as a testimony of my veneration, my gratitude, as strong proof, as a solemn appeal that you must honor your mother and carry her in the palm of your hand.' Here Jozef made a confession. His own mother had been the best of all women. His wife Jozefina had only equaled his mother Coleta. Jozef, who could speak disdainfully about his father Judocus, had never freed himself from his mother. He bound Marcel to a lifelong bond with his mother as well. Yet he had sown abundantly: he had instilled in the child the love for 'untiring' work, dedication to science, and the study of nature."

"Much seed had fallen on good soil and would bear manifold fruit. Jozefina Van Overberge took up the pen in the Diary. She would write until Marcel could take over: 'Thus, we three will have worked on your little Book of Life... Here, among us, nothing was ever done without all of us contributing our part.' Jozefina was clearly aware of the Farewell Letter and had agreed to her role in the family triangle and the life path laid out for Marcel. Until recently, she had nurtured managerial ambitions. Her illness and Jozef's death had changed her life's purpose. She retired early and decided, in turn, to focus all her energy on Marcel.

Jozefina takes over the upbringing.

For friends and acquaintances, Jozefina produced a brochure about Jozef's life. Afterwards, she edited his last collection of stories, which appeared in a

print run of two thousand. She wrote: 'Often we think of your good Papa; his portrait is in every room of my house, and his image is never far from me. Is it true what he told me a few hours before his death? 'My spirit will remain with you.' I trust that.' Once a week, she went with Marcel to the cemetery: 'It seemed to me that my heart stayed there, and I felt united with him.' Jozef had asked her to have Marcel take a woodcarving course. She promptly converted one of the rooms into a woodworking shop and arranged for a teacher. Marcel practiced twice a week: 'You had a wooden workbench, various saws, planes, chisels, and other tools.' Marcel carved a donkey 'to place Papa's medallion.' In this way, he got two right hands and would greatly benefit from it.

Marcel's school performance declined that year in Ghent. At the 1903 prize-giving ceremony, he was fifth in his class. His father's death must have affected him deeply. That summer, Jozefina went on vacation with Marcel and his Walloon cousin Robert Niçaise. They took walks in the Ardennes of more than 25 kilometers. She resolved to spend a long vacation with Marcel every year and show him Europe. Just as Jozef had shown him plants and flowers, Jozefina instilled in him a respect for the vastness and grandeur of free nature. She decided to keep Marcel at home for the next school year to optimally prepare him for the atheneum. She resumed homeschooling, made herself available to him, and devised stimuli to bring fresh content into their family life. After a visit to the cemetery, they had seen an advertisement for an Italian method in the tram shelter. Together, they set to work on it. A study of the Scandinavian languages followed. Vacations in Italy and Sweden would follow suit. Marcel was making good progress in piano playing. He performed Haydn's **The Creation**, parts from Wagner's **Lohengrin**, and Mozart's **Requiem**. They made the house more cheerful and modern. Jozefina cut copies of famous works from **The Modern Art** magazine and put them in new frames: 'This is how your sense of beauty should develop.' At first glance, Jozefina's pedagogy differed strongly from Jozef's. She tried to work with Marcel seemingly as a friend, on an equal footing. Like her husband, she aimed to enhance the child's achievements. However, she failed to keep the boy at home for the entire year. School and his peers beckoned. After Christmas, he moved to the seventh grade of the Athénée on the Ottogracht. His father had recommended a gymnasium education, so he had to catch up on Greek and Latin. His mother could teach him Latin, and together they followed an introduction to Greek. He made rapid progress. Their joint homework was likely not unrelated to this. Upon transitioning to sixth grade, Marcel was second in his class and received honorable mentions in eight subjects. He was the best in arithmetic, writing,

and drawing; second in Dutch and also received a mention for gymnastics. Jozefina spoiled Marcel. When he wanted a parrot, she wrote to the manager of the Antwerp Zoo. She got one from Congo for 26.70 francs, Jacquot, a gray red-tailed parrot. The animal didn't last a month: 'What a pity after the expenses.' That year, they saw Wagner's **Tannhäuser** in Frankfurt. They visited Wiesbaden and the Germania, the colossal unity monument of the German Empire. Many Flemish sympathizers rejoiced at the time in the economic and political successes of the Germanic brotherland. They took walks to the Patersberg and the Drachenfels and cheerfully climbed the 525 steps to the tower of the Cologne Cathedral.

A teacher becomes a housewife

Jozefina was an energetic woman. As a housewife, she often spent that energy on trivial matters which now filled the diary. For instance, she had hired a second piano teacher, Louis Lozin, in addition to Marcel's nephew: 'Of course, we hadn't revealed anything to Louis; but our married niece, Elisa Van de Wijnkel, who was married to Aimé Pepijn, had accidentally come in as Miss Tilman was giving her lesson and had quickly passed on the news to Lozin. His wife, Elodie, came to inform us that Louis no longer had time to give piano lessons. I understood the reason well enough, showed nothing, gave her the small gift we had brought for her from our trip, and we parted as seemingly good friends. Since then, we've heard very little from her family. Therefore, I decided never again to receive two different people in the same place, and for that reason, I will: 1) provide the large room on the ground floor, where four spaces could actually be created, with a lighter to turn on when someone arrives; 2) furnish the second salon as a billiard room; 3) install doors so that the single large hall is divided into four parts.'

This peculiar account also provides an image of the increasing luxury at Parklaan 72. Jozefina could hardly put herself in others' thoughts and always sided with her own perspective. An eyewitness, Dé Fornier, remembered Jozefina and Marcel's visits to Gillis Minnaert's wife on 33 Gebroeders Van de Veldestraat: 'Marcel's mother only talked about Marcel. I sat there quietly as an eight-year-old child. Marcel was not allowed to look at girls, read novels, and had to study all the time. He sat at a corner of the table, and she made sure he worked. His mother was one of those self-assured, tasteless Flemish women, typical for the emerging intellectual middle class: a fat woman with one object in her life. His niece Marie, with whom I was intimately befriended, thought that Marcel was under his mother's thumb.'

Marie's parents were kind people who didn't think to interrupt her chatter in front of her son.'

Jozefina could afford a grand lifestyle thanks to Joseph's pension, her allowance, and the rent from the neighboring property. She bought land and financed the construction of two more houses on Muinklaan, at the corner of Arendstraat. After the Dutch Marie, who married shortly after Joseph's death, the maids changed rapidly. She wrote after hiring another fifteen-year-old girl: 'I pay her 10 francs a month for now: a trifle.' The better Jozefina's situation became, the less there was for the maid.

At Easter 1905, she decided to go to Paris. Twelve-year-old Marcel was allowed to plan the trip. They traveled by carriage from the Gare du Nord to Hotel Central on Rue du Louvre. They attended Wagner's *Tristan and Isolde*; saw a fair at Olympia, Verdi's *La Traviata* and Mascagni's *Cavalleria Rusticana* at the Opéra Comique, Buffalo Bill, and the film *Tom Pit, le roi des Pick-pockets* at Châtelet. Additionally, they experienced the famous *L'Aiglon* with Sarah Bernhardt in the lead role. They visited the Sèvres museum with its porcelain, Versailles, the Père Lachaise cemetery, the Conservatoire, the Observatory ('with special permission, we were allowed to visit the halls, see the large Equatorial in operation, and watch the dome turn'), Les Buttes de Chaumont, and the workshops of the Louvre. Marcel drank greedily from the cup of Parisian culture.

In the 1904-1905 school year, Marcel became 'first in excellence': the best in Dutch and French, second in arithmetic, history, and geography; third in Latin and fourth in drawing and gymnastics. He received distinctions in all subjects: 'A remarkable result that makes his mother very proud of her child.'

A golden child in a golden cage

The projects with Marcel accelerated: his cage was gilded. Jozefina stimulated his scientific interest by purchasing expensive equipment. For St. Nicholas in 1905, he was allowed to buy electrical equipment, including an electric motor, several bichromate batteries, a Ruhmkorff inductor, an electromagnet, two Geissler tubes, and a Leyden jar. They conducted spectacular experiments with this electromagnetic equipment 'together.'

She bought a billiard table for 550 francs as a decoration for the second salon, on which Marcel had to teach his mother: 'You start by showing her a new carambole every week; you seem like a good professor, I a good student, and we are best friends.' A sturdy gas lamp was hung above the billiard

table with a 'large fire' to heat the room. Jozefina had doors with glass panels installed and set up a bathroom with heating.

A new distraction came in the spring of 1906 when Marcel received 'a clean bicycle,' first-class, with 'free two brakes and Englebert tires.' He insisted that his mother also buy one for herself: 'I decided to resign myself to it and learn how to do it. I won't mention the fear and palpitations I initially felt, nor the sweat that dripped from me at first.' They practiced at the Vélodrome and went on bike rides along the Leie. Once, they biked back and forth to Bruges, over 90 kilometers: 'The worries do make me a bit nervous, but what compensation I find in you—how loving, kind, and dutiful you are! You're a golden child, full of wonderful promises.'

They lived a reclusive life. Jozefina probably thought her boy could find all the entertainment he needed at home. If Sunday visitors occasionally broke the monotony, Marcel would come up with an entire program: 'What you invent to make your people happy is unbelievable—various experiments in physics and chemistry, electricity, card tricks, piano playing—I truly enjoy being around you!' He didn't isolate himself but felt obliged to entertain the guests.

Jozefina thought it was time to start making plans for their joint future: 'We decide to train you as a horticulturist. The reasons in favor are: 1st, it's a healthy occupation; 2nd, an enjoyable one; 3rd, a highly respected one; 4th, you have the necessary aptitude for it—love of travel, ease in learning languages, a desire for research, and a stubborn determination to achieve what you want, love for nature and flowers; 5th, you have a small capital that will allow you to establish yourself and await the success of the venture. What more could one want? You fully agree, you gladly see the plan through, and we make our plan: at least until the age of 15, so until the end of the third year of Greek-Latin studies in the atheneum, possibly until the end of the second year, then three years at the Horticultural School, affiliated with the university, while you continue with English and German languages, maybe even start Spanish and take a chemistry course as an external student at the University. One year working with gardeners around Ghent, one in Germany, one in Versailles, one in London. We settle there together, and while we work on your installation, you take a solo trip, partly in America, partly in Southern Europe, or wherever, so that you perfect yourself in your profession. Good advice I once heard told me: 'There are many horticulturists, but few are learned.'

She presented this plan to Marcel, who agreed with it according to her. She went a step further than her husband, who had nurtured his future plans in the secrecy of his diary. Marcel wouldn't finish the atheneum, even

though he was the best student in his year! Nothing more was ever heard of Jozefina's plan. Thirteen-year-old Marcel apparently made no effort to argue with his mother.

In 1906, she prepared a vacation trip to Germany, 'for the two of us for about five weeks,' which would be beneficial for Marcel's speaking skills. It turned out to be a journey with Aunt Nathalie and Cousin Emiel Minnaert. They visited Kassel, Berlin, Potsdam, Dresden, walked along the Elbe, saw the Schwedenlöcker, the Tyssaer rock walls which 'were so overwhelmingly grand and wild that nothing we ever saw on our travels, not even in Switzerland, could compare,' Chemnitz, and the Thuringian Forest. In Berlin, they attended Wagner's **Das Rheingold**: 'Needless to say, it made a very favorable impression on you.' Marcel still had a month of vacation and decided to devote himself to chemistry. Jozefina encouraged him: 'I gave you the balcony room, bought you all sorts of products, and you had a new hobby.' That laboratory, soon to become the study room, became Marcel's sanctuary: a free space for the development of his personal life.

Endnotes:

1. The quote is the first sentence from De Coster in Richard Delbecq's brilliant Flemish translation (1914). The last sentence of Part I connects to this.
2. In the Netherlands, a **Normaalschool** was called a training school and is now referred to as a pedagogical academy or PABO. In Flanders, a **regent** or **regentes** is a teacher at a pedagogical academy who is also qualified to teach in the lower grades of secondary education.
3. The source is Jozef and Jozefina's Diary for Marcel. This chapter quotes extensively from it. Jozef kept the diary from 1893 to 1902, and Jozefina continued it from 1902 to 1916. Minnaert Archives.
4. The word 'Flemish' is used here for the language spoken in Flanders at the time and now called 'Dutch.' The author uses the term 'vernederlandsing' (Dutchification) for the former goal of the Flemish Movement, unless he is quoting directly. This was the early objective of the liberal branch of the Flemish Movement, which Minnaert initially identified with.
5. Few people wonder who could have heard those final words...
6. The Flemish use 'professor' to refer to a teacher or educator in Dutch. In the Netherlands, Jozef's course was likely called a **hoofdacte** (head act), at the time an extremely solid requirement for becoming a primary school principal.
7. Laurent, 1880. Minnaert, G.D., 1919.
8. Portrait of Jozef Minnaert in the photo section. The left side shows a

strict aristocrat, the right side a serene, service-oriented man: Judocus and Coleta combined.⁹ Citations from Joseph's notebook. Minnaert Archive.

10 Portrait of Jozefina Van Overberge in the photo section.

11 This is the first time an amount in 19th-century francs is mentioned. I follow Dedeurwaerder, 2002, in his conversion to contemporary currency. For the guilder, this means a multiplication factor of around ten, and for the euro, around five. The annual tuition fee amounted to 400 francs in 1880, or approximately 4,000 guilders in 2000. This factor of ten for guilders is very convenient, even though it has since become anachronistic.

12 De Clerck, 1979, pages 13-15, 21-22.

13 De Clerck, 1979, pages 46-49.

14 De Clerck, 1979, pages 54-62, 67-71.

15 De Clerck, 1979, page 38 and following.

16 Van de Woestijne, 1902, in De Bom, 1939. A beautiful image of Bruges from a generation before Minnaert is provided by Michel van der Plas in his biography of Guido Gezelle.

17 Van der Plas, 1990, portrays Gezelle as a political street fighter. Especially chapters X and XI.

18 Municipal education included free schools and paid schools to which parents had to contribute. The latter type of education was better organized.

19 The only reflection on Minnaert's youth is found in letters from October 8 and 12, 1943, to his youngest son Boudewijn, written from the prisoner-of-war camp Sint Michielsgestel. This is also where the passage about playing in Bruges later on comes from.

20 Bertha Von Suttner, *War and Peace*, Munich 1900, translated into Dutch as *De Wapens neer!* (*Lay Down Your Arms!*).

21 Karel Lodewijk Ledeganck, *Aan Brugge* (*To Bruges*), 1883.

22 Stijn Streuvels, 1954.

23 Karel van de Woestijne in *De Bom*, 1902.

24 Georges Rodenbach, Paris 1893. Note that this is Marcel's birth year!

25 Marcel in a sailor suit in the photo section.

26 Gillis Desideer Minnaert in the photo section.

27 Minnaert, Gillis D., and Jozef, 1901.

28 The monthly magazine of Meerts Algemeen Nederlands Verbond (ANV), *Neerlandia*, was dedicated to the Boer cause. More than 20,000 children would die in these camps.

29 One of his aphorisms.

30 Minnaert, J., 1903b.

31 Minnaert, J., 1903a.

32 Information derived from Jozefina's *Levensboekje voor Marcel* (*Marcel's Life Book*), the continuation of the diary.

33 Interview with Dé Fornier. See the notes in part I.

34 The emphasis on 'we' is by the biographer."

Chapter 2

Under the Spell of Wagner

'It is characteristic of primitive peoples and especially of the Germans to closely connect nature with the human spirit.'

Marcel throws himself into social life

At the Athénée Royal during the academic year 1906-1907, Marcel took German classes from Hippoliet Meert, who was already known to him. At the time, Meert was an advocate for farmers and a promoter of the Dutchification of the University of Ghent. Marcel joined a students' circle. In his first lecture, he discussed 'how industry utilizes waste materials,' which was then an original theme. During a presentation about Reinaert de Vos, he could rely on his mother's expertise. They discussed the content together: 'Now it seems you have made up your mind, and we will get to work. I can rightly say that we want mama to stand by you faithfully and help you with your work many times.'

Marcel dutifully received his Holy Communion. Jozefina decided to provide him with sexual education when he turned fourteen: 'Hair is already appearing around your mouth; you are a head taller than any boy of your age, and you are beginning to desire knowledge of certain things that every young man of your development should know, no matter how delicate. You have already had a few conversations with me about this, to inform you of the most necessary things; mama insists that she provide you with this instruction, as it will be done in the most delicate way.' She could have involved Marcel's guardian, her brother-in-law Gillis, but she did not find it necessary.

Jozefina meticulously noted Marcel's successes in her Diary. She wrote:

'At the beginning of 1907, you resigned from the students' circle at the atheneum and preferred to become a member of the young men's society De Heremans' Zonen (DHZ), Flemish and progressive. This aligns more with your inclinations and upbringing, and this group is also more serious and better organized. There you give your first lecture on Wagner, accompanied by piano arrangements of the main motifs from the Tetralogy. You receive great success, so much so that you are almost pointed out as a future chairman. However, I do not strongly support this, nor do you, so you would not accept it if asked.'

Marcel would rework that lecture into his debut in **De Goedendag**, the Flemish magazine for all Flemish-minded students. However, by the fall of 1907, he did indeed become chairman of **De Heremans' Zonen**. Marcel didn't bother to consider Jozefina's advice but simply set it aside.

That school year brought a new joint project: 'We decide to start a collection of musical instruments and begin around November 1907. It is mainly during the fortnightly public auction at Mr. Mattijn's that we can stock up; and if we add what we gather on trips, in other auctions, our number of instruments soon increases quite rapidly: we acquire, one after another, a square piano; a Chinese gong; a guitar; an English horn; several flutes, violins, cellos, and a double bass. All bought at a modest, sometimes ridiculous price.' Jozefina also bought Marcel a new harmonium. Meanwhile, the boy had three music teachers at home: for the piano, the organ, and solfège.

Shortly after, Jozefina bought a microscope at an auction for sixty francs: 'And now an entirely new world has opened up to you. What countless discoveries in the infinitely small, what joy in research! The natural sciences become a favorite subject for you and seem to captivate you to pursue your career in them.' With the microscope, which his father had promised him at birth, Jozefina truly hit the mark.

In Jozef's time, Marcel had to play outside, even though he'd rather bury his nose in books. Now, on Parklaan, Marcel had his study room, a billiard table, a chemical and electrical laboratory, a piano, an encyclopedia, a harmonium, a woodworking workshop, and the microscope plus collections of books, musical instruments, shells, and stamps. For outdoor activities, there was cycling, photography, walking, botanizing, and shell collecting. Jozefina tried to anchor their time together in every possible way. In Bruges, Marcel had been a good student, but in Ghent, he became the pride of the school. According to Jozefina, Marcel made strong progress across the board: 'You are so intensely focused, even too much so, as you don't have a single moment to lose.' The highly gifted child not only needed many stimuli

but also worked ‘unrelentingly,’ allowing himself no rest. He always had to study, write, Meetings or developing a test. Jozefina’s personal traits and upbringing influenced each other and constructed the best Belgian student of those years. He was also gripped by the Flemish Movement and followed in the footsteps of predecessors who had fought for Dutch-language education. In that context, Jozefina and Marcel traveled to the Netherlands in the summer of 1908: they participated in the General Dutch Congress in Leiden and visited numerous cities.

Following Heremans

Marcel quickly oriented himself toward the worldview of natural researchers like Darwin, Lorentz, and Van ’t Hoff. His religiosity evaporated, and in that regard, he distanced himself from Jozef’s prescriptions. Marcel wanted to belong to the elite of students who wrote articles, composed poems, translated literature, understood physical subjects, and expressed opinions on politics and philosophy. At his atheneum, he found such a circle among De Heremans’ Zonen. That’s where he became a flamingant.

The Flemish atheneums at the time housed students from higher classes and the petty bourgeoisie. Among the teachers were always leaders who pointed the way to the Flemish Movement. Early pioneers at the Ghent atheneum included, among others, the poet Julius Vuylsteke and the Dutch studies scholar Jacob Heremans. The latter had helped establish the Language-Loving Students’ Society ’t Zal Wel Gaan (1852). The name referred to a poem by Vuylsteke, which glorified the determination of youth:

’It will go well and it must go well,
for with us, as head heart and arm
are still warm.’

The atheneums were then the breeding ground for Flemish-minded circles. These also emerged at the ‘free’ colleges, where Catholic directors even prohibited all Dutch conversations, outside of class hours. The atheneums were the strongholds of liberalism and ‘geuzendom’; the free colleges, on the other hand, were the breeding grounds for the Catholic cadre. Many Catholic flamingants consciously chose the regional language for their poems and considerations. The liberals, on the other hand, promoted civilized Dutch as the unifying language for both Flanders and the Netherlands. Heremans, in particular, opposed linguistic particularism. He once described the West Flemish dialect poems of the priest-poet Gezelle 2 as ‘mud splatters on a tailcoat.’

In 1885, after the death of the founder, student Willem De Vreese renamed the society to De Heremans' Zonen (DHZ). The aforementioned 't Zal Wel Gaan became the national association for liberal-flamingant students.

From 1890 onward, the students' circle had also become a publisher of the monthly magazine *De Goedendag*. The reference to the plebeian weapon symbolized both the combative spirit and nostalgia. During Marcel's school years, the atheneum offered a selection of Flemish-minded teachers such as Maurits Basse, Oscar Van Hauwaert, Victor Fris, Hippoliet Meert, René De Clercq, his substitute Jan Oscar De Gruyter, and Leo Van Puyvelde. In 1907, August Borms was a teacher for several months.

The 1906 edition added that this Monthly Magazine for North and South was published by the General Union of Flemish Students in Secondary Education, Voorwacht, thus the avant-garde in proper Dutch, of the General Dutch Union. By 1908, the magazine was briefly called the monthly for Jong-Vlaanderen. Jong-Vlaanderen was the collective name for circles of students and pupils at atheneums, colleges, and higher education institutions. In the 1906 edition, Marcel's atheneum passed in review: out of twenty atheneums in Flanders, his school was considered one of the three (!) where the language law of 1883 was actually enforced. Upon closer analysis, however, this proved not to be the case. Out of 350 students, ten were Walloons, while seven Walloon teachers provided numerous French-language courses. Editor Achiël Petitjean noted that physics classes should legally be taught in Dutch, but even the Flemish teacher lectured in French. Neither mathematics nor physics laid a Dutch-language foundation for studying natural sciences: 'What will become of people formed in such an illogical way? What will their interaction with the working class yield?' Petitjean called for a boycott of the illegal, French-language classes.

The 1907 edition of **De Goedendag** was also dedicated to the student J. De Hoedt, a pseudonym for Eugène De Bock, who had been expelled from the Antwerp Athénée for insisting on the implementation of the language law. It was a tragic fact that young people like De Bock, when it came down to it, found themselves faced with the entire teaching staff, including the Flemish-minded ones. On April 20th, a demonstration took place in Ghent advocating for Dutch education at the atheneum. Petitjean delivered an impressive speech to a packed hall. The study prefect and the teaching staff were notably absent. The speaker called their education outdated: 'For too long have students been misled by the old-fashioned ways. The moment has come for them to demand a normal education, free from all influence and relying on themselves, through their own language.' Ghent was in an uproar, **De Goedendag** reported. Flemish national consciousness had awoken once

and for all. The youth were the hope of Flanders: 'The elders have traded freedom for a political program.' During this turbulent time, Marcel had taken over the torch from chairman Tjtgat and editor Petitjean. Initially, it seemed his preference for culture and science would keep the policy away from flaming action. In his first session as chairman in November 1907, Marcel played Beethoven sonatas on the piano, accompanied by his nephew Robert Niçaise on the violin.

The Sons of Heremans met every Saturday afternoon, always featuring a lecture by a Flemish-minded teacher or student. The future poet Richard Minne gave a lecture in 1908 on the American writer Sinclair. That year, Marcel also delivered lectures on the Norwegian authors Bjørnsen and Ibsen, as well as the Anglo-Saxon epic **Beowulf**. Their teacher, the Germanist René De Clercq, sometimes presented his own poems. If his muse prevented him from performing, Jan Oscar De Gruyter, another accomplished Germanist, would often step in. Also, Minnaert was a good reciter. A report mentions his interpretation of **Krijgshapsodie 6 Linding**. Sometimes he ventured into his own piano compositions and texts. The group singing of these young people went straight to the heart. The societies performed at Flemish rallies, where stirring dialogues between the reciters and the audience put the listeners in a state of ecstasy. Albrecht Rodenbach's famous cry, 'Does the Bluefoot fly?' was answered with a cheering 'Storm at Sea!'

At the Young Flanders congress in August 1908, Lodewijk De Raet, a leader of the movement for the Dutchification of Ghent University, encouraged them: 'In the atheneums and colleges lies the future of the Flemish Movement; it is there that the people who truly lead the Flemish Movement today received their baptism by fire, where their love and dedication to Language and People were born, which have now become one with their own lives.' The student youth had traditionally provided the radical element that would push the Flemish Movement into new paths. Marcel Minnaert had addressed the congress attendees that same day on the topic of 16th-century Flemish Music! At that time, he was mainly occupied with his written works, which were influenced by his reverence for Wagner's music and poetry.

Marcel's treatise on Wagner

Marcel made his debut in the 1908-1909 edition of **De Goedendag**. In an article about the Word-Tone Drama in Richard Wagner, he praised the 'divine' German, who had created a genre that, with the exception of Hoffmann's

Undine, had not existed before: all arts—dramaturgy, painting, mime, and poetry—merged into a whole, 'their children born from one mother, drama; united in sacred love, they live and work only for her.' Marcel was clearly under the spell of Wagner's pursuit of a Gesamtkunstwerk and explained how the individual arts were incorporated into this synthesis. He mentioned, for example, 'the art of mime': 'Here the artist finds a wealth of expressive power: the general posture that will be proud and powerful in *Siegfried*, hunched and fearful in *Mime*; movement, which can be quick or slow; facial expression, where the eye, mouth, and head position all play a role here. The speed and form of movement can be compared to the rhythm of music: just as cheerful, exuberant music matches lively, quick, and joyful gestures, harmony is also reflected in facial expressions. The transition from joy to sorrow in facial features is a true modulation from major to minor keys.

The fact that Wagner chose his themes from the world of Germanic gods and Vikings struck a chord with Marcel. At the gymnasium, he was overwhelmed with Greek and Roman history. The revelation came when he realized there was a Germanic culture with stories rivaling those of Odysseus and Penelope. Both the Germanic people and the Flemish had their roots! Marcel wrote that the poetry of Richard Wagner, the content of his dramas, was anchored in the human soul: 'Music must express the eternal. That is why Wagner seeks his themes in universal laws, the deepest feelings of the human soul, the inner drives, the purely human, which can only be found in legends. It is there that one rediscovers the national soul in its original purity.' The gods of the Edda and the Iliad were humans with extraordinary virtues and vices. This was also the material for the word-tone drama: Wagner had 'seen it with a stroke of genius.' The German had shortened the verses, omitted the end rhymes, and replaced them with Old German alliterative verse, thus 'returning a part of their property to the people. Here too, what is one's own crowns one richly!'

Marcel adored Siegfried and Brunhilde: the seriousness and pathos, the absence of any relativization, the unconditional self-sacrifice—everything resonated with the spirit of the refined teenager. Wagner had depicted the interaction between culture and nature, which Marcel found characteristic of the Germanic nature: 'Natural events play a special role, particularly in the Nibelungenring, as they even intervene in the action, but they are never accidental because they only occur as expressions of forces that lead the drama; for example, Froh's rainbow, Loge's fire, and Wotan's lightning. It is peculiar to primitive peoples, especially Germans, to closely connect nature with the human spirit; thus, deeply offended Achilles sinks into sorrowful

reflection on the shore of the thundering sea.' Marcel smuggled Achilles out of the Iliad, but still...

Wagner's drama tapped into the deepest emotions of the teenager. He was relatively young at fifteen to engage in such cultural-philosophical reflections. He must have consulted articles and books. He could discuss his ideas with his mother, three music teachers, and his godfather Gillis. He analyzed freely and made significant connections on his own. The music fueled his passion for piano playing. Perhaps he experienced Wagner's Word-tone drama as a spiritual reality, just as real as the world around him. The second part of his reflection may point to this.

Wagner had designed a worthy setting for the performance of his works. Attending performances in the 'shimmering temple' of Bayreuth was, according to Marcel, an unforgettable event: 'Everything we are about to behold is arranged down to the smallest detail by the master, and we cannot admire enough the spirit who knew how to complete his grand creation so fully. It is four o'clock; a group of musicians with trumpets and trombones gathers in front of the theater, and there blares and resounds a brief fanfare, established by Wagner himself. It is the main motif of the act that is about to begin. Everyone enters.' Marcel acted as a guide: 'Suddenly all the lights go out; a solemn silence reigns in the hall; one detaches from everything around, listens in sacred anticipation; a minute passes; then the first note rises from the orchestra. All the sounds merge wonderfully and it seems like a giant organ resounding, never drowning out the singer, even in the greatest climax of power.'

Marcel seemed to have indulged his eyes. However, Jozefina's Diary reveals that Marcel had not been to Bayreuth. He had attended **Tannhäuser** in Frankfurt, **Tristan and Isolde** in Paris, and **Das Rheingold** in Berlin. He must have attended concert performances of other Wagner operas. But he only knew Bayreuth by hearsay. Moreover, nowhere is it literally stated that he himself visited that 'shimmering temple.' Perhaps his imagination played a role. He didn't need to be there to vividly imagine everything and instead let himself be guided by the reality in his mind. Be that as it may, Marcel would have solemnly decided to visit Bayreuth. His mother managed to get tickets for the performances three years later. Marcel could experience in 1911 what he had previously described. They visited the Master's grave and that of his son-in-law Liszt. They saw the Tetralogy, visited Nuremberg with its Germanic Museum, and also attended **Die Meistersinger** and **Parzifal**. Jozefina wrote: 'The opulence of those art-filled evenings amidst such a refined and luxurious audience; the quiet surroundings of that temple dedicated to art; the presence of Siegfried Wagner, Hans Richter—all

things that remind one of the great master—the air where his spirit still lingers, where his work continues to live. Oh, what a pleasure it is to see all this, and yet it's true that possessing wealth isn't a misfortune if one knows how to spend it well.' If Marcel had not reservations about Wagner and his Germaniana, his mother did not either. During those years, Marcel gave numerous lectures on Wagner for Flemish-oriented circles, both for Jong-Vlaanderen and the ANV. In a report from the Rodenbachs 11 Vrienden van Blankenberge, it reads: 'Comrade Minnaert spoke about *Die Nürnberger Meistersinger*, one of Wagner's most beautiful compositions. After briefly summarizing the entire piece and showing us some photographs of the picturesque city of Nuremberg, the talented speaker dissected the work for us in its smallest details. With what ease he helped us understand the different motifs of the piece—and this with piano accompaniment.'

His mother described how, as a student in 1913, he had to take over the Wagner cycle from his old teacher Van Hauwaert: 'The grand hall of the Notarissenhuis was always packed.' Gent's singers and vocalists performed themes under Marcel's piano guidance until late at night. Through Wagner, Marcel Minnaert presented himself as someone who wanted to play a role in Flanders' cultural and intellectual life.

The songs of Hildebrand and Volker

Wagner inspired the adolescent to translate Frankish—hence Germanic—texts and to write poems in staff rhyme. Part of his output between 1909 and 1911, Marcel published a Germanic saga from the 8th century, *Hildebrandslied*, translated from Frankish. In it, an old man and a young warrior fight each other. Hildebrand suddenly recognizes his son Hadubrand, who believes his father died in foreign military service. The son does not recognize his father. Hildebrand gives him armlets, which the son accepts while uttering insults in five-foot iambic verse:

'You want to strike me with your spear.

Your life, I believe, was a perpetual lie.'

The battle is inevitable, the father understands:

'Now my own child will cut me down with a sword...

Strike me with his axe... Or I will kill him!'

Was Marcel unconsciously moved by the theme? A father fighting a son who does not recognize him? That was once his own father's fear fantasy. In this

Germanic Oedipus, both the outcome of the battle and Iocaste are missing at the end. For the almanac **Zal Wel Gaan**, Marcel wrote Volker's song with the Frankish subtitle **Kuener videlaere diu sunne nie beschein** 13. Brave Burgundians under the leadership of chieftain Hagen are massacred by a overwhelming force of Huns led by the noble leader Etzel. The piece is full of alliterative rhyme:

'Then the wise Huns feared the heroes;
 They decided to slink through the night like snakes,
 And never again would an enemy hear the clear voice of the
 rooster.
 They were shown their white, woolly beds
 In a spacious hall with rich windows,
 Greetings: "Goodnight!", grimacing and grinding
 Their teeth, vanishing into the sultry, black darkness...'

Marcel's production revolved around heroes and hordes, brave peoples and cunning traitors, snow-white and pitch-black. This was part of Flemish-national romanticism. Marcel remained stuck in this mindset. Everything was either 'good' or 'evil,' just like the parties in the Boer War, with no nuance whatsoever. His poems reveal his fascination with Germanic sagas.

Yet he also translated Catullus's **To Lesbia** and Heinrich Heine's **Zee-groet**. He wrote **Salamis**, an impression from the Greek military camp on the morning of the decisive battle with the Persians, and translated a battle song about the tyrant-slayers Hermodios and Aristogeiton. In Sapphic verses reminiscent of his father's elevated thoughts, he wrote about **The Ideal**:

'So the spirit longs for ideal beauty, Reaches for virtue, freedom,
 and pure truth; So every noble soul feels a longing: A longing
 for something higher!'

With his lectures and articles, with his verbal skills and musical talent, sixteen-year-old Marcel became a beloved Flemish propagandist. Wherever he performed, he was the center of attention. His prose was not literary, and his poems were not very poetic. His merits lay in translation, description, analysis, and compiling essays. He could explain things clearly, charm with his piano playing, and had a gift for words.

A noteworthy outcome

A striking fact about Marcel was that he surpassed most of his classmates by far in erudition, knowledge, skills, and general development. There is no known record of emotions or tantrums, of girlfriends or boyfriends, of birthdays or parties, of a first kiss or love: likely, he lagged behind emotionally. Midway through the 1908-1909 school year, his average grade for all subjects was a nine. At the conservatory, he won first prize in solfège. Marcel ended that school year as first in seven subjects. In July 1909, he was invited to participate in the national competition for students of atheneums and colleges in the following subjects: Dutch, French, Greek, Latin, physics, and geography. During the last school week, he completed the assignments in the six subjects for which he had been selected; he did not participate in French.

That year, the five-week vacation trip went to Central Europe. Jozefina: 'In this way, we almost completely traversed the Inn Valley on foot and were enchanted by the crystal-clear lakes, white snowfields, and wild glaciers.' Marcel found edelweiss among the rocks. They hiked in the Dolomites, visited Innsbruck, Oberammergau, and Munich, toured Vienna, took a boat to Budapest, and traveled back via Regensburg, Nuremberg, Rothenburg, Mainz, and Cologne. In South Tyrol, he encountered Rhaeto-Romanic. He bought a grammar book and translated a nationalist poem. These Central European travel experiences would benefit his work on Wagner.

The results of the national competition left no doubt. Marcel won first prize in physics (99 out of 100) and Dutch, second prize for Greek, geography, and history, and third prize for Latin. Jozefina rejoiced: 'So, a distinction in every subject you could compete in, which rarely happens since you excelled equally in literary and scientific subjects; a score unmatched overall. Your results also caused quite a stir: newspapers published special articles; even professors sent us cards, everyone congratulated you, and your uncle wrote a kind, heartfelt letter to ensure your success doesn't go to your head. I do the same: don't become conceited, and remain the good-natured, humble, cheerful, hardworking boy you are now.'

At the awards ceremony at Ghent University, Marcel received a book prize worth 180 francs. The boy's choice of books reveals his broad interests. Jozefina proudly listed them: '1. *Het Leven der Planten* (The Life of Plants), in two volumes;

2. *Het Leven der Dieren* (The Life of Animals);
3. *Schriften und Dichtungen* by Richard Wagner, 10 volumes;
4. *Leerboek der Chemie* (Chemistry Textbook);

5. Leerboek der differentiaal- en integraalrekening en van de eerste beginselen der analytische meetkunde met het oog op de toepassing (Textbook on Differential and Integral Calculus and the First Principles of Analytical Geometry with an Eye on Application) in the field of natural sciences by H.A. Lorentz;

6. Treatise on Rational Mechanics;

7. Textbook of Musical Composition.'

In short, 'a beautiful addition to your library.' The sequel took place at the Académie des Beaux Arts in Brussels. He received books that Jozefina disdainfully dismissed as 'of no significant content, books meant for decoration, or of a Catholic nature, namely 1. The Life of Saint Louis; 2. Electricity (we already have it); 3. Poems by Hilda Ram; 4. Belgian Writers of the 19th Century; 5. History of Belgium in two volumes by Pirenne (we already have it).'

This disdainful assessment must have come especially from Marcel, who as a Flemish nationalist had no interest whatsoever in the History of Belgium as presented by Pirenne or in the foolish Louis XI of France. By then he had become a Lion of Flanders, of the Battle of the Golden Spurs and De Goedendag, of the struggle against French domination. Finally, there was a ceremony at the Conservatory with the usual prize books. Jozefina wrote modestly: 'We were truly celebrated now and set to work with renewed vigor.'

The following year, these events repeated themselves. He chose, among others, the Complete Works of Charles Darwin. In 1910, he graduated from the Athénée Royal with the best grades ever achieved. The farewell evening with a selection of classmates was, as always, in Marcel's room. There they promised to meet every Second Easter Day. Jozefina pondered: 'Will everyone keep their word? Indeed! No. Who will be missing? Will death have already taken some of them? Will differing opinions on politics, religion, or language bring division into your currently so pleasant and friendly gatherings? I am very curious.'

The cohabitation of Jozefina and Marcel

Jozefina wanted to continue in the old way, but Marcel decided for himself with whom he would engage in work. The princely balcony room played a key role here and deserves to be described by its decorator: 'A room of four by five meters, a carpet (to keep your feet warm) made of Tournai tapestry on the floor; upon it, a large table: one by two meters. A smaller table

at the window; a wonderful view of the trees in the park; on the walls: all bookcases with books, many covered and numbered; a cabinet with shells, curiosities, collections, etc.; above the fireplace, instead of a mirror, a frame with fifty portraits of great men: 'Mirror yourself in them!' I said to you. - On the mantelpiece: three statuettes: At the Harbor, a replica of a statue by C. Meunier. The Thinker, a replica of a statue by Michelangelo. The Youth Removing a Thorn from His Foot, a replica of a statue from the Vatican. I deliberately chose these three representations of man's triple labor. In a corner, on the wall to the left of the fireplace, hang weapons, products from the Congo; and in the cabinet to the right of the fireplace is the entire music treasure! A tortoise stove provides warmth and a lamp, a reading light, illuminates your room in the evening. It's cozy there. If you open the window on a fine day, you step out onto the balcony and enjoy a wonderful view of the park and the surrounding city. You love your room: you're always there, except during meals, when we are together, and that time is so short! But for you, it's good to have a place where you can work in peace and tranquility. In that room, you work with pleasure and diligence; there, the editorial board of *De Goedendag* gathers to assign articles for the publication. There, you receive your friends and companions, and on the table lies that comfortable disorder of someone who rummages through books and magazines.'

The account contains the reproach: 'So short!' Too short as far as Jozefina was concerned. She decided 'to focus more and more on my house and occupy myself with your education.' She gives me a great deal of satisfaction, affection, and wonderful promises for the future.' The young man spread his wings and flew where Jozefina could not follow. Father had found it unavoidable to lead Marcel strictly. Mother tried to bind Marcel to her with a precious shower of projects. She had furnished his study, which was open to his friends but remained closed to her. She had to show understanding and seemingly lowered the bar. By offering hospitality in her home, she got to know Marcel's friends from school and from *De Goedendag*, allowing her to continue playing a key role. The close bond between Marcel and his mother was confirmed by their daily life and was the highest commandment of his father. As a young intellectual, Marcel claimed his place in Flemish life.

In 1910, *De Heremans' Zonen* had existed for twenty-five years. Group 17 organized the Jong Vlaanderen congress. Minnaert wrote as host: 'In our good city of Ghent, so full of memories from the times of Flanders' glory and power, the spirit of our ancestors has continued to live on and still inspires us today with fiery zeal and youthful courage. Come visit our fatherland, friends; come walk in the broad lanes of our park and in the

narrow, medieval streets, come admire our Belfry, our Castle of the Counts, and our Shipmasters' House; come see the wonders that a free people once created! From every tower, from every stone, the soul of our Flanders will sing to you like a rustling symphony. Here you will feel how deeply, how intimately connected you are to our beloved people.' By 'our beloved people,' Marcel did not mean the people of Belgium.

New forms and ideas

From this nostalgic appeal, it is clear that Marcel was intoxicated by the rhetoric of the old Flemish Movement. Only gradually did he allow modern insights from progressive Flemish thinkers like Julius Mac Leod, August Vermeylen, and Hippoliet Meert to sink in. For instance, zoologist Julius Mac Leod, against the entire scientific community, had chosen a Dutch-language path. His lectures in Dutch for teachers caused a stir. After his appointment as professor of botany at Ghent University, he continued these lectures in an extracurricular program: the university extension. He had founded the Dutch-language biological society *Dodonaea* (1887) and, alongside the Flemish-Dutch Linguistic Congresses, which had been running for half a century, The Flemish Nature and Medical Congresses (1897) were established.

The work of Mac Leod had laid the groundwork for August Vermeylen's **Critique of the Flemish Movement** (1895), one of the initiators of the literary magazine **Van Nu en Straks**, where he joined forces with Karel Van de Woestijne, Herman Teirlinck, and Stijn Streuvels. The journal had created a unique Dutch-oriented focal point within Belgian culture. In his **Critique**, Vermeylen argued that an emancipation movement could not indulge in nostalgic battle songs and declamations, or in commemorations of the Battle of the Golden Spurs or other manifestations derived from the glorious Middle Ages. He demanded that the Flemish Movement become more individualistic, social, and cosmopolitan, more European. Vermeylen criticized pan-Germanic racism and condemned the anti-French sentiment dripping from the columns of many pro-Flemish journals. He wrote passages about the flamingants that lent themselves to radicalization: 'Flanders, they feel it, they want it; Belgium leaves them cold: we could happily experience the fact that the Brabançonne was booed.' For the time being, Marcel Minnaert was still infatuated with the nostalgic movement.

A modern element was also the General Dutch Union, Hippoliet Meert's creation, which Marcel and Jozefina had joined in 1906. In Leiden, they attended the national congress in 1908. The goal was 'to bring together in a powerful organization all members of our tribe who feel something for our common mother tongue.' It united people from South Africa, Flanders, and the Netherlands and received responses from all parts of the world. Their

'Greater Dutch' consciousness initially related to language and culture, not political unity. In its formative phase, it had established a Committee of Inquiry to create a Dutch-language university in Ghent. Julius Mac Leod would write the **Report** (1896) of this committee, and commission member Fredericq would oppose the monolingualism of the Flemish University, becoming an outspoken opponent of Mac Leod. Marcel's statements from 1910 were thus fifteen years behind. In 1909, as chairman of De Heremans' Zonen, he had still granted the Ghent historian Fredericq honorary chairmanship of the circle. He must have quickly discovered that this did not reflect the radicalism for which De Raet had championed at the Young Flanders congress. Over time, Marcel Minnaert shifted his main focus from culture to politics. He learned about the Belgian laws won through Flemish struggle but barely enforced. He advocated for students' right to education in Dutch and thus came into contact with socialists.

In the final decades of the 19th century, socialism had become a powerful movement in industrial Belgium. The Belgian Workers' Party (BWP) was founded in 1885 and became relatively the strongest socialist party in Europe. Socialists, broadly speaking, supported Flemish emancipation. Many progressive Flemish-minded individuals belonged to the anti-socialist wing of liberalism. Socialist agitation for universal suffrage led to the abolition of tax-based voting rights (1893). Every man over 25 gained the right to vote, though literates could cast two votes and the wealthy three. Belgium was 25 years ahead of most European countries. The 1893 elections yielded 28 socialist members of parliament, over 15% of the seats, exclusively elected in the industrial, Walloon regions. The Walloon city of Liège had elected Eduard Anseele from Ghent.

With the social question, the Flemish issue also emerged. Flemings within the Catholic and Liberal parties, supported by the socialist bloc, managed to enforce the Equality Law (1898), placing Dutch on an equal footing with French as a national language. The principle was recognized; the practice had to be enforced step by step, inch by inch. The language struggle at Marcel's atheneum, where Flemish-minded students demanded the application of the law, was one of thousands of skirmishes during those years. The privileged did not want to acknowledge that Flemish aspirations were justified. Dutch was for them the language of peasants and laborers, and a handful. Masochistic teachers and notables. The idea that professors and Walloon officials in Flanders should learn the national language seemed monstrous to them. Their resistance grew stronger after the Equality Law. Cardinal Mercier, unlike some priests and many assistant priests, exclusively chose French: Dutch remained taboo in colleges, seminaries, and universi-

ties controlled by the Church. After all, the requirement to teach certain subjects in Dutch applied to State Schools, not to free schools.

In the first half-century following 1830, many Flemish-minded individuals had felt Belgian. This began to change after the turn of the century. The Flemish-minded no longer contented themselves with a certain degree of recognition for Dutch in Flanders and no longer sought a bilingual regime in those regions. They began to demand the complete Dutchification of Flanders: monolingualism. Leaders spoke of their 'beloved Flanders,' of the 'popular strength' of the 'dear Flemish people.' When Mac Leod, De Raet, Vermeulen, or Meert around 1910 spoke of 'our people,' they meant the Flemings. This spiritual separation from Belgium would intensify in the struggle for the Dutchification of Ghent University as the resistance from professors, Walloons, and Francophiles became more stubborn and unreasonable. Some interest in Flemish demands arose in the Netherlands. Flamings sometimes became correspondents for Dutch daily newspapers. The growing self-consciousness of the Dutch people unfolded against the backdrop of the economic and cultural upsurge in both the Netherlands and Flanders. The undermining of France's authority, which had been humiliated by Germany (in 1870) and had to cede Alsace-Lorraine, played a role. The appreciation for Wagner, with his pantheon of Germanic and Nordic gods and heroes, was promoted as such by the ANV. Marcel went to the University of Ghent in 1910 to study biology under Julius Mac Leod. The battle for the Dutchification of the university reached its climax at that very moment. Marcel would choose a uncompromising tactic in this struggle and become one of the most radical student leaders.

1 Everaert 1997 shows figures like Vuylsteke, Anseele, Julius Mac Leod, Andries Mac Leod, Masereel, Basse, Borms, Clevers with a reference to the Verdurme case, Debeuckelaere, De Clercq, De Gruyter, De Keyser, Van Vlaenderen, Fredericq, Fris, Goossenaerts, Minne, Van de Woestijne, Heremans, Jacob, Meert, Minnaert, Rooses, Van Hauwaert, and Van Puyvelde.

2 Van der Plas, 1990, 201.

3 The 1907 volume shows full support for Eugene De Bock, the later publisher of *De Sikkel*. De Smedt, 1954.

4 The volumes of *De Goedendag* (DG) from 1906 and 1907 give space to Achiel Petitjean. His speech on Flemish Education from April 20, 1907, is printed in full.

5 The quotes from DG, 1907, 105.

6 *War Rhapsody* by Linding, DG, 1910, 15. A work by Marcel, *The Bell of Wengelen*, was performed at the celebration of De Heremans' Sons on

February 29, 1912, with a recitation by Michel Van Vlaenderen (DG, 1911-1912, 93). The Annual Congress of Young Flanders on May 11 and 12, 1913, in Ghent, presented Marcel as the writer and composer of the play *Zanger* (DG, 1912-1913, 155).

7 That was, at least, my experience with the images and sounds of a student procession in Leuven in the 1930s.

8 Minnaert had this motto placed on his house in Bilthoven as an exile: Blauwvoet House.

9 Speech by De Raet, August 9 and 10, 1908, in Antwerp, published in DG, 1908, 3-4.

10 Marcel Minnaert, DG, 1909, *Wagner's Word-Tone-Drama I and II*, 5-6, 5-15; 7, 4-9. Guerber, 1925: the British William Morris says about the *Volsunga Saga*: 'This is the great history of the North, which for our race must be what the story of Troy was for the Greeks - first for our entire race, and further, if the change in the world has not made our race anything more than a name for what has been - also a history that must be no less for those who come after us than the story of Troy was for us.' Marcel must have discovered the Ring of the Nibelungen in the same way.

11 DG, 1910-1911, 157-158.

12 Marcel Minnaert, *The Hildebrandslied*, DG, 1909-1910, 71-73.

13 Marcel Minnaert, *People's Song*, *Almanac 't Zal Wel Gaan* 1911, 156-159.

14 *Hermodios and Aristogeiton* (DG, 1910, issue 5). In 1910, after six issues, it switched to annual publication.

In it of Minnaert: *Aan Lesbia* (10-11), *Salamis* (27-28) en *Zeegroet* (149-151).

Refused were *De liefde in het Nibelungenlied*, *De dennenboom*, *Aan de maan*, *Hymne aan Pan*, *Er is niets nieuws onder de zon*, etc.

15 Marcel Minnaert, *Het Ideaal*, *De Goedendag*, 1910, nummer 2.

16 *Rhaeto-Romance*, *De Goedendag*, 1910-1911, 12-14, 32-34.

17 DG, 1910, 79-80. The company of De Gruyter, the Flemish Association for Theater and Recitation Art, performed Lessing's *Minna von Barnhelm* there. See the final sentence of H. Conscience's] *The Lion of Flanders* (1838):

'You Fleming, who have read this book, consider, amid the glorious deeds it contains, what Flanders once was—what it is now—and even more what it will become if you forget the holy examples of your fathers!' Mac Leod in the *Encyclopedia of the Flemish Movement*.

18 Mac Leod commemorated in the Association of Sciences, October 1935. The new congresses also stood alongside the Dutch Natural and Medical Congresses.

19 Vermeylen, Brussels 1895 (1905, 2nd edition).

20 'University' was identical to 'university' until 1970, even in the Netherlands. Therefore, a Flemish University of Applied Sciences was demanded instead of the French-speaking university.

21 Mac Leod, 1897.

22 In Belgium, 28 out of approximately 180: later comparable in the Netherlands with 2 out of 100. Capiteyn, 1991, 156-157, mentions 184 (in 1914).

23 De Schaepdrijver, 1997. Chapter 1, Before the Storm.

Chapter 3

Another Mighty Assault

'Flemish youth, noble eagle, do not shrink from the light, but fly straight to the sun.'

Botanical society Dodonaea

Marcel immersed himself in his biology studies. He completed both his propedeuse and candidate years with *la plus grande distinction*. He joined the Botanical Society Dodonaea, founded by the biologist Julius Mac Leod. In December 1910, he gave his first lecture on 'The defense of leaves against animals through thorns and spines.' A summary appeared in the Botanical Yearbook: 'The flora of a region depends more or less on the fauna. Where there is the least food for an animal species, the plants are best armed against that species.' He would continue with his own research on this Darwinian theme.

Marcel delivered numerous lectures for Dodonaea. The number of participants ranged between ten and thirty. In 1911, he attended fourteen meetings and excursions and gave four introductions. The one on April 4th already concerned his doctoral research on 'Light shade leaves in *Pinus laricio*.' That year, besides his lecture on *Gossypium*, an essay on Light-emitting Organisms was included in the Yearbook. He cited the case of *Schistostega osmundacea*, a crustose lichen whose protonema consists of 'spherical cells that collect all the light on the few chloroplasts contained in the cell; these illuminated particles gleam emerald green, as if they themselves emit light.' Marcel dedicated a fairy tale to this moss in *De Goedendag* before he managed to find it during a mountain hike. In 1912, he gave six lectures, including one on Light- and Shade Leaves in *Ilex aquifolium*, which also appeared in

the Yearbook. He investigated whether the number of spines on that tree depends on the intensity of the incident light. He picked several hundred 'light leaves' and 'shade leaves' from the Botanical Garden and Laboratoire de Botanie and found that the shade leaves have more than 3 spines.

The following year, he delivered a lecture at the Flemish Natural History and Medical Congress on The Influence of Light on Geotropism in Aquatic Plants. He sent the members of Dodonaea a reprint of his speech. He demonstrated that aquatic plants shoot upwards when it becomes dark: they become lighter because they develop more air spaces. Marcel referred to this as 'adaptation.' On another occasion, he enthusiastically reported the locations in the province of Namur where *Carum verticillatum*, *Ophrys apifera*, and the rare orchids *Aceras anthropophora* and *Loroglossum hircinum* could be found.

In 1913, he became a board member, attended ten meetings, and gave as many lectures. On December 22, he delivered a 'warmly applauded' lecture on The Auxiliary Sciences of Botany. Prior to his promotion in the unfortunate summer of 1914, he introduced, among other topics, Charlton's investigations into the origin of life, The Opening of Anthers, and Fairy Tales and Legends about Animal Behavior. During this period, Minnaert and Cesar De Bruyker were the pillars of the Society: the latter was Mac Leod's right-hand man. Unintentionally, De Bruyker would determine Marcel's scientific career.

In De Goedendag, Marcel occasionally ventured into natural science territory. He wrote about probability theory and the solar eclipse of 1912. He organized a competition about the zone clips and received two responses that he could not approve of. His fellow editors criticized him for making the questions too difficult. His defense was: 'The first part—apparent motion—aimed to determine how well the students of the atheneum knew how to use their eyes; it was simply a matter of observational spirit. The second part—the explanation of apparent motion—was a question that should already have arisen in the minds of every student and been answered long ago. Would one let such a phenomenon, which one might presumably observe only once in their entire life, pass by without even thinking about its reason? The very first principles of astronomy are the only requirements for finding the solution, and... a little scientific way of thinking.' Following this was his complicated answer, which he considered 'the simplest.' Marcel was intellectually miles ahead of his contemporaries.

Marcel's obituary of the Dutchman Jacobus Henricus van 't Hoff anticipated his career choice. He felt that the first Nobel Prize winner in chemistry (1901) had embarked on a new path in Berlin. He quoted Van 't Hoff: 'Should

there not be men whose duty it is to investigate and who, when they have the desire and time, may also teach?' The profession of researcher did not yet exist, but Marcel already felt called to it. He expertly discussed Van 't Hoff's life's work: 'Everywhere we encounter his clear language, his genius comprehension, the elegance of his experiments, the imaginative power combined with practical sense.' Van 't Hoff's Dutch-language education was a recommendation for the Dutchification of Ghent University. A curious passage deserves mention: 'Perhaps it is important to note that, neither on his father's nor his mother's side, foreign blood flowed through his veins.' At the time, Marcel was fascinated by ideas about the purity of the Germanic race. He dedicated the last two years of his studies to his own research, allowing him to both graduate and earn his doctorate.

The aspiring researcher

MacLeod had studied the effects of variations in sunlight intensity on vegetation. He utilized the statistics of his Brussels colleague A. Quételet and emphasized the reproducibility of biological measurements. This was a novel approach to his field. He was working on his magnum opus about quantitative biology and left Marcel, at that time his only PhD student, to his own devices. This fostered Marcel's inventiveness.

Marcel would graduate in 1914 with a dissertation titled **Contributions à l'étude de la photobiologie quantitative**. He investigated the influence of sunlight on a pine tree, specifically the light- and shadow-needles of **Pinus laricio Poir**. During his first year of study, Marcel discovered that in this pine tree, the number of resin canals in the needles varied significantly with exposure to light. He selected a tree situated on a slope, partially shaded from sunlight by shrubs. At the base of the tree, he collected 'shadow needles,' at three different heights above, 'light needles I, II, and III,' and at the top, he took 'top needles.' He measured and counted various characteristics: shoot length, number of buds, number of dwarf shoots, number of needles per dwarf shoot, the rotational direction of the needles around their length axis, as well as the length, width, and thickness of the needles. He made cross-sections and determined under a microscope the increase in the number of resin canals on both the flat and rounded sides of the needles. He also counted the number of stomata on the needles. He was searching for the characteristic that changes most strongly under the influence of light intensity and introduced the variation coefficient for this purpose. His hypothesis was confirmed: 'The increase in the number of resin canals with

light is evident from all our data with the greatest clarity. Equally clear is that this increase occurs more rapidly on the flat side than on the rounded side (of the needle), so that this correlation too is influenced by light.' He believed he was the first researcher to point this out.

Minnaert utilized this result in a second series of measurements. He designed a setup that allowed for more precise measurements than those taken on the slope. He planted four batches of seedlings in the ground and placed a cage over each batch. Marcel used wooden slats that were one centimeter thick and wide, leaving a constant space between them. In this way, he created cages that allowed through $7/8$, $5/8$, $3/8$, and $1/8$ of the sunlight. Marcel measured an increasing mass, more buds per shoot, an optimum number of dwarf shoots, more clusters of three needles, relatively more right-turning needles, an increase in the length, thickness, and width of the needles, and a rise in the increase of the number of resin channels. The number of stomata remained virtually constant, which he found 'very remarkable.'

Using mathematical processing and necessary assumptions, he was able to convert the increase in the number of resin channels into a growth rate. After plotting the 'time interval between the appearance of successive channels on the convex side,' as he had postulated, against this 'growth rate,' he obtained a curve in the form of a slowly rising slope with the appearance of the fifth resin channel at its peak and a steep decline afterward: 'We have thus found a curve that truly represents the course of a growth curve.' This combination of quantitative measurements and theoretical considerations seems like a creative and original construction.

Finally, he compared his results with the values in international literature. His experiments showed variable values that he had averaged, while they were usually considered constant. Many colleagues apparently counted with preconceived ideas and were satisfied with few measurements. They used terms such as 'full' and 'dimmed' light without specifying what they understood by 'light' and 'shadow.' This jeopardized reproducibility. Marcel admonished: 'Shadow must be determined by measuring light intensity.' Both in his choice of subject and in his emphasis on the quantitative method, he proved himself to be a disciple of Mac Leod. He graduated summa cum laude in the summer of 1914 and was also planning to graduate in zoology.

That Minnaert was an odd fellow among his fellow students is evident from the biographical sketch by his free-thinking friend Ciessen. Printed next to a 12 caricature of Marcel examining under a microscope, it reveals something about his youthful spirit. When Ciessen 'vivisected' Marcel's 'deep psychological mind,' he couldn't help but think of a song:

'He doesn't drink beer.'
 Does not have fun,
 has never given a kiss.
 Does not smoke tobacco,
 does not know the jail
 Therefore, is not worth living.'

Ciessen found Marcel's urge to distinguish himself 'an incurable disease': 'Where do you see a studious person on Sundays with a set of tin cans around their neck and armed with a selection of nets, in the vague hope of catching a rare butterfly? Where do you see a studious person attending public auctions, only to return with a pile of firewood, which, glued together at the cost of months of work and patience, eventually has to resemble a valuable violin?' Ciessen called him the best student of the Alma Mater, already saw him as a professor and member of the Royal Flemish Academy, and had a series of distinctions parade by 'like a kinema film that represents the same person.' He added a note about an obsession: 'Oh! I can already see Marcel at the moment he has to choose his housewife. I see him measuring her facial angles and taking samples of her hair, not to preserve them in a silk paper, but to study their cross-section, length, and color. And I hear him decide: "Miss, even though you seem to be of the white race, learn from my mouth that you are Mongolian, because the cross-section of your hair is circular. Leave me for the sake of higher Science, because the mestizos of whites and yellows are an inferior race"

His friends joked about Marcel's preference for the Germanic race. He was an outsider, but also a true student. He shared the idealism of youth. He had thrown himself into the Flemish Movement and, along with it, the idealism of Lebensreform. With his promoter, he not only shared a dedication to science but also his fanaticism regarding the emancipation of Flanders and the Dutchification of the university.

Mac Leod on the sidelines

Julius Mac Leod had written in the Report of the First University Commission in 1897: 'Only in three regions of Europe was Latin not replaced as the vehicle of Higher Education by the mother tongue, but by another foreign language: in Russian Poland, in Romanian Hungary, and in Flemish Belgium.' Among the peoples of Central and Western Europe, only the Flemish

people were deprived of higher education in their mother tongue. In normal countries, there is a fine-meshed network between all types of education: from the knowledge of the agricultural worker to that of the engineer. In the Flemish regions, this unity was broken because both ends of the spectrum spoke different languages.

A Dutch-language university had to create a Flemish upper layer that could break the fatal cycle of underdevelopment. The Dutchification of Ghent was a right that eventually had to be granted. The Walloons and most Ghent professors unleashed a storm of criticism on this Report. In doing so, they received the support of the French-speaking bourgeoisie of Ghent. Within the Flemish Movement, MacLeod's starting points were not disputed. But the tactics were controversial. The Committee wanted monolingualism in the four faculties. New lecturers had to teach in Dutch; the existing ones would be explicitly invited to do so. French would die out gradually through its phased introduction over ten years. Francophone education would temporarily continue at the Technical Schools. Some Flemish-minded individuals felt that monolingualism went too far: for example, the historian Fredericq had emerged as an advocate for a bilingual university. Others felt the Report did not go far enough. The sociologist De Raet had written in July 1892, when he was a student, about The Dutch University: 'A people must strongly organize itself intellectually if it is to resist its enemies in the struggle for life from nation to nation. Intellectual power creates material strength.' De Raet considered technical education to be of vital importance. He emphasized that higher technical, commercial, and agricultural education were essential for Flanders, and precisely those areas were being left to Frenchified education! MacLeod had also stressed the importance of 'technical knowledge,' but he had reached a compromise. The ANV-Belgium, which had developed as a Flemish discussion forum, had voted against Fredericq in 1903 with 31 votes against 3. MacLeod had written triumphantly: 'That vote closed the 'era of systems.'" It turned out to be wrong. De Raet chose a frontal attack. The clash of the personalities of Mac Leod and De Raet, the founders of the social and economic directions in the Flemish Movement respectively, ruled out any compromise. In a 1902 letter, De Raet had complained about flamingants who 'died before they were dead, stripped of all enthusiasm and resilience, blocking the way and holding back the young,' clearly targeting Mac Leod. De Raet triumphed in 1906 at the Language and Literary Congress, where he advocated for a serving university as an instrument of culture and economic power and as a strengthener of 'people's power.' Mac Leod withdrew in anger and from then on limited himself to his influence over student youth. In his final years, he mentored Marcel

Minnaert.

A Second Higher Education Commission was established, including six members from the First, among whom its chairman, the art historian Max Rooses. A key sentence from the 17th Report (1909) read: 'Between the moral humiliation, economic minority, and intellectual backwardness of to-day and the desired complete harmonious development of our people's power, the pious goal of the four generations of flamingants who preceded us, there is an abyss. A bridge must be built between the two, and that bridge is the Flemish University.' The content could be summarized in four words: Language interest is material interest. The first year of Dutchification would take effect five years after the law was passed. After that, a step would be taken each year until full Dutchification would be achieved after eleven years. The technical faculties were also included in this operation. The Commission presented itself as the center of the movement: the Great Staff. In the dark back room of Hippoliet Meerts' home, alongside Neerlandia (ANV), the monthly magazine **De Vlaamsche Hoogeschool** was also edited.

The economic argumentation made the Flemish University popular: the people missed it as if it were part of their very being. This approach largely lifted the divisions. A political collaboration emerged between flamingants from the three parties, led by the Antwerp socialist Kamiel Huysmans, the Antwerp liberal Louis Franck, and the Antwerp Catholic Frans Van Cauwe-laert.

On a meeting on December 18, 1910, Huysmans said: 'We will not stop crying out like three Flemish roosters until Ghent University is made Flemish!' The socialist leader Eduard Anseele wrote in March 1911: 'We tried to avoid the issue, but it forces itself upon us powerfully and we can no longer close the door on it.' Translations and popularizations of the Report appeared. In 1911, 368 meetings were held alongside mass demonstrations in Antwerp, Bruges, Ghent, Leuven, Brussels, Mechelen, and Hasselt. The campaign leadership organized a petition with more than 100,000 signatures; two thousand university graduates spoke out in favor of Ghent University.

The Great Staff observed that the core of the argumentation of those who continued to resist revolved around the alleged bilingualism of Flanders. In a memo dated November 19, De Raet demonstrated that Flanders was unilingual. In 1910, there were 47,000 people for whom French was the cultural language and nearly three million for whom Dutch was. The Flemish people demanded the university, which had never been anything but Flemish. The French-speaking circles were pushed onto the defensive but defended themselves vigorously. They received full support from France, which well understood that its hegemony in its outer region of Flanders was at stake.

Some interest arose from the Netherlands. Minnaert would get to know several flamingant Dutchmen well.

Three Dutchmen: Geyl, Bolland, and Domela

Marcel, on behalf of the ANV-Ghent, organized several Great Dutch Student Congresses. These also attracted Dutch students, making a great impression on them. The Third Congress in 1911 took place in Ghent. Young Pieter Geyl, later the designer of the Great Dutch historical view, stayed with his uncle, Protestant minister Jan Derk Domela Nieuwenhuis. It was an initiation, he wrote afterward: 'I was deeply struck by the moral seriousness that there emerged a sense that this was not merely a manifestation of nationalism but that these young people were aware of a significant societal task they could fulfill only if the abnormal language relations in their country were rectified.' Geyl encountered Minnaert at this Congress as a tangible example of such moral seriousness.

A short-term helper proved to be the Leiden philosopher Bolland. Ghent students visited him in the summer of 1911 and invited him 'to crush with your powerful, beautiful, and spirited words all the vermin that spits on our language.' Bolland promised to speak about Dutch as a vehicular language in science. He performed for packed halls in Brussels, Antwerp, Bruges, and Ghent, where, according to **De Goedendag**, he received stormy applause. Bolland lashed out at the francophiles, calling them 'friendly, fawning followers of the foreign woman,' 'clumsy bastards,' and 'linguistic donkeys,' and scolded his audience in the way only a Dutch preacher could: 'You tolerate it—that so-called fellow countrymen, who speak not a proper language but a regional dialect, Koeterwaals, a slang that forces them to stick to French—first and foremost in the military and even in higher and highest education—have pushed aside, suffocated, and obscured the only language that can be called a language in Belgium!' No language could express Pure Reason better than Dutch. French belonged in the opera and gossip magazines but not in science and philosophy: 'Afterward, the hall was in raptures, and the cheering and waving of hats and handkerchiefs seemed endless.' The Leidenaar appeared not to realize that his audience was conducting an unparalleled campaign for the Flemish University. 22

The historian Fredericq noted: 'Unheard-of scandal. Bolland cursed and spoke with foam on his mouth and growls in his throat. I was convinced he was drunk. Oratory skills like those of a filthy socialist.' Fredericq had noticed that not everyone shared his opinion: 'On the contrary, there was a

clique of students and Flemish-minded individuals who loudly cheered and, at the end of the sour prophet's curses, gave the Leiden professor an ovation.' Fredericq left 'crushed' in the company of Van Hauwaert and Fris, two of Marcel's former high school teachers.

23 The editorial board of Marcel's journal rejoiced: 'We have had the rare good fortune and honor to welcome a man within our walls who occupies the very first place among all our great minds in the field of knowledge, regardless of which one.'

Which country or people? A man who stands at the forefront of the great thinkers of the centuries, such as Aristotle, Plato, Spinoza, Kant, Fichte, Schelling, Hegel, Schopenhauer—the giants par excellence in the realm of intellect.' Marcel Minnaert and his friend Gaston Mahy 24 wrote to Bolland 'on behalf of Your listeners': 'You have appeared to us as an Apostle, giving us willpower and self-awareness, pride and manliness, teaching and instructing us; also reproaching and chastising us, as a father does with his children, for You came out of love... Out of love You came, - and love You have awakened. Your strongly pronounced personality shone upon us like the sun, and all beings indeed turn towards the light. A power emanates from You that inspires and elevates.'

The letter was in Minnaert's handwriting. Both young men needed a father figure, an idol, an inspiring force, a Sun. Minnaert invited Bolland 25 to provide a philosophy curriculum. He wrote: 'Is it even necessary to tell You what a deep impression we have all retained from Your series of lectures on Pure Reason?' Andries Mac Leod and he later formed a group. Every Thursday at half past five, the Flemish Philosophical Society would gather at Minnaert's home, with its chairman being Minnaert: this included secretary Edzard Domela Nieuwenhuis, Paul Van Oye, Gaston Mahy, Andries Mac Leod, and Paul De Keyser. Bolland accepted the honorary presidency. They read Kant and Plato and likely practiced dialectics in the style of 26 Hegel and Bolland.

The Dutch Reverend Jan Derk Domela Nieuwenhuis also entered Marcel's life. He had the stature of a prophet and resembled his uncle Ferdinand, the Dutch anarchist, in other ways as well. At Fredericq's suggestion, he was appointed by the Protestant community on Brabantdam, which had many Germans and Dutchmen among its members. The reverend, like Marcel, served on the board of the ANV. Characteristically, for a clergyman, his notable statement was: 27 'And furthermore, I am of the opinion that Belgium must be destroyed.' He was a vegetarian, non-smoker, and total abstainer. Minnaert adopted that ascetic disposition from him, which stood in stark contrast to the abundance at his mother's home. In the course of

1912, friends Gaston, Edzard, and Marcel emerged as founders of the total abstinence lodge *De Orde der Goede Tempeliers*. This initiative was supported, among others, by the Luxembourgish philosopher Peter Hoffmann, who taught in Ghent. The pastor found it pleasing that Minnaert followed his example in many respects but regretted all the more that the young man persisted in the absolute rejection of the Christian faith.

Just one more powerful assault

In the autumn of 1910, Marcel had written: ‘Perhaps since the 16th century, no greater or more stubborn struggle has been waged in Flanders for our own people and sacred rights than the daily battle being fought around us: the struggle for the Flemishization of Ghent University. The Flemings have become aware and now the flower of the Flemish soul is unfolding in the most glorious splendor; that Flemish soul full of poetry, strength, and will, full of courage and fire, full of untamable stubbornness and a drive for heroic deeds.’ He became one of the most impatient activists: ‘At this moment, it may be enough to launch just one more powerful assault so that the bastion of Francillonism will fall into our hands. Now is the time to steel our courage and willpower.’ He pointed to the Czech national movement in Austria-Hungary and praised the stubbornness of the Czechs, ‘his people, his language, nothing matters more to him.’ Minnaert identified with the Slavic Czechs, even when that nation resisted Germanic domination! His perspective was thus not so much about race but about the liberation of the oppressed nationality, whether Flemish or Czech.

The Czech movement was more radical than the Flemish: ‘But what we can learn from them is that we will achieve everything if only we want it. We are not even asking for as much as the Bohemians, and we are in much better circumstances than they are. Could we not attain our rights, our rightful demands? Yes, it’s true, we do not have the higher classes on our side; but then we will manage without them! And soon they will be Flemishized against their will through our Flemish University of Ghent.’ ‘It will surely go!’

In March 1911, Minnaert became a member of the Ghent board of the *Algemeen Nederlandsch Verbond* (ANV). This was an initiative by his former teacher Meert, who hoped for more decisiveness. As a result, he came into weekly contact with Reverend Domela and Catholic Flemish activists like medical specialist Speleers, who played a prominent role in the Great Staff. In Ghent that year, large meetings were held on February 19 and July 11. On

Guldensporenday, tens of thousands of demonstrators had gathered: a true triumph for the movement. Yet, from a party political perspective, things looked bleak in Ghent. Many municipal councils in Flanders demanded the Flemish University, but the Ghent council did so least of all.

In 1911, Fleming Alfons Sevens asked the Ghent city council for a position. Only six of the 38 council members deigned to respond; three in favor and three against. The liberal mayor Braun ensured that the University was not even on the agenda, while he himself publicly advocated for a bilingual university. Following this, Sevens founded De Vlaamse Blok together with Hector Planckaert and Alfons Van Roy. The 1912 campaign earned the party 1,800 votes, or 4.3%. In their magazine, they pleaded for Flemish-national independence. This last point was a new sound that resonated with radical Minnaert like music to his ears. That year, Walloon socialist Jules Destrée had argued in a Letter to the King that there were no Belgians, only Walloons and Flemings. The only way to get rid of the Catholic reaction, which had won the elections again in Belgium, seemed to Destrée to be a federal Wallonia where socialists and liberals had long held the majority. He advocated for transforming Belgium into a federation of the two peoples, thus for an administrative separation of the country. Incidentally, he rejected monolingualism, which he considered normal for Wallonia, for Flanders.

The Great Staff saw no point in addressing this administrative separation, as they considered it a diversionary maneuver from the campaign for the Flemish 33 College. Rebuttals like those from Hippoliet Meert emphasized that the Flemings were good Belgians fighting for just demands, though they did not fear administrative separation. Alfons Sevens of De Vlaamse Blok, however, sided with Destrée: 'Administrative Separation is the inevitable death of the Francophones. Finally, we will breathe pure Flemish air in Flanders and live in a disinfected house.' Sevens' hateful terminology indicated growing resentment. The flamingants suspected liberal Freemason lodges of conspiring against Dutchification. Brussels lawyer Josson then founded an imitation, De Vlaamse Veem, to 'free the Flemish people from all harmful foreign influence of France's interference in Belgium's domestic affairs, and to make the Dutch language reign as a queen over the entire expanse of Flemish land, in administration, justice, army, and school.' The Ghent branch of this Veem met monthly at Minnaert's place. Among the moderates were Hippoliet Meert and Boudewijn Maes; among the radicals were Marcel Minnaert, his mother Jozefina Van Overberge, teacher Antoon Thiry, ship's doctor Jules Van Roy, lawyer Alfons Van Roy, and atheneum teacher Jan Oscar De Gruyter. The moderates opposed administrative separation, while the radicals supported it.

In December 1913, Minnaert was among the initiators of the Association for Civilized Pronunciation, which wanted to connect more closely with intellectual life in the Netherlands. Together with the headmaster of his lower school on Onderstraat, De Hovre, and his friend Andries Mac Leod, Minnaert pointed out a 'regrettable gap': Flanders lacked a generally civilized spoken language.

The goedendag and the Dutchification of the atheneae

Marcel began to focus again intensively on De Goedendag as a 'high student.' Student Michel Van Vlaenderen had resumed the radical flamingant stance at the Athénée Royal and started a 'grievance chronicle' in 1911. His complaints about French texts on attendance slips and school fee statements nearly led to his expulsion from the Ghent atheneum. Franskiljonse study prefect Eugène Clevers was his opponent. Minister Poulet of Arts and Sciences had a conversation with Van Vlaenderen about this issue, upheld the student's case, and insisted on Dutch texts for all circulars of the Flemish atheneae. The prefect dared not take disciplinary measures. Marcel now saw De Goedendag as a means by which students could enforce their rights. That was literally what Vermeylen had pleaded for.

In 1912, the magazine, with Minnaert as editor-in-chief, entered its 20th year. Starting in September, the editorial board moved from Antwerp to Ghent, Citadellaan 73, where the management would now be based and the editors would reside. These included Marcel, Miss M. Ingels of the Hélène Swarthkring, the graduated biologist Paul Van Oye, and the high school students Michel Van Vlaenderen and Evarist Verdurme. The latter was a poet and used the pseudonym Ledegouwer in the editorial board. Van Vlaenderen continued his struggle, and Minnaert could keep him as a 'high student' under cover. In the confrontations, there was often uncertainty about the stance of the Flemish-minded teachers. There was also division regarding bilingualism.

Minnaert paused on this in the Jong Vlaenderen editorial. According to him, fierce opponents stood within their own ranks, betrayers of their own people: 'If we do not cast them away as poisonous brood, will they not be trampled by avenging feet?' His terminology resembles that of De Vlaamse Blok. Marcel considered victory near, but nonetheless wrote: 'They will stifle us in bilingualism.' He had finally noticed the danger posed by Fredericq and his followers against the Dutchification of the university. Marcel had no sense of nuance: you were either his hero or a traitor to your country and

people. The cowardice of the elders would reign 'until the day when a youthful generation, fully aware of its strength and omnipotence, will rise; until that day there will be a crowd of Flemings who will be Flemish, down to the most tender strings of emotion, down to the finest fibers of the heart. Until the day when that Flemish youth will sacrifice everything for the salvation of our tribe and the greatness of our culture." He evoked the image of the chosenness of Flemish youth. Marcel knew himself to be chosen and called upon his companions to live in this great era: 'Your meetings must be councils of war and training grounds.' The students had to free themselves from Frenchification and develop in 'the radiance of immaculate national culture.'

On October 16, 1912, August Vermeylen spoke in Brussels about Belgium and European civilization. In it, he stated: 'To be something, we must be Flemish. We want to be Flemish to be Europeans!' The misery with Belgium was that the state poisoned the sources of healthy nationalism, so there could be no question of internationalism: 'In Belgium, there is not a single scholar who has heard a word of Dutch at the university. What influence can such people have on the people?' Such a people could not develop style, play a role in Europe. On the other hand, Vermeylen praised the thorough knowledge of languages among the flamingants, who were the only cosmopolitans in Belgium, predestined to promote harmony between the Romance and Germanic spirits: 'We must be Flemish to become world citizens.'

Marcel thought it an excellent article, as it was printed in **De Goedendag** in two installments starting from the front page. Shortly thereafter, a headline appeared stating that 'comrade Ledegouwer of the Atheneum has been expelled because he wrote: "bare breasts"! Scandal! Scandal!' It was really something to cry about.

A screaming, wild hatred

It turned out that Verdurme had once assisted his comrade Van Vlaenderen when he again pointed out a violation of the language laws. Prefect Clevers had snapped at Verdurme that he should especially not follow in Van Vlaenderen's footsteps, as it would soon be over for him. On November 15, 1912, Verdurme's poetry collection **Heoos** appeared under the pseudonym Ledegouwer. Immediately, drawing teacher Van Puyvelde, an art historian and self-proclaimed flamingant, had complained to the prefect about a poem by a student mentioning 'bare breasts.' This performance is all the more astonishing because Van Puyvelde, the same man who had encouraged the

poet to make his debut, was involved. Unlike the prefect, Van Puyvelde was aware of Verdurme's pseudonym as an editorial member. On the very same day, Prefect Verdurme expelled him from school. The editorial board wrote: 'It is an unheard-of and incredible fact. And yet our colleague, our friend Ledegouwer, has been cast out of the Atheneum. Is he removed like rotten fruit from the 'good'? Is he shown the door as one infected with plague, with dirty fingers and a contemptuous mouth...?'

The editorial board of **De Goedendag** could not express their 'boundless contempt and unspeakable aversion for those who committed this knavish act.' Verdurme had been a good, quiet student. His collection had nothing to do with the school. Minnaert mocked Prefect Clevers and teacher Van Puyvelde for pages on end. There were no reasonable arguments for Clevers' actions: 'Did he see an opportunity to take revenge on one of the editors of **De Goedendag**, or did he want to strike at the Flemish nationalist through Ledegouwer?' Was it the revenge of a francophile? Minnaert could not get over it: 'I can't find the words, and my thoughts swirl like autumn leaves in a whirlwind...' He knew Clevers well from the board of **Dodonaea**; he had followed Van Puyvelde's art history course at university. A young, talented person had been betrayed.

Minnaert envisioned a small house, a boy approaching slowly. A mother's laugh, suppressed sorrow, the words 'I have been expelled,' and the thud of a falling body: 'I see, Mr. Prefect, a household full of inhuman sorrow; - I see, Mr. Prefect, a philistine sitting in an armchair, lecturing on morality. I feel the despair of the parents who had spun golden dreams with tenderness and love, but whose souls are now shrouded in cold black night. I feel the hatred, the screaming, wild hatred of him whom they trample with their feet, kicking away the deepest, most sincere, and most honest thing he possessed, like rotting filth.' Marcel identified with the victim.

He called on young people to buy Ledegouwer's collection and discover its profound humanity. The 'entire Flemish youth' stood by him, on the side of sincerity, courage, and light! Later issues mentioned the support from schools and the vengeful actions of some pro-Flemish teachers. Minnaert: 'Their "opposition" makes us laugh! What can they, those small-minded sycophants, do to harm *De Goedendag*, the journal of light? If only you knew how I despise you, so-called flamingants, who for the sake of a position as a teacher, professor, or member of an academy, lick political boots. Oh, if only you knew how I despise you, who for the sake of your parvenu politics want to oppose true flamingants. We are not afraid of you!'

In **De Vlaamse Gids**, Maurits Sabbe wrote a review in which he called Ledegouwer 'particularly mildly gifted' and 'a strong force for the future.'

The editorial team of issue 42 picked up on this assessment.

This affair radicalized Marcel. It must have fueled his deep hatred towards Flemish-minded individuals like Van Puyvelde and intensified his disdain for the ruling generation.

From bilingualism to monolingualism

Minnaert soon after wrote a treatise on bilingualism, the tone of which in the country drew attention. He gave great credit to the socialist Destrée and his Wallonists: 'They showed with unflinching courage that Belgian patriotism fundamentally does not exist. We feel nothing, absolutely nothing for Belgium, where we are treated as lackeys, as slaves; the Walloons feel nothing either: they say so themselves.' Here, the young Vermeulen resonated. Minnaert criticized the historian H. Pirenne: his attempts 'to show that Belgium had already formed a unified whole from very early on are truly ridiculous and remind one of a beetle crawling against a glass pane. Pirenne's entire theory is destroyed by a small, seemingly insignificant remark by Prof. De Vreese: the medieval Flemings never made gallicisms in the construction of their sentences.' Minnaert, a third-year student, called the Walloon Pirenne, the celebrated praise-singer of Belgium and the scientific Jupiter of Ghent University, a crawling beetle!

Marcel could get terribly worked up over bilingualism: 'If I see on all public buildings in Ghent, on municipal documents and forms, etc., the two...If I were to see languages, sometimes I could become furious, thinking to myself how ridiculous and insulting those bastardized signs are in the free, proud, ancient city of Artevelde. We want no bilingualism! Flemish must be the language here. Flanders for the Flemings." Anyone living in Flanders must learn Flemish: "Whoever does not know Flemish will find all public offices in Flanders closed to them, will not understand what they read or hear spoken. It is their fault. This is the case in every country in the world. The coercion to learn Dutch will thus be indirect but no less forceful. It must happen, because anyone who is a citizen of Flanders and does not know Dutch cannot fulfill their civic duties toward their people; they can therefore also make no claim to their civil rights."

Incidentally, Marcel, like a Cato, believed that the Frenchified Flemings formed a center of corruption that had to be eradicated: this was an echo of Reverend Domela.

His first demand, besides a Dutch-dominated university, was also for a Flemish army: "We want a Flemish army where our soldiers do not hear

a single word of French, where all communications and commands are expressed in one language alone, where they learn **De Vlaamse Leeuw** and not **La Brabançonne**. We want that everyone born and living in Flemish Belgium is necessarily enrolled in Flemish regiments; if they do not know our language, they must learn it."

Minnaert wrote: "It is better to get nothing—do you hear!—than the systems of Fredericq, Pirenne, and others for the university, and the amendment by Buysse-Pêcher-Persoons for the military law." He concluded with an ode to pure youth: "There you have our program, there you have our ideal, which is just as noble and sublime because we young people, in the full awareness of our youthful strength, dare to gaze upon its clear radiance entirely and completely. Flemish youth, glorious eagle, do not shrink back from the light, but fly straight toward the sun."

A spark of immortality

This argument by editor Minnaert was a sign of the times. In Antwerp, his article made a great impression. Young radicals were fed up with Belgium, wanted to get rid of the Moloch that trampled their ideals. At the end of this academic year, a whistleblower named **Qui tuba sonat** published an article about **Soldaterijen**. In 1913, the first conscripts were called up. Of the 104 enlisted recruits, 48 had requested instruction in Flemish, which was refused. Fifty students had shown Flemish leave passes, which were torn up by the captain. The writer called on the students in the army to fight for their rights so that their less educated brothers could benefit from it. 'Decisive Flemings' could bring about a change in discipline: 'Comrades, don't forget, conscription is near and no less is expected of you.' The May 1913 article was unsigned and thus appeared under Minnaert's responsibility.

Marcel ventured again at the start of the new academic year with a poem:

'But we want life, we want pain,
We want to fight, we want to free. O
h dearest, come, press me wildly to your heart,
And let us run on flying horses,
Drinking strength from each other's gaze,
Amidst the howling wind and the roar of cannons,
Through the screaming storm of the somber night,
Until new horizons rise far away.'

Four months later, a page with a black border appeared in memory of Evarist Verdurme, 18 years old, student in literature and philosophy, who died on January 15, 1914, in Paris after a painful illness. Marcel spoke at his funeral and wrote an In Memoriam for De Goedendag:

'He was so pure, in the glow of his youth, boldly advancing like a young hero, singing his fiery song, striving for what is noble and good. He was a poet at heart; he dared to deeply feel what stormed in his heart and his thought was stronger than prejudice and convention; he dared to fight for Life, with deed and word. He was the born reformer. He proclaimed the future of mankind. But in hours of calm domesticity, how could his eyes look at you, so tender, so clear as a child's! Then he spoke softly and questioning, telling about his village and his simple country people and the trees in the field. Then he wished to be cared for; then he felt at home; then he let himself be called Eva. Poor Eva, good comrade, what drove you to the distant land? Was it the drive for action and love for the beautiful wide world?' Was it the longing for a blue sky and warmer sun? Poor Eva, Eva with your golden hair, Eva with your clear eyes, oh, did you want to cast one last glance at life in all its beauty and joy before... dying? Now you float on wings of light in the radiance of the growing dawn. And we people of Earth, who mostly did not understand what sang in your warm heart, still feel that something great has lived among us, a soul that carried within it the spark of immortality. Your memory stays with us, pure, uplifting, and inspiring."

Marcel chose from *Heoos*, the fleeting *Dawn*, the poem "My Life":

"My life was dreaming in prayer,
In tender reverie;
My life was love, and devout melody.
Now I await Death, and sing
With a simple mouth, like a child,
Of the many, many things
I have loved."

Here Marcel showed his loving side. His rhetoric had vanished. Perhaps the loss of Evarist touched the nineteen-year-old so deeply that he could let the words come from his heart.

At the end of 1913, ANV-Ghent established a Youth Division with Minnaert and Michel and Martha Van Vlaenderen as board members. The orientation of the ANV was one of collaboration between liberals and Catholics for concrete goals. For Marcel, this meant a break with the liberal camp.

Marcel breaks with the liberals

From April 4 to 6, 1914, the Fifth Great Dutch Student Congress was held in Ghent. The organizers were the liberal group 't Zal Wel Gaan, the ANV student section (ANSV), and the Catholic Higher Education Association (KHSV). Minnaert served as general chairman and wrote: "It must be the major event of the year; it must be a festive and grand symbol of the powerful unity among all young intellectuals from the Netherlands, South Africa, Indonesia, and Flanders. We must show the gentlemen franskiljons that we are aware of the support we have in Dutch science and Culture."

The congress was timely due to the parliamentary handling of the Hogeschoolkwestie: the students had to demonstrate that political differences played no role. Minnaert pointed out the close cooperation that existed between the liberal and Catholic organizers.

On the eve of the congress, a protest meeting took place. After it had seemed that there was a parliamentary majority for the Dutchification of Ghent, this appeared to evaporate in the parliamentary committees. There was only talk of doubling the courses, thus a bilingual university. On April 1, 1951, comrade Leo Picard welcomed about a hundred students from Ghent. The report states: "Then Mr. Minnaert speaks. An end must come to the destructive nonsense of bilingualism, which is a means to impose French on us! (applause). If the doubling is approved, then we will make revolution! (long applause). We must resist half-measures and boycott the Flemish courses if they are placed alongside the French ones! (thunderous applause)."

On Saturday, April 4, at the start of the congress, there were no fewer than 110 students from the Netherlands: eighty gentlemen and thirty ladies. According to **Neerlandia**, chairman Minnaert had aroused "general enthusiasm" and Karel Van de Woestijne had praised his "inexhaustible eloquence." At the end, they sang among themselves: "Nothing went well/If Minnaert doesn't take care of the main thing." At the end of Edzard Domela's jubilant report, Minnaert had jumped up and asked: "Do you all swear, you Greater Netherlands supporters present here, that the French university will disappear," to which a prolonged "yes" echoed from hundreds of throats. The report in the members' journal of the liberal organization 't Zal Wel Gaan was entirely different in tone. Minnaert had announced at the opening session that 't Zal Wel Gaan had withdrawn and gave foolish reasons for it. Those present responded with an indignant "Hou." The socialist Kamiel Huysmans had spoken excellently, while a second speaker, one Lambrichts, had complained about the betrayal in the Flemish Movement: 'It was regrettable that the speaker had not understood where he was speaking.' 'T Zal

Wel Gaan had invited the participants to a 'tonzitting,' which was a colossal success among the Dutch.

The dispute had been widely discussed in the Ghent press. There was disagreement over the kroegjool, which Edzard Domela had characterized as a relic from the time when the Flemings were still half-wild. Everything that smelled of tobacco and alcohol had been removed from the official program by Minnaert and Domela. The liberal students could appeal to the praise in *Propria Cures*. Moreover, 'T Zal Wel Gaan felt that they had been given too few chairmen at the meetings. The protest had not helped. The liberal camp had withdrawn thereafter. The liberal columnist Lamme Goedzak believed: If the Catholics wage the struggle with the slogan All for Flanders, Flanders for Christ, then the liberal Flemings will understand that they must fight with the slogan: All for Flanders, Flanders for Progress.

This last remark was a reproach to Minnaert, who was criticized in a follow-up article: 'A student who does not belong to the clerical party recently cried out, "T Zal Wel Gaan must be destroyed!" And why? Because he thinks that there is only one fruitful flamingantism that rises above all parties and wants to work outside all politics.' According to the liberal students, this 'neutrality' was solely directed against them: 'Have we seen them take action against the Catholic Flemish-minded students? They too engage in that abhorred politics. On the contrary; before, during, and after the Great Dutch Congress, these gentlemen were shamelessly favored by the organizers for the sake of neutrality.'

There was bitterness in the liberal camp, although this conflict was formally settled. The fact that the Flemish University was off the table because the liberal parliamentarians had not wanted to support the vernacularization was discussed dismissively in the same journal. The chairman's conduct seemed arrogant and unnecessarily offensive. The reason was that Minnaert was furious with the liberal party leaders who trampled on their promises. His radicalism compelled him to break with his comrades from 'T Zal Wel Gaan, whom he had publicly humiliated. He was tired of interacting with the liberal-minded students who covered liberal politics with the cloak of love. The friendly contacts with his peers turned out to have been purely functional for Minnaert. Those who had previously been 'good' could suddenly become 'bad.' His former allies had become traitors in Marcel's eyes. He couldn't understand why his peers saw things differently than he did, yet they remained Flemish-minded. Within a few months, he shifted from a Flemish-liberal to a Flemish-nationalist viewpoint. His promoter, Mac Leod, was also the behind-the-scenes promoter of this political development.

The study group around Mac Leod

The political year 1913-1914 brought one disaster after another for the flamings. Nothing came of the Flemish regiments. The July 1913 law required officers to train recruits in Dutch over time, but the commands remained in French. In February 1914, compulsory education up to the age of twelve came into effect, but parliament rejected the principle of territoriality—Flemish in Flanders and French in Wallonia. A wave of Frenchification of primary education followed in Brussels. Finally, even the Dutchification of Ghent seemed to fail. The response of Belgian democracy to five years of Flemish mass movement was to deliver three heavy blows.

Young radicals like Minnaert felt deeply offended. Their trust in parliamentary democracy dropped below zero. Mac Leod became the inspirer of a group of young people with whom he could prove his point that the greatest danger for Flanders lay in the fragmented party politics. According to his niece, the writer Virginie Loveling, he possessed 'a miraculous ability to fanaticize the very young.' Mac Leod weekly gathered a dozen selected young people, including Minnaert, to discuss his plans with them. According to disciple Frans Primo, true leaders had to abandon their party colors and henceforth only seeing 'the black on yellow field, a symbol of our Flemish national consciousness' shining. Each of them had to choose a subject they would specialize in: 'These circles and societies in their shared work aimed at one and the same goal, which according to him would be the great study room of Flanders, from where liberation would slowly but surely be achieved through actions.' In short, Mac Leod preceded Marcel in Flemish nationalism.

MacLeod's efforts in this way confirmed his dispute with the Grote Staf by forming a new leadership for the Flemish Movement. His achievements were closely monitored, as evident from an exchange of letters in June 1913 between chairman Max Rooses and Lodewijk De Raet, mentioning a group of 57 malcontents in Ghent: this group 'consists of older leaders who have been pushed to the background with the creation and operation of the new Higher Education Committee, and some younger individuals. They seem to want to disregard the authority of the Higher Education Committee, the Grote Staf.' During the period of growth, they had no chance of success: 'In the face of the glorious achievements obtained by the Committee in the struggle for the Flemishification of Ghent, they had to remain silent; but now that the Committee, due to circumstances, the 1912 elections, and the battle begun in Parliament, cannot continue and is experiencing a period of idleness, they raise their heads again. They push forward the 'younger and

radical elements,' the 'impatient ones,' the 'incautious.' Rooses particularly had Mac Leod in mind.

Mac Leod's plan required great perseverance if it were to lead to results in a democracy. In these months, some of his followers initiated publications that were not based on scholarly work at all. In May 1914, the anonymous monthly magazine **De Bestuurlijke Scheiding** appeared: 'There is something fermenting, something brewing, something cooking in the hearts of the Flemish people! An action, an action, an action!!!' the first issue blared from the rooftops. The magazine opposed both the Belgian state and Flemish politicians as well as the leadership of the Flemish Movement with equal vehemence. The historian Maurits Basse, Marcel's former teacher, later referred to a magazine 'compiled by some quarrelsome malcontents who follow every party with mouths full of disapproval, like the abusive slave following the Roman triumphal wagon.' They were mostly young people almost in hiding, Conspiracy lovers.' Basse was concerned with the same group of dissatisfied individuals around Mac Leod, among whom was Benjamin: Marcel Minnaert.

The administrative Separation

De Bestuurlijke Scheiding had anonymous editors including Antoon Thiry, former editor of **De Goedendag**, who managed the administration with his wife Marthe Van Ael at the Flemish House on Sint Baafsplein, Jules Van Roy, former chairman of 't Zal Wel Gaan, Reimond Kimpe, also a former editor of **De Goedendag**, and Minnaert. Thiry and Kimpe were friends with Felix Timmermans and had both published literary work. Thiry later said about the magazine: 'In it, party politics were relentlessly attacked, the fatal ambiguous role of the parties toward Flanders was condemned as criminal, and the administrative separation was presented as the only acceptable goal of the struggle.'

The editorial members called themselves Testor I, II, III, and so on. On the front page of the May issue, there was a creed: 'In the pus of your rotting party politics, you are suffocating, unworthy Flemish-minded politicians! Step back, you cowardly believers and despicable traitors! Sweet-talking daily newspaper writers who still dare to say, "we wanted what is right, and we got what we wanted," those words on your overly praising lips, you wretches, must die. Fools, all of you!' The school law of May 1914 had been a stab in their hearts: 'We will shout even louder inside when the Flemishization of Ghent University also fails due to the submerged rocks of

treacherous politics, and it will.’ The Great Staff could do with it: ‘You are not breeding lions but dogs from your people, dogs maltreated and trained by animal torturers, the Francophiles and their Flemish-minded henchmen, who will only bite when the torture finally drives them... to madness.’

The editorial team was focused on action: ‘Yes, it must come to action if Flanders is truly destined for redemption!’, ‘it is not the laws that make a people! The people create their own laws!’, ‘we see no salvation other than in a National Flemish party, which will not allow itself to be involved in petty clique politics. It will bring you deliverance with one strike, with one word.’ From this prose, it is clear that the circle around Minnaert, Kimpe, and Thiry was willing to justify authoritarian politics. Their disappointment in democracy turned into a rejection of its principles. They were vague about the alternative regarding the administrative separation, they neatly wrote that it ‘will be thoroughly studied by us’ once the place has been cleaned up, but ‘we will frequently return to the same topic, with ever new evidence and arguments.’ The metaphor of the broom is timeless; MacLeod’s discourse resonated loudly.

Testor I expected the salvation of Flanders from a willingness to resist and the inner strength of the Flemish people: ‘The Flemish movement must stem from a great principle: *Die Wille zur Macht* of a people that still feels its own vital force unbroken.’ The struggles of the Poles, Czechs, and Norwegians were led by literary figures. Why couldn’t this happen in Flanders? Where was the artist who could move his people like Hendrik Conscience or the composer Peter Benoit: ‘We await him, he will come to Flanders as a new Messiah!’

This is how these radical young people rushed forward. They expected their salvation from personal study, charismatic appearances, and a sudden, authoritarian change in circumstances: a Messiah! Only a miracle, a *deus ex machina*, could provide an escape. Fanatical youths like Minnaert finally wanted action and results, no matter the cost. The August issue of *De Bestuurlijke Scheiding* focused on France, Flanders’ age-old enemy: military censorship prevented its publication.

Josef Minnaert had warned Marcel in his Farewell Letter about passion and fanaticism, a family flaw. His brother Gillis, nearly eighty and Marcel’s godfather, completed his life’s work in 1914—a kind of Layman’s Mirror for the Flemish people. He too indirectly admonished Marcel: ‘Imagination is like a soft, penetrating fire whose light and glow illuminate and warm us when it is fed and maintained with tender caution, but it consumes and destroys if allowed to flare up uncontrollably.’ This passage could have been in the Farewell Letter. However, Marcel hardly involved himself with his

godfather, nor as a 21-year-old adolescent did he need the commandments of his father. After all, these were the same principles that had laid the foundation for his extreme resistance stance.

On July 24, 1914, Marcel graduated cum laude with a doctorate in biology. A few weeks earlier, shots rang out in Sarajevo. People unaware of what was to come went on vacation. Jozefina, Marcel, and cousin Emiel Minnaert would continue their 1912 Scandinavian journey and traveled at the end of July to the southern part of Norway and Sweden. Jozefina noted in her diary: 'Trollhättan: The storm brewing on Europe's political horizon was indeed there, but we didn't notice it at all. Untroubled, we continued our journey. Belgium was so far away; surely nothing could happen to Belgium.'

Endnotes:

1 Minnaert's contributions appear in the Botanical Yearbooks of Dodonaea from the years 1911 through 1915. In Paul Van Oye's retrospect of October 1935, MacLeod's influence on his students is reflected in Minnaert's role. Other contributors to MacLeod who were remembered included Prof. Dr. C. De Bruyne and Prof. Dr. A.J.J. Van de Velde. On October 21, 1935, a bust was unveiled at the student house Huize Mac Leod.

2 Minnaert, M., Botanical Yearbook, 1911.

3 Minnaert, M., Light and Shadow Leaves in *Ilex aquifolium*, Botanical Yearbook, 1912, 23-26.

4 Minnaert, M., Proceedings of the XVIIth Flemish Natural History and Medical Congress, 1913.

5 Minnaert, M., Science: Our Competition on the Sun Eclipse, *De Goedendag*, 1911-1912, 131-133. Idem, Something about Mathematical Chance and Mathematical Hope, 73-76.

6 This explanation was contested by a mathematics teacher: More on the Sun Eclipse, 157-159.

7 Minnaert, M., Jakob Hendrik Van 't Hoff, *De Goedendag*, 1910-1911, 117-120. 8 Minnaert, M, 1914. The French dissertation is untraceable. However, the Dutch version from 1918 is available in many places.

9 In 1911, he had already conducted these experiments earlier. 10 His pride in this construction became apparent later when, as an astronomer, he referred to a graphical construction of a entirely different form as a 'growth curve' (1934). In modern astrophysics, 'growth curves' are still determined.

11 The quote is almost prophetic. In Utrecht, he was tasked in 1919 with quantitatively measuring the intensity of Fraunhofer line shadows.

12 Ciessen, M, *Almanac 't Zal Wel Gaan*, 1914, Marcel: Natural Philosophy Student; Musician; Lecturer, 182-185. Including a caricature by E.D. (Edzard Domela?): see Vanacker, 1991, 20.

13 In *De Goedendag*, there was a section called Kinema, which Marcel likely edited.

14 MacLeod, 1897. He lived from 1857 to 1919: Marcel was his last PhD student and accompanied him when he was nearly sixty.

15 Lamberty, 1961.

16 Lamberty, 1961, 75. De Raet, second edition 1911. De Raet lived from 1870 to 1914. Remarkably, many lives of prominent progressive Flemish activists ended prematurely between 1914 and 1925, such as those of De Raet, Meert, MacLeod, Fredericq, De Gruyter, De Bruyker, and Rudelsheim. The concept of 'volkskracht' was borrowed by De Raet from the Dutch Flemish-minded Leo Simons, director of the Wereldbibliotheek.

18 De Schaepdrijver, 1997, 30-31.

19 Lamberty, 1961, 11-112.

20 Geyl, 1958, 107.

21 Otterspeer, 1995. The student who visited him was the later philosopher Lucien Brulez. Bolland traveled to Flanders on December 16, 1911, for a first series of lectures. In Otterspeer, chapter 45, Bolland and Belgium. Three centuries before Bolland, Simon Stevin had already pointed out the unique suitability of Dutch for scientific work. Minnaert would later focus on this as well.

22 Fredericq, *Diary*, December 21, 1911.

23 Bolland's lectures, *De Goedendag*, 1911-1912, 36-37. 24 Bolland Archive, letter of January 17, 1912. 25 Bolland Archive, Minnaert's letter of October 2, 1912.

26 Minnaert to L. Buning, May 17, 1970, mentions studying Kant and Plato. Buning Archive.

27 Fromme, 1942. This book contains childhood memories of Domela. 28 Minnaert, M., *The Struggle for the Flemishization of the University*, *De Goedendag*, 1910-1911, 85.

29 Minnaert, M., *Czech Movement and Flemish Movement*, *De Goedendag*, 1910-1911, 41.

30 Dedeurwaerder, 154. Speleers was an ear, nose, and throat specialist.

31 Vanacker, 1991, 12.

32 Destrée, J., 1912. Brouwers, J., 1988, takes his title from this.

33 Meert, 1912. The ANV distributed his response in a large print run.

34 Vanacker, 1991, 21.

35 Vanacker, 1991, 20.

36 The Van Vlaenderen issue was major news in *De Goedendag*, 1911-1912 volume. The conversation with Poulet took place on July 16, 1912."

37 Vermeylen, in 1895, wrote that enforcing the application of the 1883 law was the task of every Flemish-minded person.

38 Paul Van Oye was the son of Dr. Eugene Van Oye from Ostend, once the beloved pupil of Guido Gezelle. Van der Plas, Chapter V, *Poësis*.

39 Minnaert, *Jong Vlaanderen*, *De Goedendag*, 1912-1913, pp. 2-4, Minnaert's main editorial for those two years.

40 Vermeylen, A., *Belgium and European Civilization*, October 7, 1912. Appeared in *DG*, 1912-1913, pp. 17-19, 33-35.

41 The adventures of Evarist Verdurme in *De Goedendag*, 1912-1913, *The Ledegouwer Case*, pp. 49-55, 65-66, 68. Leo Van Puyvelde had been appointed at the University a few months earlier. Marcel followed his academic course in art history and took the exam on July 15, 1913. Van Puyvelde became the art pope of Belgium, curator of the Royal Museums in Brussels, an expert on Rubens. Therefore, due to his profession, he would have to deal with many bare breasts and worse; let it be granted to him.

42 Sabbe, M., *The Flemish Guide, A Youth Book*, January 1913; cited in *De Goedendag*, 1912-1913, pp. 80-81.

43 The same Van Puyvelde plays a remarkable role in *Dedeurwaerder*, p. 194.

44 Minnaert, M., *Tweetaligheid*, *De Goedendag*, 1912-1913, 83.

45 De Smedt, 1954.

46 *Qui tuba sonat*, *Soldaterijen*, 16 mei 1913, *De Goedendag*, 1912-1913,

47 Minnaert, M., *Vers*, *De Goedendag*, 1913-1914, 4.

48 De Keyser, P, 1936.

49 Minnaert, M., *In Memoriam Evarist Verdurme*, *De Goedendag*, 1913-1914,

50 Minnaert, M., *Orgaan 't Zal Wel Gaan*, 1914.

51 *Protest Meeting*, *Orgaan 't Zal Wel Gaan*, 1914, 24. In the 1920s, students would indeed boycott the Dutch courses of the bilingual system-Nolf.

52 E. Domela Nieuwenhuis, *Neerlandia*, 1914, 101.

53 *Neerlandia*, May 5, 1914; *Organ ZWG*, *The Great Dutch Student Congress* (25-26), *A Heated Disagreement* (29-31), *Klauwaert and Geus by Lamme Goedzak* (35-36), *Klauwaard and Geus* (51-53), *Echoes of the Fifth Great Dutch Student Congress with quotes from Propria Cures* (53-55). How unexpected his step was is evident from the biographical sketch in the 1914 *Almanac of ZWG*. The 1913 *Almanac*, pages 62-63, mentions Minnaert's presence as a representative of ZWG at the Fourth Great Dutch Student

Congress in Amsterdam on February 1, 2, and 3, 1913, where he must have met the medic H. Burger.

54 On April 24 the governance of the ANV decided that the dispute had to be resolved. A committee decided that they would collaborate 'More united than ever'. Everything had been based on a misunderstanding: Minnaert had merely interpreted an unofficial statement as official.

55 Quote from V. Loveling in Vanacker, 1991, 24.

56 Obituary of Mac Leod by Frans Primo in **De Toorts** of March 10, 1919.

57 Quote from a letter by M. Rooses to L. De Raet from June 1913 in Lamberty, 140.

58 Quotes from **The Administrative Separation** of May, June, and July 1914. The third issue on bilingualism seems to have come from Minnaert's pen, as well as the discussion of the performance of Peter Benoit's *Rubens Cantata*. The call in **Through the people, for the people** for a Flemish Messiah would rather have come from the literary corner.

59 Basse, M., 1930, I, 71.

60 Characteristic description in Vanacker, 1991, 22-23. Quote from Thiry, 1943.

61 Minnaert, G.D., 1913-1914, Part I, 109. **Mind and Aesthetic Sense** is an encyclopedic work for ordinary people, covering all aspects of social life. It is a product of the pursuit of popular elevation. Fredericq mocks it in his diary.

Chapter 4

Flanders free under German authority

‘All the so-called “theories” of these “scholars” do no harm, and they may write entire inkwells full of them, as long as they do not hinder fresh, lively action.’

The start of the war for the Minnaerts

The Minnaerts arrived in Norway at the end of July. On August 1, 1914, they packed their suitcases for a trip to Trondheim. They read that Belgium had mobilized and that Germany had declared war on Russia. They had intended to continue their journey but the Norwegians also mobilized. On August 3, the newspapers reported: ‘Germany declares war on France and Belgium.’ They took a ship to Newcastle and arrived in Ostend via Folkestone on the *Leopold II*. On the evening of Monday, August 10, they were back in Ghent.

The Germans had demanded free passage through Belgium. King Albert rejected their ultimatum. His proclamation of 4 August ended with: ‘Remember, Flemings, the Battle of the Golden Spurs, and you Walloons, that at this moment the honor of the 600 Franchimontois falls to you.’ At that time, the King was aware that Flemings and Walloons lived in the country. The invasion unleashed a wave of Belgian patriotism. Some 20,000 volunteers enlisted to strengthen the conscript army; mostly Flemings. The Belgian defense stalled the German war machine. The Germans committed war crimes against the population: executions, including of women, hostage-takings, reprisals, looting, and even mass murder. This terror was meant to

paralyze the Belgians, so that the communication lines to the French front would remain untouched. The Germans destroyed Liège, Aarschot, Leuven, Mechelen, Andenne, Dinant, Ypres, Tamines, and Aalst. The burning of the Leuven library became world news. By brutally attacking a small country, Germany turned world opinion against itself. Cyriel Buysse portrayed the desperate panic of the people in **The Two Ponies**. In the first weeks, more than a million Belgians fled to the Netherlands: one in seven inhabitants! France also took in hundreds of thousands of Belgian refugees. The army only had to surrender the fortress of Antwerp on 2 October.

Minnaert did not want to fight for Belgium. He had set up a hospital in the Normal School and served as its head for two months. When the Germans stood before Ghent, that field hospital was evacuated. He fled to Sluis in the Netherlands on 12 October and considered studying in Amsterdam under biologist Hugo de Vries, a friend of MacLeod. Ghent was spared from war violence because the city surrendered: the Germans behaved relatively correctly. He returned on 17 October when it seemed that the Germans would not take measures against young men. He continued his research at the Plantentuin, worked on a publication about botanical walks around Ghent, and began self-study of Russian. Primary and secondary education resumed that month, but the university remained closed.

In mid-October, the Belgian army regrouped in the extreme southwest corner of Flanders behind the Yser line. Flemish civilians had pointed out to the military leadership the inundation techniques used by Maurice of Nassau three centuries earlier. The area around the insignificant stream transformed into a marshy, kilometers-wide trench system. The fame of Brave Little Belgium was immense: the entire world was engaged in Belgian works. The pacifist writer Romain Rolland compared the spirit of Belgium to that of Charles De Coster's *Tyl Ulenspiegel*, the legendary Fleming who had always resisted the 3 oppressors. The occupier banned passenger traffic between municipalities. Ghent lay in the Etappe, the zone between the military operational area and the rest of the country, where further restrictions applied. Hatred for the occupier was universal.

The only Flemish group that secretly pursued an anti-Belgian course was that of the Ghent dissidents from *De Bestuurlijke Scheiding*. Julius MacLeod, their spiritual leader, had pinned on the Belgian cocade and fled to Scotland. De Bruyker, MacLeod's right-hand man, would remark: 'The seed sown by MacLeod has grown: Minnaert, Picard & Co are his fanatical followers.' The orphaned youth found a new leader in Reverend Domela.

The oath-sworn of Jong-Vlaanderen

Defending Belgium had been different for the Flemish-minded volunteers than choosing sides for the Allies. The coalition of arch-enemy France and tribal enemy England, exterminator of the Boers, with the tsarist Russia of 'butcher' Nicholas II could stir little enthusiasm. The most radical Flemish nationalists, including Minnaert, did not see Belgium as their fatherland and refused to defend it.

The group of De Bestuurlijke Scheiding had remained intact. During the warm late summer of 1914, they often gathered at Minnaert's home. The group expanded with telegraph officials Jozef Boulangier and Frans Primo, architectural draftsman Lodewijk Pintelon, 'exchange agent' Omer Steenhaut, and teacher Robert Rens. Two striking personalities joined them. The first was the historian Leo Picard, a student of Pirenne and a friend of the Dutch nationalist Frederik Carel Gerretson, alias the poet Geerten Gossaert. The second was the older Dutch reverend Jan Derk Domela Nieuwenhuis Nyegaard.

The young people had hoped for a miracle for Flanders, for a Messiah. Their wishes were fulfilled. Domela had a long beard, piercing eyes, and a prophetic presence. He presented them with his bold plan inspired by Paul: 'If this World War shatters the monster that oppresses the Flemish people, and forever crushes the Belgian-Brussels-Royal-ministerial-parliamentary Walloon clique, Flanders will awaken.' In 1918, he described his own role: 'In God's strength, I grasped a dying nation with a mighty hand and breathed the life-giving idea of an independent Flemish State into those who had been half-dead for centuries, devoid of the capacity to form a state.' He had fulfilled Ezekiel's vision from chapter 37, which Flanders' poet Vuylsteke had already celebrated:

'But no!... withered bones,
grow together again into men!
Let sinews and muscles wrap around your bones once more,
and flesh cover you!
And you, O Spirit of God,
breathe life into these dead ones,
and they shall live! Obey His command.'

These statements perfectly capture the Protestant zealot Domela.

The group chose the name Jong-Vlaanderen on October 30, 1914, borrowing it without permission from the circles around Minnaert's *De Goeëndag*. Domela became the leader. His program proclaimed 'the necessary attachment from a Germanic perspective from the Dutch-speaking parts of Belgium and French Flanders to Germany.' The name and the state of Belgium had to disappear. The second language would henceforth be German. The fate of Wallonia was 'of no concern to the Flemish people'. Flanders had to become a dam 'through which all Romanic influence will be stopped forever.' Domela presented himself as a 'pan-German'.

Minnaert was the first to speak 'about the victories of the Germans and the importance that the Flemish people have in this.' He distanced himself from Domela's argument: 'The goal must remain Greater Netherlands; cooperation with the Germans is not really in line with the Flemish people's approach.' Still, he accepted the pro-German majority and became the second secretary in a board of four. The eight men signed a Declaration of Principles. At the meeting on November 13 at the presbytery on Coupure, Domela 'reminded the gentlemen of the seriousness of Young Flanders' conspiracy against Belgium, of the life dangers that arise from it, and of the necessity of unity.' Domela made them 'swear loyalty to each other in times of need and death until the end.' That all this took place outside the half-dead Flemish people was no problem for them. An elite had to show the way to the people: they had learned that from Mac Leod.

They had wanted to stir this people into action. That was a passed station: they had to liberate the passive Flemish people with the help of the Germans.

Minnaert's dreams and the *Flamenpolitik*

Minnaert seemingly provided a critical voice in this company. At his insistence, 'annexation by' was changed to 'rapprochement with' Germany in the secret program. At Christmas 1914, Domela sent an anonymous Message to Wilhelm II on behalf of Young Flanders. For Flanders, after the trial, the hour of deliverance from Romanic compulsion had come: 'Then we will become loyal border guards of the mighty Germanness under the high leadership of Your Majesty.' Shortly thereafter, the group sent concrete wishes to Berlin: the Dutchification of Ghent University and administrative separation.

Minnaert's own viewpoint is outlined in a letter he sent to the philosopher Bolland. He was apprehensive about the future, particularly when

considering the nonsensical way the nations of Western Europe are weakening each other while the Slavic threat looms; we become wildly desperate at the thought that Flanders might lose its last piece of Germanic tribal consciousness and fall permanently under French influence. He realized that a German defeat would be disastrous: 'If the Allies return, then, as we know, a terrible reaction will occur; a professor told us: "It will be a blow to the Flemish Movement, even heavier than 1830: it will be its end." The Flemish sympathizers will be persecuted, and French influence will reign supreme.' Nevertheless, Flemish interests dictated seizing the opportunity offered by their German brothers: 'When they understand that, in the interest of all Greater Germany, Flanders must be incorporated into strong Germany, but with respect for its own nature and language, then—we greet them as our saviors!' He notably used Domela's term 'inlijving' and added hopefully: 'There are signs indicating that this will happen.'

Perhaps Minnaert tended to divide the world into a good camp and an evil camp, making Germany as white as France was black. In any case, he cherished this illusion: 'The heroic struggle Germany is now waging as a higher cultural power against barbarian hordes is our struggle. That's how we think, despite everything. And in distant, distant imagination, we see a great Germanic alliance, where each nation remains itself but still merges into the greater whole, and where our Flanders would finally stand again as a South Netherlandish state alongside the North Netherlandish brothers.' Marcel apparently believed in Domela's vision. He cautiously asked Bolland to handle the letter, which he found 'possibly life-threatening.' The reply was to be sent to Dr. H. Wirth, interpreter at the civil administration of the Etappeninspectie in Ghent, 'without mentioning my name on the address.' At the time, the difference between Domela and Minnaert was not significant. Minnaert's fear of the Slavic and Romance threat also seemed to have racist, pan-Germanic roots. He appeared to have forgotten his sympathy for the Czechs and ignored the fact that the Franks were also Germanic. He grossly misjudged the character of German Flamenpolitik, in which he had become a pawn.

At the time of the German invasion, Chancellor Bethmann had stated that Germany would not make any claims on Belgium and would compensate for the damage. After encountering unexpected resistance, the political right wing opted for annexation: the German Empire could not relinquish what so many soldiers had fallen for. On December 16, 1914, even before Jong-Vlaanderen's letter, Bethmann instructed Baron Von Bissing, the German governor of the occupied part of Belgium, about the opportunities offered by the Flemish Movement: 'The German Empire can acquire the position of a

natural protector and reliable friend for a significant portion of the Belgian population.'

The British, who portrayed themselves as the ultimate defenders of Belgium, urged, 'Remember Belgium, enlist today.' German propaganda now portrayed Belgium as if it were a French territory oppressing the Germanic Flemish people. Pius Dirr, Von Bissing's advisor, saw in Flanders on a small scale what was unfolding across Europe: the undermining of Germanic folk strength. Dirr's ideological vision was also shared by Wirth, the interpreter in the German administration who became a friend of Minnaert. These intellectuals indeed viewed the German invasion as an act of liberation for an enslaved, racially related people.

Their idyllic vision clashed with the policy of the occupier, which sought to maximize profit from the country. The *Flamenpolitik* aimed to transform the Flemish element into a bridgehead that, regardless of the war's outcome, would strengthen German influence in Belgium. In January 1915, a committee for Flemish affairs was established, and in February, Von Bissing set up a political department responsible for propaganda, censorship, and language policy. Under the leadership of Oscar Freiherr Von der Lancken Wakenitz, reports were produced on the administrative division of the country according to the language border and on ending Belgium's 'international legal personality.' There was political support for *Jong-Vlaanderen* from Protestant Domela, who, as a chaplain to wounded German soldiers, was a well-known figure.

Fredericq interrogates Minnaert

Minnaert could start working at the Atheneum in early 1915 as a substitute, possibly due to the shortage of teachers resulting from the war. He also received a part-time position at the girls' atheneum. He was occupied, aside from his teaching positions and administrative work for *Dodonaea*, by *Jong-Vlaanderen*'s intention, supported by the Germans, to establish a daily newspaper. The Ghent press had disappeared due to their refusal to work under German censorship. There was a need for printed material, if only for death notices. The future editor-in-chief Picard believed that after a cautious start, the paper could spread *Jong-Vlaamse* ideas: it should become 'the splitting fungus of a Belgium inclined towards its downfall, the dawn of an independent Flanders.'

Jong-Vlaanderen decided to consult several leaders of the Flemish Movement to gain support. This required them to take public action. On February

4, 1915, they organized an evening event at Hotel Royal for about twenty Flemish activists. Alfons Sevens from De Vlaamse Blok called accepting German help treasonous, 'a horrendous crime against Flanders.' Those present, including Minnaert's uncle Gillis, advised against the venture. Minnaert chaired the meeting and abruptly cut short the heated debate: 'The paper has been founded and will be published.' A week later, a second gathering failed, and Jong-Vlamingen decided to make personal contact with several leaders. That is why Professor Fredericq found a note on February 14 from 'Dr Marcel Minnaert.'

In his Diary, the historian Fredericq had cursed the Emperor on August 20, 1914, as a 'murderer of peoples.' He and his colleague Pirenne had been taken hostage in December 1914. On February 3, 1915, he had heard from his liberal friend Van Hauwaert that young radicals wanted to establish a 'league.' The next day, Pirenne had informed him that his student Picard wanted to start a weekly magazine. He had noted: 'If Picard and the Van Roys collaborate with Marcel Minnaert, it will become a beautiful paper of troublemakers and wastepaper.' On February 10, he was given an oral account of the meeting at Royal. He had written: 'Minnaert, who has already called his nephew Marcel to order, will speak to him again tonight to beg him not to commit this moral suicide.' The next day, the 79-year-old Minnaert visited him to say that his nephew, supported by his foolish mother, aspired to martyrdom and was not to be persuaded 15: 'He claims that the magazine will be a very moderate and neutral publication and that he will only deal with science and music in it. It will appear anyway, no matter what.'

Reverend Domela had been present at both meetings. On February 12, Fredericq had written: 'They are committing suicide, those poor boys of the first trousers; but Rev. Domela must fly.' So Fredericq was informed when Minnaert visited him on February 15.

Fredericq's Diary reports: He says, 'In the main article, we want to explain our purpose in more detail: defending rights, upholding truth,' ('That is not possible under German censorship,' I interrupt. 'Indeed, but within the bounds of that censorship.'!!!), 'defending Flemish language rights with the Flemish language laws in hand, which are respected according to The Hague Convention.' (Those Germans would not accept a Flemish university from those good gentlemen because it would be against The Hague Convention.) So he first sells some lengthy and complicated nonsense. I let him continue almost without interruption. Then I ask him the following questions: Who are the founders and contributors? He answers evasively without mentioning names. - Where does the money come from? - Again, he answers evasively. Some Flemish friends are doing it. Not much money is needed.

They will certainly make money, etc. - Additionally: a friend has gone to the Netherlands to collect money there. I suddenly interrupt him: 'Domela??' - 'Exactly, Professor.' (He had fallen into the trap. That confession is worth gold.) Another question: What are the relationships with the Germans? - 'Through Domela in contact with Dr. Wirth, lecturer at the University of Berlin, but a Dutchman by birth.' - I: 'No, German on his father's side, naturalized German, officer in the German army, an armed enemy of Belgium, not a Dutchman.' Minnaert finally declares that they have received 'all conveniences from the German authorities for the establishment and distribution of their magazine, car, Schein to go to Ingooigem Stijn Streuvels to buy a serial, etc.'

Now I knew enough and had had enough of it. I told him that he could no longer defend his fatherland behind an inkwell, but rather should join his university comrades by the Yser or in the ranks of the Germans, if he felt nothing for Belgium. 'Nothing for Belgium,' he said, 'everything for Flanders.' I stood up and told him: 'I find your attitude disgusting, even though I know you are acting in good faith. I can no longer respect you, and I ask you to leave my house. My blood is boiling, and it's better that we part ways.' He desperately grabbed his hat. The maid was in the hallway: I told her, 'Please show the gentleman out,' and turned my back on him without shaking hands, as I had done at the beginning of our conversation. He could do as he pleased. But now Domela has been thoroughly unmasked in his hypocritical scheming. Fredericq called Minnaert's mother a "fool" in his diary.

Removed from the ANV administration

De Vlaamse Post appeared on February 21. The newspaper announced that it would publish as much as censorship allowed: "However the war may decide our fate in Europe, our goal remains the same: Flanders above all and Flemish within Flanders." Riots followed at the atheneum, leading to Minnaert's dismissal. *Echo Belge* reported on this with great relish: "From his very first lesson, this pedantic joker has taught his students to accept the hand of the Germans. Immediately, a hail of projectiles rained down on the Ghent Zannekin: inkwells, rulers, chalk, notebooks. Result: forty broken pots and Minnaert covered in shame and projectiles." Shortly afterward, Minnaert lost his position at the girls' atheneum and was reappointed to an atheneum in Brussels by late April.

On March 2, Fredericq wrote that *De Vlaamse Post* was a filthy rag.

He quoted: "There is a strong conviction that it will be impossible, no matter what happens, to drive the German troops out of Belgium." He added as commentary: "The Minnaerts, Picards, & Co., who send such things into the world in these days, are worse than traitors; they are beasts without hearts and without a fatherland." Along with board member Van Hauwaert, Fredericq set out to expel the young Flemings Domela and Minnaert from the Ghent administration of the General Dutch Union (ANV).

On April 7, Van Hauwaert informed Fredericq that he had forced "young Minnaert" to resign from the ANV administration "despite a nervous breakdown by Rosa De Guchtenaere and the ambiguous stance of Dr. Speleers. On April 13, Van Hauwaert received a 'dry impolite note' from his former student, withdrawing his resignation. Now, Fredericq gathered the liberal men of Het Volksbelang to launch a counterattack: these included at least teachers Basse and Van Hauwaert and writer Pol Anri. They threatened to resign their ANV membership if Domela and Minnaert were not removed. On April 21, Fredericq heard that the ANV board had considered that there was no evidence against Minnaert and that it was not authorized to make exclusions. Fredericq also pressured Hippoliet Meert. His ANV magazine *Neerlandia* had congratulated *De Vlaamse Post* on its appearance with its 'robust spirit.' He warned Meert that 'if M.M. and D.N. are not barred, a triumph of the Allies would shake the ANV to its foundations!' A special meeting of the board brought the resolution.

Van Hauwaert revisited a statement by Minnaert, which 'even the calmest mind would find disturbing.' Minnaert had said that most volunteers in the Belgian army regretted having gone to war. He compared them to a flock of sheep being led to the slaughter and included 'our brave fellow members Van der Haegen and De Kesel, who fell on the field of honor.' He called Minnaert and Domela a danger to the Ghent ANV: he threatened that many members would resign if the two remained on the board.

Domela responded that 'a large number of intellectuals in Holland are on our side' and claimed not to understand the board's stance. Minnaert challenged those present to name articles in *De Vlaamse Post* that contradicted the principles of the ANV. Chairman Speleers then explained to him that legality excluded any political collaboration with the Germans. Ultimately, Domela withdrew, followed shortly by Minnaert: 'I will resign under the same circumstances, although I believe I am wrong to do so.' Fredericq noted with satisfaction: 'MM and DN were present and challenging. But everything was done properly. The outcome was that both gentlemen had resigned after refusing to do so twice. None of those present uttered a word to support them.' He felt relieved that the board had rid itself of the two

Albochen: "Marcel Minnaert was downcast and declared, 'I wanted to play a heroic role among you, but I feel not everyone is prepared for such a role.'" Like Domela, he had just shaken hands as a farewell. During the meeting, the small Anabaptist had even led Domela by the nose. "All's well that ends well," Fredericq thought.

De Vlaamse Post and de Vlaamse Stem

Picard had become editor-in-chief of **De Vlaamse Post**, while an editorial board consisting of Domela, Minnaert, and Steenhaut would monitor the course. Picard had also reestablished contact with his Dutch friend Frederik Gerretson, who was the editor of the exile magazine **De Vlaamse Stem** published in the Netherlands. Both newspapers began publication in February 1915, and both men shared the perspective of a free Flanders within a federal Belgium. Picard would dissociate himself from Gerretson's tactics and confront Domela.

On April 1, 1915, Picard had written: "We have always accepted Belgian state unity. The Flemish people must claim their full freedom in the state that governs or will govern it." A few days later, he provoked Domela again: the goal was 'not to form a small state alongside French, German, English, Dutch states, or Wallonia or any other small state.' The German civilian administration also disliked Domela's radical strategy, which they considered counterproductive to their *Flamenpolitik*, and instead supported Picard. On the other hand, the German military leadership saw an ally in Domela. Minnaert did not seem involved in these skirmishes. He reviewed Beethoven's symphonies for the newspaper and, when asked, stated that Picard's approach seemed 'more practical' to him than Domela's.

These intrigues unfolded against the backdrop of the stalemate of 1915. The Belgian army, under King Albert, did not need to participate in meaningless trench assaults, but a large majority of Flemish soldiers were still commanded by Francophone, Walloon officers. The idea gained ground that the 'Flemish Lions on the Yser danced for Latin culture.' Some Flemish-minded individuals began to attach conditions to their loyalty: Belgium's war goals must serve Flanders. **De Vlaamse Stem** wrote that the truce of God was being violated by Francophone publications and urged a 'liberating word' from the king on the 21st.

Editor Gerretson, also Berlin's trusted man, had used strawmen and the help of German funds to gain influence in the Flemish journal. His actions led it to take a 'federalist' course. In his view, Flemish-minded individuals

who refused to let the language struggle rest were definitely not unpatriotic. On the contrary, they were the patriots who, like William the Silent, sided with their people. Gerretson managed to lure chief editor Alberic Deswarte into a confrontation with the Belgian government in Le Havre. In June 1915, Deswarte raised the issue of Flanders' autonomy within Belgium. A promise had to be made for after the war. That 'word' was provoked by the telegram Deswarte and editor René De Clercq sent to King Albert on July 11, 1915: 'Flemings and Dutchmen, united in their thousands at Bussum, commemorating in the Battle of the Golden Spurs the first foundation of Flanders' and Belgium's independence, pay their respects to Your Majesty in confidence in Her wise policy to preserve an independent Flanders within independent Belgium.'

This was a cunning text. If the response were negative—and that could be anticipated—it would undermine the loyalty of the Flemings. If it were positive, it would set a premium on striving for Flemish goals during wartime. On the same day, the Utrecht student section of the ANV, led by lawyer Anton van Vessem, urged Von Bissing in a motion to take up the Dutchification of Ghent University.

The king's response was: 'His Majesty believes that the legal authorities of the country, when the nation shall have recovered the free exercise of its sovereignty, will take all measures necessary to safeguard the aspirations and interests of his people. Meanwhile, the King makes an urgent appeal to the Belgians that they should have no other goal or concern against the enemy than the liberation of the territory. Later, this would be summarized as 'Fight and Keep Silent! For now, the editorial team thanked the king but added that the Flemish people could hardly renounce their say in matters of vital importance. Flemish-minded individuals who prioritized Flemish loyalty were henceforth called activists, a term coined by the germanist Antoon Jacob, editor of *De Vlaamse Stem*. The passivists were the flamingants who maintained the truce until after the liberation of the country.

At the same time in Ghent, it was about Picard's position, who followed the federal line in *De Vlaamse Post*. Domela wanted to use the newspaper for propaganda for his anti-Belgian program and managed to win over half of Jong-Vlaanderen. He advocated for a General Flemish Council of radical groups, a nascent government that would negotiate with the occupier to arrange the future of Flanders. On August 3, 1915, the split occurred: 'We, Steenhaut, Kimpe, Thiry, Pintelon, Rens, Domela, demand Picard's resignation.' Minnaert tried once again to resolve the conflict but found no support: 'He claims to be just as radically anti-Belgian as Mr. Domela and his followers but sees in Mr. Picard's attitude merely a divergent tactic and

does not wish to acknowledge the existence of a deep rift.'

No one could follow Minnaert. There was an abyss between Picard's and Domela's views. Minnaert did not let the conflicts affect him and did not bring forward a new perspective. In June, he wrote a few challenging editorials like 'Has Our Direction Changed?' and 'Our Struggle,' in which he swore to continue the struggle 'until death.' Shortly thereafter, the 'domelists' took over the newspaper. Picard left for the Netherlands and became a correspondent for the pro-German *Het Vaderland*. Minnaert worked in Brussels, so perhaps he could not follow the Ghent troubles as well. He informed the school administration that after the summer he would go to the Netherlands to study.

In the spring of 1915, the border with the Netherlands was equipped with a wire fence charged with 50,000 volts. Minnaert had the papers to cross the border normally. His friend Wirth had wanted to stand bail for him. He did not go to Amsterdam, where the biologist Hugo de Vries was based, but to Leiden. He went to the Netherlands for physics.

Initiation into physics and didactics

Minnaert and De Bruyker had picked up the thread of the Botanical Society in Ghent again. From November 27, 1914, to July 4, 1915, thirteen meetings took place, eleven of which Marcel attended and six of which he chaired. Two of his introductions were about Darwin's *'The Origin of Species'*, while his lecture on X-rays and the structure of crystals testified to his interest in physical chemistry. His last talk on June 18 dealt with *'The Propagation of Light and the Laws of Reflection'*. The meeting on July 4, 1915, was the last one attended by the 26 members.

Minnaert must have learned from Wirth that the Germans would continue the Dutchification of Ghent. In that case, De Bruyker would make himself available for biology; Minnaert might be able to play a role in physics. On September 10, he arrived in Leiden, where his mother helped him settle on *Pieterskerkhof*. The first few months in the peaceful Mecca of physics, the city of Nobel laureates Lorentz and Kamerlingh Onnes, did him good. He was warmly welcomed as a Belgian into the circle of physicists around the Ehrenfest-Afanasjeva couple. At the faculty, he got to know the Bosscha Reading Room, a creation of Ehrenfest. Students had access to the latest books and journals there. The Ehrenfests had built a sunny study room at home, with walls lined with books and a large blackboard recessed into them. Twenty-seven domestic and foreign researchers organized a weekly

colloquium there. Minnaert was a welcome guest. He became a member of the Christian Huygens disputation group, where he made lifelong friends such as mathematician Dirk Jan Struik, fluid dynamics theorist Jan Burgers, historian Jan Romein, and theoretical physicists Dirk Coster and Hans Kramers.

The wife of physicist Ehrenfest, the Russian Tatiana Afanasjeva, had ideas about didactics which she presented to a circle of interested individuals, Struik recounted in his **Memoirs**: 'During the monthly evening gatherings, Minnaert and I were introduced to the trends of educational reform, inspired at the time by Klein in Göttingen, Jan Ligthart, and R. Casimir in the Netherlands, and not least by Tatiana Ehrenfest herself.' Minnaert later said: 'The colloquium at Ehrenfest's home was a true experience for all of us. It was a time when the theory of relativity was stirring up the world, while Einstein struggled to develop the special theory into the general one. It was also the time when Bohr's atomic model opened entirely new possibilities for understanding matter; Sommerfeld had further developed it in a magnificent way—somewhat to the irritation of some Huygens members who disliked both the Germans and classical systematic methods.'

Annie Verschoor, historian and literary scholar, wife of historian Jan Romein, remembered Minnaert as an ardent advocate of the Flemish University. Christiaan Huygens had convinced socialists in Dirk Jan Struik, Jan Burgers, and Dirk Coster, whom Romein had converted. However, their Marxism was not for Minnaert. Yet Marcel must have discussed this a lot, since his address, Pieterskerkhof 34, was Struik's. His room was on the ground floor: when the windows were open, friends could simply step inside. The dispute brought Minnaert into contact with brilliant contemporaries who had a critical eye and were not prone to hero worship or idolatry. Struik, for example, left no stone unturned in criticizing Bolland. It also seemed as though Marcel only became aware of social contradictions in Leiden, which were equally glaring in Ghent. During an excursion to a factory district in 'a neighborhood you rarely visited, whose existence you hardly knew,' he recalled 'the contrast between the gray poverty of the streets and the lovely splendor of Rapenburg or Breestraat.' And, of course, Pieterskerkhof as well. His Flemish leanings were accepted, and he introduced the couple Romein, future writers of **De Lage Landen**, to the Flemish emancipation struggle. As for the actual reason for his stay in the Netherlands—his upcoming lectureship at the Ghent University—most people had their doubts. 'Despite our respect for Minnaert, most of us could not approve of his willingness to serve under the Germans in an occupied country'

Preparing for physics had seemed like a personal sacrifice. In Leiden,

Minnaert became acquainted with the discussion on the foundations of quantum mechanics through Ehrenfest. He immersed himself in those few months in Christiaan Huygens, which, like Dodonaëa, was a scientific society of about twenty men and women that met every fourteen days. A session lasted five hours: first a lecture with a discussion, then the actual introduction, 31 the minutes, an improvisation, and a shorter essay. Tea, lemonade, and cookies were served between sessions. For the Ehrenfest couple, as for Minnaert, nicotine and alcohol were taboo. Minnaert later found it strange that the topics—from Plato's mathematics, The Sewing Machine, and Death Movements to The First Reading of Bolland—did not involve politics, while World War I raged around them. However, Struik thought that Coster, Burgers, Ehrenfest, and he himself realized at the time that a discussion about the global situation, whether pro-German or pro-French, would have torn the group apart.

This introduction to many new friends did not prevent him from playing his role in a confrontation that would lead to the downfall of *De Vlaamse Stem*.

Domela and Minnaert torpedo *De Vlaamse Stem*

After the clash with the Belgian government, Deswarte distanced himself from the course of events. De Clercq and Jacob took over the editorship of *De Vlaamse Stem* and were subsequently dismissed from their teaching positions by Royal Decree. 32 De Clercq then wrote his *To Those of Havere*, because they did not know 33 that Flanders lay within Belgium, with the refrain:

'Do I have no right, I have no land;
Do I have no bread, I have no shame;
Flanders, Flanders, with hand and tooth
I stand up for you, Fight for You!'

Activism had its first martyrs. There were protests, for the Flemish folk poet René De Clercq was a great figure! A petition was signed by 34 young writers such as Paul van Ostaïjen and Willem Elsschot. From then on, **De Vlaamse Stem** advocated for the unitary state of Belgium to be replaced by a federal system of self-governance. The magazine promoted the slogan 'First Flemish, then Belgian.' No one knew that Gerretson actually controlled the publication.

From these months dates a curious letter from Minnaert, in which he explains to the historian Gerretson why he disliked historical writing: 'There are indeed laws in history; but no one knows them. Yes, not even rules are known. History so far has been nothing but a science par après. It cannot predict. And the proof is that one predicts this and another that.' He went a step further: 'All the so-called 'theories' of these 'scholars' do no harm, and they may write entire inkwells full about them, as long as they do not hinder fresh, lively action. If Belgium were to disappear now, they would prove a few years later that it was inevitable and had to be so, etc. One engages in history when one has nothing better to do. (With Paul I say: 'It is still better than burning or stealing!') But let history stay out of the Flemish Movement.' Minnaert, perhaps under the influence of Nietzsche's critique of Hegel's historicism, wanted nothing to do with psychology, sociology, or history.

Meanwhile, Gerretson had presented his **Flamenpolitik** proposal to the German envoy in The Hague. His memorandum, titled **Deutschland, Flandern, Holland**, was a carefully devised action program for the occupier. **De Vlaamse Stem** would advocate for federalism and neutrality for Belgium, which was attractive to both the Netherlands and Germany. For the Belgian government, this would be unacceptable: 'Its refusal would make it clear to the Flemish people that they had to find their salvation elsewhere, namely with Germany and the peace conference.' A select group of well-known flamingants would then have to draw up a 'minimum program' and organize a 'people's petition.' After repeated rejections by the Havere government, the German authorities could agree with it. **De Vlaamse Stem** had to play an essential role: 'the newspaper is officially completely free, and apart from the drafter of this Memorandum, all shareholders, editors, contributors, and administrators are fully convinced that they are dealing with a Dutch-Flemish enterprise. It is of the utmost importance that this remains so.'

But Domela was also still involved. At the beginning of September 1915, the Domelians formulated their Seven Points. These contained new elements. An independent Flanders was to become a 'kingdom' that could accommodate German fortifications and warports. Domela presented the Seven Points to Governor Von Bissing, who urged patience. On November 1st, the First National Congress of Jong-Vlaanderen took place. Thirteen local 'branches' were established, overseen by a national board with Dr. Eugene Van Oye from Ostend as chairman and Domela as second-in-command. On December 5th, about seventy people publicly signed the Seven Points. With this document, Domela traveled to Amsterdam to seek declarations of support from

some editors of **De Vlaamse Stem**. He hoped to use these to convince the German government in Belgium of his importance. He enlisted the help of the eloquent Minnaert.

In Amsterdam, an irritated Gerretson tried in vain to explain Domela's tactics regarding **De Vlaamse Stem**: naturally, he couldn't reveal everything. Meanwhile, Domela succeeded in getting the chief editor and the secretary-editor of **De Vlaamse Stem** to sign a letter written by Minnaert on December 15, 1915, in which they expressed support for the establishment of a Flemish state: 'The increasingly sharp hostile attitude of the Belgian Government toward the Flemings, and the systematic rejection of our justified, loyal demand, lead us to the conviction that final peace and a beneficial future for Flanders are impossible within a Belgian state framework and that a Kingdom of Flanders is the only solution.' This was signed by L. Brulez, M. Minnaert, J. Eggen, R. De Clercq and E. Rietjens, along with four out of five signatories, renounced their 'conditional' loyalty to Belgium. Domela spread rumors that the editorial boards of **De Vlaamse Post** and **De Vlaamse Stem** were aligned with the Jong-Vlaamse line. On the evening of December 16, Marcel arrived in Ghent for his Christmas vacation. His mother wrote: 'This evening at half past five, I finally saw your eyes and pince-nez shining under the gaslight of the station.'

Gerretson was furious. The political foundation had been pulled out from under **De Vlaamse Stem**. At the end of January, Gerretson stopped the publication. By 1916, the withdrawal of German support would also cause **De Vlaamse Post** to fold. Domela had blown both publications sky-high. For a year, **De Vlaamse Stem** had been an authoritative propagandist for Flemish aspirations. Its distribution among soldiers was allowed until the editorial changeover, so soldiers on the Yser front could take note of calls for self-organization around Flemish demands. After the changeover, loyal Flemings in the Netherlands, led by the Catholic Frans Van Cauwelaert, had founded **Vrij België**. At the end of 1915, the monthly magazine **Dietsche Stemmen** appeared in Utrecht, the publication of *De Dietsche Bond*, an activist alternative to the passivist ANV-Nederland. In 1916, two Greater Dutch and pro-German monthly magazines, **De Toorts** and **De Toekomst**, also emerged, with German money involved. In **De Toorts**, Minnaert polemicized about the collaboration of Dutchmen in the Flemish University. Because in December 1915, Von Bissing had declared that the German administration would rapidly Dutchify Ghent University.

Minnaert recruits professors in the Netherlands.

Von Bissing's decision caused a stir among the Ghent elite. The struggle over the opening of Ghent, over the recruitment of professors and students, became a test of strength. In late 1915, a secret policy document had been produced within the Jong-Vlaanderen circle. This Report regarding the opening of the Flemish University in Ghent was signed, among others, by lawyer Jan Eggen and drawn up in consultation with philologist Willem De Vreese. It provided an open-hearted sketch of all the difficulties and made suggestions for appointing professors and administrators. As major opponents, it noted the professors Pirenne and Fredericq. On January 8, a dignified protest declaration had appeared, initiated by Antwerp's Franck, with 38 prominent signatories who denied Germany the right to interfere in domestic affairs. Only seven of the fifty members of the Second University Commission had signed. Jong-Vlaanderen mocked that this 'swan list' of Old Flanders had nothing to say to the fresh Flemish forces.

Minnaert's position in Leiden became controversial when he emerged in January as an upcoming lecturer and public spokesperson for the recruitment of Dutch lecturers: 'When it became known in Leiden that Minnaert had accepted a call to Ghent - directed at him by Dr. C. De Bruyker and Prof. W. von Dyck - and would go there to teach, he immediately experienced a cool reception from many professors and students who had previously always expressed their high esteem and friendship for him.' Ehrenfest considered cooperation with the Flemish University as collaborating with the enemy and no longer wanted to receive Minnaert at home. Minnaert found Ehrenfest's attitude unjustified but continued to regard him as the most valuable educator and physicist in the Netherlands.

The anti-German *De Telegraaf*, with cartoonist Louis Raemaekers, was at the forefront of combating German politics and the Flemish University. The newspaper gave geographer J.F. Niermeyer a platform, who recounted that through a Dutch intermediary, an acquaintance had been approached to see if he would be willing to occupy a chair in Ghent: 'That's all we need! When there is a group of Flemings, so consumed by hatred of the French that they do not realize the shame of accepting a university from hands stained with the blood of thousands of their compatriots, from hands that have destroyed their villages and cities and their artistic treasures have been shattered by those who officially declared that Belgium would not emerge unscathed from the witches' cauldron—then surely there will be no Dutch scholar outside The Future Group who does not consider themselves above this mess.'

47 Against this, Minnaert responded: 'If truly capable Dutch forces were to eventually refuse to come and teach at the Ghent University, if they were to truly abandon the Flemish people in this decisive moment, the consequences would be doubly horrific: the danger that German forces would occupy the chairs rejected by the Dutch; and lasting resentment from the best of the Flemish towards Holland.' In reply, the pro-Flemish Leo Simons, director of the World Library, stated that a North Netherlander accepting a professorship in Ghent would either be an out-and-out pro-German, a careerist, or such a convinced Greater Netherlands advocate that he would sacrifice everything: 'If Dr. M.M. truly wishes to bring Flemish and Dutch people closer together for better mutual appreciation and understanding of each other's insights, let him explain this side of our situation to his compatriots who would otherwise become seriously disgruntled with us.' 49 Minnaert argued that the measure taken by the German authorities was in line with The Hague Convention. His opponents' arguments seemed to pass him by.

The Germans pushed the University forward. A German advisory committee of officials and professors was established under the leadership of Walther von Dyck, the former rector of the University of Munich. He aimed for the replacement of unwilling teachers. The rector became Peter Hoffmann, a Luxembourgish philosopher advocating for Dutchification and a moderate Flemish nationalist. In February 1916, the German administration sent a questionnaire to professors about teaching in Dutch. Were they 'capable' and willing? Fredericq jokingly replied, **capable, mais pas en mesure**, which many others adopted. Out of eighty forms, only eight positive responses came back. Von Dyck's committee branded Fredericq and Pirenne as leaders of a resistance that needed to be broken. They were deported to Germany. Worldwide resistance, from the Pope and the Spanish King to the President of the United States, had paralyzing effects on the eight teachers who had wanted to cooperate.

A regulation by Von Bissing from March 15, 1916, amended the Belgian Royal Decree of December 9, 1849. A circular from March 22 reminded them of the principle of the 1878 language law: 'Dutch in Flanders.' German propaganda emphasized formal legitimacy: they were carrying out what, according to Belgian law, should have been done long ago. Chancellor Bethmann pledged support to the fraternal people on April 5, 1916: 'We must provide ourselves with real guarantees that Belgium cannot become an Anglo-French vassal state and is not established as a military and economic stronghold against Germany. Germany cannot again abandon the long-oppressed Flemish people to Frenchification.'

The legal arguments seemed like nitpicking to most Dutch people, as

the Belgian government rejected the Dutchification after all. From Leiden, physicist Kamerlingh Onnes sent a German-language letter on June 6, 1916, to his equally famous colleague Arnold Sommerfeld in Munich, who had asked if his Leiden colleague Keesom would be interested in the vacancy in Ghent. Kamerlingh Onnes wrote that Keesom would accept an appointment in Germany but not in Ghent and added his unsolicited opinion that most Flemings 'would only accept a Flemish university if they obtain it through Belgian legislation. We think that people in Germany do not fully understand the true views of the Flemings.'

Kamerlingh Onnes and Ehrenfest, alongside Lorentz, were the professors on whom Leiden physics relied. Both distanced themselves from the Flemish scientist, whom they had earlier welcomed hospitably.

The success of Flamenpolitik

The recruitment of teachers was progressing meanwhile. Von Bissing requested financial guarantees from Berlin for the new professors and received them. In June, he suspended the positions of the erudite refusers. The re-opening of the university seemed to offer prospects for economic activity in a city that was withering away under military occupation. Flemish support for the University unmistakably came from a broader circle of flamingants.

August Borms found some support in Antwerp with his activist *Het Vlaamse Nieuws* for the Flemish University and a federalist program for Belgium. On June 12, the board of the Catholic Flemish Alumni Association unanimously approved the Dutchification, except for one member. Alongside Dutch and a few German professors, mostly Flemish academics who had called for the acceptance of the 'rectifying' university in manifestos were appointed. These calls appeared at the beginning of September. The one from the University Union, where Meert and Rudelsheim, the secretaries of the University Committee, resumed their work, was signed by more than a hundred Flemish academics. A Catholic manifesto counted sixty-six people, some of whom appeared in both manifestos. Nineteen out of fifty members of the Second University Committee signed. Basse wrote to the deported Fredericq: 'The announcement of those two manifestos naturally makes a great impression... You see: it is an important movement.'

Minnaert prepared for his physics lectures. In a letter to his mother on June 20, 1916, he wrote about herborizing with Burgers, Struik, and Coster in the dunes of Egmond. She wrote: 'You will stay in Leiden until the end of July; the theoretical lessons have ended; now you are woodturning and filing

iron: practical education for your field of study! This is a difficult time for me, especially when I hear the cannons roaring day and night, sitting alone here in your room. Yet I am glad to be here among your friends and books! Now I see you returning here within four weeks. It's quiet again outside and also in my heart.' She added that relatives and acquaintances disapproved of their conduct: 'Your name was dragged through the mud, and you were slandered as a traitor to the country along with Thiry and Kimpe... Many no longer greet us... Still... You remain loyal to the Flemish people.'

Jozefina Minnaert stood firmly behind her son. At the end of July, Marcel returned. Recruiting professors was not easy, but attracting 52 students was much harder. Student Remi Bosselaers said: 'Last year, you had to be at least a hero to dare go there. You had to go against everything. Against your parents, teachers, pastor, mayor, against your entire village; against the invalidity of diplomas, which even very intelligent people, so sure of themselves, threatened with; against a resolute boycott for the rest of your life; against yourself, because Ghent was so far behind the lines and food there was so scarce and the Allies' bombs were so abundant, and in the end, you had to guess whether you would be there with four hundred or forty people, and whether your gigantic efforts under all these precarious circumstances would be somewhat rewarded.'

Minnaert traveled that late summer with a propaganda group through Flemish villages to recruit students. The first copy of 'Berichten van de Hogeschool' stated: 'Dr. Minnaert has made himself exceptionally meritorious with regard to the preparatory measures for receiving students in Ghent and spreading correct ideas about the new university to be opened in Ghent among the students.'

Endnotes:

1 Extensive travel report in Jozefina's Diary.

2 De Schaepdrijver, 1997, chapters 2 and 3.

3 De Schaepdrijver, 1997, chapter 4. The writer Rolland, a pacifist who had emigrated to Switzerland, was friends there with Masereel and Stefan Zweig, persona non grata in France. Romain Rolland was nonetheless mentioned in the British King Albert's Book, 1915, 107.

4 De Bruyker according to Fredericq's Diary, May 15, 1915.

5 Faingnaert, 1933, 96-101. Buning, 1977, chapter V, In de voorhoede, 63.

6 Buning, 1977, 70.

7 Domela's complete speech at the Ghent Academy on May 18, 1918, is in Van de Velde, 1941, 211.

8 The minutes and statements of Jong-Vlaanderen and Domela's heroic deeds in Van de Velde, 1941.

9 Minnaert to Bolland, December 31, 1914. Bolland Archive. Bolland wanted to cooperate with Jong-Vlaanderen.

10 Picard had heard this from his promoter Van Houtte, who then broke off contact.

11 De Schaepdrijver, 1997, 147. The German H. Wirth was promoted on the Dutch national anthem.

12 De Schaepdrijver, 1997, chapter V.

13 Vanacker, 1991, 39-46.

14 Fredericq's Diary, February 14 and 15, 1915. On Marcel's card was the editorial address of De Goedendag, Citadellaan 73.

15 The relationship between Fredericq and Gillis Minnaert, national chairman of the liberal Willemsfonds, must have deteriorated—probably due to differences in their relationships with Marcel Minnaert. Dedeurwaerder, 268, reports that G.D. Minnaert called Fredericq a 'babbelduivel' (chatterbox) and a 'vuiltong' (dirty tongue) that year.

16 Echo Belge, A Gand, undated clipping. In Fredericq's Diary is a pamphlet by J. Bidez, président de l'action patriotique, against FR. DR. SC. M.K.P.Z. Mullaert: 'I even threw a stone at his head and broke a window-pane. Then our teacher retreated to seek fortune elsewhere, somewhere in the Athenaeum for ladies, where he achieved strange success thanks to his proud male figure and his bright, blue, truly Germanic eyes.' Minnaert's eyes were brown.

17 Report of the board meeting of April 29, 1915, in Fredericq's Diary.

18 Dedeurwaerder, 2002, 265-267.

19 Dedeurwaerder, 2002, reports that ANV-Ghent would be on good terms with Minnaert again in August 1915. It should be noted that the ANV board members Speleers, Meert, Wannyn, and De Guchtenaere would join activism in 1916 when the Germans decided to Dutchify the university.

20 Vanacker, Gerretson's Voice, 52-53. This alignment is confirmed in the correspondence between Picard and Domela's biographer Buning, such as in letters 458 and 459. ARA-Den Bosch. Gerretson in De Vlaamse Stem of May 11, 14, and 15, 1915.

21 A notorious French-language pamphlet had turned against the 'betrayal of Antwerp' by Flemish city administrators. It stated that 'the time for flamingantism was over forever.' Lode Wils considers it a German forgery in his *Flamenpolitik*, 1974, but does not substantiate this. Fredericq, however, found it necessary to write a French-language counter-pamphlet on February

3, 1915. His closing sentences were: 'Turn away from these wretched people with disgust. Unity makes strength.' Fredericq, Diary, February 3, 1915.

22 Gerretson's role in Vanacker, 53, 63-65.

23 Deswarte, *De Vlaamse Stem*, June 28, 29, and 30, 1915. Faingnaert, 131-132.

24 Antoon Jacob, like Minnaert a former editor-in-chief of *De Goedendag* and former chairman of *De Heremans' Zonen*, *De Vlaamse Stem*, November 4, 14, and 16, 1915.

25 *The Flemish Mail* of June 18 and 28, 1915.

26 The first post-war meeting was on November

27, 1920. Tatiana Ehrenfest-Afanasjeva in Klomp, 1997, *The Geometry Education and Euclides' Axioms*, 164-179. Offereins, M., Tatiana Ehrenfest-Afanasjeva, in *NVOX*, 9, 2000, 490-492.

28 Struik, D.J., typescript on the Leiden study years of the seventies.

29 Minnaert on Ehrenfest in the lecture *University and Didactics*, October 14, 1961.

30 A. Romein-Verschoor, *Looking Back in Wonder*, I, 129.

31 Minnaert, *Huygens Lecture*, manuscript, 1970.

32 Royal Decree of October 9, 1915.

33 Vanacker, 1991, 55.

34 *De Schaepdrijver*, 1997, 158.

35 Minnaert to Gerretson, November 27, 1915. Gerretson Archive, ARA-The Hague.

36 Nietzsche, 1964, *On the Use and Disadvantage of History for Life*. An essay in which Nietzsche warns against a historiography that burdens those who want to make history. History is only 'objective' for those who will never make history. Minnaert's view may have been influenced by Nietzsche but is not its consequence. See Janssen Perio, 1953.

37 Memorandum of October 7, 1915.

38 Vanacker, 63-65.

39 Picard, I, 211. Van de Velde, 1941, 19-21. The Seven Points of December 5, 1915, in Domela's manuscript, are printed at the beginning of this book but chronologically belong on page 101, writes Vanacker the author.

40 Vanacker, 66.

41 Von Bissing's decision on December 31, 1915, unofficially in the newspapers.

42 Report regarding the opening of the Flemish University in Ghent, Christmas 1915. Letter from Jong-Vlaanderen to Von Bissing, integral in Van de Velde, 1941, 107-120.

43 Faingnaert, 402-403. Possibly learned from Minnaert; he was temporarily his neighbor in Soest in 1919.

44 Minnaert to Jan Burgers, February 2, 1919: 'The main character in Leiden for me is still Prof. Ehrenfest, even though his conduct towards me and his stance on activism are unforgivable. But he is the ideal professor and almost the ideal human being.'

45 See Raemaekers, 1914-1917. A selection of his anti-German drawings on the CD-ROM *Chemistry and Society* by L. Molenaar, 1998, *Nature & Technology*.

46 Faingnaert, 398-401, summarizes the core of the controversy. The mentioned Niermeyer is indeed the erudite geographer, former teacher at *Erasmiaans Gymnasium*, and the man behind the *Bos and Niermeyer Atlas*.

47 Minnaert, *A Danger to the Dutch Race*, *De Vlaamse Stem*, 18 January 1916.

48 Leo Simons, *De Vlaamse Stem* of 21 January 1916.

49 Minnaert, *De Vlaamse Stem*, 28 January 1916.

50 Vanacker, 114-115. *De Schaepdrijver*, 160-162.

51 Kamerlingh Onnes to Arnold Sommerfeld, letter of 6 June 1916. *Archive-Sommerfeld Munich*.

52 Vanacker, 1991, 340.

Chapter 5

The 'Min' in Full Armor

'What a treasure of new perspectives and discoveries, new inspiration and new feelings can we expect now that women are taking their place alongside men in all fields?'

Mutual Service and Division of Labor

During these war years, De Min, as he was called in Ghent, underwent an interesting development. He initially adhered to Domela's views and his biological racism. But gradually, he tried to formulate his own positions. This must have been encouraged by the Leiden student environment, where Domela and Bolland's racist and chauvinistic ideas encountered strong opposition.

Many wondered, whether they were named Fredericq, Gillis Minnaert, Struik, or Ehrenfest, why De Min identified so strongly with Flanders and the fate of the Flemish University? He wanted to answer this question himself and set his earlier positions straight. Hence, he wrote a series of articles in *Dietsche Stemmen*, which were also published as a brochure. Upon closer analysis, it was a personal defense, a *Pro Domo*, in which he does not appear himself but is nonetheless the subject. Probably, he had to consider political censorship in a neutral country that wanted to stay out of the war and therefore could not write concretely about the position of Germany and Flanders. The development process of the young Minnaert can be analyzed through this brochure from spring 1916: *The Division of Labor 1* and *the Principle of Nationalities*.

He began by clarifying his 'biosociological' starting point. The great Master, Darwin, had written about the struggle for life. This concept had

been adopted by the politics of modern Europe. The necessity of war was, so to speak, clothed with the authority of science. Darwin's argument was taken out of context but also led to misuse: he had explained that those individuals who were best adapted—i.e., the strongest, wisest, or fastest—were selected. The Russian Kropotkin modified this central thesis: those individuals are best equipped in the struggle for existence who practice mutual aid to the highest degree. Precisely groups of animals with a strong development of this mutual aid, such as humans, are the most widespread and show the highest intellectual abilities. Minnaert called Kropotkin's proposition 'the first law.'

Thanks to this mutual aid, language arose as a characteristic and condition for development. The naturalist did not overlook that reciprocity also played a role in the development of each individual: all higher plants and animals consist of cell complexes that exhibit an exemplary pattern of mutual aid. These cells are of unequal kinds, so 'a second law' emerged: 'Mutual aid goes hand in hand with the division of labor.' This was another key point: 'If this principle truly has universal validity, we should find its opposite in associations, not of cells but of entire individuals among themselves.' Where cooperation between individuals increased, a specific division of labor indeed emerged, and 'specialization' arose. Kropotkin spoke in this context of the abolition of competition through mutual aid and mutual support. This phenomenon is observable everywhere in nature. Darwin's 'divergence of characteristics' was therefore closely linked to the division of labor and specialization.

Such views were common at the time and were propagated by pacifist-minded intellectuals. Mac Leod had early on devoted a lecture to Kropotkin's ideas. Mac Leod's wife, Fenny Maertens, was friends with Kropotkin and had translated his work into Dutch. Their nephew, the Flemish graphic artist Frans Masereel, had drawn lifelong inspiration from it. Even the Dutch socialist Ferdinand Domela Nieuwenhuis had written a brochure on this subject.

Minnaert proposed applying 'the law of mutual service' to the human species: 'It is the only means by which we can somewhat free ourselves from our usual overestimation of ourselves and through which we learn to perceive the spirit of society with greater sharpness.' War did not arise from overpopulation, as was often claimed: 'Instead of fighting each other, people should rather join forces against the greatest enemies of our species; the *Bacillus tuberculosis*, the *Spirochaeta pallida*, and alcohol!' Marcel picked up ideas that were in the air and tackled human society with his 'laws.'

Women's Movement and National Striving

When applying the law of the division of labor to society, 'international cooperation' was the appropriate means to stand strong together. This cooperation was not based on 'equalization,' but rather on utilizing the specific characteristics of the partners. Effective cooperation arose through specialization. Minnaert did not have technical specialization in mind here, but rather a division of labor related to 'perspectives and methods.' He cited the Swedish educator Ellen Key: 'Not in the subject that man studies, but in the way he comprehends the world and feels it resonate within him, thereby creating the highest division of labor.' Only the boundaries that favor an effective division of labor between groups of people have a reason to exist: the physiological boundary between men and women and the psychological boundary between people of different nationalities. He elaborated on this through the striving of the two fundamental movements of his time: the women's movement and the national movement.

Half of the human race dedicated its efforts to creating a good home, demonstrating great talent and rendering immense services to civilization. However, women remained almost entirely aloof from the pursuit of art and science as well as from socio-political life: 'What a treasure of new perspectives, new discoveries, new enthusiasm, will we not expect now that women are taking their place alongside men in all fields?' Within art and science, there were no female or male boundaries: "Why would a woman lose her femininity by engaging in astronomy or sculpting marble? Woman must unlock the world for herself, and that is in the interest of all humanity. And she will remain a woman in all her thoughts and actions: only then can she truly be a woman." As long as women did not develop their strengths in all these areas, they had not yet found themselves, and "as long as we humans are only half-conscious of our humanity." The Swedish pedagogue Key had called on women to participate in all life's tasks while also making use of their specific gifts. Therefore, the women's movement was essentially about applying the laws of 'mutual service' and 'division of labor.'

When these biosociological laws were applied to national movements, they resulted in the concept pair 'pacifism' and 'nationalism': "The entire origin of the nationality idea is inextricably linked to that of world citizenship and the brotherhood of all people." Minnaert sprinkled no less than seven quotes from German early romantics. He cited Herder, who had argued that the 'natural state' consists of a single people with a national character. The essence of patriotism lay enclosed in world citizenship. A nationalist does not impose his civilization because he knows "that nothing is more dangerous

for the pure and original preservation of our own people than incorporating foreign elements."

Minnaert advocated for the inviolability of Flemish soil but opposed chauvinism: "Who loves their own country the most will also best appreciate the good qualities of other countries." Some rejected chauvinism so vehemently that they denied the sense of nationality altogether. A 'denationalized state' uproots people: "Strong, on the other hand, is the man who rises from among the ranks of a people, carrying the strength built up through generations; he brings new shimmering treasures to all humanity, new jewels and new swords..."

No great man, De Min thought, exists without being marked by his nationality.

National boundaries also existed in the pursuit of science: "As long as doubting, searching people struggle to gain a portion of truth, science remains national. Our entire personality lies in our scientific work as well as in our social work or art.' National differences were expressed in the way questions were posed and addressed; in the choice of methods; in the observation and selection of facts themselves; in the conclusions drawn from these facts; in the theories resulting from the research; and in the manner in which the findings were communicated: 'And, in general, throughout the entire investigation: greater or lesser rigor; a greater analytical or synthetic ability; bold imagination or cautious prudence; extensive familiarity with the work of others and foreign civilizations or greater originality; respect for existing theories or polemical force.'

For history, it was natural to be 'national': 'Please note, however, that precisely the most interesting parts of scientific research often remain entirely unknown to us in most cases: in what way, through what thought process, through what qualities and associations of ideas did the researcher arrive at what he communicates to us? There we would observe the very strong influence of national feeling.' Without realizing it, scientists reasoned from national limitations and assumptions.

'Truth' may thus arise from the interrelation of relative truths determined by sexual and national divisions of labor. The peaceful competition of these 'national contributions' to 'international cooperation' guarantees truth and progress, Minnaert seems to suggest. Fundamental differences must be expressed. Hence, Minnaert believed that within a nation, there should be no mixing of perspectives, as this would harm the clarity of the 'national contribution' to the global community. Because such mixing occurred abundantly in Ghent, even if only as a result of the World War, this construction of 'purely national' contributions seems artificial.

Differentiation of humanity

Minnaert's argument led to political conclusions. If a nation was to be equipped for its contribution to art and science, it had to be able to develop freely. The first condition was learning the mother tongue at school and effortlessly using that language in intellectual work. That was precisely what was being withheld from the Flemish people. If Belgium suppressed this Flemish linguistic community, the Belgian yoke had to be cast off, for Minnaert was not concrete!

Language was the main thing: 'Thus, language is the first factor for humanity that provides continuity, connecting us to the past and the future. In this way, it develops alongside mankind, keeping pace with our advancing spirits, taking something from everyone, and giving everything to everyone, uniting every people in a powerful spiritual communism.' Minnaert's 'communism' was a communism of the spirit, of language, and of the unity of a people. Language was the first principle for the 'distribution of labor among humanity': knowledge of the mother tongue ensures that the energy inherent in a people can be utilized. This was also a moral imperative, for which everything else had to yield. This reasoning could implicitly justify collaboration with the Germans if they gave space to the mother tongue. Minnaert's views on humanity's striving for differentiation and specialization, for achieving 'more diversity,' as it were, toward a grand entropy, guided him.

In an era of rising workers' movement and political struggle between Catholics and socialists, also a time of friendship with socialists like Struik, Coster, Burgers, and Romein, both Marxism and Catholicism remained fundamentally alien to him. Religion and class were only conditionally relevant to Minnaert: if they divided a country, cooperation was hindered. 'Social class can be very important in many respects. However, for the sake of obtaining a harmoniously differentiated humanity, division into hostile social classes, with the blurring of other boundaries, is certainly not suitable. Whether someone emerges from the ranks of the proletariat and dedicates themselves to science, or whether someone from the bourgeoisie does so—their nature (all else being equal) will not differ fundamentally. Improving the fate of workers, even radically reforming society, can have many good consequences for humanity; more capable and productive individuals will emerge in every field; cooperation among all people will also be promoted. But more diversity will not be achieved through this...' And it was this last point that mattered to Minnaert. The goals of class struggle and religion were essentially identical: making everyone equally entitled or equally believing. If they succeeded in this, the religious or social principle of division

would lapse, consequently, it was not fundamental and had to fade away. More practical principles should be sought. Marcel decidedly did not want to follow the socialists in their concept of 'class struggle.'

According to this iron logic, Minnaert should have approached racial diversity positively. That did not happen. However, he did distance himself from his earlier fixation on Germanism. He found 'language' as an expression of culture far more important than race: 'It is high time that people stop fantasizing about the Germanic race or the Latin race. As soon as a nation adopts a particular language, it also acquires the corresponding way of thinking and feeling. The influence of race is probably infinitely small, or even zero according to modern research.'

That was a bold statement, an overcorrection to the other extreme, in which he conveniently skipped self-criticism. Had he not, in his 1914 Christmas letter to Bolland, identified both the Slavic and Romance races as threats? Yet, on this point, he intellectually distanced himself from pan-German Domela.

Against the Belgian state

Minnaert arrived at his treatment of attitudes toward the state through these pure thought steps. The state was indispensable in disseminating intellectual property and functioned through a network of officials for that purpose. The state had deep cultural value as 'an organization of cooperation and division of labor among people.' The state became the link between nationalism and internationalism. From this, two principles could be derived: 'the necessity of disarmament' and 'the disappearance of wars,' which indeed hindered international cooperation to a great extent.

On a national level, the state existed for the people. It could foster the characteristics of the nation. The history of the state showed that its role had been increasingly misunderstood over time. The state had become an end in itself: 'The State abuses its financial and economic power to favor a small number of capitalists, who in turn become the pillars of the State; it directs the entire education system towards inspiring awe and reverence for itself; its officials become salaried defenders of the existing state form: decorations, national anthems, official displays are introduced. And finally, the State wastes an immense amount of energy on organizing armies, fleets, fortresses, which serve no other purpose than to strengthen its own authority by hypnotizing the people and conquering power over other states. Unfortunately, this criminal, misguided state policy, based on violence and deception, still

prevails around us...'

In its territorial drive, the State does not care about nationalities, even tries to eradicate them if it deems it desirable for its unity: 'Where peoples of roughly equal strength inhabit the State, one can usually not be completely suppressed by the other; and there the State makes every possible effort to build an artificial, half-hearted state people ad hoc through mixing and to promote language confusion, not hesitating to make all true civilization and noble culture impossible in its territory for centuries.' The last part referred to Belgium, though everything had to remain implicit.

He noted that even national sentiment was made subservient to the State: 'More than once we have seen how the most intimate, sacred national feeling is used by the State to stir up a people against their own brothers and interests, despite all bonds of language or history and religion; and how one calls upon the songs and legends of that people, the poets and thinkers, to whip it up, while flattering national pride. This creates a disastrous confusion between People and State. In this way, more than once a people has been murdered, destroyed by means of her best affections.'

According to Minnaert, millions of people faced an unavoidable conflict. They had to choose whether to remain loyal to the existing state form to which their people were being destroyed or to remain true to their nationality.

He was referring here to four million Flemish people. The State is based on war and diplomacy and obeys the wishes of a few selfish individuals: 'Holy patriotism cannot be confined to a State that has been delineated at the green table. It does not form part of the inventory transferred from the former owner to the incoming victor. It remains forever and always loyal.'

Minnaert assumed at the time that Belgium, like the great powers, was also to blame for the outbreak of World War I by playing into French diplomatic cards. That was a lesson from activism, but it lacked any foundation. His conclusions were: 'The serious solution to the nationality question is the first and indispensable condition for world peace, and thus an international rather than an intranational affair.' And: 'The solution can only be: the complete parallelism between civilization groups and state structure.'

Minnaert advocated in this closing sentence for a separation of nations based on language, as in Belgium between Flanders and Wallonia. On the terrain of international relations, such a stance could promote annexations. Would German-speaking Swiss people really want to join Germany to fight for Wilhelm II? Once those cantons had left the German Empire to avoid permanent war conflicts.

He finally propagated a world of mutual service and division of labor. He added that he had consciously placed himself on an ahistorical standpoint

because he was focusing on the future rather than the past. If one wants to curb the 'fresh energy and drive of youthful striving minds,' then history is misused to halt evolution. And that happens all too often! Minnaert had written this to Gerretson at the time, and on this occasion, he joined a speech by the socialist Henriette Roland Holst in which she had pleaded for 'fearless idealism' to tackle unacceptable social conditions and shake off the slave mentality: 'We know what immeasurable energy humanity can dispose of when a great goal is in sight.'

The min in full armor

It was a defense document from a young Flemish intellectual: hyperindividual, abstract, apodictic, straightforward, and irreconcilable. Bolland's lectures on 'pure reason' had borne fruit. Min was therefore considered in activist circles as the man of unwavering theory. He accounted for his reckless actions and presented a strange brew, borrowed and self-made, alternately stimulating and suffocating views. He justified his activism with a conclusive construction that compelled voluntaristic and radical action: a personal armor.

This young scientist transformed the reality of the World War into a hyperindividual, personal reality. He drew large circles of magic around himself of pure thoughts, which he did not test against the reality of the war. He could abstract himself from the destruction of Flemish cultural heritage, from the corrupt background of German Flamenpolitik, from the gas warfare that the Germans had begun in 1915 near Ypres, or from their 'total' submarine warfare. His circles of belief shielded him from reality so that he could live safely in the world of his constructs. From the armored Minnaert, a short circuit between fiction and reality was not to be expected. The collapse of his constructs could only come about through a harshly intruding reality. In December 1916, he would still congratulate the Emperor on his brilliant victory in Romania. How would he react to the reversal in Germany's chances in the war?

In the letter to Bolland from late 1914, it became clear that he was still aware of the great risks that Jong-Vlaanderen was running, but gradually he seemed to believe that the vast majority of the Flemish population 'actually' supported the activist leaders. After all, he had irrefutably proven that the activists had the salvation of Flanders in mind. Belief in these constructs gave De Min the necessary certainty.

Finally, it is characteristic of Minnaert that he needed this justifica-

tion; at this point and in this form. Other activists, such as Antoon Jacob, Lodewijk Dosfel, or Herman Vos, also justified themselves during the World War, but they dealt with concrete circumstances and made real considerations.

In October 1916, Minnaert threw himself into the realization of the Flemish University, and that was concrete enough. He was also a doer, a fanatical fighter for an ideal that finally seemed to be fulfilled. That perspective could also have persuaded former fellow fighters from the Ghent ANV board, such as Speleers, De Guchtenaere, Wannyn, and even Meert, to participate in activism.

Endnotes:

1 Minnaert, 1916a.

2 On the fifth Vlaams Natuur- en Geneeskundig Congres in 1901 in Brugge, Mac Leod had lectured on the Fight for existence and Mutual Service: - A Factor of Evolution, 1902 was translated from English by Fanny Maertens.

3 Van Parys, 1995, 25-27. The woodcarver Masereel is four years younger than Minnaert. The Ghent native Masereel fled to Switzerland in 1914 and engaged in pacifist agitation there. He was only allowed back into Belgium after the 'muzzle law' of 1928. Masereel and Minnaert share many similarities, such as their peace activism and their love for the poetry of the American romantic Walt Whitman.

4 De Rooy, 1995, also mentions Ferdinand Domela Nieuwenhuis, 1910.

5 Nowadays, 'mutual service' as a basis for human evolution is a respectable scientific standpoint. Think, for example, of Edward O. Wilson's Sociobiology. The New Synthesis (1975), On Human Nature (1978), and The Future of Life (2002).

6 Key, E., Kärleken och Äktenskapet, Stockholm 1911. Minnaert read the original and referred to it. It was translated in 1916 as The Love and Marriage.

7 This early 19th-century German movement focused on the unification of Germany. Bismarck's military solution (1870-1871) put an end to the democratic character of this German nationalism. Minnaert did not realize that the philosophers he cited had not gained prominence in Germany. More respect for history could have served him well.

8 Romein, 1967, chapter VII on The Legacy of Chauvin.

9 One source was Pierre Duhem, who in his *La Théorie Physique*, Paris 1906, demonstrated with numerous examples that the same expressions of nationality could be found in physics as in literature, legislation, and history.

For the Netherlands, Minnaert wrote this passage: 'The equation of state by Van der Waals, the asymmetric carbon atom by Van 't Hoff, the electron theory of Prof. Lorentz are fundamentally expressions of the same Dutch striving: to penetrate the deepest causes behind seemingly mystical facts and to think them simply, almost to grasp them.' The respectful 'Prof.' probably had to do with the fact that he had actually met Lorentz in Leiden.

10 Minnaert quoted from Wilhelm Wundt's *Völkerpsychologie*, Band I, *Die Sprache*, Leipzig 1900. He referenced the work of the Groningen psychologist Heymans and Wagner's praise for alliterative verse in *Oper und Drama*. His argument was also a display of erudition.

11 He cited Fr. Boas, *Kultur und Rasse*, Leipzig 1914.

12 Minnaert to Bolland, January 31, 1914, Bolland archive.

13 Wils, L., 1974, refutes the 'fact' that Walloons and francophiles massively violated the truce of God during that first year of the war.

14 First lecture for the Leiden Association for the Study of Socialism, March 30, 1915. Perhaps. had he seen Henriëtte Roland Holst-van der Schalk's speech on Struik's table. Etty, 1996, chapter 13, about the euphoric mood of HRH in the spring of 1915.

15 Basse, 1930, I, 174. Letter dated December 7, 1916, on behalf of Jong-Vlaanderen.

16 A clarifying passage about this 'hour U' by De Deurwaerder, 2002, 286.

Chapter 6

Radicalism to the extreme

'I feel great pleasure in spreading as much science as I can with the knowledge I possess.'

The late reaction of the Belgian government

Only at the end of August 1916 did the Belgian government respond mildly to the German decision to Dutchify the university. Rector Hoffmann and his adjutants would lose their royal honors. They probably didn't lose any sleep over that. The opening took place on October 21. The day before the opening, the government announced that after the war, parliament would resolve 'la question de la transformation de l'Université de Gand.' The Belgian Documentation Office in The Hague interpreted this as the government envisioning the Dutchification, but promptly contradicted it.

In his speech at the start of the academic year, Von Bissing emphasized that he was giving Flanders the university it legally deserved. The rector highlighted the serving role of the university in society. In the auditorium, five hundred Flemish sympathizers gathered with the lecturers in their brand-new robes, German officials and military personnel in civilian clothes. Apart from Minnaert, his mother and godfather Gillis were also present. The festive joy coincided with the first raids for the German war industry. On October 20, workers in Ghent were herded like cattle and driven to the station. A new phase of the World War had begun.

On August 28, 1916, Hindenburg had become chief of staff and his right-hand man Ludendorff chef of the Oberste Heeresleitung. Peace had become an impossibility, the soft *Flamenpolitik* was transformed into a harsh occupation policy. This concentration of military power undermined the civil

government. Submarines torpedoed cargo ships carrying aid for Belgium, regardless of the Relief for Belgium in the flags. Under these circumstances, the decision to collaborate with the Flemish University was an irreversible step.

The pacifist Vermeylen wrote that anyone who wanted to take up the Flemish cause after the war would need 'pure hands.' He loathed a university opened by 'gallooned murderers and exploiters of our people, including our Flemish people.' And he addressed Minnaert and others when he wrote that after a German defeat, 'the great exiles will return, and the cheers they will receive will be your verdict... Because your work at this moment must - yes, has to be destroyed. We want a Flemish University, but one not burdened with German original sin.'

Minnaert preaches rebellion against the fathers

At the university, 43 professors and lecturers were appointed, of whom 36 were new. Out of 25 Flemings, the majority had signed the university manifestos. Classes began with 38 students and two female students. During the course of the academic year, this number grew to 138. In the second year, it rose to nearly 400 enrollments: 366 boys and 26 girls. Some men escaped German forced labor in this way.

Even Flemish nationalist parents kept their children at home because they wondered what would happen to them if the Germans lost the war. Minnaert addressed a reproachful word to these parents in the activist *De Goedendag*. 'Where are the parents who now speak to their children about loyalty to the Flemish ideal, about the duty of intellectual youth towards the people? Where does one hear the manly language that befits a Flemish father when he speaks to his son? In a much higher degree, girls suffer under this constant lack of freedom, and it is no coincidence that Bernard Shaw says: 'Home is the girl's prison!'

In the middle of his argument, he suddenly switched to a plea for private space: 'Such a little room of your own, with your stuffed bookcase and the inkwell with the pile of pens and pencils, and all the familiar things—the color of the table and the train whistling in the distance—late at night, the wonderful fresh air when the window has been open; that whole atmosphere, that piece of yourself. Don't parents feel that their children have just as much right to a room of their own—as small as it may be under the roof—as they have the right to their own thoughts, their own joys and sorrows, their own personal lives, yes, to solitude?'

For Minnaert, who must have thought of his own balcony room, these two punitive predication belonged together. He was concerned with the conflict between educators who wanted to muzzle children and children who wanted to fight for their freedom. He cited from **The Clouds** by Aristophanes:

'How glorious it is to go into battle with new and clever ideas
And to despise prevailing opinions!'

Minnaert wrote that lack of freedom was passed down from generation to generation. Fathers imposed duties on sons. Children who had rebelled eventually continued in the same way. Young people who had chosen pedagogical reforms at university soon belonged to the worst school tyrants. He urged the students to preserve 'the memory of their youthful desire for freedom as a precious treasure,' so that they could call out to their own sons:

'Sei Du! Sei Du!
And if your old father ever speaks to you of filial duty,
My son, don't obey him, don't obey him:
Listen to how the Föhn wind awakens spring in the forest.'

Did this also convey indignation over the commandments his own father had imposed on him? Or was he merely fanning the flames of rebellion so that young people would push aside their cowardly parents and enroll? What mattered now was action; the future would decide who was right.

A New Physics Education

Lector Minnaert thoroughly turned the physics curriculum upside down. There was no compassion for the 'old wig' whose function had been stolen by a young man with only a short year of Leiden physics under his belt. After all, he believed he was doing it much better than his Francophone predecessor.

In a letter addressed to the Natural Science Students, he assured them that the exact sciences were not 'dry': 'They are the study of reality and the entire nature surrounding us; reality and Nature are not boring but full of mysterious wonders whose explanations provide the highest satisfaction for our minds and sense of beauty.' He recommended Dutch, German, and English books, trusted they could read French fluently, advised them to learn Swedish, Norwegian, or Danish ('three months for a Fleming'), while knowledge of Italian was actually necessary for electrical engineering. The

students must have been amazed. Just like with his eclipse prize question, Minnaert created an idealized image of a Flemish student. In the 1918 student almanac, there is an overview of the first two years' courses: notably, he introduced not only familiar physics topics but also 'Principles of Practical Meteorology.'

Minnaert assigned a more important role to experiments than his predecessor. His unpaid assistant Gaston Mahy, himself a student, helped repair equipment and design modern instrumentation. The facilities of his father's boiler factory came in handy, and Minnaert's experience with home practices must have paid off. The open field also provided opportunities. During an outing with students, they searched for whistling echoes and found 34: 'Almost the entire city of Ghent will become a whistling echo!'

Soon enough, Minnaert had to admit he had set the bar too high. Some students had never had physics before, and their math skills were insufficient. As a result, his teaching level lay between secondary and higher education. Why wasn't practical physics being taught at the atheneums? Reforming secondary education seemed to him 'a life question for the scientific revival of Flanders.'

The letters to Jan Burgers testify to his efforts. After three months, he reported: 'We have turned everything upside down; new orders must constantly be made to provide for everything that is lacking; a modern spirit is replacing the old, stuffy school atmosphere that lingered in the building. Even the engineers are being released from their former discipline and are almost becoming human again. We have set up a beautiful reading room for mathematics and inorganic natural sciences, which (note well!) is open in the evenings from 9-11:30 and during vacations! I have introduced physical practical exercises for medical students (who previously had none) and for pharmacists and biologists (the same), and I have extended it to two years for mathematicians, physicists, and engineers. Everything I learned in Leiden is now serving me wonderfully; of course, I greatly regret not having had the opportunity to study for my own enjoyment any longer, but I feel great satisfaction in fulfilling a role that no one else could fulfill at this moment and in spreading as much science as I can around me.'

He enjoyed the students. The student association was set up in consultation with him, following the example of the Leiden Corps, so without separation into liberal or Catholic. Teachers invited students to their homes for a cup of tea: Minnaert had also done this repeatedly. He complained about the quality of textbooks and the lack of schematic drawings: 'One would say that the authors do not dare because then one would too well notice the unclear aspects in their representations.' He pleaded with Burgers

for a reprint of the good physics book by Julius, a physicist from Utrecht. Minnaert and Mahy that year created advanced demonstration equipment, which made the lectures lively: the alternating current dynamo made its debut, as did experiments with liquid air. In 1917, the physicist Arnold Sommerfeld came from Munich to give a lecture on the atomic model and stayed with us for a few days as our guest.'

When everything was in order, Minnaert wrote to Burgers, he wanted to 'investigate the teaching of physics in our various schools. I already know that I will discover 'unheard-of scandals' (Ehrenfest's term): in a state teacher training school for female teachers, there is not a single piece of physical equipment; when they talk about a magnet needle, they cut one out of paper and use that 'see' how he 'tunes in.' He wanted to organize vacation courses for teachers and establish a 'school museum.' To drastically expand the inventory of physical devices in schools, he considered setting up a special workshop: 'There are future plans. Let there first be peace, then everything will be fine.' In the second year, he also began to focus on his 'favorite subject': the didactics of physics. Three senior teachers introduced exercises in practical physics at Normal Schools, which turned out to be a great success. In between, he worked on converting his French-language dissertation into a Dutch-language book, which appeared as one of the Works of the Flemish University.

His mother also contributed to the enterprise. Although Minnaert was a lecturer and she was not his wife, she became chairwoman of the Senate Ladies' Circle and led the Society for Social Works at the university hospital. Supporting needy patients was intended to enhance the university's reputation among the population.

An intimate friendship

Minnaert could move relatively freely as the head of the University. The front was unrealistically far away. He could attend performances of plays by Norwegian playwrights Ibsen and Bjørnsen. His work completely occupied him. He could imagine himself in a normal world. Within the boundaries of the occupied city and within his total abstinence lodge, he was known as a vegetarian and pacifist, feminist, and internationalist. Writers like Ibsen and the Swede Strindberg, whom he could read in their own languages, called on women to tear apart the conventional lies of marriage and throw off the yoke of men. Gaston Mahy introduced him to the work of the American free spirit Walt Whitman and the graphic work of their former schoolmate Frans

Masereel.

Minnaert was particularly charmed by the oeuvre of the Swedish Ellen Key, following Havelock Ellis's critique of traditional marriage, transformed it into a new morality of marriage and education. At the time, numerous movements had emerged aiming to reorganize society; their collective name was Lebensreform. Followers were characterized by seriousness and asceticism, behaving like members of a secular clergy. This seriousness suited Minnaert well, as humor and self-deprecation were not his strongest traits.

Minnaert wanted to share his new insights with a woman. The mixed lodge Licht en Liefde (Light and Love) of the Order of Good Templars provided him with the opportunity. He could ask the 'brothers and sisters' to read certain books, which would be discussed during meetings. One of the girls was Jet Mahy, Gaston's sister. She was a regent and had also enrolled as a student in natural sciences and mathematics. She confided her view of their friendship in her Diary of 1918. Before the war, she had given her consent to Rudy Hoffmann, the rector's son, who had moved to the United States. Nonetheless, she wrote that outsiders considered her and Minnaert as 'engaged.' Minnaert even offered her an assistantship during her second year of study. She refused because the work 'under such a strict teacher' would be too heavy for her, but she felt flattered.

Jet was enraptured by Minnaert's lectures. During a meteorology lecture, she experienced moments 'of pure scientific pleasure; understanding a difficult question, the solid outcome of an experiment puts me in sweet ecstasy and I feel deep joy.' On April 16, she reported that she had been shaken out of her 'inner balance': 'I no longer have the same peace with myself that I once knew; lasting unrest torments me.' This was due to a visit from Minnaert and the 'delightful' collaboration that followed. Minnaert had assigned her, as a lodge member, to read Key's *The Ethics of Marriage* and *The Century of the Child*.

Jet had an authoritarian Walloon father who opposed his children's Flemish inclinations repulsive, she found. She recognized the family patterns Key had described from experience. She copied long passages about the equality of women. The fact that many men consider their wives as their property, she learned to see 'as a remnant of lower, erotic feelings, summoned by desire for power, vanity, cruelty, and blind passion.' Only complete, mutual freedom between man and woman could open the way to love and 'complete reciprocal surrender.' These were Minnaert's ideals, with which Jet agreed: 'I believe more and more that our current marital life is nonsense, totally contradictory to the natural inconstancy of men. As a rule—especially these days—every married man engages in amorous or sexual relations outside

his marriage. The households where everything goes normally are easily counted; yes, where everything goes well, they form the exception. I hear that several of our Dutch or German professors avoid their wives and children in their homeland to start fresh here. That breaks my respect for them.'

She added dreamily: 'Sometimes I dream of the delightful simplicity in which I would later want to see everything around me. I am a passionate advocate of simple beauty. Lots of air, lots of light in the house; modern, practical furniture amidst harmonious wall and window decorations. Bright, harmonizing colors that bring sunshine; none of the excess that disrupts unity and leaves a heavy impression.' She embraced Key's educational ideals, which were at odds with what she herself had experienced. Educators had to become children themselves if they wanted to educate; not directly intervene when a child made a mistake; focus on the environment in which the child grew up; not force a child to show affection and reserve touches for important moments. She underlined Key: 'Those families that send the morally strongest and most active sons and daughters into the world are those where children and parents are work companions and equals, in the same way as an older sister considers a younger brother or an older brother considers a younger sister, where parents, by being children with the children, young with the youth, spontaneously support the upcoming girls and boys in their development into people, by always treating them as people.'

Key's views were also based on adult illusions. The educator is not on the same level as the child and should not be a work companion. Her books were nevertheless, worldwide, an impetus toward a more child-friendly pedagogy. Minnaert perhaps recognized the upbringing of his mother; for Jet, it was all new. She discussed these intimate matters with Minnaert; undoubtedly in all modesty. For she had promised fidelity to her young man in America. Meanwhile, her teacher and she were swept up in the radicalization of activism.

Resoluteness to the extreme

The activism in Antwerp and Brussels had gradually overshadowed that in Ghent; even the Young Flemish groups were stronger there. The star of August Borms, a teacher at the Antwerp atheneum, rose. On January 21, 1917, Minnaert participated along with twenty-three professors from the University in a first tribute to Borms. This event led to an 'activist day' on February 4 in Brussels, where a tactic was established that 'must unite us all.' At this activist day in the Flemish House, 125 Flemish militants were

present, including Minnaert. They approved a manifesto To the Flemish People and delegated the formation of a Council of Flanders to Borms. He assembled a council of forty-six members. Among the ten Ghent members, seven were professors at the University. The Young Flemish leaders Domela and Minnaert were absent. Domela felt excluded and protested vehemently. Incidentally, the composition of the Council remained secret. A delegation of seven men made a trip to Berlin in March. The composition became publicly known through German press photos. The Belgian public showed itself shocked.

That year, the resistance of Flemish frontline soldiers had led to the establishment of the Front Movement. The long-standing calm of the Belgian military at the front enabled their leaders to build an organization. In an open letter to King Albert I on July 11, 1917, they wrote: 'Due to the fault of our government, the Germans have been able to establish a Flemish University in Ghent. The Flemings have accepted it; they have done well.' In the mud of the Yser Front, the later Flemish Nationalist Front Party was born.

German propaganda could thus drum up support for the Flemish nationalists. The right to self-determination seemed to be of particular importance to the Americans. Nevertheless, the unrestricted submarine warfare was the reason for the American declaration of war in April 1917. In contrast, there was the German diplomatic success in Russia on November 7, 1917, which suddenly eliminated the Eastern Front. The German troops were immediately transferred from East to West. The American war machine still had to get into gear. Therefore, Germany had to force a victory on the Western Front in the first half of 1918: the Ludendorff offensive. The precarious situation of Germany called for further radicalization among the activists. The Council of Flanders proclaimed the independence of the state of Flanders at the end of 1917, much to the displeasure of the Germans who wanted to retain control over Belgium's future.

Minnaert was not only involved in this radicalization but strongly promoted it. In March 1918, he joined the party when the Ghent activist Jan Wannyn founded the Nationalistische Voorwacht. This marked the start of gatherings, sometimes attended by thousands, where Minnaert acted as a speaker and agitator. He even became involved with Wannyn's militant magazine *De Vlaamse Smeder* in April. The first editorial proclaimed: 'We want to grasp the enemies of our people with an iron fist and strangle them mercilessly because we know it is a life-and-death struggle in Flanders between the powerful French-minded oppressors and the suffering, weak, misguided Flemish people.' Wannyn even found the establishment of a Flemish Na-

tionalist Party undesirable. Minnaert protested: 'If we renounce political, therefore parliamentary action, we renounce the strongest weapon that the Flemish Movement should have used to achieve victory.' Minnaert had seen this clearly, but why was he then part of a group that had taken authoritarian leadership as its starting point?

Domela felt offended, wanted to turn his back on activism, and threatened to make his archive public. Minnaert managed to keep him within the movement. He took charge of the Ghent chapter of Jong-Vlaanderen and organized the resurrection of the 'father of the movement.' Minnaert wrote: "You can be assured that in our Group, the old spirit of resolute action to the utmost still lives on. With you as our leader, as the spiritual leader of our Movement, we want to move forward more resolutely than ever before, to achieve the realization of the 'free independent Flemish State.'" The national congress of Jong-Vlaanderen in May 1918 offered Domela an honorary chairmanship and a seat on the Council of Flanders. The man then delivered a rousing speech about his leadership role: "The spearhead of all Flemish people is the Jong-Vlaamse Beweging, and as soon as this spearhead loses its sharpness and becomes dull, it can no longer penetrate all obstacles." And: "A pure idea is strong; stronger than any alliance with impure ideas. The pure idea of 'a Flemish state,' without any added Walloon elements, will ultimately triumph, even if the entire world, with all its emperors, kings, presidents, governments, and half-Belgians, oppose it." These passages make clear why Minnaert could not do without the pastor: he embodied for him the pure principle, the sharp spearhead that had to remain cutting-edge.

The impending defeat could hardly penetrate Minnaert's awareness. Luidendorff's offensive had been halted in July. While the Council of Flanders, on June 20, 1918, tied its fate to that of the German Empire through an Appeal to the German people, the Germanic brother roughly shook off his Belgian sister. On Guldensporendag, Chancellor Von Hertling declared that he was willing to guarantee the restoration of Belgium as an independent state. This was the work of the advocates of a 'compromise peace,' primarily the social democrats. For the activists, this was, according to Hippoliet Meert, the most cowardly betrayal ever committed against a Germanic brotherhood. The Chancellor promised during the peace negotiations amnesty for the activists but that was also his final commitment. The Germans reserved an amount from the Belgian state funds (!) to pay the promised compensation to the professors of the Hogeschool.

All the more remarkable, the correspondent of **Het Vaderland** from The Hague, likely Leo Picard, found Minnaert's speech of August 27 to the

34 Young Flemings of Antwerp. He had concluded as follows: 'We must not waver. Young Flanders sets a goal. And note this: we ask for everything to achieve everything. If everyone does their duty, we will reach our goal.' The reporter was flabbergasted: 'That is what Dr. Minnaert said. Simple, straightforward, even simplistic, was his speech..., but I did not get the impression that a politician was speaking. We heard a lot about the goals and ideals, nothing about the means to achieve them in connection with current events. I know that a public speech is not very suitable for discussing such matters, but it seemed to me that the speaker had barely grasped the importance of the issue.' Perhaps the realization of defeat only set in after Minnaert, on behalf of the Council of Flanders, visited the front in Northern France.

General Ludendorff had ordered Governor Von Falkenhausen, the successor of Von Bissing, on July 8 to 'give some insightful Flemings the opportunity to visit the front. They will better understand the value of a firm future union between Belgium and Germany. This refers to a visit to the salient near Ypres and a trip via Saint-Quentin to the Chemin-des-Dames.'

At that time, the trips were still intended as German propaganda, but due to the shift in military initiative, it became clear to the selected individuals that Germany was going to lose the war. Minnaert visited the front lines at Chemin-des-Dames from September 14 to 16, along with De Clercq, Wannyn, and Faingnaert. The Brussels native Arthur Faingnaert wrote: 'Now, we have seen the battlefield south of Laon...! Upon our return, we communicated to the German authorities on Wetstraat that they did not need to prolong the war for Flanders. After a short storm, the mood in Flanders would clear up, and the self-confident part of our people would continue their struggle, even without foreign help.'

The independence of Flanders was soon over. On September 26, the German administration dissolved the Council of Flanders. On October 15, 1918, the University opened its gates for the third academic year. Five days later, classes were suspended. Even Minnaert realized that Germany had lost the war and that the Flemish University was at the mercy of victorious Belgium.

Jet Mahy and the furiously pro-French

Minnaert left for the Netherlands around October 20 with his mother. They were able to save themselves, which means Jozefina must have withdrawn or transferred part of her assets to the Netherlands. Minnaert was convinced

that the storm would pass after a few weeks and he could return to Ghent. He had likely placed the most valuable musical instruments and books with his aunt, Nathalie Van Overberge, but did not expect looting. Other activists, such as his friends Jet and Gaston Mahy, refused to flee.

On October 23, 1918, in The Hague, Professor Bodenstein and jurist De Koning, members of the activist organization *De Dietsche Bond*, met with Reimond Kimpe and Minnaert from the Ghent group *Jong-Vlamingen*. The Dutchmen believed that the activists should remain in Flanders. Minnaert thought that Flemish nationalism was still too underdeveloped for martyrdom: those who fled also made sacrifices. It also had to be considered that in case of imprisonment, 'the best forces' would be immobilized.

However, the Antwerp native Borms had said in the Council of Flanders the previous year: 'I think you will not commit the cowardice of fleeing and leaving behind the poor devils we have gathered in the activist army to be stabbed and sacrificed. If we were to do that, we would commit a cowardly act.' Borms would act accordingly. Minnaert had still pleaded for final victory in August, while now he confidently justified his flight. It was a metamorphosis that is hardly comprehensible. His friend Jet Mahy, at least, had great difficulties with it.

The Allies' victory was within reach from late October onward. On November 11, the armistice was signed and the Germans withdrew. How Jet Mahy experienced those weeks, she wrote in her Diary. 37

Jet wrote on October 24, 1918: 'Those dear Allies have meanwhile come to station just a few kilometers from Ghent; they promise us day after day that we will see them fully, but it seems that cannot happen so soon. You cannot believe how our hearts rejoice and cheer. They are inside and we see before us the great iron gate on the Coupure being unlocked. We are called 'political criminals' in their respectable mouths and must atone for the crimes they have promised. Our leaders have polished the plate for a long time - actually, much too early, as it turns out - as is fitting for their role, right? There, the Temple of Science now stands lonely and abandoned, ready to be stormed by the former rulers. We will still suffer greatly from the rabble who do not know anything about the matter; we can feel that already: in prison, we will finally be safest. The German troops still present here make themselves deeply hated through the atrocious destruction they seem to carry out with real pleasure.'

November 13, 1918: 'The neighborhood was stormed today and many shameful acts took place under the impulse and encouragement of Belgian soldiers. We too are threatened and, as true apostles of peace, we will all go to bed armed tonight. We no longer know rest, for we now live under a vile

regime. Bought-off scum and drunken soldiers roam unpunished and plunder one house after another; we experience dreadful lawlessness here. And there is a whole series of miserable regulations that we have to read. Oh! How sunny the future seems that our saviors have opened for us... Full of bloody plans, we stood ready this afternoon - after being warned by neighbors - to repel the attack on the house. Water, tar, and sturdy iron cleats, everything was prepared; the men in front, behind the door; we, the rear guard with the sharpest and heaviest kitchen utensils. The alarm was once given when the plundering procession passed by; the shutters were torn open and we all stood there, pale with rage, on guard.'

November 14, 1918: 'The night is noisy; the shouting and screaming from stumbling drunken fools persist endlessly, even for days on end. The barking of a dog in the neighborhood, the stamping of a horse, everything startles you and you gaze with tense eyes into the clear, cold November night. But we will live with resentment in our hearts and eventually, inevitably, demand revenge...'

Like Cassandra, Jet foresaw the drama of the Interwar period.

Great sorrow and the plundering of 72 Parklaan

If Minnaert had stayed on Parklaan, he would have experienced something similar. The Minnaerts had left their house at Parklaan 72 undefended. Their furniture would not escape the wrath of the mob. A reconstruction of the 38th plundering later also gives an impression of the rich interior of their home: 'A soldier stamped through the shutters and windows of the ground floor with his heavy boots; then they stormed into the two rooms on the same level, smashing the marble fireplaces and the stained-glass windows. The nearly new Pleyel et Wolf grand piano from Paris was battered to pieces with rifle butts and such violence that its panels and parts soon flew around the room. An old harpsichord made of solid walnut wood met the same fate; all the windows in the house were shattered, the mirrors above the fireplaces were broken, and not a single piece remained whole in any of the upstairs rooms. Hundreds of books were torn apart or carried away, clothes pulled from the closets were ripped to shreds, the musical works that filled the library were torn to pieces, and when nothing else seemed to satisfy the drunken soldiers, who appeared to be mainly searching for money and wine bottles in the cupboards and drawers, the gang of looters, led by neat little officer types, withdrew. However, much had escaped the destruction: the house was large, fully furnished, and the library was extremely rich, the

cherished possession of the house, assembled with heaps of money and careful dedication by three studious and passionate book lovers: books in many languages, valuable dictionaries, scientific standard works, and a treasure trove of literary masterpieces from world literature, along with an important music library and a few more musical instruments that the family had not been able to save in time.'

On the afternoon of November 11, a group of civilians broke in: 'The wrought-iron chandelier, the heavy oak wardrobe, the mahogany clothes cabinet, the beds, the kitchen stove, the Cadé heating stove—nothing was too heavy for the scavengers. The entire house was literally filled with torn-up papers, and even the bath heating system was crushed and thrown into the garden, the lead pipes ripped out and taken away, the copper faucets stolen, and along with the large remaining copper musical instruments of the refined music lover Dr. Marcel Minnaert, one could see the scoundrels calmly leaving the house in groups. The heavy carpenter's bench was thrown downstairs, and the beautiful staircase railing was smashed to pieces.

The French-Flemish fury also turned against pacifist Flemish sympathizers. Thus, the interior of MacLeod's country house was equally devastated. Alone in Ghent, 156 homes were burned and plundered. Minnaert had summoned Jet to come to the Netherlands, as witnessed by his undated letter: 'Dear Sister! Listen for a moment, no more jokes! You want to return to the lion's den; but now that you've experienced how things stand there, only one thing remains to be done: go North, here. Consider that much more is at stake now than ever before; remain calm, think carefully, but act quickly! For truly, if you fall into their clutches, we are all powerless.' However, Gaston and Jet Mahy were caught. Jet was held in solitary confinement for a month, after which she was suddenly released.

In January 1919, she received a comforting letter from Minnaert. He had chosen the metaphor of 'The Tree of Great Sorrow' from a poem by Henriëtte Roland Holst: 'A dark tree, with a murmuring crown, represents great sorrow; most travelers flee from it; some are lured by the illusion of faith (=religion); others go to dry, dreamless paths: since they fled the Tree of Great Sorrow, the Great Longing no longer awakens in their hearts.' Sometimes there is an individual who sits in the shadow and

'listens and weeps and ponders, but does not despair'.

These individuals gain the strength to chew the fruits and then feel

'the power that arises in humans only from the bitter food of great sorrow,'

and when they understand the meaning of the song rustling in the tree, they stand up and step toward a bright horizon:

'They are the ones who lead the children of men
and sow in their pale minds
The flame seed of high-flying wishes,
And fertilizing with a ray of courage.'

The question is whether the Flemish Jet found comfort in the Dutch Jet. Gaston would receive a five-year prison sentence. She wanted to escape from 'the flame seed of high-flying wishes' and emigrate to her Rudy in America.

Marcel picked up the thread again in the Netherlands. He never complained about the loss of his treasures. For Minnaert, the present and future were always more important than the past. However, his confusion became visible in the tactics he published in **De Toorts**.

Three tactics in two months

After his return, King Albert I made three promises. The loyal socialists cashed in on two: universal suffrage for men and the right to strike. The third concerned the Flemish Movement. The king said on November 22, 1918: 'The government will propose to parliament to lay the foundations for a Flemish University in Ghent, subject to the right of the Chambers arising from elections to regulate the specific forms and methods.' He added that amnesty for extremists was unimaginable: 'The Flemish population itself has already disavowed these agitations, but the guilty must undergo the severity of harsh punishment.'

Minnaert initially viewed it optimistically. At the beginning of November, before the plundering, he devised a tactic, almost a strategy: the activists actually took the same position as the socialists toward the Belgian government. After all, the socialists also sought to overthrow the existing conditions. Activism had 'a clearly defined path' ahead: its representatives could be proud and need not be ashamed of changing their tactics. After the plundering, he remained optimistic. The Flemish question had been internationalized, and a 'wonderful crowd of young intellectuals and convinced propagandists' had been trained to fan the flames of national consciousness. The Flemish University had 'its splendid possibility of existence and forever proven.' The Francophones and Walloons had settled the destructions: 'The

people in Flanders generally hold favorable views towards activism and activists.' He seemed to have no understanding of the population's feelings or the severity of the offense committed by Jong-Vlaanderen.

The Conseil Académique of Ghent University accepted an address in December rejecting the Dutchification 'forever.' Only two professors voted against it. Rector Fredericq, back from deportation, went along with the majority. On January 21, 1919, he opened the university in French and announced that some courses would be taught in Dutch. After 44 months, he resigned his position. The Dutch specialist J. Vercoullie, a lonely supporter of Dutchification, wrote:

'This strong resistance to activism should not be surprising, especially in Ghent, where people have been so provocatively mocked and ridiculed by activism. Whoever is even slightly compromised by activism must patiently await the turning point.'

The Ghent scholars made a list of traitors and asked foreign universities to reject them. Administrator Eeman expressed the prevailing opinion: 'Our professors left their chairs, which they could no longer occupy honorably, due to the betrayal of the sold-outs, the opportunistic careerism of some cancers, and the hyena instinct of some disgusting Batavians. Woe to the victors. Glory to the defeated.' A group of 46 teachers, including Minnaert, responded: 'Our goal was to change the center of Frenchification that Ghent University has been for Flanders for over 75 years into a center of Dutch civilization.' They faced their trial confidently, it seemed. In September 1919, Minnaert received the message that all books and instruments he and Gaston had acquired and developed were destroyed by the French professors! The same would have happened with De Bruyker's new plants and trees in the botanical garden.'

At the first meeting of the General Board of the liberal Willemsfonds on January 5, 1919, the four attendees, including Vercoullie and Fredericq, took note of the resignation of general chairman Gillis D. Minnaert. He passed away a few months later. Biologists Cesar De Bruyker and Marcel Minnaert were expelled. Nevertheless, the Fund published a brochure denouncing the fact that Walloon activists could move about freely.

Every Flemish initiative was paralyzed. Even the passive resisters received the slur 'flaminboche,' 'vlamenmof.' Passive resistor Kamiel Huysmans, secretary of the Socialist International, observed as early as January 4, 1919, that the Francophiles were exploiting the 'activist error': 'The fury of the Francophiles was no longer directed at those who had committed blameworthy acts. No distinction was made anymore between the signatories of a manifesto for the Flemishization of Ghent University and those

consciously contributing to the destruction of Belgium.' Huysmans warned: 'We will not be strangled!' The warning lay in the word 'we.'

The Process of the Flemish University

Minnaert wrote a third article for *De Toorts* in January 1919: To Our Friends in the Netherlands. He had come to realize the gravity of the situation. He began with a defense: 'Imagine sitting alone late at night in your cozy living room, surrounded by familiar surroundings built up piece by piece over the years, and facing a decision on which your entire future depends; to remain silent or to speak out, to endure or to act, to be a passive resistor or an activist. There is no longer a middle way; life's reality confronts you: choose! And in one pan, you first throw the respect by which you are surrounded in society, the greetings of acquaintances, the handshake of a friend or family member, your good reputation in respectable circles; you throw into it everything you have acquired in the past through the long struggles of youth: money, possessions, position; you throw in the future that could be beautiful, the future of your wife and children, your life's task which you may no longer be able to fulfill, perhaps the peace of your old age. And on the other side of the scale... No, no! It is not a novel; no, on the other side of the scale there is not the proud awareness of bringing salvation to your people and fatherland; no—on the other side lies doubt! Life is not so simple, the circumstances are so complex and confusing that one cannot be certain what is **now** good, **what** is the way out. And now, for the love of Flanders, everything must be sacrificed for the sake of a solution that many warn against and which one does not immediately consider much better than the other. Faced with this choice, the activists have chosen what Flemish duty commanded.'

Minnaert thus dramatized the dilemma of the radical Fleming who had chosen his country, even though it was an impossible choice. It was a transparent lead-up to a call for support for his fellow sufferers in the Netherlands: 'There must be some way to provide decent people of good will with work that allows them to earn enough for the simplest lifestyle. Honor the soldiers who have returned from the front for the Dutch cause for a while!' The Minnaerts contributed a substantial amount to a solidarity fund for former Ghent professors and students.

Minnaert refused the Germans' compensation. He had fulfilled his Flemish duty, but that did not mean he had served the Germans. He alone made it a matter of principle. A settlement list from a Berlin archive dated March

27, 1919, shows that 38 professors from the University received several years' worth of salaries as severance pay. It states: 'Professor Minnaert has waived any guarantee payment and merely requested confirmation from the German government that he had not received any payment from them.' He could apparently afford to take this stance financially.

Minnaert followed the Belgian legal process and wrote to his friend Burgers, who had since been appointed a professor in Delft: 'The first verdict that has been pronounced imposes the death penalty on a colleague, Dewaele, who played absolutely no significant role in the movement. You understand that all of us, through these terrorizing measures, are more unyielding and stubborn than ever in upholding our ideal; the fact that Flemish soldiers in general are very much in an activist mood gives much hope.' About this verdict, the socialist Vooruit judged: 'From the bad and mean, one moves to the absurd and equally dangerous.'

After the state of siege was lifted on April 30, 1919, the cases were brought before the Courts of Assizes. August Borms had been arrested in Belgium and sentenced to death. This sentence was also commuted to life imprisonment after protests from the Vatican. Extradition requests to the Netherlands regarding the condemned linguist Willem De Vreese, who was now a municipal librarian in Rotterdam, yielded nothing. The Netherlands granted asylum, even to Kaiser Wilhelm II. At that time, Belgium was also at war with the Netherlands because the Belgian government claimed not only Luxembourg and German territories up to the Rhine but also parts of Dutch Limburg and Zeeland Flanders as spoils of war.

It wasn't until July 1920 that the Court of Assizes in East Flanders handled the case of the Flemish University. This coincided with the appointment of Henri Pirenne as rector of the university. Newspaper reports make it clear that the trial was tumultuous, with defendants and their defenders accusing the Belgian government and its military security services. The Catholic leader Dosfel said: 'I do not consider it a disgrace, but an honor, to be imprisoned by Belgium for Flanders.' Four professors defended themselves: Dosfel received ten years in prison, and Cesar De Bruyker received five years. Among the exiles, Minnaert was sentenced to 15 years of forced labor, Speleers to 12 years, student Bob Van Genechten to 8 years, and artist Jozef Cantré to 5 years. Student Wies Moens was sentenced to 4 years and wrote his **Celbrieven** (Cell Letters), which became literature. After the final hearing, the 'cart with the convicts' could not pass through the crowd. People shouted: 'Long live the Flemish University.' Cesar De Bruyker believed that the sentences placed a heavy mortgage on Belgium's future because they suggested 'that the interests of Belgium and Flanders

are irreconcilably opposed to each other.'

A year later, the leaders of the activist press and Jong-Vlaanderen were next: Domela was sentenced to death, Leo Picard received life imprisonment, and Jules Van Roy received 20 years. By mid-1922, there were a total of 268 convictions, 168 of which were by default, and 45 death sentences. Not a single death sentence was carried out. The convicted lost their civil rights and were expelled from the government apparatus. Those condemned by default could no longer return to Belgium and played no further political role.

Those who had defended themselves in court, such as August Borms, Lodewijk Dosfel, Cesar De Bruyker, Antoon Jacob, and Roza De Guchtenaere, were martyrs. Minnaert's view that Flemish nationalism was too young for this was disproven.

The activism and the young Minnaert

Before the World War, the Flemish Movement had matured. Groups of young people had radicalized and concluded that they had nothing to expect from the Belgian state. The Flemish historian Maurits Basse wrote afterward: 'If one of these directions ripens into sufficient power to deserve one of the leading roles and is underestimated by those holding the dominant opinion, extremism is born out of resistance on one side and impatience on the other.' The Ghent historian Capiteyn sighed that the course of the World War would have been different if the Belgian parliament had decided in 1914 to make the university Dutch: what a moral disaster Belgium, and Flanders, would have been spared if the government and parliament had understood the people's interest and their duty! Then Jong-Vlaanderen would not have been viable: after all, the only achievement of the *Flamenpolitik* had been the university.

The Dutch historian Pieter Geyl later wrote that activism, which he opposed, was inevitable: 'Injustice causes bitterness. The activists' actions were unwise but were provoked by the foolishness of the Belgian regime.' Geyl's student Arie Wolter Willemsen observed that decades of disappointment among part of the Flemish Movement had cultivated a latent anti-Belgian sentiment, which had served as fertile ground for activism: 'It was only one step to hostility.'

Activism had fled forward and lost contact with the population. The obsession with the Flemish ideal made the activists blind to the World political relationships. They desired not only the victory of Germany for the

benefit of Flanders but accepted everything that could contribute to it. The historian Vanacker therefore concluded that the activist adventure was 'understandable, almost inevitable, but unwise.' Vanacker also incorporated the generational aspect into his analysis: circles of young artists and writers saw activism as a resistance against the bourgeoisie, as a heroic, anti-authoritarian movement. This was an aspect that had played a significant role in both **De Bestuurlijke Scheiding** and **Jong-Vlaanderen**. The young people in the occupied cities were given an exciting task through this movement. Writers such as Felix Timmermans, Antoon Thiry, Reimond Kimpe, Paul van Ostaijen—and at a greater distance, Willem Elsschot and Richard Minne—were involved in activism. Activism created a deep divide within the Flemish Movement. The watershed between activists and passivists in the interwar period can be compared to the schism between communists and socialists in Flemish relations

Snapshot 1919

Marcel Minnaert, who fled to the Netherlands, turned 26 in February 1919. He is 1 meter 90 tall, has dark, thick hair, and brown, piercing eyes. He takes great care of his appearance, wears a monocle, and sports a bushy mustache in the style of Groucho Marx. After the death of his father, he dedicated himself to culture and science, and his youthful knowledge and abilities have drawn attention. He is accustomed to being at the center of attention, can interact functionally with people, deliver speeches to large audiences, and agitate passionately. Within the Flemish Movement, he adopts a didactic and instructive style. He is versatile, restless, and has an insatiable work ethic. He can push acquaintances and friends away. According to his father, stubbornness, obstinacy, and temper are hereditary traits of the Minnaerts: his son makes no effort to prove the opposite.

Minnaert uses a vocabulary with terms such as "maximal decisiveness. He has read Nietzsche and claims to have been 'steel-like' through him. He glorifies both the youth and the older teachers. For his decisiveness, he needs pure starting points. The philosopher Bolland appeals to him because of pure reason. From the biologist Mac Leod, his initiator in the natural sciences, he adopts not only his 'biosociological' views on mutual service but also the distrust towards politics and the humanities. He remains loyal to Domela and his pure line. The sabotage of Flemish rights and desires ignites radical activism in Marcel. He clings to the principles of Jong-Vlaanderen, even though they are discredited during the war. This raises questions about

Minnaert's personality. Is there a psychological explanation for his behavior?

A few observations seem possible. His hyper-individual, strict upbringing spares him confrontations with Sinterklaas, Snow White, and Bluebeard, keeping unpleasantness at bay. His frustration threshold is therefore low. It is conceivable that the reluctant attitude of the Belgian state frustrates the young man more than others and that he is quicker to radical resistance to get his right. The world-alienating nature of some of his convictions corresponds to the way his parents shielded him from the outside world. His simplistic solutions to the problem of the exiles' tactics may indicate that he lives under the illusion that he can mold things to his will. It is difficult for him to confront self-constructed images of reality with reality.

However, there seems to be more to it. For instance, the death of his strict father may have awakened a desire to follow older individuals like Mac Leod, Bolland, and Domela, who, just like his father, show the way with great certainty.

A psychoanalytic interpretation is also plausible. At the moment Marcel becomes a radical flamingant, he is 17 years old. That is the age at which an adolescent separates from their father or mother, often triggering intense conflicts to free themselves from them." is father, however, has passed away and, due to his final wish, makes it impossible for Marcel to engage in a harsh conflict with his mother. The anger he cannot direct at either his father or mother can be sublimated into a choice of the most radical activism, in the struggle for the destruction of Belgium and the independence of Flanders. The child's striving 'to destroy the father' is then shifted toward Belgium. The liberation of the 'self' is deferred to that of Flanders. Identification with Flanders is a safe way to express his anger; the unsafe way could harm his mother.

His mother is also trapped in this triangle: Jozefina binds herself unconditionally to Marcel. She loses herself in him and 'possesses' him through her love. Marcel fulfills the promise of societal brilliance and takes his father's place. Jozefina goes along with everything her son does out of fear of losing him. She also accompanies him to the Netherlands, where their symbiotic relationship continues.

In line with this, an explanation for his extreme radicalism is possible. Father and mother throw themselves at the child and block his emotional development. The father's commands hang around his neck like a millstone. The child feels betrayed by adults and enters permanent rebellion. When those in power destroy things, he erupts in savage anger over yet another betrayal. Marcel identifies in that case with an oppressed person, party, or cause: with Evariste Verdurme, Flanders, 'the Czech,' 'the child,' 'the

woman,' and the Flemish University.

Minnaert is a man of deeply rooted resistance. He develops immensely on intellectual and cultural levels. His drive is restless because he cannot consciously confront the source of his anger and aggression. He remains loyal to his great ideals and has the ability to sacrifice himself. At the same time, he is selfish in his striving, struggles with nuance, and finding empathy for others' feelings. His eager interest in pedagogical and didactic issues may serve as a way to ward off reflections on his own upbringing and give it a positive spin.

Under Mac Leod Minnaert had become a lauded biologist in Flanders/ His father had encouraged the natural investigator within him and stimulated his capacity for self-examination. At his mother's home, he ran an electrical, optical, and chemical laboratory. He had learned carpentry and at the university of applied sciences, he had specialized in metalworking and the construction and operation of modern physical demonstration and precision equipment. He was ambidextrous and had an unlimited dedication to natural science. In Leiden, he had learned to think back and forth between advanced physical theories and phenomena and had seen an elite of physicists and educators at work. He had developed a broad cultural interest and, in addition to German, French, English, Greek, and Latin, he also knew three Scandinavian languages, Italian, and elementary Russian.

Someone like him should be able to find work. The Netherlands and its colonies could once again attract an appealing brain drain of capable, overzealous Flemish intellectuals. The country had once welcomed Stevin, Lipsius, and Dodoens; it still knew how to appreciate such gifts.

66 Marcel looked at the sun, which, unlike him, still came to greet Flanders. He sought her advice. She was warm and clear. He followed Klaas's advice and tried to be as good as she was warm and as honest as she was clear.

Endnotes:

1 Vanacker, 1991, 132.

2 Vanacker, 1991, 230, mentions Gillis Desideer Minnaert as an activist. Minnaert claimed in 1924 that his uncle was not a member of an activist organization but wanted to attend the opening of the Flemish University. The Encyclopedia of the Flemish Movement, including the new version from the 1990s, mentions Gillis' resistance to De Vlaamse Post and implicitly characterizes Gillis D. as a passivist.

3 Daane, 2000, 96. Vanacker, 137.

4 De Schaepdrijver, 1997, 169.

5 Minnaert, 1916b. The activist monthly was under the leadership of

Michel Van Vlaenderen.

6 Aristophanes, *The Clouds*, lines 1399-1400.

7 Dehmel, R., *Lied an meinen Sohn*. The core: 'Be yourself! And if your old father ever son's duty speaks, my son, obey him then.'

8 Minnaert, *To the HH students in Physics*. At Vanacker, 138.

9 Letter to Burgers 11 April 1917 The whistling echoes in the first edition from 1939 of **The Physics of the Free Field**, II, 29, but then in Baarn and Utrecht. There is an echo under the arches at the Stropbrug in Ghent and under the Ghent-Wetteren railroad bridge over the Scheldt, II, 26.

11 The complaints of Minnaert and De Vreese in Vanacker, 144.

12 Letter to Burgers from December 28, 1916. Archive of Burgers.

13 Because he would become Professor Julius's assistant by the end of 1918, this observation is significant.

14 Minnaert would later correspond with Sommerfeld. Schulmann and Kox (1998) published a letter from Ehrenfest to Einstein dated March 27, 1918, in which he announces that he will inform the misguided Sommerfeld 'about some gentlemen whose chatter his impressions are based on. We know them here in Leiden.' Ehrenfest alluded to Minnaert's position in Ghent: the prominent quantum theorist Arnold Sommerfeld was not lectured to by either Kamerlingh Onnes or Ehrenfest and maintained a friendly relationship, along the lines of German politics, with the people of the Flemish University and with Minnaert. In Utrecht, he would still visit Julius and Minnaert in the early 1920s.

15 Minnaert, 1918.

16 Vanacker, 256.

17 Minnaert to Burgers, April 11, 1917.

18 Gaston Mahy introduced Minnaert to Whitman's **Leaves of Grass**. For Masereel in Ghent, see Van Parys, 1995, **At the Foot of the Belfry**, pp. 19-40, and **Arènes de Lutèce**, pp. 41-51 with drawings by Jules De Bruyker.

19 Key, 1900 and 1911. Key is a main character in Romein, 1976, which provides the title for **The Century of the Child**, Chapter XLI.

20 Nottingham, 1999.

21 Jet was born on July 18, 1894, a year and a half younger than Marcel. She only became a member of Jong-Vlaanderen in 1918.

22 Mahy, 1918, July 20. The quotes come from Jet's Diary of 1918, which she wrote for Rudy Hoffmann in the US. Simon-Van der Meersch, 1982, with a photo of Jet Mahy, the first female student. Vanacker, 177, with a photo on page 145. Van de Velde, 196, mentions a Declaration of the Jong-Vlaamse Wacht to the Council of Flanders on August 13, 1917, with Jet as the second

author, urging the proclamation of the State of Flanders. In her Diary, she cannot conceal her joy when the Council indeed did so.

23 Vanacker, 170. De Schaepdrijver, 1997, 262.

24 Vanacker, 170-172.

25 De Schaepdrijver and Charpentier, 1919.

26 If Jong-Vlaanderen had the charismatic reverend Domela as its leader, among the soldiers, the priest Cyriel Verschaeve played a corresponding role.

27 Churchill, 1926. On April 1, 1917, the Aztec was torpedoed, resulting in the drowning of 28 Americans. The next day, President Wilson requested Congress's approval for a declaration of war against Germany. He received it on April 6. In 1918, a million Americans came to Europe, and several million were expected in 1919.

28 This proclamation took place on December 22 and 23, 1917, but was only made public a month later.

29 Vanacker, 302-305. Minnaert's signature is missing from the magazine, except under an article about the Battle of the Golden Spurs on July 11, 1918.

30 Vanacker, 313.

31 Buning, 123-125. Vanacker, 241-243. Van de Velde, 191-192, 206-248, contains the letter of December 6, 1917, to Domela 'in deep humility and high veneration, with Flemish sincerity,' and Minnaert's handwritten letter of April 30, 1918. Jet Mahy was also involved in this rehabilitation.

32 Domela, Vlaanderens Ontwaken, Van de Velde, 211-248. Previously mentioned in the establishment of Jong-Vlaanderen in chapter 4.

33 Faingnaert, 817-818.

34 Het Vaderland, correspondent, August 27, 1918.

35 Dietsche Stemmen, November 1918.

36 Faingnaert, report of the bizarre meeting of the Council where independence was proclaimed, 694-722. Borms' statement is from December 18, 1917.

37 A play on words by Jet, mixing alliés (Allies) with aliénés (alienated).

38 'Flor' (Jan Wannyn) in De Noorderklok, May 25, 1930, The Belgian terror in Ghent in 1918; the plundering of Mrs. Wed. Jozef Minnaert's and Dr. Marcel Minnaert's home. The report will provide an image of the destruction based on the testimonies of neighbors/family members. Flor's article was part of a series that, following the disappointing 'extinguishing law' of 1929, aimed for real amnesty and economic compensation for the activists.

39 The destruction of the Mac Leods' villa is mentioned in his biographical sketch in the Encyclopedia of the Flemish Movement. In other biogra-

phies, this is often not mentioned.

40 Minnaert to Jet Mahy, undated. 41 Minnaert to Jet Mahy, January 12, 1919.

42 Minnaert, De Toorts, November 30, 1918.

43 Minnaert, De Toorts, December 7, 1918.

44 Fredericq (1850-1920) could no longer endure the poisoned atmosphere. In his obituary note, the rarely one-sided H. Pirenne wrote in 1924: 'After the war, Professor Fredericq was disoriented due to the excesses of the Flemish activists who had followed activism during the war and the reaction that followed after the liberation of the territory.' On March 23, 1920, Fredericq died of a stroke.

45 Vanacker, 359.

46 Vanacker, 358.

47 Eeman, E., *Le corps professoral de l'Université de Gand sous l'occupation Allemande*, Ghent 1919.

48 The Open Brief dates from February 21, 1919.

49 Minnaert to Arnold Sommerfeld, September 14, 1919. Sommerfeld Archive, Munich.

50 Vanacker, 356.

51 Roemans, 1961, 190-191.

52 Minnaert, *To Our Friends in the Netherlands*, De Toorts, January 9, 1919.

53 Minnaert to Burgers, February 2, 1919. The verdict was from January 23. Burgers Archive.

54 Vanacker, 361.

55 Luykx, 1969, 278-280. Kossmann, 1979, *After the Armistice and the Belgian-Dutch Conflict*, 429-433.

56 Newspaper article from July 11, 1920.

57 Reports from July 19, 1920. Vanacker, 361-362.

58 Prof. C. De Bruyker and the Flemish University before the Belgian Court, 1920, 102-103. Dedeurwaerder, 2002, 404.

59 Even in Ireland, the Easter 1917 rebels only became popular after their trial by the British. There, however, it was about the external relationship of a colony to the mother country. The relationship between Flanders and Belgium was one of internal colonization.

60 Basse, 1930-1934, I, 71, 156/157.

61 Capiteyn, 1991, 156-157.

62 Geyl, *Nederlandse Figuren* 2, 29. 63 Willemsen, 1969, 72, 74.

64 Vanacker, 368-370.

65 'Groucho' Minnaert is a creation of his friend Gaston Mahy."

66 Back to the Leitmotiv of Part I, Minnaert in Flanders, the opening quote from De Coster's *Tijl Uilenspiegel*.

Part II

(1919-1945) Minnaert in the
Netherlands

Proclaimer of the Salvation of
Science

'Oh blessed are the spirits who first strove for knowledge
And rose into the star-studded heavens!
They must have been elevated above life, Human joy, and human
frailty.
Neither Venus nor wine ruled their hearts,
Nor political bustle, nor rough soldier's work,
Frivolous ambition not, nor idle glory,
They did not know the thirst for money and great wealth.
They brought the distant stars closer to our eyes
By encompassing the universe through the power of their genius.'

Ovidius, *Fasti* I, 297-306. 1 (translation: Marcel Minnaert)

Chapter 7

Flanders from Afar

'There is only one thing that can help: radicalism and once again pure national sentiment.'

Asylum in Zeist and Soest

Minnaert had settled with his mother in Zeist by the end of 1918. They apparently had access to cash. He could immediately start working at the Physical Laboratory of the solar physicist W.H. Julius. He wrote to his friend Jan Burgers that he, along with his mother and a colleague, had found a spacious accommodation at Slotlaan 70 in Zeist. He already announced that he would miss a reunion of the fraternity Christiaan Huygens. He mentioned having little free time, not wanting to leave his 'old, brave mother' alone, and needing to save money to help comrades in the Netherlands 'and in the occupied territory.' With that last term, he delivered a concise judgment on the events in Flanders.

After several months, they moved to Soest, where they settled at Malvahoef on Boschstraat 2. This was located in the humanitarian colony Chreestarchia of Lodewijk van Mierop and Felix Ortt: it was one of the idealistic enclaves that the Netherlands was rich in at the time. In this circle of vegetarians, non-smokers, and teetotalers, Minnaert felt at home. The stream of Belgian refugees in 1914 had caused much discussion in the colony about the Flemish question. The Belgian village near Amersfoort, De Vlaschakkers, was located a half-hour's walk away. Chreestarchia had taken in activists such as the tailor Arthur Faingnaert and the family of Jef and Marie Hinderdael. Jef, like Minnaert, had been a contributor to *De Vlaamse Post*. At Ortt's home, Flemish concerts took place with Lieven

Duvosel at the piano and singing by the Flemish minstrel Geert Dils. The debates about Flanders had inspired Ortt to write **Staat en Volk**: according to Ortt, the Belgian national spirit had no connection whatsoever with the Flemish folk spirit. The so-called traitors of 1918 belonged to the finest of the Flemish people. In a postscript, he paid 'respectful tribute' to the condemned individuals, 'high-standing figures, some of whom I proudly call my friends.' Among these figures were the Minnaerts, who were his closest neighbors.

Minnaert reported to Burgers: 'We are living wonderfully here amidst forest, dunes, heath, and meadow, in a peaceful and invigorating environment where one can work quietly and diligently; my mother is thriving here, putting on weight delightfully; by chance, we have been able to rent half of a furnished villa, magnificently modern-built, a house that is a pleasure to live in—and all for little money. There has been some inconvenience because we have taken in a young activist lady from Ghent, but she is wonderful company for my mother, and I won't deny that I also enjoy her presence.' They thus offered shelter to Jet Mahy while awaiting the formal arrangement of her crossing to her fiancé in the United States.

Every morning, Minnaert walked through dunes and heath to Soesterberg; half an hour later, he was on the train to Utrecht. At six o'clock in the evening, he was home again. He didn't waste that hour of walking. He outlined the ripples in the dune sand for Burgers: 'I might perhaps find some aerodynamic laws in their course and maybe even derive a measure from their mutual distance for the pressure exerted by the wind.' That interested Burgers, who had become a professor of fluid dynamics in Delft. The heath was full of interesting phenomena, such as the witches' circles formed by *Carex arenaria*. Minnaert sketched these and explained how only seven mysterious rings remained after withering: 'Finally, I should tell you about a small investigation I conducted at home regarding the tones of bubbles forming in water and other fluids; as far as I know, it's an entirely new subject, rich, and yet applicable everywhere around us.'

Marcel, at 26, was a busy man. A love affair seemed inappropriate during this hectic time. Yet, his longing for a love life was evident from his joy over Burgers' marriage to the physicist Nettie Roozeschoon: 'What a pleasure it must be to completely renew oneself, adopt new habits, and lead a new emotional and intellectual life entirely in line with what one had desired as a modern idealist!' Incidentally, that modern idealism for Jan Burgers, like other Leiden comrades such as Dirk Jan Struik and Jan Romein, was the communism of the CPH.

Reemergence of the Flemish nationalism

Minnaert dedicated himself to providing financial aid to exiles and restoring contact with the home front. In early June 1919, a first meeting of the Flemish Committee took place in The Hague, which he attended. The nationalists achieved an electoral success by the end of that year. Minnaert wrote enthusiastically to Burgers: 'You will have heard about the Front Party; they are the soldiers of the Yser united with our activist fighters. For the first time, they appeared as a national party in the November elections and won five seats. That's beautifully beyond all expectations for those who know our situation.' Minnaert wrote that the five Flemish representatives were feted in Ghent and openly acknowledged declared that they owed their victory to the activists: 'A large procession forms and demonstrates in the city, under the cries: "Long live the activists! Long live prison!'

It became increasingly clear to him that the nationalists would win: 'I am particularly pleased that the Bolsheviks immediately took a national stance and solemnly assured the Afghan envoys of liberating the smaller nationalities. Where a people is free, authority must naturally come into the hands of democracy. Meanwhile, the exiles overcome numerous difficulties but mostly keep their heads above water.' Minnaert's remark about the Bolsheviks recognizing the 'right of nations to self-determination' had to encourage Burgers. That this recognition in practice would have to give way to the higher interest of the world revolution, in this case the Soviet Union, would only become clear in the coming years.

The demand for amnesty for the convicted activists became the focal point of the activity of the Flemish nationalists. A movement also emerged among the relatives of the fallen. On hundreds of graves of Flemish boys stood Celtic crosses, designed by the Irish-Flemish artist Joe English with the inscription 'All for Flanders/Flanders for Christ.' After the war, the government had these replaced by simple stones with the Belgian tricolor and the inscription 'Mort pour la patrie.' In one case, the crosses were crushed and incorporated into the pavement. This would in part become the reason for organizing annual pilgrimages and building the IJzertoren in Diksmuide.

King Albert's broken promise regarding the Dutchification of Ghent would leave its mark on the 1920s. The joy about the end of the occupation was initially general. Because the Belgian state consciously confused activism and Flemish emancipation, its actions were increasingly experienced as suppression of Flemish-mindedness. The activists' negative judgment of Belgium seemed justified in hindsight. The resentment towards Belgium grew.

It seemed as if the Flemish-minded population of Belgium had not belonged to the winners of the World War but to the losers. The country became torn apart over the Flemish question.

Minnaert sacrifices his family name.

In the summer of 1919, Marcel's godfather Gillis Desideer Minnaert passed away. The Belgian state had still summoned him to court, although no organizational involvement in activism was known about him. His daughter Marie, who had married a Dutchman, was not allowed to visit him. In a farewell letter, he complained: 'How is it possible that the gentlemen inspectors show so little humanity toward their own countrymen, that they will only give you a passport if I am in mortal danger!' The obituary mentioned his two knighthoods but remained silent about his presidency of the liberal *Willemsfonds*.

In 1924, Marcel Minnaert used the magazine *Vlaanderen* to claim the legacy of his uncle for activism. This radical exile journal of classicist Josué De Decker and priest Robrecht De Smet, the organ of the Federation of Flemish Nationalists *De Blauwvoet*, preached irreconcilability toward Belgium. Every issue contained the Ten Commandments of the Flemish Nationalist. These included: 'You shall believe in one fatherland: Flanders'; 'You shall accept all effective help for the liberation of your fatherland'; 'You shall promote the Greater Netherlands striving with word and deed' and 'You shall forsake Belgium with all its pomp.' The commandment regarding assistance justified collaboration with Germany in the past, present, and future. *Vlaanderen* hunted down every Fleming who showed even the slightest trust in a federal path toward Flanders' independence. Minnaert became a close friend of De Decker.

Minnaert claimed that the liberal men of the *Willemsfonds* had silenced his uncle, even though he had been responsible for the great flourishing of this institution: 'He was not a member of any activist association. But his sympathy was with us and in his faithful Flemish heart, he so fervently wished us victory! Did he not have the right to his own thoughts?' For Minnaert, the Flemish-minded liberals were finished: French was spoken at home by most of them. The Flemish nationalists were now the bearers of Flanders' future: 'The work I attempt to do for the Flemish-national movement, I consider to be the direct continuation of my uncle's work.' Minnaert's claim that Gillis Desideer had secretly chosen activism was a new revelation. He would not have discussed this with his aunt Marie and

his cousins Marie and Helena. Minnaert sacrificed his family name on the altar of Flemish nationalism. Perhaps it seemed to him the least he could do as an exile for his comrades.

The Minnaerts had their own scores to settle with Belgium. Jozefina Minnaert's house on Parklaan, after being destroyed, was sold for half its market value. She had not been persecuted or convicted, so she demanded compensation for the loss in value from the War Damages Court. The case dragged on, and the outcome is unknown. The Minnaerts were financially stable enough that Jozefina must have sold her remaining houses by 1920. During the course of that year, they decided to build a new house in Bilthoven, again on Parklaan. Minnaert had an observation tower installed on the roof so he could enjoy the starry sky and sunrises. On two gable stones, numbers 16 left and right, neighbors could read Albrecht Rodenbach's battle cry: "Does the Bluefoot fly? Storm at sea!" Starting in 1921, their mail went to "Huize De Blauwvoet." According to a neighborhood boy, Jozefina, with her gray hair, spent the whole day tending to her garden: "In summer, it was like a waving sea of colorful flowers.

Discussions among exiles

Some preserved letters and cards give an impression of what occupied Minnaert. Notable is a prison letter from the fall of 1919 by Roza De Guchtenaere, the former activist and director of the Ghent girls' Athenaeum, who was also one of Jozefina's 17 former students: "Pity, Marcel says, and you too want to improve my situation. Oh! I wish I could share my joy and calm happiness with you, but my heart flies toward you in gratitude for your strong, enduring affection that shines through both of your letters. I had also imagined it all very differently, much more terribly. My cell has already become dear to me like a home, within whose walls I enjoy a far greater freedom than life usually grants us. Solitude does not oppress me; on the contrary, I view the turmoil of ordinary life with anxiety.'

This composed and unwavering Roza became a loyal visitor to Huize De Blauwvoet after her release in late 1921.

Minnaert re-entered the strategy discussion in 1920. He wrote in **Federalisme of Nationale staat** that there were two types of federalists. The principled federalists distanced themselves from state interference and advocated for decentralization. Among these, he counted friends such as Jacob, Herman Vos, Gerretson, P.H. Ritter Jr., and Leo Picard. However, Minnaert believed that a centralized Flanders could better fulfill its positive role

within a future World Federation. These people made mistakes, ‘but ultimately, how dear they are to me because of the honesty of their conviction.’ The tactical federalists, however, recoiled from the ideal: ‘Why should the path that leads the Poles, the Irish, and the Jews to their goal be bad for us?’

Minnaert himself pleaded for an independent Flanders, thereby opposing federalists of every stripe: ‘The main thing remains to combat mixed states, which threaten our national character with destruction and from which it is high time we save ourselves.’ He consistently chose the straight line, the most difficult path to follow, and the most anti-Belgian policy.

Minnaert repeatedly wrote to the imprisoned Cesar De Bruyker, the biologist who had replaced Mac Leod at the Vlaamse Hogeschool. He reported that a Ghent flamingant had told him that the passivist Kamiel De Bruyne had addressed a packed hall: ‘Such a thing is sad. That you are not optimistic does not surprise me; the situation is far from rosy, and I assure you that, seen from afar by an observer, the view becomes increasingly gloomy and miserable. There is only one thing that can help: radicalism and, once again, pure national sentiment; perhaps it would be best of all to organize a series of theater performances, acted by enthusiasts, perhaps poorly, but compelling and romantic; and on a large scale, a hundred performances every week. Art speaks to the people, awakens dormant forces, elevates man above his own mediocrity. Daydreams? Maybe...’

At the beginning of 1924, the Catholic Flemish nationalist Frans Van Cauwelaert came to Utrecht to speak about Flanders within the context of Faith and Science. Minnaert, representing the Utrecht-based Flemish-Dutch Association, had arranged with the Catholic association Faith and Courage that an opponent would also be allowed to speak, albeit at a subsequent meeting on the 20th. He tried to persuade the philologist Willem De Vreese, who was then the municipal librarian of Rotterdam, to accept the challenge. Ultimately, he found in the physician Reimond Speleers, the second rector of the Flemish University, a capable defender of the Flemish-nationalist viewpoint. Minnaert was deeply committed to ensuring that the debate about Flanders would take place and that the arguments of the Belgian government and the passive resistance opponents would be refuted.

Minnaert became the librarian of De Dietse Bond. In a note from 1924, the exile Jules Spincemaille wrote that he would send Minnaert his list of Flemings in the Netherlands and abroad. Apparently, Minnaert was officially responsible for maintaining the administration of the activist exiles.

Board member of De Dietse Bond

De Dietse Bond, established on June 23, 1917, aimed to replace the passive resistance General Dutch Union (ANV). It adhered solely to 'the pure Great Dutch interest' as its guiding principle and rejected 'any foreign influence that conflicted with this interest.' Its members could decide for themselves whether to emphasize the political or cultural aspects of Greater Netherlands. Ultimately, Belgium was to disappear. The Bond was neutral in matters of religion, not aligned with left or right, and focused solely on what was best for Flanders: 'The preservation and development of Dutch civilization and the societal welfare of the Dutch people as a whole are vital interests for each individual part.' Minnaert had contributed his series on the national question to *Dietse Stemmen*, the activist publication founded by the Bond. After the war, the journal ceased publication. During the General Members'

Meeting on October 1, 1921, Minnaert was elected as a board member. He thereby became part of a company of high-ranking officials, cultural figures, and scientists, with South African General J.B.M. Herzog as honorary chairman, Dutch lawyer mr P.W. de Koning as chairman, Flemish poet dr René De Clercq and South African dr Ph.R. Botha as vice-chairmen. In addition to Minnaert, the Utrecht-based lawyer dr A.J.M. (Anton) van Vessem, editor-in-chief of **Vlaanderen** J. (Josué) De Decker, Ghent native Boudewijn Maes, and geographer prof. mr S.R. Steinmetz were board members.

In February 1922, Minnaert undertook to investigate whether Flemish children could have a holiday in the Netherlands: he initiated a modest exchange of children between families of refugees and Flemish sympathizers in the Netherlands and those of nationalists in Flanders. The board established the *Diets Studenten Verbond* in 1922, at the suggestion of Utrecht journalist P.H. Ritter Jr., as an alternative to the student section of the ANV. A committee with Minnaert as secretary awarded several scholarships to refugee students.

Activist Roza De Guchtenaere had proposed organizing greeting days between refugees and nationalists in Flanders. Minnaert decided to take charge of organizing them. She spoke at the 1923 *Guldensporendag* in Utrecht and stayed at De Blauwvoet house. A month later, the first Greeting Day took place in Hansweert, where Roza was one of the speakers. Minnaert wrote: 'For the Flemings from Flanders, the greeting day means: that the Flemish struggle is placed under the sign of activism. For the refugees, it means: that they remain loyal to Flemish ideals and to the brothers who are fight-

ing there. For everyone: that love for Flanders can bridge all oppositions, reconcile disagreements.’ According to the romantic Minnaert, there were only two occasions where the Flemish sentiment was so strong that everyone joined hands: the great Borms protests and these Greeting Days. In the summer of 1923, Minnaert also organized a meeting of Dutch nationalists in Vlakte; in addition to organizing it, he was also responsible for the content of the program. This would apply to most of the Landdagen and Begroetingsdagen that followed.

The board reports sometimes mention Minnaert’s interventions. At his suggestion, the Board decided to complain about the un-Dutch behavior of the Commissioner of North Brabant, as he had greeted the King of Belgium in French in Ghent. On another occasion, there was a difference of opinion regarding the assessment of the Belgian-Dutch Treaty. ‘Messrs. Minnaert and Besse judged that the Netherlands was relinquishing part of its sovereign rights, while Mr. Minnaert also feared that the Netherlands had fallen too much into the sphere of interest of Belgium and France.’ On such occasions, Minnaert invariably chose the most anti-Belgian stance. The imprisoned August Borms became an honorary member of the board on January 26, 1925. Starting from the 1926-1927 academic year, De Bond began publishing the monthly magazine *De Dietse Gedachte*.

Lectures for Flemish-Dutch audiences

Minnaert gave numerous speeches to exiles in the 1920s, even as far as India. His lectures, for example, are about the composer Benoit, the poets Vuylsteke and Rodenbach, the writer Hendrik Conscience and his ‘*Leeuw van Vlaanderen*,’ the work of the imprisoned Dutch scholar Antoon Jacob, or ‘On the Necessity of Cultural Rapprochement between Flanders and Holland.’ These lectures consistently evoke memories of the abandoned land and inspire hope and optimism. Minnaert could see the silver lining in a thundercloud. He wrote such stories by hand and did not date them. An article in which he pleads for Jacob’s release must have been written before November 21, 1923. Many lectures were adjusted and updated.

One of these lectures, for Flemish-Dutch Associations and related societies, is about the composer Peter Benoit: ‘I would like to invite you to follow me in thought to the land that lies south of your borders and is called Belgium on the map.’ In the Flemish landscape, Benoit was born in 1838: ‘Who tells us how the landscape surrounding us unconsciously influences us during our childhood? Who explains the secret ties? During this period

of the unconscious, during his youth, Benoit gradually developed that deep love for his birthplace, for his Flemish fatherland and his Flemish people, which would later make him Flanders' outstanding national composer. His further life would increasingly come to be marked by nationalism. A tough twenty-year struggle with the institutions followed, which in 1898 resulted in the establishment of the Royal Flemish Conservatory.

The Czechs and Norwegians incorporated folk music into their national music. Benoit did not use those songs because he had so deeply immersed himself in the spirit of the Flemish folk song that he could create his own folk songs: 'He had become a part of the people himself.' Minnaert valued this higher than transforming a folk tune: 'Benoit awakens the listener, grips you. Each of his works is marked by his lion's claw. They have an impact. Clear melodic lines, fluttering like flags; simple, muscular harmonies; compelling rhythms in the spirit of folk songs and dances; telling stories of courage, self-confident strength, noble pride.'

In the cantata **De Schelde** with text by E. van Hiel, 'a poem like a bread,' Minnaert incorporated political current events. One of the 163 lectures took place during the time of the Belgian-Dutch Treaty, when the opening of the Scheldt was at stake. Minnaert admonished: 'The Scheldt has become infamous in more than one way in recent months. If they still tell you that the Belgians want the Scheldt, answer them: yes, but the Flemings will resist it to the utmost. For them, the Scheldt is the river of the Netherlands. That is the best response to the annexation plans.' On such evenings, Minnaert evoked nostalgic memories of Flanders, used the piano to introduce Benoit, connected art and culture with nationality, addressed political current events, and stirred up resistance against Belgium. In these circles, he became a beloved introducer.

Flanders Fermenting

31 In a lecture for students from the late 1920s on Nationalism and Internationalism referred Minnaert to the influence of Bolshevism and fascist leaders such as Mussolini. They set unprecedented forces in motion, which had to be made subservient to the pursuit of a harmonious world federation and disarmament. He called for idealism and fearlessness, speaking about 'being one's own cause' and the omnipotence of humanity.

Nationalism also gained ground in Flanders. The historian Pirenne still referred to the activists as a 'pathetic group amidst a population that repudiated them with disgust.' This proved no longer to be the case ten years

after 1918, specifically on December 9, 1928.

By-elections were held in Antwerp due to the death of a liberal MP. Socialists and Catholics refrained from fielding a candidate. The activist Herman Vos, spokesperson for the Front Party, nominated the imprisoned August Borms as a candidate, although he could not become a people's representative. The Brussels elite assumed that the liberal candidate would win effortlessly. However, Borms received 83,000 votes compared to the liberal's 44,000, while 58,000 ballots were blank or invalid. The people of Antwerp had taken their revenge on the anti-Flemish spirit of the Belgian state: Tijl Uilenspiegel had played a new trick on the authorities.

On January 17, 1929, Borms was unconditionally released. On Sunday, February 3, 1929, tens of thousands marched in Antwerp for the 'king of Flanders.' Exiles such as René De Clercq crossed the border in large numbers. After all, the Amnesty Law had come into effect on January 19. Former activists could cross the border again without being arrested. However, the law primarily caused bitterness. No restoration of rights took place: the convicted individuals could not exercise official professions or accept political functions. The confiscations were also implicitly confirmed. Minnaert signed the Declaration of Convicted Flemish Nationalist Activists. This document rejected this 'abomination' and addressed Borms with a militant 'You bear the standard. Our homage is that of the warrior: deep and short.'

There followed Borms' acknowledgments in a series of Dutch cities, including the one in Utrecht on March 16. Minnaert became a member of the Committee 35 Justice and Reconstruction, which was established in Brussels on May 4, 1930.

Minnaert began to involve himself with the leadership of the Flemish Movement, which was hopelessly divided. He had argued at the Landdag in Breda in 1927 for an overarching leadership of the Flemish nationalists. The release of Borms gave impetus to the idea that a highest authority should be established, a Council to prepare for the independence of Flanders. On November 23, 1929, a meeting took place in Antwerp: Minnaert made his opinion known in writing. Two weeks later, a secret Flemish People's Council was formed. It sent out 139 invitations to prominent individuals, nearly half of which went unanswered: 53 selected individuals accepted and 20 people refused. After this setback, Borms was personally tasked with making contact with organizations and people so that a new Council of Flanders could be established. In the course of 1931, a Declaration of Principles was drawn up by Borms and René De Clercq.

Only Borms knew the names of those who were invited for membership: the secret member had to return a written oath. The Council had established

36 secret committees. The whole endeavor resembles undertakings such as the Flemish Veem and Jong-Vlaanderen. Minnaert also would have signed up. In 37 letters he sent to De Vreese, he told him that he had become the chairman of the education committee of this Council of Flanders.

The spring elections of 1929 had yielded gains for the Flemish nationalists. The law of April 5, 1930 finally provided for a gradual Dutchification of Ghent University. It was adopted with 154 votes in favor and 6 abstentions. Rector August Vermeylen was able to open the university in Dutch on October 21, 1930. The students had asked Speleers, the second rector of the Flemish University, to create a shadow opening in **De Uilenspiegel** No. 38, which he gladly provided. The principle 'regional language is the leading language,' rejected in 1914, was finally accepted.

In 1931, the students of Leuven treated King Albert and Queen Elisabeth to a flute concert and a volley of cooked apples. The king's ambiguous tactics had failed. The price for Belgium was high.

Endnotes:

1 Ovidius quote by Minnaert, 1946, 119, referred to by him as **In Praise of Astronomers**.

2 This is explained at the beginning of chapter 8.

3 Minnaert to Burgers, February 2, 1919.

4 Interviews with Hans Littooi and Nanda Mierman-Ortt.

5 Ortt, 1917. Epilogue from May 1920.

6 Minnaert to Burgers, April 13, 1919. Minnaert begins work on **The Physics of the Open Field**.

7 The result, published in **The Philosophical Magazine**, was according to the Science Citation Index his most frequently cited article in 2002. Minnaert (1924b, 1933).

8 Minnaert to Burgers, August 19, 1919.

9 Alkemade, 1995. Romein-Verschoor, 1970. Stutje, 1999. Struik was an observer for the Comintern during the founding of the Communist Party of Belgium (KPB) in 1919 and met in Antwerp the fiercest Flemish nationalist: it turned out to be the Dutch diamond cutter Paul de Groot, later a leader of CPH and CPN.

10 Meeting on June 2, 1919, mentioned in a retrospective in **De Dietse Gedachte** 2, 27.

11 Minnaert to Burgers, December 30, 1919.

12 De Schaepdrijver, 1997, is a contemporary hagiography regarding King Albert. She has heard nothing about the annexationism of Albert's government. Time does not necessarily enhance the objectivity of historical writing.

13 Marie Minnaert wrote in 1915 from the Netherlands that her cousin Marcel disgraced the family. The postcard caused a stir at Ghent City Hall, according to Fredericq. The literarily gifted Marie van Zadelhoff-Minnaert published the story *A Consultation in Waterveld* in *De Vlaamse Gids* in 1912, p. 216.

14 Letter from H.C.J. De Decker in Molenaar, 1994, 393. The classic De Decker at Brugmans, 1980, p. 46.

15 Minnaert, Flanders, November 16, 1924. In the anniversary edition of the Willemsfonds from 1926, Gillis D. Minnaert was notably present.

16 Memories of F.W. van Milaan, a neighbor from Parklaan 50. Letter dated June 26, 1998.

17 Roza De Guchtenaere to the Minnaerts, September 26, 1919.

18 Minnaert, Federalism or National State, De Toorts, 1920.

19 Minnaert to De Bruyker, March 18, 1922.

20 Van Cauwelaert spoke on January 30, 1924; Speleers on March 21.

21 Minnaert to De Vreese, January 19, 1924. Archive-Dousa. Dedeurwaerder, 2002, pp. 440-446. Speleers had to take an exam again as an ENT specialist and had settled in Eindhoven.

22 Jules Spincemaille to Minnaert, June 30, 1924.

23 Minnaert, 1916a.

24 E. Besse, The Dietse Bond; A Look Back at Ten Years of Existence, DDG 2, 1927-1928, p. 7.

25 E. Besse, DDG 2, p. 51, Minutes of the Board Meeting on February 11, 1922, and also the establishment of the DSV.

26 The support from the Dietse Bond to the exiled activists, Scientific Announcements, 2000, p. 230.

27 Minnaert, DDG 1, pp. 34 and 121. There were about 300 people according to Dedeurwaerder, 2002, p. 434.

28 Minutes of the DDB Board, DDG 2, pp. 84 and 87. The disputed greeting took place on October 26, 1924.

29 Archive-History. It contains a folder of lectures from the 1920s, such as the one about Benoit.

30 The Scheldt Treaty issue occurred in 1925. See Burger, 1932.

31 Minnaert, Nationalism and Internationalism, undated. Archive-History.

32 Pirenne, H., Belgium and the World War, Paris 1929.

33 Geyl, P., Herman Vos and the Flemish Movement (1952), in *Historian in Time*, p. 147, Utrecht 1954.

34 DDG 3, from p. 139 onwards.

35 Dedeurwaerder, 2002, p. 492.

36 Dedeurwaerder, 2002, p. 465. Besides the one mentioned here, there was apparently an education committee.

37 Minnaert to De Vreese, May 9, 1932. Archive-Dousa.

38 Dedeurwaerder, 2002, provides the full text: p. 486.

39 Balthazar, H., **Het maatschappelijk-politieke leven in België 1918-1940**, p. 148, in **Algemene Geschiedenis der Nederlanden**, vol. 14, Bussum 1979.

40 Suarez, G., **Nos seigneurs et maîtres**, Paris 1937. Interview with a grieving Albert, published after his death, pp. 247-257. The royal visit to the Catholic University was abruptly cut short.

Chapter 8

A Solar Physicist on His Way to the World Top

'Doesn't Plato also tell us about the shackled ones, how they are blinded by daylight when they are finally made to look, how their eyes hurt and how they would much rather return to the dark cave?'

Minnaert at the Heliophysical Institute

In Leiden, the Mecca of physics, Minnaert had become persona non grata. He had deliberately sought out Julius' Heliophysical Institute in Utrecht. An anecdote circulates about this: he supposedly told his promoter MacLeod that he wanted to determine the strength of sunlight quantitatively. MacLeod is said to have replied, 'Young man, get that notion out of your head; measuring the strength of light is impossible.' Julius had dedicated himself to this challenge and therefore Minnaert would contact him. It's possible that the physicist Arnold Sommerfeld, who visited him at the Flemish University, pointed him to Julius' work on the sun. In any case, he informed his friend Burgers in early February 1919 that he was attending the spectroscopy lectures of physicist Leonard S. Ornstein and was already fully engaged in work for Julius.

Willem Henri Julius was director of the Physical Laboratory and had been granted permission in the 1910s to establish an experimental research center: the Heliophysical Institute. Julius, without much consultation with the Utrecht astronomers, was pioneering at the interface of physics and astronomy and needed someone who was both theoretically and technically

skilled and also had two right hands to make his spectroheliograph operational. Minnaert would have offered his services unpaid and likely suggested to Julius that his salary be arranged later.

After the war, the victors of World War I forced a break in collaboration between professional organizations of scholars. Their intention was to isolate Germany and its allies and harm the practice of science, which had been so crucial for warfare. Many French and Belgian scientists proved irreconcilably hostile toward 'the Central Powers.' This effort resulted in the creation of the International Research Council, established in Brussels in 1919, with sections dedicated to fields such as astronomy—the International Astronomical Union (IAU)—physics, and chemistry. Researchers from sixteen countries joined: the losers of World War I were excluded from the scientific community. Forty-seven members of the Royal Academy of Sciences, including physicist W.H. Julius and astronomer J.C. Kapteyn, had unsuccessfully appealed to the scientific world to admit their German and Austrian colleagues. Minnaert likely greatly appreciated this step taken by his director.

On June 30, 1919, Julius wrote in his annual report: 'In the astrophysics department, Dr. M. Minnaert regularly worked, whose expert and meticulous assistance in the extensive preparations for solar research was of great value.' At Julius' suggestion, the curators appointed Minnaert as an observer on December 31, 1919, with an annual salary of 2,600 guilders. Julius referred to the establishment of this position in his 1920 annual report as 'an important gain.'

In 1919, Minnaert had accepted a second part-time position at the Meteorological Institute for one afternoon. He found the work engaging: 'The approach in De Bilt is very physical; while other meteorologists constantly seek accidental correlations between weather and certain phenomena through mere description, here they aim to understand the entire system of lower and upper air layers and derive forecasts from it in a completely rational way.' Working on something as changeable as the weather in such a 'completely rational' manner was truly suited to him.

To understand Minnaert's later breakthrough into the world elite of solar physicists, it is useful to outline some key principles of physical optics as they were taught during his youth. Following this will be a brief overview of the relevant experiments in this field until the beginning of the twentieth century. Julius attempted to explain these experimental results in a way that soon proved outdated. Minnaert initially defended Julius' views and as a result was at risk of being sidelined. This chapter from the history of science should clarify how he struggled and why he ultimately succeeded. It is fascinating that through his strong promotion of solid experimental research, Julius

could still play a positive role for Minnaert.

The spectrum; frequency and wavelength of light

The nineteenth century had confirmed the understanding that, like sound, light can also be understood as a wave phenomenon. A wave is the result of the propagation of a vibration. In the case of sound, a medium is required: the speed of sound waves in air at room temperature is approximately 340 meters per second. If the source of the sound is a tuning fork, when struck, it produces a tone. This tone has a frequency, the number of vibrations per second, expressed in Hertz (Hz). A higher frequency corresponds to a higher pitch. The lower limit of human hearing is at a frequency of 20 Hz; the upper limit for young ears is around 20,000 Hz. The 'length' of the sound wave (λ) is equal to the quotient of the propagation speed (v) of the waves and the 'frequency' (f). A tone with a frequency of 5000 Hertz has a wavelength of $340/5000 = 0.0680$ meters. Thus, a high frequency corresponds to a small wavelength, and vice versa.

Light waves are electromagnetic waves with a very high frequency that do not require a medium to propagate. Just as the pitch of sound is determined by frequency, in visible light this is the case with color. Violet light has a higher frequency and thus a smaller wavelength than red light. The speed of light in a vacuum is approximately 300,000 kilometers per second for all wavelengths. The wavelength is the quotient of this speed and the frequency. Red light has a wavelength of about 0.000,000.70 meters; for violet, it is 0.000,000.40 meters. For these small measurements, an additional—"

suitable unit has been introduced: the Ångström (Å). An Ångström is 0.0000000001 meters, so one ten-billionth of a meter or 10^{-10} meters. Red light therefore has a wavelength of approximately 7000 Å, while for violet it is 4000 Å. Light waves with wavelengths longer than 7000 Å are invisible: they lie in the infrared range. Wavelengths smaller than 4000 Å are also invisible to the human eye and lie in the ultraviolet range. Detectors exist for observing infrared and ultraviolet light.

The Austrian physicist Doppler has lent his name to an important analogy between sound and light. When the sound of a car horn reaches an observer from a stationary car, the observer hears a certain pitch. If the car is moving toward them, more vibrations per second reach the ear, causing the observer to hear a higher pitch. After passing, the experienced pitch becomes lower. This Doppler effect plays a major role in astrophysics. If a star is moving away from Earth, light waves will have a slightly lower frequency

and exhibit a redshift compared to the same terrestrial light source.

The physics of the sun had advanced in the 19th century through the study of its spectrum. It had been known since Newton that sunlight can be split into the colors of the rainbow. This happens, for example, when it passes through a triangular piece of crystal glass at a certain angle of incidence: a prism. Red light deviates the least in the glass, while violet deviates the most. This phenomenon is called dispersion. With the help of prisms, the solar spectrum could be studied around 1800 by displaying it like a small piece of the rainbow. The separation of colors becomes clearer when the light enters in a very narrow beam.

\figcaption The colors of dispersion and the formation of a spectrum lie between them.

\figcaption "A piece of the violet spectrum between 4380 and 4399 Å with Fraunhofer lines is depicted as a narrow strip of a rainbow. "

If the slit is narrow enough, it also turns out that the spectrum is interrupted at thousands of places by a forest of vertical dark lines, named after the German optician Joseph von Fraunhofer. He had already discovered more than 500 of them in 1814. He marked the most striking ones with a letter: from A in the red to I in the violet. One Fraunhofer line is narrow and dark, another is wide and vague: it's 'a full richness of chiaroscuro' to quote Minnaert, an infinite variety of shadows and halftones. The German physicist Kirchhoff meticulously copied this spectrum by hand due to the lack of photographic means. In 1860, he assigned a letter from a to g to each line's width and a number from 1 to 6 to its darkness.

The combination of the three components—the entrance slit, prism, and imaging system—is called a spectrograph. The American Rowland replaced the prisms around 1895 with a reflection grating or 'grille.' Such a grating is a perfectly flat glass plate with parallel grooves at identical distances. Rowland managed to fit 600 of them in one millimeter. The distance between the grooves is then one-six-hundredth of a millimeter or $16,000 \text{ Å}$, which is close to the wavelength of red light. Using this grating, he was able to photograph a bright spectrum. Rowland's *Atlas of the Solar Spectrum* mentions 20,000 Fraunhofer lines with wavelengths accurate to 0.01 Å , one-billionth of a meter! By photographically enlarging the spectrum, it can naturally be made longer, and thus Rowland published a spectrum that was thirteen meters long. On those 13,000 millimeters, he accounted for 3000 Å , so each Å was enlarged to 4 mm. Rowland gave each of these lines a number that served as a measure of the blackness or 'strength' of the line: that was a qualitative estimation. This Rowland scale became the standard for the measuring the intensity of a 12 Fraunhofer line.

The strength of the Fraunhofer lines

Naturally, physicists tried to explain the origin of the lines. In the second half of the 19th century, experiments by the Germans Kirchhoff and Bunsen made a first interpretation possible. When colored light from glowing vapors passes through a prism, colored lines of the emission spectrum appear against a dark background. They heated sodium vapor and found around 5890 Å a yellow double line. Exactly at that location, the solar spectrum shows a dark double line, which Fraunhofer named the D-line. The Fraunhofer lines indicated the presence of atoms of terrestrial elements in the photosphere, the gaseous surface layer of the sun, which absorbs this light precisely.

Every chemical element, whether hydrogen, sodium, iron, or uranium, when heated so much that it becomes gaseous, emits its own characteristic set of lines. By this, one recognizes the element: it is as if the barcode of the gas in question. The solar spectrum shows all the lines of all elements that float in the outer, visible envelope of the sun. The lines do not emit light but are dark instead. This phenomenon had already been discovered by Kirchhoff: a cool gas, floating between the observer and a hot light source, absorbs the light from the light source at the wavelengths of the barcode of the gas. Thus, since Kirchhoff, it has been clear that the Fraunhofer lines together form an absorption spectrum, a fingerprint or barcode of the atoms of chemical elements in the photosphere of the sun and other stars.

In the second half of the 19th century, such chemical analysis of solar gas had made good progress. A special discovery was that of a gas with an unknown barcode, which was named 'helium': the gas of Helios, the sun god. A problem was formed by the emission lines of the corona: the tenuous outer atmosphere of the sun, visible only during total solar eclipse. These lines were not known from laboratory experiments: did this indicate a new chemical element, Coronium? Also, the visible protrusions or protuberances above the solar surface posed difficulties: according to Doppler, the measured redshift of the spectral lines suggested that these enormous masses would move at an almost unimaginable speed of hundreds of kilometers per second. The fundamental questions about the sun and stars made solar physics a favorite research object for physicists like Julius, who ventured into the territory of astronomers.

Rowland and others before him used a camera as the imaging instrument of the spectrograph: the spectrum was photographed on glass plates. These plates are therefore negatives: what emits light appears black on the plate; the Fraunhofer lines, which are actually dark, thus appear as light or less black streaks against a black background. A German named Schwarzschild

could detect the darkness and light of a moving photographic plate using a photoelectric cell. Schwarzschild died in 1914, putting an end to his pioneering work. His technique was perfected during the war by Julius' associate W.J.H. Moll, who replaced the photoelectric cell with a sensitive thermoelectric element, which at the time provided greater accuracy and reproducibility.

The spectrograph at the Heliofysisch Instituut

Julius immediately set Minnaert to work installing his spectrograph in his Heliofysisch Instituut. Installing this expensive research instrument had a quarter-century history (see the Appendix on anomalous dispersion and Julius' sun theory). It was equipped with a Rowland grating of 600 grooves per millimeter and, in the 1920s, needed only to acknowledge the observatories at Mount Wilson (US) and Arcetri (Italy) as its superiors. The right wing of the Physics Laboratory was fitted with beams and floors of reinforced concrete to dampen resonances. On the roof stood an instrument called a coelostat, which consists of two heavy mirrors: one rotates with the movement of the sun and reflects the light to a second mirror, which projects it into the solar telescope. Thirteen meters below, a solar image with a diameter of 12 centimeters appeared. At the same location lay the entrance slit of the spectrograph.

\figcaption Schematic drawing of Julius' spectograph in Utrecht (1919).

Minnaert had to design the follow-up mechanism for the coelostat and wrote to Burgers: 'It was a long-lasting task; every half minute, a position had to be recorded from a little light line reflected by the rotating coelostat mirror; from that, the irregularities were calculated. Just for the worm wheel, the investigation lasted 48 hours, and that on the roof while it was freezing so hard that the ink in my inkwell had solidified! Then there came out a curve with a double period, corresponding to the rotation time of two gears from the clockwork; we had them remade to make the waves disappear. Then the Foucault regulator had to be adjusted and made isochronic; what an interesting, simple-yet-complex little device it is! After that, I went on to silver the mirrors according to the Mount Wilson method; that worked fairly well.' Minnaert loved solving technical puzzles and proved to be the right man in the right place.

The most important part of the setup is the spectrograph. The entrance slit is located in a plate at the top of a four-meter-long metal tube. The grating was attached to the bottom of it. The tube can be tilted over a steel ball in the basement pit: by hand, a part of the meter-long spectrum

can be selected by turning the grating slightly. Also, the solar image can be photographed as a 'spectroheliogram' through a second slit on the worktable at a selected wavelength by moving the spectrograph under the solar image.

Minnaert's role becomes clear indirectly from an article in March 1923 where Julius proudly described his Institute. The story mentions no names, but on the final page, there are two spectroheliograms 'obtained by Dr. Minnaert with the Utrecht spectral equipment in two kinds of light near the calcium line K, on September 11, 1919.' That must have been a tribute.

Minnaert wrote enthusiastically to Burgers that he would have heard about Julius' Sun theory. He had to substantiate this theory using spectrograph 21 and the self-recording microphotometer of Julius' assistant W.J.H. Moll: 'It was a complex mechanism, with slides moving up and down, diaphragms opening and closing, the prism and the recording drum turning a few degrees each time, and a counter shifting position with every new stand.' In two hundred steps, which took about two hours, the intensity of a portion of the spectrum was recorded fully automatically. Moll was one of the first physicists to introduce an automatic recording technique. Minnaert was one of the first to gain experience with it.

\figcaption Moll's microphotometer

\figcaption A couple of angstrom of the profiles from the microphotometer near the orange-yellow Na D-line.

A light beam thus traces the dark and light lines on the moving photographic plate: a thermo-element measures the heat effect of the transmitted light, which is converted via the deflection of a sensitive ammeter into a profile of the Fraunhofer line on a moving paper roll. Minnaert wrote lyrically: 'A small section of the spectrogram, just a few millimeters long, is thus transformed into a beautiful registrogram about ten centimeters in length, resembling an emotional mountain landscape with peaks and rolling valleys. One can clearly distinguish single lines and the places where two or more lines almost coincide and partially merge; faint depressions that the eye would never notice when studying the plate are flawlessly recorded by the microphotometer; and all these details are represented in such a way that the transmission of the plate can be read quantitatively and accurately at every point. If the entire spectrum were converted into a registrogram on a reasonable scale, it would result in an enormous curve approximately 100 meters long.' He found it sensational: 'I remember that our first microphotometric registration of a small part of the solar spectrum immediately gave rise to the highly ambitious plan of creating a complete photometric Atlas.'

These quotes are recollections. In the early years, much creative work was required before the measurement of the photographic plates would defini-

tively reveal the intensity of the Fraunhofer lines. Minnaert was at the forefront of this effort. His admiration for Julius seemed boundless during those first Dutch years.

Minnaert sings the praises of his teacher

In the fall of 1920, Julius fell ill. He handed over the leadership of the laboratory to his younger colleague Ornstein. He somewhat recovered and in 1921 was able to celebrate his 24th or 25th anniversary as a professor. Minnaert's contribution to the *Liber Amicorum* appeared in *Physica*, the journal of the recently established Dutch Physics Association. It deserves ample mention.

According to Minnaert, Julius had proposed ideas that opened new paths in solar physics. Due to significant differences in density and temperature within the solar atmosphere, irregular refraction would undoubtedly occur. The mirages and the 'flattened' setting sun in Earth's atmosphere are attributed to this phenomenon. Additionally, anomalous dispersion occurs near the wavelength of the Fraunhofer lines (see Appendix).

According to the optical formulas known at the time, these anomalous phenomena should manifest in the refraction, spreading, and scattering of the solar light in question. Through anomalous refraction, bent bundles of a specific wavelength and color could unexpectedly appear elsewhere, explaining numerous solar phenomena in their early stages. This is why Julius focused on it. Unlike his new teacher, Minnaert dared to present these preliminary ideas with admirable certainty.

Minnaert believed that Julius' theory had linked numerous physical laws into 'a grand astrophysical theory,' which his teacher had sometimes referred to as a 'preliminary study': 'One does feel compelled to humility, however, when considering how essentially all the rays of light that the sun radiates toward us have traveled thousands of kilometers through glowing gas masses and could have been bent or scattered in the strangest ways along their path. So that a protuberance we thought we saw rising like an enormous flame at a speed of hundreds of kilometers per second, now it appears there is a slight condensation that propagates like the stirring of foam along a wave and refracts a little light from the solar core into our eye. Everything thus becomes an apparent image, an 'optical illusion,' and one would almost be inclined to regard solar research as hopeless, were it not for the fact that Prof. Julius has been able to indicate general laws that summarize the regular consequences of this irregular refraction and scattering and point out

the safe path in deciphering solar phenomena.'

The writer of these vivid sentences shows the pupil who continues to celebrate his teachers. No one had thought of this: Julius was the only one who saw through it! And still, there were unbelievers among the physicists! Minnaert therefore scolded them with the parable from **Politeia**: 'An old comparison comes to mind, the famous comparison with which Plato begins the seventh book of his treatise on the State. - Men are in a cave, chained from childhood, able to see nothing but a rock wall in front of them, illuminated by a fire behind them; when their guards walk back and forth behind a low wall, carrying objects that protrude above the wall, the captives see the shadows of these objects moving back and forth on the rock wall. These shadows are the only thing they perceive of the external world; through habit, they have come to recognize the shapes of the shadows, give them names, find a certain regularity in their movements and sequences. And they imagine that those shadows actually move of themselves and constitute the essential part of the phenomena.

Is it not remarkable how accurately Plato represents the relativity of our sensory impressions with this image? And is it not peculiar that he derives his comparison precisely from optics, where illusions can be so frequent and deceptive? - The observers who count and catalog thousands of sunspots, who stubbornly draw protuberances and make spectroheliograms every day, they are inevitably inclined to regard the shapes they 'see with their own eyes' as material boundaries on the Sun; and naturally, we all sometimes find the ideas of dispersion theory unpleasant, since it is much harder to find one's way in this new, still unfamiliar line of thought than to continue preserving the empirical rules of old. Does Plato not also tell us about the captives, how they are blinded by daylight when they are finally made to look around, how their eyes hurt and how they would much rather return to the dark cave?

But he also tells how they gradually succeed in observing first the reflections, then the dimly lit objects themselves, then looking around in daylight, and finally contemplating the clear sun, 'not just any appearance of it, but the sun itself, in its place and as it is.' - This pious wish could certainly be taken literally by heliophysicists! However, the philosopher's words also contain deep comfort for anyone who might despair over the hesitations and uncertainties plaguing the still-young solar physics: through all the doubt, despite detours and obstacles, we are moving forward step by step. Justice is done to everything; outdated theories gradually fall away, and the correct positions are preserved. No solid work is lost. Yes, that's how it is! And so the dispersion theory can certainly face the future with confidence.' It

was almost a political argument, which also ended optimistically. Minnaert was not yet operating independently. He was also not a trained physicist. As a party member, he turned Julius' cautious prose into an irreconcilable polemic against physicists like Lorentz, Ornstein, Zernike, and Einstein, who had serious reservations. Minnaert would later regret that optical illusion. It was a striking, uncertain, and therefore seemingly arrogant entry into the world of Dutch physics. Julius, 33 years older than Minnaert, was apparently delighted with his master student's contribution and did not urge caution upon him. No more so than Mac Leod, Bolland, or Domela had ever done.

Ornstein's international center for photometric research

With thermodynamicist Leonard Ornstein, Minnaert developed a more equal relationship. Ornstein was an imposing and energetic figure who, like Minnaert, dedicated himself fanatically to political ideals. As a 26-year-old doctoral candidate in 1907, he had been the secretary-general of the Eighth Congress of the Zionist World Organization in The Hague, and four years later, he led the Zionist Congress in Basel. He proved to be a skilled agitator: 'After an inflammatory speech by Ornstein in 1918, the audience spontaneously broke into the Zionist hymn, despite explicit agreements to the contrary.

This Ornstein became curator of the controversial Hebrew University of Jerusalem and thus a colleague of Einstein. This university had to educate the elite of a future Jewish state, placing it at the heart of world politics. After World War I, England and France had taken countries such as Lebanon, Iraq, Iran, Syria, and Palestine away from the Turkish caliphate. The British had made promises to Jews, Arabs, and Indians that were mutually contradictory. Jewish colonists tried to create facts on the ground by force of arms. Ornstein's combative choice must have appealed to Minnaert, twelve years his junior, with a similar love for Flanders and the Flemish University.

Ornstein had earned his doctorate under Lorentz on a theoretical subject. In 1915, he was appointed as a theoretical physicist in Utrecht. He had admired Moll's automatic microphotometer, designed for Julius' experiments. Moll's instrument could perform quantitative measurements of the intensity of spectral lines. In Leiden, everything revolved around the cryogenic equipment for Kamerlingh Onnes' work at extremely low temperatures. Ornstein, in turn, as director of the Physics Laboratory, had acquired a unique instrument and understood that he had to capitalize on this divine gift. He

wrote in his 1922 annual report to the curators: 'It is intended to expand the microphotometric department in order to assist other institutions with this work for which there is now great experience and an exceptionally fine instrument available, thus making our laboratory an international center for photometric research.'

With this microphotometer, Utrecht could place itself at the heart of modern physics. Quantum physics had provided a theory of Fraunhofer lines that was more convincing than Julius' dispersion theory. The atomic model (1913) of the Danish physicist Niels Bohr proved to be the Rosetta Stone for solving the Fraunhofer script. When atoms are given energy in the form of light of a certain frequency, electrons can reach higher-energy orbits by absorbing 'photons,' light quanta of a certain frequency; when they fall back to a lower energy state, they emit light with a frequency corresponding to that energy difference. This frequency matches the wavelength of the respective Fraunhofer lines. When light from the sun's interior falls on atoms of specific elements in the photosphere, photons with exactly the energy needed to move electrons to a higher energy level will be absorbed. For example, sodium atoms in the photosphere will absorb the frequency corresponding to yellow-orange light; the double D-line indicates a 'doublet,' two slightly different electron energy levels. The electrons re-emit that orange-yellow light when they fall back into their original energy level, but scatter it in all directions. An observer will see an absorption line in the yellow-orange region of the sun's spectrum.

The British-Indian physicist Saha (1920) demonstrated that the diversity in emission spectra at the sun's periphery, from the chromosphere and corona, was not due to extraterrestrial elements. Under those physical conditions, atoms lose many electrons, resulting in multiply charged ions that exhibit their own Fraunhofer lines. Initially, this multiple ionization was attributed to extremely low pressure. It is now known that elevated temperature, rather than reduced pressure, promotes ionization. The 'unknown elements,' such as the coronal gas Coronium, turned out to be earthly elements after all.

However, the spectral lines recorded in various laboratories depended on the conditions. In radiation experiments, flames, glass discharge tubes, or electric arcs could be used, with significant differences in temperature, pressure, and concentration. The only constant was the position of the emission line in the spectrum. The shapes of the line profiles, obtained using different photometers—thus their height, width, or symmetry—differed from one institution to another. As many 'strength classes' emerged as there were research centers. For the compilers of Atlases of spectral lines, this was a

discouraging fact. Here lay a great opportunity for an institution that could create a standard.

The first task thus involved standardizing optical procedures so that the measurements taken in Utrecht would yield results that could be verified and reproduced elsewhere. Ornstein initially focused on photographic materials: developers and fixing agents. His staff investigated the light-sensitive layer of the glass plates, the size of the silver grains after development, and the influence of impurities in the gelatin layer. Those photographic plates for which a graph showing the relationship between darkening and the intensity of the incident light appeared to form the best straight line were preferred. The 29 plates had to be calibrated before each experiment.

Minnaert's step attenuator and true intensity

The new director incorporated Minnaert into his research program, which seemed to conflict with Julius's program, to which Minnaert had initially adhered. In practice, however, the microphotometer could serve both programs. No wonder that Minnaert's first achievements focused on work with this instrument.

Minnaert was assigned two major tasks: calibrating the measurement errors of the spectrograph grating and calibrating the profiles of the spectral lines produced by the microphotometer. Regarding the former, Minnaert wrote: 'I have taken a side path in sun research and am trying to learn something about the issue of ghost images with a grating. The ultimate goal for which these and other already conducted or pending measurements are intended is the investigation of intensity distribution within a Fraunhofer line.' He reported the results in 1921 in a voluminous report to the Academy. The grating produced weak spectral lines on its own due to small deviations in the regularity of the grooves.

These 'ghost images' proved to be real nuisances, but Minnaert was able to demonstrate that their integrated effect resulted in a uniform veil across the spectrum. This veil is no denser than a few percent of the continuous light, and its effect can be accounted for by subtracting a fixed percentage of the light intensity of the continuous spectrum. He provided an electromagnetic theory of the phenomenon, supplementing it with extensive calculations using Rayleigh's and Voigt's classical formulas for scattering and diffraction. He found himself here in Julius's optical paradigm, where he attempted to hack a 32 quantitative path.

His second assignment immediately led to a discovery. Both he and his

colleague Van Cittert took a step forward with the step attenuator. The microphotometer does not directly measure the intensity of the light that has fallen on the photographic plate: if that light has ten times greater intensity, the emulsion of the glass plate does not need to become ten times blacker. Minnaert designed a piece of glass, 2 cm long, coated with platinum in six gradations, from black to transparent. Previously, he experimentally determined that these platinum steps, at a certain wavelength, transmit 11, 16, 26, 43, 65, and 100% of the light intensity. He placed this step attenuator over the slit of the spectrograph and covered the rest of the slit.

On the photographic plate, six spectra appeared on top of each other with varying degrees of darkening. In each of these spectra, he determined the transmission of a piece of continuous spectrum between the Fraunhofer lines using the microphotometer. He then found six transmission numbers which he plotted graphically against the pre-determined transmitted intensities: this gave him a calibration curve. Subsequently, he had to manually convert the transmission profiles automatically recorded by the microphotometer into intensity profiles using this calibration curve.

This cumbersome text corresponds to the time-consuming work that was necessary before Minnaert and Van Cittert first obtained line profiles showing the true intensities of Fraunhofer lines. The same method could, of course, be used to find the true intensities of emission lines from glowing vapors and gases in the laboratory.

With his brand-new equipment and methods, Minnaert was naturally a pioneer worldwide. He abbreviated his new quantity, true intensity, with 'i.' He immediately had a brilliant idea regarding the unit of this quantity, which he presented in 1923 to the Dutch Natural and Medical Congress: 'For absorption and dispersion lines, it is desirable to adopt another determination for strength, namely the energy that has disappeared from the spectrum, expressed with the unit of energy within 1 Å of the surrounding continuous spectrum. This way is currently used to calibrate the Rowland scale of solar lines at the Heliophysical Institute in Utrecht. The strongest line from the solar spectrum has a strength of 9.4 units; the weakest lines seem to have values of a few thousandths of this unit.'

These were groundbreaking sentences for astronomy, which did not elicit a single question from anyone at the conference.

\figcaption Minnaert's principle of equivalent width: the area under a "line profile" is converted into a "width."

The Fraunhofer lines, after registration, show a parabola-like curve whose shape depends on the number of grooves in the grating and to some extent on the slit width of the microphotometer. However, the area of the curve

is constant. This represents the energy removed; after calibration, it gives the true intensity. Minnaert proposed determining the hypothetical width based on a rectangle with one side equal to the local continuous radiation and an area equal to that of the processed line profile. He referred to the quantitative result in $\text{milli-}\text{\AA}$ as the total absorption or true intensity of a Fraunhofer line. Minnaert thereby extracted intensity from the intuitive realm it had occupied since Fraunhofer, Kirchhoff, and Rowland—more than a century earlier.

At that very moment, astronomers in the United States were joining forces to revise Rowland's Table. However, the new values remained based on estimates. Minnaert began promoting his project: converting more than 20,000 Rowland values into true intensities, which he would eventually refer to as equivalent widths in the late 1920s. It would take a decade for the importance of his proposal to penetrate the awareness of astronomers. However, research groups in Germany and Australia quickly supported him. Minnaert's star began to rise considerably. He now had to turn his idea into publications.

He once complained to biologist De Bruyker: "I spend all my time on my duties; nothing remains for my own research. In the late evening hours, tired from physical and mental work, I try to make further theoretical progress. So many beautiful plans, almost completed, lie waiting there. Occasionally, I hear that someone else has carried out something I wanted to undertake. I try to economize on time—in the morning, afternoon, while eating my sandwich, at night; perhaps I am gaining ground after all. The piece I sent you is not yet my dissertation; it's a side path that caught my attention, and along which I took some time to explore an interesting area in depth. The dissertation, I hope, will be five times as extensive. But when? "

It must be borne in mind that Minnaert was engaged in regular work at the Physics Laboratory. Supervising the practicals for students of natural sciences, astronomy, and mathematics, as well as for many medical students, was certainly no sinecure in Utrecht. Since Minnaert had quickly formed an idea of the life's work that could be laid out before him, the responsibilities must have weighed heavily on him at times. He took the stance back then that writing a dissertation was comparable to preparing for an exam: it should not happen during his employer's time!

Minnaert defending Julius

Julius involved Minnaert, who operated mathematically skillfully, in his polemics and encouraged Minnaert to pursue his doctorate on the defense of his sun theory. In 1920, Julius' assistants, Van Cittert and Minnaert, had separately reported that the line profiles they measured showed an asymmetric redshift postulated by Julius, although their results were actually within the margins of error. In 1923, Julius and Minnaert jointly undertook a so-called 'crucial' experiment proposed by Julius. Julius had deduced in an incomparable way that two adjacent Fraunhofer lines of a certain type must 'repel' each other, so their centers should be slightly farther apart. Minnaert calculated seventeen selected cases, which he graphically plotted. The result could be briefly summarized: 'The theoretical expectation is thus not at odds with the results of the observational material known so far; but our conclusion cannot reach further for now because the quantities under investigation lie on the edge of current measurement precision.' That was essentially a repetition of 1920 and deadly for a crucial experiment.

Remarkable in their text are the ambiguous, Julian passages that try to save the situation. Julius then decided to comprehensively set out his solar physics once again in a 'Textbook of Solar Physics. When he died in 1925, he was halfway through his work. In the introduction, he wrote that there could be no systematic growth in solar physics in the sense that researchers would continually build upon foundations laid by their predecessors. He needed this starting point to justify the break with his predecessors. He repeated the condition for his palette of beam curvatures: 'We will introduce the hypothesis that a relatively large local variety of optical densities is found in the rarefied mass.' Recently, he had drawn courage from Minnaert's dissertation, which had already succeeded, under certain restrictive but highly plausible assumptions about the distribution of irregularities, in calculating how an originally parallel beam of light would spread out in terms of direction and intensity in such a medium. The devoted student gave the old master false hope!

Einstein called his friend Julius in his eulogy 'one of the most original exponents of solar physics' and hoped that his views on anomalous dispersion would not be overlooked. He agreed with Julius regarding protuberances, 'that it is incorrect to posit high speeds when explaining solar phenomena.' However, he noted that Julius, in turn, had placed no faith at all in redshift as a result of his theory of gravity. Julius's PhD student H. Groot hoped that one of Julius' students would attempt to complete his *Textbook of Solar Physics* 'as an act of scientific piety in a manner worthy of the Master.'

Minnaert naturally felt called upon to do so.

Irregular Beam Curvature

In the early 1920s, with the help of all possible exemptions, Minnaert had graduated again in physics and devoted himself to his promotion. He wanted to demonstrate with his second dissertation in mathematics and physics that Julius' ideas were indeed solid physics. In his Foreword, he promised the deceased that 'it will be my endeavor to continue working in Your spirit.' The substitute promoter Ornstein had been willing to take over the cum laude already awarded by Julius. Minnaert had picked up an article by Ornstein and Zernike, 41 in which they had laid the foundations for the mathematical treatment of some of Julius' concepts.

First, Minnaert once again defined the terms he used. When a parallel beam of light falls on an optically smooth planar piece of glass, with parallel front and back surfaces, it reflects back in one direction (normal reflection) and the transmitted beam is refracted in a certain direction (normal refraction). If the glass plate is provided with small protrusions like frosted glass, the light reflects back in various directions depending on how individual light rays (photons) bounce off the protrusions (irregular reflection), and the same applies to the transmitted light (irregular refraction).

If one considers the case where not only the surface but the entire medium is irregular, then the density will vary from place to place. Minnaert took as an example a non-homogeneous, concentrated solution of kitchen salt. Then individual light rays would be deflected differently at each location. The initially parallel beam of light spreads out and becomes wider: Minnaert 43 calls this irregular beam curvature. When light passes through a medium where the disturbing particles are comparable in size to the wavelength of the light, such as cigarette smoke in a living room or dust in the atmosphere, one speaks of 44 scattering. Minnaert's argument had to lay the mathematical and quantitative foundation for two solar phenomena that Julius had explained qualitatively.

The first, the distribution of light across the solar disk, he could not bring closer to a solution despite much impressive calculation work. The second was the question of the sharp solar edge. If the sun is a gas ball with a gradual variation in density, how does it present a sharply defined disc? To this, he applied an ingenious calculation: he used a formula for the 'spreading coefficient' that he himself had derived, substituted his estimates, and concluded: 'Near the apparent photosphere boundary, the Julius

theory demands that the spreading coefficient decreases 125 times over a height difference of 700 kilometers; with the 'disturbance' in the atmosphere remaining the same, it is sufficient for the density to decrease in the ratio of 11 to 1. This is much more plausible than Schwarzschild's ratio of 10,000 (over 200 km) or Stewart and Russell's ratio of 100,000 (also over 200 km). Thus, Julius' basic idea is completely confirmed.'

The numbers associated with Julius' assumptions, therefore, seemed more realistic than those of his competitors. For such a great effort, that seems like a meager result. It is remarkable that the spectrograph, the instrument that was supposed to provide the hard data for Julius' theory, plays no role at all in the dissertation.

Minnaert's thesis provided little evidence to revive Julius' theory. Ornstein even wondered what he should do with the Heliophysical Institute. He had completely overhauled the laboratory in the mid-1920s; it could restart as a new facility serving as a center for photometry. The ministry had sent two letters after Julius' death: one of condolence to his family and another regarding the termination of his professorship to the faculty. The board, led by Ornstein, refused to accept the termination and even wanted to appoint a new professor. A compromise between zero and two was reached by maintaining Julius' position. A long-lasting intrigue ensued, against Ornstein's wishes, leading to the appointment of the theoretical physicist H.A. Kramers.

The Heliophysical Institute was also a point of attention on November 19, 1925, in the confident letter to the minister. The faculty board wanted to maintain it due to Minnaert's great qualities, who should be appointed as a lecturer. However, the institute was formally subordinated to the Physical Laboratory, and Minnaert's lectureship could remain unpaid for the time being. The curators were pleased and agreed: 'We strongly support the awarding of the personal title of lecturer to Dr. Minnaert on the grounds presented by the Faculty.' A year later, on November 5, 1926, Minnaert was indeed appointed as a lecturer and *privaatdocent* with a yearly salary of 4400 hfl.

Minnaert completed the second half of Julius' textbook the following year, making use of his publications and 'everything he shared with me in our daily conversations.' The passage in which Minnaert compares the wavelengths of 46 Fraunhofer lines with those of terrestrial emission lines deserves attention. The centers of the solar lines indeed show a tiny shift toward the red, varying from line to line, mostly between 0.0010 and 0.020 Å, increasing with wavelength. This was literally in agreement with Einstein's hypothesis regarding redshift! However, Minnaert bluntly dismissed this

redshift for Julius and wrote literally:

'This explanation of the redshift leaves no room for the relativistic shift posited by Einstein. Since the measurements already yielded much smaller shifts than required by relativity theory, there is certainly far too little left after subtracting the dispersion shift.'

Both Julius and Einstein were seeking a redshift on the order of 0.01 \AA , albeit of different natures (see the Appendix). Minnaert rejected Einstein's claim because there was simply no room for two effects!

Minnaert concluded the book with an ode to Julius' theory, which 'results in a minimum of assumptions.' He seemed at first glance still a supporter of Julius, but he was no longer one at that moment! He had spoken in his public lecture on the history of solar physics over the past century and allowed himself the freedom of new insights. He had cited the Dane N. Bohr, the Brit A.S. Eddington, and the German K. Schwarzschild as sources of inspiration and had outlined a fairly ambitious research program for a lecturer. He wanted 'to calculate the entire composition of the Fraunhofer spectrum and the ratios of the strengths of all Fraunhofer lines from simple assumptions regarding temperature, pressure, and composition of the layers.' That was a lifelong work and more than that. He had the ability to set ambitious goals, thinking on a timescale of decades, and also possessed the necessary perseverance. He had already begun preparations for the attack on the generally accepted Rowland scale of intensities.

Using equivalent widths.

The year 1927 brought new success. The previous year, a four-month eclipse expedition to Sumatra, including Amsterdam astronomer Anton Pannekoek, had yielded nothing due to cloudy skies; an expedition with Pannekoek and Minnaert to Lapland was brilliantly successful. In 1928, the Academy published the extensive report by Pannekoek and Minnaert. They succeeded for the first time in measuring the 'absolute' intensities of emission lines in the chromosphere by comparing them with a standard lamp developed by Ornstein. It was meticulous work: they processed 1,900 measurements of emission lines between 4154 and 4768 \AA into 30 pages filled with minuscule text. They were able to identify many lines using Saha's theory as multi-valent ions such as yttrium $10+$ or iron $6+$. They interpreted the emission lines of the most prominent elements as electron quantum jumps. This detailed explanation took up twelve pages with 300 details.

The two astrophysicists reasoned in terms of radiation transitions be-

tween electron levels, 'summation rules,' 'multiplet intensities,' and 'transition probabilities': these were terms from the quantum physical work in which Ornstein's Physical Laboratory, along with H.C. Burger and H.B. Dorgelo, had specialized in collaboration with theorists like A. Sommerfeld, W. Pauli, H.A. Kramers, and N. Bohr. Their book indeed referred to the work of Ornstein and his colleagues. It contained not a single reference to Julius. The publication took place in 1928, the year in which Julius and Minnaert's Dutch-language textbook on solar physics appeared, and this one was in English.

During these years, Pannekoek imparted not only his knowledge and experience but also his scrupulous attitude to his young friend Minnaert.

He wrote in his 51 diary about Minnaert: 'Here, in Lapland, as well as during the Indian eclipse, I have come to admire Minnaert for his practical skill and theoretical insight, as well as his complete dedication: he has effectively been the soul of the work in both expeditions. 52 In his letters, he could sometimes reprimand: 'Since I saw your original drawings, on which the deviations among themselves were visible, I did not suspect for a moment that you would leave them out here in the explanation.'

Pannekoek knew many prominent astronomers personally, such as E.A. Milne, J.S. Plaskett, and H. Shapley. Some were comrades from his time as a Marxist theorist. When Milne came to visit him in Bussum, he invited Minnaert to join the discussion with the great man. He wrote to Minnaert about the American H.N. 53 Russell: 'He has a talent for skillfully handling large material and extracting the main trends; clever and dominant; yet I have an instinctive resistance to all kinds of treatment methods. He also has a broader collection of multiplets than others because he has done much beautiful unpublished work on it.' He taught the young 54 Minnaert to critically examine the giants in the field as well. That must have been important for the enthusiastic 55 Minnaert.

In 1927, Minnaert published an article with Ornstein on the intensity distribution in recordings of spectral lines. The article provided an overview of how they worked with the spectrograph and the microphotometer. They discussed the influence of slit widths on the profiles and that of the developer on the photographic plates. It illustrated only their intensive collaboration. A spicy footnote reveals Minnaert's authorship: the plates for the article were 'taken and measured in a commendable manner by Miss M.B. Coelingh and Miss J.G. Eymers.' This refers to Miep Coelingh and her close friend Truus Eymers; Minnaert had just become engaged to Miep.

He continued steadily working on a publication about his own experiments. He compared his true intensities for weak Fraunhofer lines with the

intensities according to the revised Rowland Table by the Americans and derived an empirical formula that converted Rowland's intensities R into Minnaert's true intensities i . For the first time, through extrapolation, he deduced that the Fraunhofer lines absorb approximately 15% of the energy from the solar spectrum: 'All theoretical considerations about the shape of the sun's energy curve were dangerous as long as the depression of that curve caused by the Fraunhofer lines was not taken into account.'

During final editing, he was unpleasantly surprised by an article from German H. von Klüber on emission line profiles from the chromosphere. It included measurements of the intensities of the K and H lines of the Ca ion, which Minnaert himself had worked on with Pannekoek. Von Klüber worked at the Einstein Tower in Potsdam, where director Freundlich continued the photometric work of his predecessor Schwarzschild, who had died in 1914. Minnaert hurried to submit his article and immediately included harsh criticism of the German's methodology. The latter's intensities differed too much from his own values. He advised taking into account the 'ghost images' of the grating and urged better standardization. However, their values actually matched quite well, while Von Klüber used a peculiar 'half-value width.' This may have annoyed Minnaert.

The German had not criticized Minnaert, nor even mentioned him. That could also have been a point of contention. Minnaert's reaction seems haughty. This was painful because he had tried to find a theoretical explanation for the ratio of the surfaces of the two emission lines. But he did not succeed to connect the theory with the data. His article had already given much food for thought. While correcting the proofs, he received the first set of galley proofs from a contribution by Albrecht Unsöld, a colleague of Von Klüber: he could just mention in a footnote that he suspected that this had satisfactorily solved the issue.

An earthquake

60 Unsöld had theoretically interpreted the results of his colleague Von Klüber. His article must have shocked Minnaert for two reasons. He had insufficiently prepared himself for the reality of absorption, emission, and scattering as a result of atomic processes due to his fixation on Julius' theory. In his calculations, the number of particles in the chromosphere that cause emission played no role at all! According to Unsöld, these provided an explanation for both the spectral lines and the Fraunhofer lines. The more active atoms or ions per unit volume of sun, the greater the effect. Unsöld

worked with quantum mechanical formulas for the 'scattering coefficient' and 'radiation damping' as a result of colliding and passing particles. A sober consideration in terms of really existing particles Minnaert had described in his 1916 brochure as a characteristic of the Dutch way of thinking in physics!

Minnaert must also have been shocked for a second reason. He had moved for years both in Julius's optical research program and in Ornstein's quantum mechanical domain. Unsöld finally opened his eyes: his story originated from a quantum mechanical world of thought, but in Juliaanse terms, it came down to anomalous scattering in optical physics. Minnaert had focused on anomalous refraction following Julius because those refracted bundles of rays could 'in principle' explain so many solar phenomena!

For Minnaert, solar physics got back on its feet. Protuberances, sunspots, and chromosphere lines became real again. The asymmetry of the line profiles might be a peculiarity of the 61 spectrograph, a waste of useless work within the margin of error. Not these phenomena but Julius' explanations were an optical illusion: food for psychologists! He himself had honored optical illusions in the manner of those chained in Plato's cave: his mockery was simply hubris. Minnaert must have realized all of this during that July month of 1927.

Unsöld made it clear that the scattering activity depends on the number of absorbing particles, 'resonators' or 'oscillators' N , and this also applies to the energy lost in the line profile. Quantum physics provides the data for the probabilities of electron transitions: for the K and H lines of the $+Ca$ ion, it turns out that they are in a ratio of 2:1. The easiest transition brings about the greatest scattering. Interestingly, Ornstein's Physical Laboratory was set up in the 1920s to provide empirical evidence for these 62 quantum rules. It was the pioneering work of Burger, Dorgelo, and Ornstein himself. Unsöld derived a formula in which the intensities of two lines are related as the square roots of the number of particles N and the square roots of the ratio of transition probabilities. One surface had to be in proportion to the other as $\sqrt{2}:1$, as 1.41:1.00, and that was correct. His calculations approached the line profiles quite decently.

Minnaert had submitted his article on July 29th and it appeared at the beginning of September. He had denigrated the methods of his German rival. Unsöld had every reason to strike back sharply in his revised article. However, Minnaert, as a Sunday's child, born exactly at noon, had all the luck in the world: his German and American opponents would manoeuvre him into a comfortable position.

An opportunity for an open goal.

Unsöld explained that if the intensity of spectral lines is determined by the number of particles, then inversely, the frequency or abundance of those particles can be derived from the line profiles. He thereby opened the way for the quantitative chemical composition of sun and stars. For the first time, he made estimates known of the abundances of metal atoms in the chromosphere:

'From the width of a line, one can calculate the total number of atoms resting on a square centimeter of the sun's surface.' In a Nachtrag, he addressed Minnaert, who 'criticizes the procedures applied by Von Klüber and myself.' He argued against Minnaert's points of criticism: 'Without delving into Minnaert's theoretical considerations, I would like to mention that, as far as I can see, Julius's beam curvature does not play a noticeable role in our problem. From an experimental perspective, the agreement between Minnaert's results and those presented here seems more substantial than the remaining specific differences.' That was well said and truly the case!

Unsöld had also stirred up the Americans. In July 1928, an article by H.N. Russell, W.S. Adams, and Charlotte E. Moore appeared, in which they established a connection between the number of particles N introduced by Unsöld and the intensities R of their Rowland scale. They had two advantages: their revised Rowland values and extensive quantum studies on atomic spectra. However, the Americans also acknowledged that the basic idea came from Utrecht.

Following preparatory work by Sommerfeld and Heisenberg, in the years after 1924, Ornstein, Burger, Dorgelo, and De Laer Kronig established rules for the relative extent to which different quantum transitions in an atom contribute to the strengths of spectral lines. In technical jargon, these relative contributions are called 'numbers of active atoms.' These 'summation rules' pertain to lines that, from an atomic perspective, are interconnected because they originate from the same ground level in the atom. Such a group of lines is called a 'multiplet.' Using these summation rules, Russell and his co-workers determined the 'numbers of active atoms N ' for 228 atoms and ions belonging to several multiplets. They also estimated the Rowland intensities of these lines. Thus, they could investigate how the observed strength of the lines depended on these 'numbers of active atoms.' They attempted to find a graphical relationship by plotting these N values horizontally against a derived function of the Rowland values vertically, which they also varied with wavelength. They might have expected a linear relationship: twice as many active atoms would result in a line twice as strong. That turned out

not to be the case, however. They found a complicated graphical relationship that did not lend itself to a meaningful interpretation.

The Americans were aware that Minnaert wanted to measure the thousands of surfaces of his calibrated line profiles to find the true intensities: 'The value and importance of such work are clear. But even if the laboratory measurements were completed, the physical interpretation will not be easy. It is absolutely not allowed to assume that when a line blocks ten times as much solar energy as another, it will contain ten times as many atoms. A satisfying theory of the widths and depths of Fraunhofer lines is difficult to establish. It is likely that such a theory will be the end product of a general theory of the solar atmosphere rather than a step in its development.'

Their own results had not been encouraging, but they still believed a priori that there must be a royal path. In that case, at a certain wavelength, a given number of particles could be converted into the intensity of a Fraunhofer line by deduction, and vice versa, without requiring Minnaert's heathen measuring work! It was not so strange that they thought in that direction, because five Americans, including two of the three mentioned authors, had just published the Revision of Rowland's Preliminary Table: 66 a standard work with the estimated Rowland strengths of 21,835 lines. They were not the first to be called upon to address Minnaert's criticism of their Rowland values!

Minnaert became the undisputed opponent due to the Americans. Through this polemic, he was referred to his colleagues at the Physics Laboratory by both the Germans and the Americans! His Utrecht colleagues could provide him with quantum numbers for the number of particles N of closely spaced lines. He was the only one with measured surfaces, his equivalent widths, which were more accurate than the Rowland values. And he could measure himself! Good old Julius, whose foresight had resulted in a spectrograph that could still attract worldwide interest.

The discovery and explanation of the growth curve

Minnaert alone was the only one who could attempt to establish a graphical relationship between these two quantities, N and its equivalent width i . This happened in an article he co-authored with his assistant Van Assenbergh. Minnaert chose a blue-violet segment of the solar spectrum, 150 Å in length, representing 5% of the visible spectrum. They measured the equivalent width i for 57 lines between 4400 and 4550 Å. They recalibrated the Rowland scale at this wavelength. By working within a narrow wavelength range, the

necessity to treat wavelength as a variable was eliminated. Following the approach of the Americans, they plotted the logarithmic values of i against those of the number of absorbing particles N . A curve emerged, indicating that the intensity of a Fraunhofer line does not increase linearly with the number of 'oscillators.'

\figcaption This was the first 'growth curve' of the Sun. Half a century later, it turned out that the general trend appeared somewhat different.

In fact, three qualitatively distinct relationships seemed to emerge: one for small values of N (weak lines), one for 'medium-strong' lines with larger N values, and one for 'strong' lines with very large N values. For weak lines, i appeared to increase proportionally with N , but 'for medium-strong lines, a systematic deviation occurred in the sense that the absorption lines were less dark than theory would have suggested.' In the strong section, two Fraunhofer lines deviated significantly from the flat middle section. They achieved a result that, contrary to what the Americans had feared, invited theoretical explanation.

Since no one had anticipated this relationship, Minnaert gained an advantage over his rivals. He was convinced that the curve contained essential information. According to him, it resulted from theories proposed by Julius—'anomalous scattering' due to anomalous dispersion—and quantitatively developed by Unsöld. Here, Minnaert proved himself a street fighter, even daring to present Julius as the champion of anomalous scattering. He knew very well that his mentor had promoted anomalous -refraction-. Minnaert stood alongside the greats in the field of astrophysics.

He had published hagiographic works about Julius only in Dutch 68, which was not to his disadvantage. There was great anticipation for his new findings. Could the curve be reproduced in other wavelength regions? How could it be explained? His announced intention to create an Atlas of all true intensities using the microphotometer met with approval everywhere.

In 1930, Pannekoek published an article on the precise shapes of the 69 curves produced by the microphotometer. Changes in pressure and temperature altered these shapes, as did electromagnetic effects that caused line splitting, resulting in line bands. Sometimes, those physical processes affected the wings of the profiles, while other times they manifested in the center of the profile. Minnaert considered this article at the time to be the best theoretical work ever written on the Fraunhofer lines. However, one of his own theoretical articles made at least as much of an impression.

Minnaert was eager to have the scoop on the theoretical explanation of 'his' curve. For him, physics ultimately revolved around explanation rather than phenomena. After two years of research, he and his Ph.D. student

Mulders published an article on the wavelength region between 5150 and 5270 Å. They determined the equivalent widths of 47 green lines. Once again, they calibrated the Rowland scale: the equivalent widths of the Rowland values were found to be, on average, $1.29 \times$ greater than in the blue region! This finding damaged the authority of the Rowland scale. They rediscovered the familiar curve.

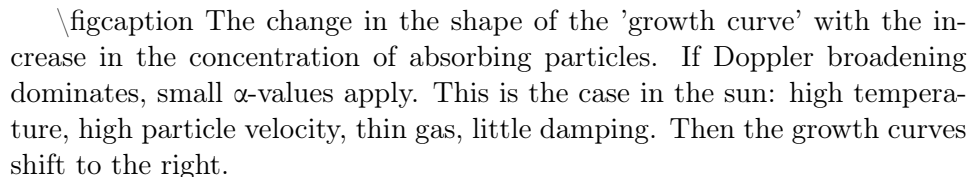
Initially, they had wanted to work in all color regions before attempting a theoretical explanation. However, they abandoned this plan after a publication by the German physicist W. Schütz, who, based on laboratory experiments with spectral emission lines, had discovered a similar curve. They calculated for days on end, from morning till night, and obtained the first theoretical 72 growth curves for the sun. Minnaert named his curve a 'growth curve' because its origin reminded him of the hypothetical figure he had proposed in his biological dissertation on the stomata of pine needles. In 1934, he wrote: 'A curve showing the functional relationship between equivalent width and oscillator concentration shall henceforth be called the growth curve of the respective spectral line.' This is what it has been called for sun and stars to this day.

The physical background of the core of a Fraunhofer line is the absorption of an 'individual light ray,' a photon, by an atom and its subsequent scattering when the photon is re-emitted. But the line also broadens. There are two causes for this. One, even in very weak lines, is due to the high speed of particles causing a Doppler effect, which results in minimal variations in frequencies and thus wavelengths. The second main effect is 'damping.' This is a consequence of the fact that an absorbed photon remains absorbed for only a finite time. The shorter this time, the broader the line becomes. The 'natural' lifetime of the photon is shortened by collisions with other particles. These broadenings are referred to as 'natural broadening' and 'collisional broadening.' Together, they are called 'damping broadening.'

With a small number of atoms, the Doppler effect plays the main role, and the absorbed intensity is proportional to the number of particles. With a larger number of particles, there is a slight increase in absorption, which is primarily attributed to damping. When this damping becomes the dominant influence with a very large number of particles, the absorbed intensity in the wings of the profile increases again with the square root of the number of particles. Of the three parts of the curve that one may theoretically expect, Minnaert and Mulders wrote that Schütz had found only the last two in his experiments: 'The solar spectrum, on the other hand, shows us the entire course of the theoretical curve in the purest completeness.' They could have equally well used Unsöld's scattering theory as well as Pankoeck's. Here

begins Minnaert's eclectic grappling with the results of colleagues and his own theorizing based on formulas he creatively adapts to the material to be interpreted. The manual calculations were murderous, but Minnaert felt at home with them. Incidentally, they honestly noted that the growth curve would also appear if, instead of plotting the equivalent width w vertically, they had plotted the Rowland intensity R !

In 1931, Minnaert and his collaborator C. Slob wrote a triumphant article 74 for the Academy. They predicted that the equivalent width would make a splash in astrophysics. In star spectra, the precise profile of an individual line can hardly be determined, but its surface area can! Minnaert and Slob illustrated, with the help of formulas from Pannekoek, that the growth curves would prove to be universal. By now, Minnaert's articles were teeming with synonyms: true intensity, total intensity, total absorption, and equivalent width. Over time, the latter term came to the forefront.

 \figcaption The change in the shape of the 'growth curve' with the increase in the concentration of absorbing particles. If Doppler broadening dominates, small α -values apply. This is the case in the sun: high temperature, high particle velocity, thin gas, little damping. Then the growth curves shift to the right.

Minnaert allowed himself more liberal articles from then on. In the *Zeitschrift für Astrophysik*, he pondered the remarkable residual intensity of light in the heart of a 75 Fraunhofer line, as found by Unsöld. Could the scattered light perhaps deviate slightly from the frequency of the incoming radiation? He was no longer the journeyman of his teachers, whether Julius, Ornstein, or Pannekoek. He became someone who thought aloud about his field, dared to ask open questions, engaged in dialogue, and knew how to appreciate the contributions of others.

Minnaert surpasses Rowland

The debate between the Minnaert scale and the Rowland scale had not yet been settled. On Ornstein's instructions, Minnaert also occupied himself with the Foundation for Lighting Science and physiological issues. He repeatedly encountered the treacherous aspects of color perception with the eye. Based on a comparison of the results from 76 observers of the Orion star Betelgeuse, he concluded 'that an observer of red stars should have their own eyes tested for color vision ability.' Another time, he posed the question: 'If an image is so faint that I can barely perceive it with my eye, how long do I need to capture it on a photographic plate?' Minnaert asked a seemingly

simple question, which nevertheless had significant practical implications. It turns out that such exposure times sometimes amount to several hours, meaning that such phenomena are overlooked by instruments. Visual observation is more effective in such cases. The eye proves to be insensitive to violet and very sensitive to green: 'The eye is most sensitive in the region where the photographic plate is least sensitive.'

\figcaption The 'catastrophe' between green (5500) and green-orange (5900)

Minnaert always understood that surprises could occur if the Rowland scale were applied across the entire spectrum to its equivalent widths. His PhD student, Mulders, addressed this question and announced their discovery in 1934. During the graphical processing of the results, Mulders plotted the equivalent width i in $\text{m}\text{\AA}$ vertically against the wavelength in \AA . The graph now showed the Rowland intensities compared to i , ranging from '-3' to '+4'. If Minnaert's entire operation had been useless, eight more or less horizontal lines would have appeared here. In that case, the intensities according to Minnaert and those according to Rowland could have been converted into each other via a simple proportionality factor. This was the case between 4000 and 5400 \AA and between 5900 and 8500 \AA . The R-values suddenly dropped. Between 5400 and 5900 \AA . That had to be made known to the entire world! This unexpected drop must have dealt a decisive blow to the skepticism about converting Rowland units into Minnaert units. Suddenly, the lack of quantitative sense in Rowland's work and that of his followers proved to be a major mistake—a game of misunderstandings between the eye and the plate. No one except Minnaert could have imagined such a green-yellow catastrophe; it was also a triumph for Ornstein's calibration program! Minnaert's star rose to the zenith.

In 1936, Minnaert even received congratulations from Unsöld, by then the undisputed theoretical expert on the sun, because he had succeeded: 'The fact that you managed to derive the theory of line wings from the differential equation in such a simple way delighted me greatly. I have always wished that these formulas, which are so simple and intuitive in their structure, could also be derived in a straightforward manner.'

A versatile astrophysicist

Minnaert engaged with various aspects of his field. For years, he had been focused on eclipse images of the solar corona and chromosphere. He published extensively on the corona. In 1930, he wrote an article about the

polarization of its light. Scattering by 'free electrons' would provide a good explanation for this polarization, but it conflicted with other assumptions. Minnaert addressed a note by Einstein on this subject and considered a suggestion by Ornstein regarding a 'recombination spectrum.' He agreed with his discussion partners that the corona must have a lower temperature than the solar edge of 6,000 Kelvin; the consensus on a temperature of one million degrees came only ten years later with the work of Bengt Edlén from Sweden. In a lecture in Leiden, he said: 'The corona likely consists of strongly ionized gas, i.e., a mixture of atoms, ions, and free electrons. The free electrons should scatter the most strongly because their mass is the smallest; this would align well with the Observation that Fraunhofer lines in the inner corona are not visible, apparently because the thermal motion of free electrons imparts strong Doppler shifts to all lines, erasing them. If he had continued his reasoning based on these facts, he should have predicted the high temperature of the corona. He also struggled with explaining the continuous spectrum: this only became possible ten years later with Rupert Wild's discovery of the negative hydrogen ion in the solar atmosphere.'

In 1932, Minnaert and his doctoral student Wanders addressed the theory of 83 sunspots. The accepted view was that sunspots resulted from rising gases that expand and thus cool down. When they photometered and interpreted their recordings—a rare practice—they concluded that radiation equilibrium must prevail, leading to a temperature of 4,300 K. They referred to Julius's work, who had not found the violet shift in the umbra of sunspots that should have accompanied rising motion. Wanders could position himself at the heart of a long-standing controversy with his dissertation.

Minnaert guided his doctoral students, formally Ornstein's, always into the heart of debates and ensured that he also received credit through joint publications. He did not forget himself; in his own publications, he prominently presented his students' results. They benefited from his questions, and he could use their results in syntheses beyond their capacity: here too, there was 'mutual benefit.'

In the early 1930s, recognition of Minnaert's quality accelerated. He corresponded with colleagues, attended conferences and observatories, wrote an internationally accepted masterpiece, and became one himself. Only a small part of his correspondence has been preserved. In 1930, the Russian E. Perepelkin sent him some protuberance spectra from Leningrad; he had a thousand of them. He wrote to Minnaert: 'Unfortunately, I cannot process my extensive material now because the Pulkovo Observatory does not yet have a self-recording photometer. A Moll has been ordered for a long time, but when will we get it?' In response to an article by Minnaert on protu-

berances, he wrote: "I think your result is much more accurate than my earlier 85 measurements." In 1932, Von Klüber wrote from the Observatory of the Einstein Foundation in Potsdam. He had made recordings of the red atmospheric bands of the solar spectrum: "As I hear, you are working on the same issue, and it might be good if we stayed in touch about it?" Von Klüber had heard from his director Freundlich that Minnaert was visiting their observatory: "We would all like to see that." Willi Cohn from Harvard Observatory asked Minnaert that year for assistance with the eclipse expedition and help with photometric standardization: "Could I get a standard lamp from your lab, like the type you gave to the Potsdam eclipse expedition of 1929?" He invited Minnaert for further discussion on the polarization of the corona.

In 1933, he attended the congress of the International Astronomical Union in the United States. He traveled around Canada and America, making friends for life. Theodore Dunham Jr. from Mount Wilson Observatory later wrote to him that he wanted the article by Minnaert and Slob. He was working on a device that could radically reduce the reduction time of the microphotometer, otherwise hoped that Minnaert would soon return to California, and referred to the conversation between them and 'Miss Payne.' Also dating from that year are the letters from the Russian W. Barabascheff from Kharkov about measuring sunspots: "I am very interested in Mr. Wanders' dissertation and would be grateful if I could get one."

At the end of 1933, Prof. Dr. W. Grotrian, editor of the *Zeitschrift für Astrophysik*, wrote: "Here in Potsdam, a lot has changed since you left. It has become quiet in the tower: a definitive new arrangement is still pending. We have good news from Mr. Freundlich in Istanbul." He would publish two articles by Minnaert: "We look forward to the Dutch colleagues continuing to publish in our journal." The Jewish scholar who fled Hitler tried to keep his head above water in Turkey. The idea of a publication boycott would not have occurred to Minnaert, even though he was opposed to the German regime. Precisely in times of political disagreement, scientists must continue to communicate with each other!

The fame of the 43-year-old Minnaert can be illustrated with a passage from the letter that Gerald P. Kuiper, recently appointed as Assistant Professor in Chicago, wrote in 1936 to the Utrecht astronomer J. van der Bilt. The people who pass by 91 revue were, without exception, giants in the astronomical world: 'Struve wanted to add another theorist to his staff. I proposed two candidates, Minnaert and Chandrasekhar. Shapley was enthusiastic about the idea of Minnaert and strongly supported it. I wrote, among other things, that I thought M. was 42-44 years old; that Chandrasekhar con-

sidered him the best solar physicist in the world, etc. It then turned out that Struve felt very strongly about Minnaert because he had been looking for a good solar physicist for years; but the President preferred Chandrasekhar, who is only 25 years old (a young genius!). Van Biesbroeck then told Struve that he thought Minnaert was much older than I had said, close to 50. That completely rejected M.'s candidacy, as they only wanted to appoint young people. I immediately felt the possibility that Van Biesbroeck might be anti-Minnaert; so I asked you how old M. was.' Unfortunately, the cards were already shuffled. Kuiper had found it regrettable: 'Minnaert is internationally highly regarded! I hope we can have him for a year. (Of course, you don't want to talk about this Minnaert issue!)' Minnaert was thus almost appointed in Chicago, where in those years a world top of astronomers was being acquired. His Flemish past had thrown a spanner in the works.

The curtain falls on anomalous dispersion

In 1937, the British astronomer R. Woolley had determined that the sun's density gradients are not significant. He concluded that Julius' anomalous dispersion was therefore permanently ruled out. Minnaert filed 92 objections against this.

According to him, Julius had distinguished three effects of anomalous dispersion. The first effect was classical anomalous dispersion: regular refraction according to Kundt. This could not be ruled out because it was hard physics that had been around for a century. However, this effect played no role in solar physics, even though Julius had hoped to explain protuberances and chromosphere lines with it.

The second effect was anomalous dispersion due to spreading in a non-homogeneous gas. Indeed, this effect too had proven to be an illusion: 'I myself have demonstrated that in the solar atmosphere, in that case, very sharp density gradients would have to occur, extending only over millimeters; this is indeed unlikely.' He now interpreted this part of his dissertation, unlike earlier, as a feat against Julius.

The third effect was anomalous dispersion in the form of scattering. According to Minnaert, both physically and mathematically, two elaborations of this phenomenon were equivalent. First, a quantum mechanical argument was possible using the scattering coefficient k , which takes an abnormally large value at the relevant wavelengths, and radiation damping. Additionally, an optical consideration was possible, which states that the refractive index near the two Fraunhofer lines is abnormally large (or small) and thus

applies the factor $(n - 1)$ after which Rayleigh's scattering law is applied. Minnaert suggested that the results of these two approaches would lead to identical physical relationships. According to him, it was childishly simple to convert the terms Julius borrowed from classical physics into those of quantum theory.

This was Minnaert's retrospective on Julius that he circulated. He would not gain any supporters. For the last bastion of anomalous dispersion, his straw man of anomalous scattering, the curtain would fall in the late 1930s. Scattering also plays no role in the solar atmosphere; it is too sparse. With this, the anomalous scattering at the wavelengths of Fraunhofer lines was out. The basis for understanding Fraunhofer lines lies in the absorption calculated using Planck's quantum law. Minnaert believed there should be a bridge between classical optics and quantum theory. Such a bridge did not exist. Minnaert went to great lengths in adhering to his preconceived notions. In a certain sense, this is characteristic of a theoretically inclined natural scientist, but his persistence bordered on dogmatism.

That Minnaert would continue to position himself as the defender of Julius' ideas is nonetheless understandable and is not based solely on psychological grounds. Without Julius' solar theory, no spectrograph would have been installed. Without the spectrograph, independent solar research in Utrecht would not have been possible. Without Moll's microphotometer, which was made for Julius' experiments, the true intensities and equivalent widths would not have been defined in Utrecht. Without the micrometer measurements of alleged redshifts and line center displacements, Minnaert would not have learned such extreme precision. In all these aspects, Minnaert owed his success to Julius.

Additionally, in the 1920s, the microphotometer had become the basis for Ornstein's photometric project at the Physical Laboratory. Minnaert's breakthrough was also a result of his involvement in the calibration work within Ornstein's research program. In Utrecht, Minnaert found two ideally prepared research environments that offered him, as an exile, the space to deploy his ambition, perseverance, and boundless work ethic for Greater Netherlands. He would show the world that his appointment to the Flemish University had not been a mistake.

Endnotes:

1 De Jager, 1993, 40.

2 Sommerfeld, 1914; 1919.

3 Minnaert to Burgers, February 2, 1919.

4 This issue is the subject of Otterspeer's book, 1997, 61. See also the

review by L. Molenaar in *Jaarboek Buitenlandse Zaken*, The Hague 1998, 148.

5 Julius to Curators, December 1919. *Astronomy Archives*.

6 Minnaert to Burgers, December 30, 1919.

7 Nowadays, the unit nanometer (nm) is used, i.e., 10^{-9} meters, which is ten times larger.

8 Minnaert, (1947). See *Literature Part III (1945-1970)*.

9 In the Kirchhoff year 1959, Minnaert wrote: 1859 - Kirchhoff explains the Fraunhofer lines.

10 To observe the operation of a reflection grating, one simply needs to hold a CD under a white lamp. Looking at the top of the CD, one can see that the light is decomposed into all the colors of the rainbow. The pits on the CD surface function like the grooves in a grating.

11 Rowland, 1895.

12 Vervaet, E., *The Birth of Spectral Analysis*, *Intermediair*, 43, 1987, 43.

13 Heijmans, 1994, 73.

14 Minnaert, (1947).

15 Moll, 1919.

16 Appendix at the end of the book.

17 Here and there, the present tense is used because the coelostat, 'the device that holds the sky,' is part of the museum setup of the Utrecht Observatory, which was made operational again in 2002.

18 Minnaert to Burgers, April 13, 1919.

19 Julius, 1923.

20 Minnaert to Burgers, April 13, 1919.

21 Heijmans, 1994, 33.

22 Minnaert, 1936, 66.

23 Minnaert, (1947).

24 Minnaert, (1921a). The journal *Physica* with the subtitle *Dutch Journal for Physics* marks the professionalization of physics.

25 Heijmans, 1994, 43. Minnaert received a postcard from Ornstein in Jerusalem in the early 1920s.

25 Heijmans, 1994, 51

27 Bleeker, 1951. It seemed logical that gas layers farther from the core would be cooler than the solar edge of 6000 K.

28 Heijmans, 1994, 81.

29 Heijmans, 1994, 64.

30 Minnaert to Burgers, June 17, 1921.

31 Minnaert, (1921b).

32 Minnaert, (1921c) mentions that he is working on attenuators. De Jager, 1993, 99, refers to the year 1923.

33 Minnaert, (1923a), 103.

34 Minnaert to De Bruyker, March 18, 1922. He probably sent a reprint of his 1921 article on *Ghost Images*.

35 Minnaert (1923b, 1923c).

36 Hentschel, 1994, 121.

37 Julius, 1928.

38 Minnaert, 1925.

39 Einstein, 1925. See the Appendix.

40 Minnaert, 1925, July 6, 1926.

41 Ornstein and Zernike, 1916-1917.

42 The astronomer De Jager was helpful in formulating a short summary.

43 A modern example is that of a laser beam aimed at the moon. Without Earth's atmosphere, a spot with a diameter of 400 meters would be illuminated on the moon; because the beam passes through the atmosphere where density fluctuations occur, the diameter of the spot is several kilometers.

44 Or the electrons of the corona around the sun.

45 Letter from H.J. Jordan (chairman) and L.S. Ornstein (secretary). The latter wanted his colleague H.C. Burger to be appointed as a theoretical physicist; the faculty received H.A. Kramers from Copenhagen, the Mecca of quantum mechanics: an acquaintance of Minnaert from his time at Christiaan Huygens. His friends Dirk Coster and Jan Burgers had already been appointed as professors in Groningen and Delft.

46 See the Appendix.

47 Julius and Minnaert, 1928.

48 Minnaert, 1926, January 16th. In two installments that year in *Hemel en Dampkring*.

49 Pannekoek and Minnaert, 1928.

50 Heijmans, 1994, Chapter 5, The sum and intensity rules, p. 73, and Chapter 6, Further research on intensities in atomic and molecular spectra, p. 97.

51 Pannekoek, *Memories*, 1982.

52 Pannekoek to Minnaert, May 2, 1928. *Astronomy Archives*.

53 Pannekoek to Minnaert, September 10, 1928.

54 In his speech at Pannekoek's funeral in April 1960, Minnaert referred to him as his 'great teacher' and dear friend. For the first time, he seemed to have a relaxed relationship with someone he highly valued as a scientist and who was twenty years older.

55 Minnaert, Ornstein, (1927c)

- 56 Saint John, 1928.
- 57 Von Klüber, 1927.
- 58 See the Appendix.
- 59 Minnaert, (1927b).
- 60 Unsöld, 1927.
- 61 It ultimately proved to be so. Other spectrographs, such as those of the American Evershed, showed an asymmetry toward violet.
- 62 Fascinating overview by Heijmans, 1994, 85.
- 63 Unsöld, 1928a and b, effectively a continuous article.
- 64 Russell, 1928.
- 65 Ornstein and Burger, 1926, 412."
- 66 Saint John, 1928.
- 67 Minnaert, (1929b).
- 68 Minnaert, (1921a), 1926, 1928.
- 69 Pannekoek, 1930.
- 70 Minnaert, (1931e).
- 71 Schütz, 1930.
- 72 Minnaert in: De Jager, 1965.
- 73 Minnaert, (1934a).
- 74 Minnaert, (1931f).
- 75 Minnaert, (1932a).
- 76 Minnaert, (1931d).
- 77 Minnaert, (1932b).
- 78 Mulders, 1934.
- 79 Minnaert, (1936b).
- 80 Unsöld to Minnaert, August 27, 1936.
- 81 Minnaert, (1930a).
- 82 Minnaert, (1930b). Leiden, May 24, 1930. Note from De Jager
- 83 Minnaert, Wanders, (1932c).
- 84 E. Perepelkin to Minnaert, 1930. Astronomy Archive.
- 85 H. von Klüber to Minnaert, 1932.
- 86 Willi Cohn to Minnaert, spring 1932.
- 87 Theodore Dunham Jr. to Minnaert, 1933.
- 88 About Cecilia Payne-Gaposchkin (1900-1979), discoverer of the dominance of hydrogen in the universe, M. Offereins wrote a Women's Portrait in: NVOX 1997, 10, 516-517.
- 89 W. Barabascheff to Minnaert, 1933.
- 90 W. Grotrian to Minnaert, December 1933.
- 91 G.P. Kuiper to J. van der Bilt, March 15, 1936. Astronomy Archive.
- 92 Minnaert, (1938a). He responded with his Anomalous Dispersion in the Sun to a lecture by astronomer R. Woolley from December 1937 for the

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Royal Astronomical Society, which was printed in *The Observatory* in early 1938.

Chapter 9

A marriage which couldn't be modern

"For Mrs. Curie, marriage by no means implies saying goodbye to scientific work."

Marcel Minnaert and Miep Coelingh

Minnaert had lived with his mother for nearly a quarter of a century. His father had advised him at the time to dedicate himself to work and to be cautious in choosing a life partner. He had mentioned the age of thirty. Minnaert was not far off from that.

Little is known about the blossoming love between the extroverted Marcel Minnaert and the very reserved Maria Bourgonje 'Miep' Coelingh. In 1923, at the age of seventeen, she began studying physics in Utrecht after completing her HBS (higher civil service). They must have met during their first year of study. The romantic relationship between the student and her lecturer may have only begun after Minnaert's first eclipse expedition, in the spring of 1926. He was then thirty-three years old, and Miep, born on February 17, 1906, was twenty. She still lived with her parents in Bussum and commuted to Utrecht. The enamored Minnaert received the approval of her parents. Several postcards indicate their relationship. The earliest was from Jet Mahy, who wrote in May 1927 from Blankenberge in Flanders: 'Glad that I at least caught a glimpse of you and briefly met Miss Coelingh.'

Derk Coelingh, Miep's father, had received a scholarship as a mathematics student from the municipality of Amsterdam, became a math teacher, and later director of the 3rd HBS on Mauritskade. In 1900, he was awarded

a cum laude doctorate in mathematics and physics and married a French teacher, Maria Bourgonje Smit. They had four daughters: Joop, Wil, Miep, and Mia, who were one, four, and nine years apart in age. They lived outside Amsterdam due to the mother's malaria. Derk Coelingh became a member of the Education Council and was appointed Officer in the Order of Orange-Nassau in 1924.

Minnaert and Derk Coelingh must have known each other even before the relationship with Miep. Coelingh was, after all, the lifelong secretary of the Dutch Nature and Medical Congresses, where Minnaert had presented both his staircase attenuator and his equivalent latitude. Coelingh knew his Flemish colleague Frans Daels, professor of medicine, secretary of the similarly named Flemish Congresses, and initiator of the Yser Pilgrimages. Coelingh must have understood his son-in-law's passion for physics, didactics, and Flanders well and therefore approved of his new passion.

The teacher's family was not very warm. The father was always away for science. The mother had given up her work outside the home, was cool towards the children, and could not forge the family into a unity. Miep had a difficult relationship with her mother. Two children studied natural sciences: Wil studied biology and Miep studied physics. At the time, girls actually made up half of the physics student contingent.

When Miep was fifteen, she met Felix Ortt, who was then Minnaert's neighbor and directed the Liberal Christian Youth Community of Bussum from Soest. Derk Coelingh was a member of the progressive Freedom League and did a lot for the People's University. He was an atheist, and Miep's mother was non-religious. Still, the girls had to attend catechism for five years as part of their general development. Miep became a member of the Reformed Church and had herself deregistered by a bailiff after her marriage.

Miep adored Marcel and shared all his ideals. She had been a teacher at an industrial school for girls, where she had pioneered physics for three student projects. She began giving lectures on the position of women for Flemish-Dutch Associations. She lived for science. Her first scientific publication was written at the Physical Laboratory when she was twenty-one, together with her close friend Truus Eymers and director Ornstein.⁴

A marriage and a divorce

Miep and Marcel married on December 20, 1928. The story goes that they were averse to tradition, wanted to live together unmarried, and got married in raincoats. The story also goes that Ornstein had threatened to have them

removed from the Physical Laboratory if they would live together without being married. Miep wanted to be addressed by her maiden name after her marriage, which was highly unusual. A laboratory servant understood that she no longer went by 'Miss Coelingh' and did not want to be called 'Mrs. Minnaert,' so in desperation he addressed her as 'Miss Minnaert.'

The couple moved in with Mrs. Minnaert at De Blauwvoet. This might have been understandable for an inexperienced 22-year-old woman who wanted to leave her parental home, but Minnaert could have known it would cause problems. The Flemish widow adored her son and viewed her daughter-in-law with skepticism. The casual way her son got married probably didn't sit well with her: a formal wedding and a new home would have been clear signals that a different time had begun for her.

Their honeymoon was the 1929 eclipse expedition to Sumatra: for Minnaert, it was his second boat trip to Sumatra in three years. They set sail in March and returned four months later. On May 3, Minnaert wrote: 'Often until 10 or 11 at night, I am taking readings, and Miep always helps me and is tireless. Apparently for the double reason that she doesn't want to leave me alone and that she finds the work pleasant herself.' They led their own lives, on the boat and in accommodation on Idi. The story goes that Minnaert tipped his hat to the coolies: that was unheard of. Miep and Marcel talked with the locals and heard the old stories of the Aceh uprising. Even then, the idea must have arisen among them that communism could contribute to a more dignified world.

At the end of the trip, it turned out Miep was pregnant. They celebrated this with an additional vacation in Switzerland. Koenraad was born on January 28, 1930. A postcard from Miep's sister Wil from Pasoeroen in the Indies has been preserved: 'Dear people, what fun pictures; on the two large ones from March 2, 1930, he looks like Miep, I think. Also nice of Father and Mother. Father is really holding him cleverly. Mother's way of course, hers are also good looks, but she really needs to get a little comb someday! Too bad you lost your girlfriend, do you have another one already?'

Miep probably had a tough time on Parklaan. The mentality of that bossy mother and the stubborn Miep differed greatly: the difference between a Flemish matron and an independent Dutch woman also played a role. According to Jozefina Minnaert, the daughter-in-law should do what the mother-in-law says. Probably, a bad relationship arose from the beginning. Miep devoted herself to science and continued her studies, even after having children: she hired a maid to take care of them. Jozefina opposed this, although at the time in Bruges, before Marcel's father died, it had gone the same way.

Miep Coelingh graduated, to the dismay of many professors, with a thick belly, three weeks before Boudewijn would arrive on April 5, 1931; thirteen months after Koen. The Germanic names reflected Flemish resilience: 'Koen of counsel' and 'Boude wien' (brave friend). Postcards from August 1931 from six Spanish cities show that Minnaert celebrated his mother's 75th birthday together with her. From Madrid, he wrote to Koen: 'In this palace, a king used to live, a very rich man. But now the people have said that the king had to leave. And now many other people live in the house, but no king anymore.' In hindsight, this text preludes the civil war. Minnaert went on a trip with his mother while his wife took care of the babies. That had little to do with the 'fresh married life' that Minnaert had highly praised to his friend Burgers. At some point,

Miep probably demanded that her mother-in-law live separately in a small house on the property, which could only be reached from outside. Maybe the Spanish trip had made up her mind to go through with this housing separation. Jozefina Minnaert-van Overberge was joined there by Miss Anna Secrève, who had been the companion of the flamingant Roza De Guchteneere.

Miep Coelingh wanted to get her Ph.D., but ran into a wall of disapproval. Ornstein was not opposed to women in physics but believed that mothers belonged at home. At the Physics Laboratory, she was mockingly referred to as 'the second Madame Curie.' Miep could fortunately rely on a group of six girls in physics with whom she could stand strong in this male-dominated environment. Miep continued her promotion, and her husband followed suit. She eventually earned her doctorate under the chemist H.L. Kruyt. Ornstein allowed her to conduct experiments at the Physics Laboratory after all.

The Curies: an exemplary marriage?

The derogatory reference to Curie may have been partly due to a book by Minnaert that dealt with both radioactivity and the life of Pierre Curie. In it, he addressed the concept of 'nuclear reactions' and drew a relatively early revolutionary conclusion: 'The astronomer has found new possibilities in radioactivity to explain the source of the sun's and stars' heat.'

Minnaert likely mirrored himself in his biographical sketch of Pierre Curie: 'A silent man, often lost in thought. And yet, one could sense a gentle kindness emanating from him, a great benevolence and helpfulness toward everyone. He had firm notions of what was good and noble, and he lived by those principles in everything he did, even if such steadfastness

brought him little advantage. He never wanted to compromise on such points or let himself be carried away by half-measures. He did not engage in superficial distractions, but he was extremely sensitive to beauty and dedicated his entire life to science. Like many other scholars, he could not entirely free himself from the very human desire for recognition, fame, and advancing in the world. Curie did not think about these things in his work; all his thoughts were directed toward this single goal: understanding and uncovering phenomena. He never rushed to publish a discovery to prevent someone else from being first; he was indifferent to who received the credit as long as science progressed.' The question is how Minnaert arrived at that last piece of wisdom: in any case, he himself had certainly hurried to publish in order to stay ahead of competitors.

Minnaert sketched several tableaux vivants of the Curies' lives. One of these likely also concerned his own marriage: 'The old notion that the man is meant to provide money and the woman for the house and clothes, they do not want to acknowledge. Instead, they strive to be companions in their life's work as man and woman. They also wish to encourage and support each other and share both joy and sorrow together. Is this form of love and fidelity not at least as noble as what was once considered the duties of a housewife? For Mrs. Curie, marriage therefore does not mean bidding farewell to scientific work. She is a teacher at the Higher Normal School for girls in Sèvres near Paris, thus contributing her part to the family income, and in her free time, she dedicates herself entirely to physical research.'

Marya Curie-Sklodowska had been 'regentes' and remained dedicated to science as the mother of two daughters. In the scene from 1906, Pierre was run over by a carriage. 'Mrs. Curie continues her husband's work faithfully,' Minnaert wrote casually, while earlier he had argued that she had initiated the research into radioactivity. Marie Curie would be the only one to receive both the Nobel Prize in Chemistry and Physics, become a professor, and yet be rejected as a member of the French Academy: 'Apparently due to a lack of advertising and political friends,' Minnaert thought. He was blind to her being rejected because she was a woman.

Was Minnaert's idyllic sketch of this scholarly marriage a blueprint of his own desires? The French couple had come to appreciate each other based on equal careers, without including a mother-in-law in the deal.

A Diary about family life

Minnaert started a diary in February 1934. He wanted to document the early childhood of the children, just like his father did. Koen was then just four years old and Bou almost three. Koen could suddenly be wild, moody, and troublesome. He was sensitive, took harsh words very much to heart, and spoke wisely for his age. Boudewijn hopped around, ate plenty and often, it was balanced and cheerful. Both children were often sick. The parents, like Minnaert's parents had done, consulted numerous doctors who consistently provided contradictory advice. Doctor Van Schaik vaccinated the children against colds. Another doctor advised showering with cold water, during which the children had to shuffle slowly for two rounds.

Koen was the first to attend juffrouw Schroeder-van der Kolk's Montessori class near home. His upbringing wasn't without its challenges: 'It's a huge problem to get Koen to obey. He only does what you say if you negotiate with him as equals. Force won't make him give in. When he plays with Bou, he's the boss, Bou the cat; or he's the captain, Bou the sailor. Koen plays independently a lot, with ropes, planks, crates, stones. Bou is more fond of people and harder to encourage to play on his own. Koen calls his mother 'my favorite,' and Bou calls his father 'my favorite.' Even though we carefully avoid making any distinctions. Every evening the routine is: picking me up from the train, an evening walk, treats, undressing, showering, a little dip in our bed, telling a story, sleeping.'

Minnaert read aloud from Nils Holgersson by the Swedish Lagerlöf and from the Fairy Tales by the Dane Andersen. He pondered: 'A lot of trouble comes from jealousy, which manifests as an exaggerated careful weighing and considering of everything to check if both boys are getting exactly the same things. Along with that, Koen's tendency to boss Bou around, which Bou responds to by spitting, saying nasty words, etc. If Bou doesn't do what Koen wants, he hits him; something Bou almost never retaliates against with hitting. At Miep's urging, we're doing our best to combat these tendencies solely through kindness and understanding reasoning.'

He wrote that in 1933 he had dressed up as Sinterklaas and had taken off his costume to reveal who this holy man really was. He had apparently adopted this approach from his father. The following year, there was again knocking and stomping: 'The children were no longer afraid, still somewhat impressed, but found it normal when I took off my suit again. Bou cheered that he had now gotten a new daddy. But he didn't dare go upstairs: "See, Koen, there is a real St. Nicholas, because I heard his horse." Magic, after all, is hard to push aside with Enlightenment.'

In the winter of 1934, the children were sick and coughing for half the school time. For those staying home, the maid was available, so the parents kept their hands free. They were visited by Doctor De Kleyn, who prescribed calcium chloride and a diet without purines. At Easter 1935, they went to visit family in Ghent for three days. In the summer, with Koen five years old and Bou four, they finally started playing on the street with other children. That was a year later than Marcel's experience in Bruges: 'They enjoy it incredibly there. Koen is often the leader, assigning all kinds of tasks to the smaller boys. He always longs for more, further ahead. When he gets what he wants, he immediately thinks about the next thing; he desires things so passionately; he can talk so sensibly and defend his position energetically.' About Bou, his father thought: 'He doesn't take pleasure in others' misery. If someone takes Koen's side against him, he gets angry and says that one should give in to Koen.'

Miep Coelingh practiced a sober upbringing, with sparing use of sweets or gifts. On Sunday walks, she divided four pieces of the six-piece chocolate bar; the rest was for another time. The story goes that Miep had become a vegetarian after a youth leader told her, after she petted a lamb, that she could have that creature on her plate that evening. She had a fierce argument with her mother about it and found a natural ally in her husband. She imposed her vegetarianism on the children, who sometimes had little understanding for it. The story goes that once the maid gave Koen a piece of ham, whereupon Miep slapped it out of his hands. There were things with which one could not joke in the Minnaert household. Playing with the children from neighboring families taught the boys that different norms applied elsewhere.

There was no cuddling in the Minnaert household; the contact between parents and children was rational. In the winter of 1936, Minnaert picked up his diary again. He apologized for a year of absence with the characteristic line: 'The present and the future are more important than the past.' For colds, Dr. Hetteema had prescribed a new regimen: 'Cold shower in the morning, warm bath in the evening, no animal fat, no egg, lean cheese, no beans, no peas, no peanuts. The result is truly increased appetite. Eating raw vegetables in the morning also contributes to this.'

The word of the doctors was the holy word of science for the parents. On the advice of Professor Ten Bockel-Huininck, they spent a month in Zandvoort during the summer: 'Once a week, I come back to Bilthoven with the children to say goodbye to Grandma, otherwise she can't cope.' The children received an autoped from Grandma. 'Occasionally, friends visit. Permanent friendships do not form.' It seems that cozy children's birthday

parties are not the order of the day; just as they were not common at Marcel or Miep's in the past either. The family seems somewhat inward-looking.

Minnaert now had a family of his own, but his lifestyle had not changed. He was occupied with his scientific work, which gained international recognition in the early 1930s. For this, he had to spend several months in the United States in 1933. His organizational and political work for Flemish refugees also took up a lot of time. His pioneering work in the field of physics education drew attention. He simply continued the restless activity he had developed while living with his mother.

Endnotes:

- 1 Jet Mahy to Minnaert, May 28, 1927.
- 2 Derk Coelingh only laid down this function in 1941.
- 3 This book by Minnaert is central to the next chapter.
- 4 Ornstein, Eymers, and Coelingh, 1927.
- 5 Minnaert to Jozefina Minnaert, May 3, 1929.
- 6 Wil Coelingh to Miep from Pasoeroen, March 1930.
- 7 Minnaert to Koen, August 1931.
- 8 Stamhuis, J.H., M.I.C. Offereins, Two female physicists and their promoter in the Interwar period; Lili Bleeker, Truus Eymers, and Leonard Ornstein, *Gewina* 20, 1997, 98.
- 9 Minnaert, 1931, in the series Character-Knowledge-Art for Industrial Education. The brochure was a spin-off from his work on the article Science in Flanders, which is discussed in chapter 11.
- 10 Minnaert, *Diary*: several quotes from it.
- 11 Memory of Koen Minnaert, communicated by and through his wife Els Hondius.

Chapter 10

Pioneer of Physics Didactics

'Teachers form a conservative mass that opposes the development of education.'

Criticism of existing education

Minnaert had been interested in education from an early age. 1 His godfather, following Erasmus, believed that upbringing should shape people harmoniously: 'Through ignorance, one can ruin the most precious material, while from a worthless chunk of ore, through melting, hammering, and striving, an immortal masterpiece is wrought.' At the time, there was already much criticism of rote learning, performance-oriented education, the limited attention to personality development, and education for self-reliance. Minnaert's father had summarized these shortcomings in his comments on Marcel's teachers. From the United States came impulses to base education on practical training, which fit well with the 2 pioneering spirit of that country, and the socially committed Kerschensteiner advocated for an Arbeitsschule in Germany. Many authors emphasized the rights of the child and found 3 that educators should guide more.

Mrs. Ehrenfest-Afanasjeva had fueled Minnaert's love for didactics. 4 She had formed a group in Leiden that debated about her 'family tree' of geometric propositions at her home. Minnaert wrote afterward: 'This new approach to elementary mathematics immediately gripped us: here was an interesting logical problem to think about, but here also lay the key to simplifying the school curriculum.' A spark had jumped: 'I still remember how it initially seemed like blasphemy in my ears, when I heard her claim that Euclid's logical method, from a psychological perspective, should be

considered very poor because the student cannot guess at all where it is heading at the beginning. I believe we then understood that an original idea in the field of didactics can be just as important as a scientific discovery.

As a teacher at the Hogeschool, he had let students experiment to increase their self-reliance. He had supervised physics education, which some teachers at teacher training colleges had implemented. He read publications on didactic matters and discovered that the German educator Kerschensteiner had made a connection between gymnasium education and physics didactics. He then wrote: 'From a didactic point of view, it is particularly remarkable to see how much the teaching of classical languages can be turned into aesthetic enjoyment, into living beauty. Just in recent days, I read **Wesen und Wert des naturwissenschaftlichen Unterrichts** and, to my delight, found that this proponent of the activity school also fully appreciates the value of classical languages.'

Minnaert wanted to realize his didactic ideals. As a child, he had learned to identify flowers, indulged in chemical materials, learned to understand the coherence in the nature of landscapes, observed the sky day and night, and was well-versed in experiments with electromagnetic and optical tools. If anyone was ideally equipped to become a pioneer in physics didactics, it was Minnaert.

Minnaert and the New Education

After the World War, the movement for educational renewal gained momentum. There was a strong emphasis on cooperation and mutual assistance among children, on striving for peace, so that humanity would not plunge into the abyss again. This was expressed in terms like **Education in the New Era** and **Reformpädagogik**. The establishment of the New Education Fellowship (NEF) marked a breakthrough. Unlike international scientific organizations, the NEF had French, English, and German sections. Its congresses attracted attention: the number of participants grew from 500 in 1925 in Heidelberg to 1,200 two years later in Locarno. The NEF wanted to stimulate independent thinking 'instead of being carried away by mass emotions.' World peace could be preserved if education from now on would focus on cooperation between nations. The NEF functioned 'as a catalyst in a global innovation process in the field of education and teaching.'

Its Dutch leaders, such as Kees Boeke, Beatrice Cadbury, Cor Bruijn, Felix Ortt, Lodewijk van Mierop, Tatyana Ehrenfest-Afanasjeva, and Marcel Minnaert, shared a philosophy of life in which vegetarianism, total absti-

nence, non-smoking, clean living, and pacifism played a key role. In 1913, the 'humanitarian' Engendaalschool was founded in Soest, which was partly based on the philosophy of writer-educator Lev Tolstoy. Minnaert had lived next to the Engendaalschool, while Boeke and Cadbury, with their four daughters, began De Werkplaats in 1926, near the Minnaerts' house in Bilthoven.

In 1926, a Dutch branch of the NEF was established: De Nieuwe Opvoeding. Of the twelve Dutch NEF schools, nine were Montessorian. General pedagogical characteristics included the child's freedom of movement, 'the leader as helper,' self-designed 'teaching aids,' responding to 'stages of child development,' timekeeping, and school walks. At De Werkplaats, students were called 'workers' and teachers 'collaborators.' Many teachers worked without pay. The children received all the attention, which appealed to parents. Sometimes people moved house to enroll their children in these schools, and often children came from afar to attend. The position of the collaborators was ambiguous. On the one hand, they had to remain reserved to enable the child's own development. On the other hand, they had to play a guiding role if they did not want to be overwhelmed by national chauvinisms.

At the first annual meeting in November 1927, besides Kees Boeke, Dr. Elisabeth Rotten from the International Council was also present. According to the report, she visited the 'training course of the association where, among other things, she attended lessons by Dr. M.G.J. Minnaert, which focused on Physics and student self-activity.'

In this movement, Minnaert had indeed contributed with his *Physics in 11 student experiments. In September 1923, he wrote to the biologist Cesar De Bruyker that he had completed the book: 'This morning I sent the entire stack of papers to the publisher (Noordhoff); the 136 self-made drawings and photos cost a lot of work, but now it's all behind me.' With this, he had written the first book on student experiments in the Dutch language.

The book began with his Credo: 'There was once a time when children learned about nature through little drawings on the blackboard or in a book: that was physics with chalk and eraser. Then came an era where the most important feature of good education was considered to be its visual nature. The teacher performs an experiment for the class, and all the children are allowed to admire it as best they can; sometimes you see a light ray pass by or a little bell ring, other times there's a beautiful fire phenomenon or a popping effect. But how these nice things come about remains a mystery to many children: they look at this demonstration as if it were a picture—albeit an animated one! Since Lichtart, Kerschensteiner, and Montessori, the school's motto has become: self-reliance! And a group of enthusias-

tic men and women have proclaimed, applied, and developed this principle with dedicated devotion. Under this sign, the physical student experiment developed.'

Minnaert thanked his friends in Soest, who for years had stimulated the creation of this book during Sunday gatherings: 'You gave time and labor; with moving dedication, you bought the necessary materials from your own pockets; in your friendly, simple Engendaalschool, it has now been shown how one can achieve excellent physics education even with limited means.'

He himself was not averse to manual work. Former students from 1920 could testify how Minnaert, armed with wires and batteries, taught physics lessons and used the seesaw on the schoolyard as a balance during explanations of mechanics.

The three classrooms were equipped for twelve students. Minnaert: 'The class I envision working like this consists of at most 20 to 25 students. With a larger number, one cannot achieve good results - not for physics nor other subjects.'

Physics in student experiments

The book was 'a safe guide in seeking new paths for our 14 public education system.' It was intended 'for the highest classes of primary school, for teacher training colleges, agricultural, domestic science, vocational, and evening schools, and for private education,' but could also be useful for the lower classes of lycea, gymnasiums, HBS (higher civil service), and Flemish atheneae. He addressed a heartfelt word to 'the boys and girls who love physics, who want to supplement what is taught at school through their own tinkering and experiments. I hold dear these young discoverers! I know how they are mocked by their family members and banished to the attic; how bravely they save up to buy small devices; how often they must seek advice from outdated, silly booklets; but also how their eyes sparkle with the joy of the first success, which makes them forget all the effort and trouble! I hold dear these young discoverers!'

Minnaert showed how persistent collecting and manual labor, with the help of local carpenters and a few handy parents, could deliver a true instrumentation of physics materials. Saving metal plates, eyeglasses, magnets, nails, rope, coil springs, pieces of candle, small mirrors, cigar boxes, needles, cardboard, and corks brought about a wonder: 'All these worthless things turn into the most useful tools as soon as they find their place in the cabinet.' His experiments reveal that test tubes, beakers, glass tubes, flasks, and

rubber hoses were also needed. They weren't free, but the costs were indeed minimal.

Minnaert adhered to four principles for his didactics. First [p. 15], subject teaching is only meaningful if it is connected to real life. Extracurricular experiences are both the starting point and the endpoint: 'The development of physical concepts in children takes place along the same paths that humanity has followed over the centuries. We must convince the government that physics cannot be taught with books. If we wish to discuss living nature in lower school, we must have elements of that nature in the classroom: plants, an aquarium, etc. Similarly, the physics teacher must be able to demonstrate the most important physical phenomena in the classroom.' Physics cannot be taught with computers either, a note that can be added here after a small century.

Secondly, unaware of Piaget's work at the time, he presented developmental psychological arguments advocating for early science education. The child is busy collecting a treasure trove of material for memories and can draw from it later. The young child enjoys conducting experiments: 'I saw a six-year-old boy spend an hour investigating the smallest slope needed on a piece of cardboard to make a pencil roll off. Two little girls played just as patiently on a balcony with a crumpled newspaper hung from the end of a long rope, exploring the muted swinging and falling movements. Could most children's games be anything other than excellent series of physics experiments?'

Thirdly, he introduced new teaching methods from England, Germany, and America, such as simultaneous student experiments. The children carried these out in pairs using their own equipment. Kropotkin's vision of evolution inspired Minnaert: it stimulated cooperation and mutual assistance. Ideals and didactics coincided: 'In this way, the desire for collaboration grows naturally—that noble, truly human feeling—of such invaluable importance for life and society.' The classroom becomes a unified whole that seeks, works, and decides together! Lucky discoveries by one student benefit everyone else, just as much as mistakes made: 'Comparing results builds confidence and introduces understanding and appreciation of observational errors; creating class averages significantly improves the outcomes and gives each student a sense of responsibility. Finally, the teacher draws the necessary conclusions from the collective work.'

Fourthly, he connected cognitive development with affective and motor education. The physics lesson meant much more than just formulating a law. The subject was not confined to the brain but also involved collaborating, sawing wood, setting up experiments, and discussing observations with part-

ners and the class. Minnaert: 'The child must directly engage with nature; it not only wants to see things, to see them well, but also to feel, smell, and hear them up close; their 'being' must become tangible! Only then is the sense of movement exercised, the most important of our senses, and through thousands of new experiences, we learn how our movements affect the things around us. Therefore, every student should have their own small apparatus, which they can build and modify according to the play of their imagination and the demands of their common sense; an apparatus with which they can perform measurements, so that the numbers come alive for them. In this way, every lesson can become a delightful hour of joy in discovery.'

Minnaert introduced the home experiment: "Why shouldn't one occasionally conduct real experiments at home or observations in the open air? There are plenty of experiments for which the necessary tools can be found in any household; and I wouldn't even hesitate to lend the children a more expensive instrument (a thermometer) for a day. Experience has proven to me that such exercises are very much appreciated."

A "joint" student experiment

In Minnaert's book, the subjects pass by in the classical order: mechanics of solids, fluids, and air, heat, light, sound, and electricity. As Van Genderen notes in retrospect, Minnaert wrote as if he were addressing the students directly. The experiments are sometimes original and spectacular; he must have taken inspiration from Tom Tit, for example, with the center of gravity tricks around 'the egg that always stands upright' and the iron wire with balls dressed by the children that can easily be balanced on a finger using a nail. An example from the book gives an idea of Minnaert's style and approach.

\figcaption An empty eggshell, filled with clay at the bottom.

\figcaption A body with a low center of gravity will automatically stay balanced.

The teacher proposes a 'collective student experiment' with classroom processing. Previous experiments have introduced the thermometer. The children measure the temperature of air and water: "A beautiful autumn day, for example, is very suitable for these measurements. Observing the air temperature is still not too..."

"Simple. Determine those who are always in the shade; make sure the thermometer is thoroughly dry, then firmly hold it by its top end and swing it back and forth for two minutes. Only then can you be certain that it has

taken on the true temperature of the air itself. Read off the tenth degree!

Every two hours, between classes, we step out into the delightful fresh outdoor air and measure the temperature in the shade; we need to observe for 24 hours! For this evening and tomorrow morning, you will take the thermometer home with you; who plans to stay up late? Who wants to get up early? All in the name of science! Between midnight and 6 a.m., just leave it as it is; I myself will make an observation at 3 a.m.

The children create a neat little table, carefully chart everything, and become curious to know what the thermometer will indicate in the next hour! After a day, a night, and another day, we will represent all our numbers with a drawing. The consecutive squares on our millimeter paper represent the hours; for each hour, draw a line indicating how high the mercury column stood at that time. Where we have skipped hours without observing, you should also leave squares empty. '

\figcaption Course of air temperature over a 24-hour period.' d = day, n = night.

The same happens with water nearby: a river, a canal, or even a rain barrel in the shade. The difference between the two graphs allows for the conclusion: 'Apparently, water is difficult to heat and difficult to cool.'

The book effortlessly crossed the boundaries between subjects. The optical topics required the biological treatment of 'the eye,' and the electric cells needed a bit of chemistry. The discussion of the electromagnetic bell and the Morse alphabet ends with the climax: A visit to the telegraph office. Groundbreaking were his photos of 20 girls experimenting. A girl handled the color disc that accompanied a story about the solar spectrum! Twenty years later, a series of books appeared in the Netherlands with titles like *Boys and Physics*; eighty years later, a Flemish TV program was called *Boys and Science*.

In the spirit of Kerschensteiner, Minnaert casually pointed out the 'easy-to-read' Greek text about Heron's ball! His cardboard models of suction pumps and steam engines were certainly inventive. As a non-chemist, he considered the brownstone in a battery to be unnecessary and the conductive graphite as the effective component. But contrary to what the proponents of rapid obsolescence think, this book continues to captivate and amaze generation after generation.

Empirical and epistemological approaches: Minnaert versus Dijksterhuis

In 1924, Ehrenfest-Afanasjeva published her vision on geometry education for ‘non-mathematicians’. She replaced axiomatics and memorization with self-activity and the intuitive ability to derive propositions from geometric images. Minnaert was not alone in his advocacy for student experiments: prominent physicists, chemists, and astronomers such as Ehrenfest, Kohnstamm, Pannekoek, Kruyt, Zernike, Coster, and Fokker believed that experimentation and self-activity should play a greater role in physics education.

In mid-1923, the Dutch Physics Association (NNV) sent an Address to the Ministry regarding laboratory hours for teachers in physics. Teachers were to receive additional hours due to the ‘time-consuming effort and care required outside of class hours to give experiments their due place in lessons’. In 1927, an educational study committee of the NNV was established, consisting of six teachers and school principals under the leadership of Delft professor A.D. Fokker. On April 20, their Propositions were discussed at a well-attended meeting of members, interested parties, and education inspectors. Various views were discussed, such as those of Kerschensteiner who demanded that students would independently solve problems. The commission rejected this, even for the HBS: ‘The student must be trained in making simple observations and measurements; only after that can they be allowed to independently solve simple problems, a phase which, however, is likely to be left to the university.’ Minnaert’s revolutionary proposal to combine laboratory and classroom from then on was rejected due to ‘practical objections.’ The present physics teachers agreed that student practical work should become part of the program. It looked promising for the practicals in this circle.

The opposing effort was equally successful. A group of teachers, led by mathematicians Dijksterhuis and Beth, advocated for deductive education in mathematics and physics. Dijksterhuis distinguished between empirical knowledge based on experience and memory and epistemological knowledge based on the interrelationship of facts and abstractions. Epistemological education required students to account for the terms, formulas, and methods used and would serve as an excellent selection tool for the university. Education should not attempt to connect with ideas and intuitions about nature that students had acquired in daily life.

On the border between mathematics and physics, these opposing directions fought over the control of mechanics, which was still an independent

subject. Should the incorporation of this subject into epistemological mathematics, a favorite exploration field of differential and integral calculus, be maintained, or should it belong to physics as an experiential science? A compromise was reached between the Beth commission and the Fokker commission: the four hours of mechanics would be divided among the 30 teachers of physics and mathematics. The Groningen physicist D. Coster presented this to the members of the NNV on May 19, 1928: 'The Utrecht physicists L.S. Ornstein and M. Minnaert definitively caused discord by advocating against the advice of the Fokker commission for the incorporation of all mechanics.' The NNV board adopted this principled stance: mechanics should be taught as an experimental-physical discipline. 31

The members of the Beth commission were present. Minnaert challenged them by saying: 'If one asks what is more important, the physical content or the mathematical formulation, one would perhaps say that students can best reproduce the mathematical formulation. That is what they learn by heart. But if one asks what stays with them later, it turns out to be precisely the physical content.' The meeting tore up the compromise and followed the executive board with five votes against (the Beth committee) and six blank votes (the Fokker committee). It was a Pyrrhus victory, as Fokker had warned beforehand.

The NNV wrote an Address to the Minister, in which they refused to agree with 'the overly large classes and the excessive number of teaching hours for teachers.' Some formulations must have been written by Minnaert himself. The teaching method had to take into account the main requirement of modern education: self-reliance. Practical education had to form a whole with the lesson. Mechanics had to be what it had always been everywhere and at all times: a part and one of the foundations of physics. Historical development had led to mechanics being taught by the mathematics teacher: 'In education, as in all scientific teaching, deduction and induction should alternate. If one emphasizes too much the axiomatic, abstract side, one also commits the pedagogical error of not connecting to what is closest to the students' experience.'

Minnaert criticized Dijksterhuis in an educational journal: 'The mathematicians who want to maintain mechanics as a separate subject often argue that mechanics rests on a completely different basis than physics and that its statements can be derived from fundamental axioms given to us by reason itself. Nothing is more incorrect and dangerous than this claim! The 'principles' of mechanics are so little self-evident that they are not even correct! It is not true that a velocity u , combined with a similarly directed velocity v , would equal a velocity of $u + v$; we know this from the theory of rela-

tivity and Michelson's experiment. It is also not true that the acceleration of a body is proportional to the force acting upon it; we know this from experiments by Bucherer and others with fast electrons. The principles of mechanics are therefore certainly not a priori truths.'

Minnaert believed that Dijksterhuis' mindset belonged in the Middle Ages, 'as if one could learn about nature merely by theorizing about it in the manner of Hegel, who in his youth attempted to prove a priori that only seven planets "could" exist.' He sighed: 'It is as if one wanted to teach a foreign language by only having students learn word lists and grammar.' His polemical style did not become any milder. The physicist and later Nobel laureate F. Zernike joined him. Physics education lagged behind chemistry and biology, which are 'much more modern, much livelier, than physics.' The lecturers and professors who participated in the discussion still knew what they were talking about because they acted as examiners during oral final exams.

The NNV established a second study committee under the leadership of teachers Reindersma and Denier van der Gon, with university lecturers H.C. Burger, Zernike, and Minnaert. Their report was published in 1936 under the title *Physics Experiments for Students*. It was a collection of 60 experiments with a separate booklet for students. A year later, a second booklet with 69 experiments appeared. The texts were distant, and the drawings looked too polished. Teachers could consult the professional journal *Faraday*, which would focus on experimentation.

The Utrecht teacher training college

The battle of pens had been unusually sharp thanks to Minnaert. The victory was entirely for the mathematicians and traditionally oriented physics teachers. The Beth faction represented an overwhelming majority of the teachers. Thus, the critics got nothing instead of two hours of mechanics. Minnaert moved forward.

Just as in Flanders in the spring of 1914, when he still expected salvation only from fresh forces willing to overturn relationships, he now expected nothing more from the teachers in existing education. In the late 1920s, he took over the unpaid lectures on the didactics and pedagogy of physics in Utrecht from the thermodynamicist Ph. Kohnstamm, who was appointed as an educator in Amsterdam. In 1930, the faculty recommended Minnaert to the Minister as a private lecturer in the didactics and methodology of natural sciences. Both the addition of 'methodology' and the omission of 'pedagogy'

were Minnaert's doing. According to U. Keller's lecture notes, Minnaert began his lecture with the statement: 'Teachers form a conservative mass that hinders the development of education.' This was his conclusion from his defeat against Dijksterhuis and others. Such an elitist attitude toward professionals, despite all good intentions, would not have been conducive to creating support for innovations.

During Ornstein's rectorship in the early 1930s, a collaboration emerged in Utrecht between the faculty of letters and philosophy and the faculty of mathematics, natural sciences, and astronomy to establish a teacher training program. At Minnaert's instigation, by the mid-1930s, a 'didactics for teachers' program was functioning, which consisted of a lecture on 'didactics and methodology' in the chosen natural science and a pedagogy course. Students were required to intern for three months during two school periods per week, with practical training taking center stage. A committee was established comprising professors of mathematics, physics, chemistry, zoology, and botany, with the didactics lecturers having an advisory role. The committee's chair and two student representatives formed a 'bureau' that administered the internships. This was pioneering work. The involvement of students betrayed Minnaert's signature style.

His engaging didactics lectures attracted many students. He emphasized the formative value of the subject: conveying attitudes and norms such as 'the value of truth,' 'trust in reason,' 'respect for causality,' 'respect for labor,' 'sense of responsibility' in student experiments, 'skill in handling materials,' and 'sense of beauty.' He warned that transferring these values to other areas of life was not automatic.

The bulk of his lectures consisted of demonstrations, leading student practicals, guiding didactically profitable teaching methods, analyzing and structuring lessons. He taught experimenting in nature: 'The laws of physics apply outside the school as well!' He discussed books and professional journals, explored connections with mathematics, and examined border areas with chemistry, astronomy, mechanics, and meteorology, and introduced historical and philosophical works.

However, he did not refer to the general pedagogy course of the educator M.J. Langeveld. His dismissive attitude toward the humanities had thus not changed. On the other hand, Langeveld did refer to Minnaert. The 39-year-old astronomer H.C. van der Hulst recalled that Langeveld used examples from the work of psychologist Ludwig Klages when discussing teacher types: 'Such a type was characterized by this *Wille zur Verständlichkeit der Welt*. He said: "That's Minnaert": that absolute desire to understand the world and rejection of anything that hints at the mystical."

Ornstein and Minnaert had collaborated on establishing the Utrecht teacher training program. Ornstein wrote proudly afterward: 'For years, plans and laws followed one another, but the strong life that our University fortunately possesses brought forth this new branch, and with the valued help of teachers from secondary and higher education, this training has been established and will grow for the benefit of our students and the youth in schools.' The magazine *Vernieuwing* dedicated a theme issue to the program and gave Minnaert the floor.

He argued that the university-educated teacher could not agree with traditional school science but instead engaged in the didactic translation of new insights: 'He feels inspired by the zeal of the reformer, the life before him becomes rich in content and worth devoting himself to.' Visiting the best practice schools was meant to confront future teachers with the 'unforgettable impression' of modern education. The influx of new people had to break through the routine of the old guard: 'I wish that he will see this ideal image for himself, even before starting his career; as a sunny gift from his youth, he will receive it, in the period of his life when he is most receptive to all ideals. Lack of inspiration is more dangerous than inexperience!' Finally, according to Minnaert, true inspiration came from the didactics of the subject: 'One captivates students the most by directly tackling the central, practical problem: "How will I convey my science to the pupils?" From there, we must elevate ourselves to the more general pedagogical and psychological questions. This path best protects us from abstract theorizing, which has so discredited the older, more straightforward 'pedagogy.' Every sentence expressed Minnaert's disdain for the existing education system, where Dijksterhuizen's epistemological approach remained dominant.

Endnotes:

1 Gillis D. Minnaert, 1913-1914, I, 56.

2 Romein, 1967, 808. Ellen Key plays a role again.

3 Kruithof, 1982, outlines the principles of Pestalozzi, Fröbel, Kerschensteiner, Montessori, and Dewey.

4 Lecture on University and Didactics from October 14, 1961. Astronomy Archive.

5 Minnaert to Burgers, June 17, 1921. In the 1950s, he revisited this topic in a radio debate with the classicist C. Spoelder: he then argued that classical education overburdened students unnecessarily and stood too far from 'the full life.' He advocated for a school 'based on natural science and new art,' which could represent a higher stage of classical education. AVRO, March 1951; discussion leader P.H. Ritter Jr sided with C. Spoelder, who

defended gymnasial education.

6 Morsch, 1984.

7 Bruijn, 1984, 95, 104.

8 Interview with Hans Littooi, son of the administrator of Chreestarchia.

9 Report in Morsch, 1984.

10 Minnaert, 1924.

11 Letter to De Bruyker, September 18, 1923. AMVC Archive. 12 Minnaert, 1924, 1.

13 Interviews with Hans Littooi and Nanda Ortt.

14 Minnaert, 1924, Foreword.

15 Quotes stitched together from the introductory pages.

16 Before the Swiss J. Piaget, Minnaert used the notion of developmental psychology. His work began circulating in the late 1920s. It is questionable whether Minnaert, with his reservations about the humanities, ever read pedagogical standard works like **The Language and Thought of the Child** (1923) and **The Origins of Intelligence in Children** (1936).

17 Van Genderen, 1994.

18 Minnaert, 1924, 33.

19 Minnaert, 1924, 83.

20 Minnaert, 1924, 81,34,137. There are three photos with girls and one with boys.

20 Minnaert, 1924, 63.

21 Minnaert, 1924, 73, 104.

23 Minnaert, 1924, 169.

24 A first review by J.M. Telders in the Dalton issue of *Volksonderwijs*, June 12, 1924.

25 T. Ehrenfest-Afanasjeva, 1924. Klomp, 1997, 166.

26 Address from 1923 to the Minister of Education, Arts, and Sciences, signed by J.M. Burgers and P.H. van Cittert.

27 Klomp, 1997, 186.

28 Minnaert on April 20, 1927, at a meeting of NNV. Report in *Physica*.

29 Klomp, 1997, 180-217, D. The great struggle over mechanics.

30 Klomp, 1997, 187. Dirk Coster was indeed Minnaert's friend from Christiaan Huygens.

31 Report in *Physica* 8, 1928, 173.

32 Fokker had written to his colleague Ornstein in a letter of June 12, 1928, that Ornstein was right. He himself could 'not demand more where I have accepted less.' However, he warned against 'general resistance from teachers who feel threatened themselves and their subject.' Klomp, 1997, 255.

33 Address from NNV to the Minister, July 11, 1928, *Physica* 8, 1928, 183.

34 Minnaert, (1928d). Berkel, 1997, 142-150. My emphasis. Minnaert and Dijksterhuis shared a common concern for teacher training: they were not always at odds with each other. Dijksterhuis had delivered a lecture on teaching at the Dutch Natural and Medical Sciences Congress in 1925, which was published in full in the Proceedings.

35 Zernike, F., The old and new mechanics education, *Weekblad* 25, 1928-1929, 901.

36 Lecture notes by U. Keller. University Museum Archive.

37 Berkel, 1997, 135.

38 Heijmans, 1994, 133. Ornstein was rector in 1931-1932 when this initiative began.

39 Interview with H.C. van der Hulst.

40 Ornstein, lecture on teacher training in Utrecht, 1939. 41 Minnaert, (1941b)."

Chapter 11

The Fist of Moscow in Lage Vuursche

'We no longer surround with prestige the somber pages in the history of our people, the pages that tell of war murders, barbarism, and violence.'

The commemorative book 1830-1930

Minnaert continued to commit himself to the fullest extent possible to the liberation of Flanders. On the occasion of the centenary of Belgium's existence, De Dietse Bond had taken the initiative for the anthology *A Century of Injustice and Oppression*. 'Against the cynical celebration full of champagne of the Belgian state, a dignified protest from Flanders.'

Minnaert took charge of two topics: Education in Flanders 1 and Science in Flanders. The Belgian state continued to deny the Flemish people what they needed to develop as a modern nation: education and science in Dutch. Comparisons with Wallonia, the Netherlands, and 'other Germanic countries' invariably turned out to the disadvantage of Flanders. The hypocritical 'respect for minorities' had resulted in numerous French classes for Walloons and Francophiles: 'every French school, every French class in Flanders will remain a center of denationalization and must therefore disappear.' After fifty years of struggle, the language law of 1883 had yielded an average of eight hours of Dutch per week; 20% of teaching time. When, in the 1920s, some lectures were given in Dutch at the University of Ghent, the Francophiles had established an *École des Hautes Études* where the same professors repeated their lectures in French. As late as October 1929, a

Royal Decree had established that the rector of the University of Ghent did not need to know Dutch. Although the law stipulated that 'the Flemish language is the administrative language of the University,' all faculty meetings were still held in French in 1930.

Moreover, all higher technical education remained in French. Lodewijk De Raet had written: 'Now that Belgium's industrial center of gravity has shifted to Flanders, good technical education becomes crucial for us.' A quarter of a century later, Minnaert noted that nothing had changed! The recent decision regarding the Dutchification of Ghent was immediately undermined. The Dutchification of technical schools would only be allowed to begin in five years, and professors could continue teaching at the *École des Hautes Études*: 'We are also disillusioned because we now discover how much more needs to be done to make all higher education in Flanders Dutch.' Flemish-national legislation would not tolerate the continuation of this French education, he threatened.

In his explanation of Flemish science, the comparison between France and the Netherlands played an important role: 'Every Fleming who has come into contact with Dutch science has known the wonderful feeling of liberation from the one-sidedness of French civilization.' Minnaert praised the connection of Dutch scholars to the world's top. He commended the many Nobel Prizes, the work of the astronomer Kapteyn and the biologist De Vries, who were 'world-famous,' and 'the Philips factories' light bulbs where science and technology go hand in hand to an extent that is hardly found even in the best American factory laboratories.' Flemish science was held in lower regard: 'This is evident from the quality of the publications; rarely does a Belgian article appear in foreign journals.' Students worked more scholastically and did less research: 'Our backwardness is the faithful reflection of France's decline as a scientific nation since the beginning of the 19th century.'

The Belgian Academies had banned Dutch for a century and abused their authority against Flanders. Now that Flemings were demanding their own academies for medicine and natural sciences, those institutions suddenly declared that Dutch could be freely used there: 'Not being disturbed by this and continuing the constructive work quietly within entirely Flemish organizations is the only method to command respect.' Flemish newspapers still showed an 'enormous backwardness' in articles about science. The dominance of French had prevented the establishment of journals such as **De Natuur** and **Hemel en Dampkring** (**Sky and Circle of Air**).

He only provided a positive turn at the end. The turning point had been the collaboration between the Netherlands and Flanders regarding the

Flemish University: 'No Belgian government has appointed Dutch scholars to the University of Ghent, even when it was 'Flemishized': the Dutchification had to happen in a Belgian way! The spirit could not be Dutch!' The Belgian government would not have been charmed by Minnaert's specific accusations.

Antimilitarist nationalist

In the late 1920s, Italian fascism and the rise of German National Socialism forced every nationalist to make a choice. Minnaert expressed his stance at the Van Speyk commemoration organized by the Vlaams-Hollandsche Vereniging in Utrecht. This event was intended as a protest against the positive reactions in the Netherlands to the celebration of 100 years of Belgium. The exiles reminded everyone that this secession had been an act of mutiny, that many Dutch soldiers had fallen, and that Commander Van Speyk in 1831 would rather have blown himself, his crew, the attackers, and the ship to pieces than surrender.

Minnaert, however, wanted to view Van Speyk's action from the perspective of antimilitarist nationalists: He distanced himself from authoritarian currents: 'A "nationalist" in our terminology does not mean a "chauvinist," who wants to conquer, who places the so-called holy self-interest of one's own people above all else; it also does not mean "fascist".' In Minnaert's view, there was no necessary connection between nationalism and militarism. Because patriotism was nonetheless being misused to whip people into a war frenzy, 'there was every reason for nationalists like us to counter this looming danger by being not only nationalists but also antimilitarists.'

Van Speyk had remained loyal to his prince and to the honor of his soldiers. Minnaert's idea of national 'honor' had nothing to do with that: 'I will tell you when a country's honor is tarnished: that is when people start flogging the Congolese and cutting off their hands if they don't produce enough rubber. But these stains cannot be washed away by blowing up a ship!' Minnaert couldn't even find Van Speyk's suicide action 'brave': 'We find heroism in the resistance of the mild, the clear and rational, of love for humanity against bestiality. A hero, to us, is one who, despite all dangers, whims, and fancies of fate, and despite the smallness and meanness of his opponents, remains true to his ideal of freedom, truth, and purity (...). We defend our people against the greatest danger: the obligation to kill others. Nothing outweighs that, nothing outweighs the sanctity of life.'

Minnaert had already heard so many war slogans: Against British domi-

nance at sea; Against German militarism; For God, Prince, and Fatherland—they were all hollow phrases. After the World War, American President Wilson had determined that it had essentially been a trade and industrial war. Minnaert likely had the movement of the then-popular Gandhi in mind when he wrote: 'A resilient people are those who do not kneel down in worship of violence, but who listen to their prophets and artists speaking of a noble past and a glorious future: a people tainted by a desire for justice, armed with the consciousness of their solidarity, striving for the disappearance of human exploitation, morally upright and living happily. Such a people are invulnerable to foreign violence in our modern times. (...) Therefore, we must stop gilding the iron. We no longer surround with prestige the somber pages in the history of our people, the pages that tell stories of war murders, barbarism, and violence.'

He put his words into action. As an assistant to Ornstein, he was assigned tasks for the Foundation for Lighting Science. A captain from the Corps of Engineers had requested an investigation into searchlight beams, which took place in November 1930. Minnaert began his article 'Measurements on Searchlights with Simple Means' with a poetic reference to the Iliad: 'The magical interplay of searchlight beams on a dark night, under the high starry vault; with delicate color nuances of yellow and light purple, sometimes like fingers pointing skyward in the distance, then suddenly as powerful arcs of light stretching across the entire sky...' He demonstrated that at low altitudes above the ground, Rayleigh's scattering law could not be applied: the scattering turned out to be 2.5 times greater than predicted, which Minnaert attributed to polluted air. Yet, the purpose of the research was less idyllic than it seemed.

He presented his friend Burgers with a moral dilemma: 'I refuse to contribute to military purposes under any circumstances; however, to what extent can such a conviction conflict with my duty as an official?' Burgers' response is unknown. Minnaert refused to continue the research: it was completed by two colleagues. Ornstein assigned him other tasks in this field, given his publication on light scattering through milk glass and his final editing of a standard book on Lighting Science. He had meanwhile become a staunch advocate for an international language. With his cycling companion on the Bilthoven-Utrecht route, economist W.P. Roelofs he discussed grammatical issues. Esperanto is economical, rational, and promotes international cooperation. The book on Enlightenment studies appeared in five languages as well as in Esperanto.

Did Minnaert believe that an end should indeed be put to the belligerent language of Flemish nationalism? Yes and no. For just as in 1916, alongside

his pacifist and internationalist arguments, he also maintained a different narrative.

The man of the pure line.

In 1930, the Flemish-nationalist *De Noorderklok* wrote about Minnaert: 'In our struggle, he was always a rock when it came to purity of line, seriousness in striving, and persistence in work. He is not the man of the popular movement; he is the young fellow who can sweep the studying youth off their feet with his calm, icy-cold, but relentless logic and extensive knowledge.'

Minnaert was apparently a member of the new Council of Flanders. On May 9, 1932, he wrote to De Vreese: 'The Council of Flanders has appointed a committee for the study of educational legislation; this committee consists of subcommittees for primary, secondary, higher, and technical education. The higher education subcommittee includes Prof. Dr. R. Speleers, Prof. Dr. De Groodt, Mr. R. Van Genechten, Dr. A. De Waele (Ghent, secretary), and Dr. M. Minnaert (chairman).' The letter was confidential because some in Belgium could suffer 'the most unpleasant consequences' from its disclosure. This Council rejected anything that hinted at federalism and therefore could not play a conciliatory role.

The 1932 IJzerbedevaart pilgrimage attracted as many as 200,000 visitors, all advocating for full amnesty and a Free Flanders. All Flemish members of parliament supported the Amnesty Law that year: the activists had adopted a different attitude than the passivists, but they had still been good Flemings. After Hitler's rise to power in early 1933, Flemish nationalists and Greater Netherlands supporters were faced with the concrete question of whether they once again expected salvation from the Germans? In Belgium, in October 1933, the *Vlaams Nationaal Verbond* led by Staf De Clercq was founded, which cultivated authoritarian leadership and imitated fascist displays. In the Netherlands, the National Socialist Movement (NSB) under Anton Mussert seemed to be the only party embracing the Greater Netherlands ideal. Flemish allies of Minnaert, such as jurists Anton Van Vesseem and Robert Van Genechten, held prominent positions in the NSB. Initially, the NSB did not seem enthusiastic about antisemitism.

At its General Assembly on June 3, 1933, *De Dietse Bond* prioritized the political union of the Netherlands and Flanders. Earlier, members had been free to emphasize either the cultural or political aspect of their Greater Dutch identity. The question arises as to why the leadership believed this tightening was opportune. Minnaert's unwavering stance that year could be read in *De

Dietse Voorpost*, the magazine of Roza De Guchtenaere, which carried the slogan *Delenda Belgica, Neerlandia Una*: 'Therefore, it is important to clearly and purely define the principal goal of our national struggle, without being confused by temporary, accidental circumstances. Only in a Dutch state form will Flanders ever be able to become itself. Bilingual states are a constant cause of cultural decay and international friction; they disappear one after another, and soon we will forget that they ever existed.'

This had already been stated in Minnaert's 1916 brochure. How could this irreconcilable stance be reconciled with his pacifist speech? His militant rhetoric and his peaceful ideal of international brotherhood still stood apart from each other. The dominant influence of Hitler's National Socialism made a connection between the two unavoidable. The moment and place of that short circuit can be precisely determined in Minnaert's case.

Minnaert barred from Belgium

The Extinction Law of 1929 had exempted him from prosecution; in 1932, he naturalized as a Dutch citizen. He could visit his family and friends, such as the Mahy's, as often as he wanted. According to Rudolf Mahy, there were many points of contact between Minnaert and his father Gaston: 'My father admired the idealism of *New Land Under the Plow* by Sholokhov. The World Library published numerous Russian editions. That was mandatory reading for us: "There they build in a peace-loving way." Father received a book from Rabindranath Tagore from Minnaert at the time, which he read aloud at the table. Gandhi's politics: that was their perspective: "Look what that little man achieved without shouting like those of our Eastern neighbors with their bellowing." His father was also friends with the graphic artist Frans Masereel, the Ghent pacifist with whom Minnaert must have felt a deep affinity. This memory from young Mahy places Minnaert's ideal of nonviolence within a political perspective shared by organizations like Church and Peace.

The Dietse Landdagen could also be held in Flanders starting from 1931. That year, the gathering in Ghent had taken place without incidents. At the 1932 Landdag in Utrecht, Minnaert organized an evening program on Modern Dutch Film Art. The critic A. van Domburg showed the films *Zuiderzee* and *Heien* by Joris Ivens, as well as *Pierement* by J. Theunissen, at the Arts and Sciences building. During the 1933 Landdag in Mechelen, the Belgian Security Service, without giving any reason, expelled three Dutch nationals across the border: writer Anton Coolen, historian

Geyl, and Catholic MP Dr. H. Moller. The Belgian press targeted Minnaert. *The Gazette of Ghent* wrote: 'Under this fine company was a former Gentenaar and Belgian, one Marcel Minnaert, for whom his father, a good liberal Fleming and leader of the Willemsfonds, would blush... He obtained Dutch naturalization for services proven during the war and thus became Dutch. Holland is not averse to accepting such condemned traitors who betrayed their country when, as students, they annually cost Belgium thousands, as citizens. Thank you...'

The Antwerp Gazette noted that 'a certain Minnaert' gave a speech, 'condemned to death in Belgium after the war for political offenses.' These Flemish papers were unforgiving and took little care with the truth. At the 1934 Landdag in Tilburg, there were 250 participants, and the Flemings received a speaking ban from the Dutch government. Minnaert discussed 'the special task of youth in the Dietse movement.' Poems by the late René De Clercq were recited.

During the 1935 Landdag in Mechelen, Minnaert was expelled from Belgium without specific cause; he received prohibition number 22, 'never to cross the border of this state again': 'A Flemish-Dutchman can scarcely receive greater honor,' De Dietse Gedachte believed.

The monument for René De Clercq

On June 12, 1932, the Flemish poet René De Clercq was buried in Lage Vuursche near Utrecht. Two years later, a committee for a monument was established; a bank account was opened, and an advisory committee of 125 people was formed. The Amsterdam physician H. Burger, chairman of De Dietse Bond, chaired the Committee; Borms was honorary chairman, and Minnaert was an ordinary member. The unveiling was scheduled for Saturday, September 19, 1936. Naturally, the organization of this event was in Minnaert's hands. The poet would receive a sculpture on his grave from his friend Jozef Cantré.

Minnaert had received several signals indicating that difficulties were looming. For example, Burger had addressed his 'dear friend Minnaert' with guidelines on July 20: 'I live in fear of what Van Vesseem will prepare for us. It would not surprise me if there would be many people on the Lage Vuursche cemetery, who would stand with their hand in the air next to the Flemish Lion'

On 11 September, Minnaert received a letter from Boudewijn Maes in Sint-Martens-Latem. In late April, Maes had spoken with Ria De Clercq and

several friends in Amsterdam: 'There, I first learned that certain individuals were maneuvering to seize control of the unveiling of René's memorial, intending to turn the ceremony into a celebration of fascism or National Socialism.' Although Minnaert was aware of Van Vesseem and Van Genechten's fascist convictions and the pro-German sympathies of many old comrades, he did not heed these warnings.

That afternoon, wreaths were laid by DDB, ANV, Raad van Vlaanderen, the Grijze Brigade of the Vlaams Nationaal Verbond, 27 South African groups, NSB, Nationale Jeugdstorm, and Zwart Front, all mindful of the truce. Burger explained the symbolism of Cantré's sculpture: 'De Clercq rising in the garden of Dietsland, with his face turned to the sun, pressing The Noodhoorn against his heart, while his left hand holds fast to the mother earth, Dietsland.' A choir from Utrecht sang De Clercq's songs set to music by composer Jef Van Hoof. The highlight was Magda De Groodt reciting several verses, including Belijdenis:

'Netherlands, my land has come.

Ensure that Flanders does not perish.'

Uniformed youth stormtroopers then marched around the cemetery. During the singing of the national anthems, the majority of those present gave the fascist salute. In protest, Jozef Cantré and Minnaert raised a clenched fist during the *Wilhelmus* and *De Vlaamse Leeuw*, as reported by the social-democratic newspaper *Het Volk*, which added: 'In the name of René De Clercq's memory, we strongly protest against the outrageous imposition of these fascist enemies of freedom, and we seriously reproach the committee for failing to prevent this desecration of De Clercq's grave.' The paper called the Flemish folk poet De Clercq a social libertarian who wanted nothing to do with fascism.

Minnaert's 'fist of Moscow

During the meal, the National Socialists repeated their display, and once again, the now isolated Minnaert raised his fist. The fascists threatened him, and eventually, Minnaert left the dining hall. The NSB newspaper **Volk en Vaderland** criticized *Het Volk*'s commentary: intimate friends of De Clercq, such as Borms, Jacob, and Van Vesseem, were in the front row and, along with hundreds of others, gave the Diets greeting 'in the spirit of the poet.' 'We do not know if Dr. Minnaert and Jozef Cantré had the shameless intention—entirely without the knowledge of the family and the committee—to misuse

this commemoration for a manifestation of red-political sentiment; in any case, *Het Volk*—perhaps out of regret over the failure of such an unlawful annexation—takes the opportunity to also strike a Diets tone, to expand its clientele.’

Chairman Burger, on the other hand, approved Minnaert’s actions: ‘His clenched fist was certainly not directed against the princess or against the *Wilhelmus*, but rather against the fascist greeting of his neighbors. It should be said that this man is not a communist, but rather an uncompromising idealist, with a deep-seated hatred of fascism.’ Burger believed Minnaert was in the right. Demonstrations for fascism, communism, or any other ‘ism’ were inappropriate: ‘However, based on our political beliefs, if we cannot refrain from such demonstrations, justice and tolerance demand that we also allow others to express their views in an equally silent manner.’ On October 2, Burger refused to accept Minnaert’s resignation as a member of the Bond: ‘For De Dietse Bond, Van Vessem and Van Genechten have resigned as members. Your withdrawal from the Diets movement must under no circumstances occur. It is urgent that alongside the fascists, a neutral Diets movement continues to exist. None of us can be absent from this.’

At the end of 1936, De Dietse Bond was unpleasantly surprised by political maneuvers in Belgium, where the Flemish-nationalist VNV of Staf De Clercq had entered into a collaboration with the Walloon-fascist Rex of Léon Degrelle. This was a shock to many Groot-Nederlanders. At the same time, the NSB completely rejected any Diets sentiment. Under the influence of the newly emerged ideologist Rost van Tonningen, Hitler’s policies had become the guiding principle for its actions. Promoting Diets ideology could create a barrier to the acceptance of Hitler’s National Socialism. The NSB had to cover up this ideological reversal, which it did by using Minnaert as a scapegoat, who, upon closer inspection, had proven to be an ideal candidate for this role.

On October 16, the NSB newspaper *Volk en Vaderland* cheered: ‘Flanders against Moscow; Agreement between Rex and VNV; Peace between Flanders and Wallonia.’ On October 23, *De vuist van Moskou* focused on Minnaert’s performance in Lage Vuursche: ‘The display of the fist of Moscow within De Dietse Bond has taught us much and made many things clear to us.’ By November 13, the editorial board had added headlines such as *In the Grip of Moscow*; *De Dietse Bond Degenerated into a Front Organization*. According to the newspaper, ‘Jewish Marxists’ in ‘our association’ suddenly played a leading role: ‘Dimitrov’s tactics triumphed over vague nationalism and spineless intelligentsia, diverting this nationalism toward Moscow.’ The article directly attacked ‘Dr. Minnaert, the Belgian communist, whose

unfortunate naturalization granted him Dutch citizenship.'

Burger mocked in *De Dietse Gedachte*: 'Poor Mr. Van Vessem! For years, he sat harmoniously alongside a dangerous communist, Jewish Marxists, and a group of spineless invalids within *De Dietse Bond*. Miraculously, he escaped unharmed. Yes, thank God, the NSB opened his eyes and clearly showed him that all his former comrades were dangerous individuals and that his *Dietse Bond* had become a helpless tool in the hands of Moscow. Take care!' Of course, Minnaert was no 'communist cell builder.' Why didn't Van Vessem want to see that? 'Or has the cry Against Moscow, like for so many Flemings, pushed all attention for our Greater Dutch cause into the background?'

Minnaert also wrote 'A letter' denying any party affiliation: 'When I raised my fist against the fascist demonstration at the René De Clercq tribute, it was solely an anti-fascist gesture.' The impulsive Minnaert had unequivocally chosen internationalism and anti-fascism. The NSB exploited him to mask its own ideological flight. His name was dragged through the streets for two months. He wrote in his diary on page 242: 'The astronomy lectures are temporarily being given by Van der Bilt alone, the future looks bleak for me.' Indeed, an investigation had been launched into his political views.

Suspension due to communism cancelled.

On November 5, 1936, the Board of Curators received a letter from the Minister of Education, 'Cabinet Division,' urging the immediate suspension of Minnaert's lectures and the initiation of a political background investigation. In response, Secretary De Geer contacted the Utrecht Police Commissioner (HC) 'to obtain more information about the political inclinations of the individual concerned, if possible.' The HC consulted his inspectors and informed De Geer by telephone. He wrote a Note for the Board: 'At the time, it was rumored that M. had sympathy for the Communist Party, after which attention was paid to M. No evidence was ever obtained. There has never been anything indicating this. M. does not attend Communist meetings. It is difficult to gather information from the professors. Then came the incident at the dinner. Prof. Burger wrote the article in *De Dietse Gedachte* about it. For the Foreign Service, what was stated there is not implausible.' The Police Commissioner warned against rumors often spread by people with ulterior motives: 'In HC's opinion, there are too few grounds to hinder M.'s career. The case is much too weak for that. Possibly, the NSB would protest against admission.'

That 'admission' referred to Minnaert's request to make his unpaid position as a private lecturer in the didactics and methodology of physics, which he had been doing for years without pay, official. He had written his Address on November 26, immediately after his suspension. Probably, Minnaert wanted to force a decision about his future. On December 7, the Curators received an extremely positive recommendation from the faculty board. The College, in turn, fully supported Minnaert and wrote to the minister: 'Since no objections to admission can be raised otherwise, we have the honor of proposing a favorable decision to Your Excellency in this sense, that the applicant is admitted as a private lecturer in the didactics and methodology of physics, in accordance with the statement in the faculty's official message.'

Minnaert's request seems to have accelerated the resolution. Minister J.R. Slotemaker de Bruïne decided on February 10, 1937, in line with the recommendation and personally informed Minnaert about it on February 19. The uncertain situation had lasted three months.

In 1936, after the death of astronomy professor A.A. Nijland, Minnaert had become eligible for a lectureship in astronomy. At Ornstein's request, he and Van der Bilt took over Nijland's lessons. Ornstein explicitly told him that he was eligible for it. The suspension thwarted this promotion.

In that anxious November, Minnaert also started a project that would bring him great fame.

Endnotes:

1 Also published in DDG 4, numbers 10, 11, and 12. Minnaert, M., *Het Onderwijs in Vlaanderen*, 57, and *De Wetenschap in Vlaanderen*, 67.

2 In *De Dietse Gedachte*, a controversy had just been fought out with Ph. Kohnstamm, also a pioneer in physics didactics. Kohnstamm wanted to introduce French as the second language in primary school. This alienated Minnaert greatly from Kohnstamm. E. Besse, 3, 33, 49, criticized the 'French-mad spirit' of the 'Nutsrapport'.

3 In his brochure on Pierre Curie, Minnaert criticized the state of French natural sciences at the beginning of the 20th century by unfavorably comparing it to her pioneering role of a century earlier. Curie was then the exception.

4 The Dutch-language Academies would emerge in the course of 1938.

5 Minnaert, Van Speyk and his deed, seen from the perspective of anti-military nationalists, DDG 5, 1930-1931, 157.

6 Romain Rolland, *Mahatma Gandhi*, Amsterdam 1930. Besides Gandhi, his counterpart Rabindranath Tagore, whom Minnaert also admired, is discussed.

7 Heijmans, 1994, 117.

8 Minnaert, (1931c).

9 Minnaert to Burgers, December 2, 1930. Heijmans, 1994, 127.

10 Minnaert, (1935a).

11 Standard work on Lighting studies, Utrecht 1936.

12 Interview with W.P. Roelofs.

13 Flor, likely a pseudonym of Jan Wannyn, A second Pro Domo for the Minnaert family in: De Noorderklok of May 25, 1930.

14 According to DDG, which mentions the intention on February 11, 1931, the Council was established on March 15.

15 Letters from Minnaert to De Vreese, among others from May 9, June 8, and December 18, 1932. At the time, De Vreese built a unique collection of and about Erasmus as a Rotterdam librarian. Dousa Archive RUL.

16 An Amnesty Law was only introduced on June 13, 1937: the confiscated goods were not returned and the functions in social life were not restored. The activists did get their civil rights back! Those sentenced to death, such as Borms, could not be made eligible. The material aspect of the law brought renewed bitterness among activists. Someone like Minnaert could work in Belgium.

17 The literary figure G. Knuvelde still discussed this and was reprimanded by the editorial board. DDG 11, 1936, 49.

18 Minnaert, October 1934. The Latin motto: 'Belgium must be destroyed so that the Netherlands can become one!'

19 Molenaar, 1994, 20.

20 DDG 6, 1931-1932, 192. This detail is included because Minnaert apparently had a soft spot for experimental sound films. Many film enthusiasts at the time swore by the artistically superior silent films and strongly opposed the introduction of sound, as shown in the early years of Menno ter Braak's *Filmliga*.

21 DDG 8, 1933-1934, 66.

22 DDG 12, 1937, 96.

23 Committee for René De Clercq. He occupied a country house in Hollandse Rading belonging to his friend Anton Pieck, DDG 7, 1932-1933, 1-3.

24 Call for September 19, 1936, in DDG 11, number 7.

25 H. Burger to Minnaert, July 20, 1936.

26 B. Maes to Minnaert, September 11, 1936.

27 Report in DDG 11, number 11.

28 The Noodhoorn was a collection of Patriotic Songs by De Clercq, Amsterdam 1927 (second edition), which wrote: 'In holy admiration, I dedicate The Noodhoorn to Dr. August Borms, Flanders' greatest man.' De Clercq's

first poem about Borms dates from 1917. The poet had passed away before the division of spirits within Flemish nationalism.

29 Het Volk, September 21, 1936. 30 Volk en Vaderland, September 21, 1936. 31 Burger, H., DDG, number 11.

32 Burger to Minnaert, October 2, 1936.

33 Etten, H.W. van, The Germans and the Dietse striving, typescript RIOD Amsterdam.

34 Volk en Vaderland, October 16, 1936.

35 Volk en Vaderland, October 23, 1936.

36 Volk en Vaderland, November 13, 1936.

37 The Bulgarian communist Dimitrov was acquitted of the Reichstag arson and became the spokesperson for the Communist International (Comintern) in 1935 regarding the united front against fascism. Communists had to isolate and combat fascists in all 'mass organizations.' Volk en Vaderland thus claimed that Minnaert had applied this tactic within De Dietse Bond.

38 Burger in DDG, The NSB against Groot-Nederland, 11, 1936, 113.

39 Minnaert, in DDG 12, 1936. 40 Minnaert, Diary, winter 1936.

41 A report from Secretary De Geer to the Board of Curators followed, which complied with the minister's request. Archive-Curatoren in Het Utrechts Archief.

42 Note from De Geer dated January 11, 1937. What mattered was only whether he was a 'communist.'

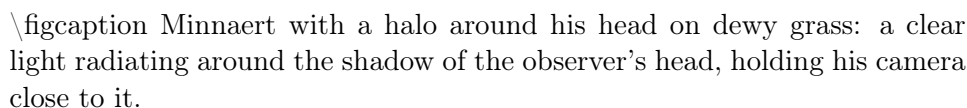
43 Minnaert's address is from November 26, 1936. On November 16, he had written to publisher Thieme about The Physics of the Free Field.

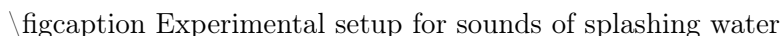
Chapter 12

The Physics of the Free Field.

Who loves nature observes its phenomena as naturally as they breathe and live; driven by an innate, deep urge.

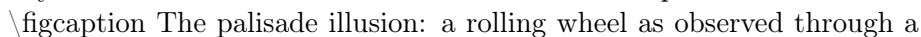
On the way to a classic book

 \figcaption Minnaert with a halo around his head on dewy grass: a clear light radiating around the shadow of the observer's head, holding his camera close to it.

 \figcaption Experimental setup for sounds of splashing water

In the 1920s, Minnaert had begun collecting, cataloging, and documenting observations and explanations of physical phenomena in free nature.

On a page of a notebook, he had scribbled twelve topics: Measuring and Observing; Along the Water; At Sea; Play and Sports; The Sounds of Nature; Light and Color on Earth; Heat and Cold; The Realm of Air; Electricity in Nature; Precipitation; Colors in the Sky; On the Train. He had gone through an impressive number of articles and even contributed original work. One of his most successful contributions was 'On the Sound of Splashing Water,' about which he shared that a water droplet falling into water carries a small amount of air with it. This air forms a tiny bubble that rises to the surface and creates a tone: 'The sound of splashing water in nature can be attributed to the unison of millions of such sounds: the bubbling of streams, the splashing of fountains, the rustling of the sea.' Everyone knows this phenomenon, but it required Minnaert's uninhibited curiosity to want to investigate it! In the early 1930s, he had taught a course on Physical Observations in Free Nature at several People's Universities.

 \figcaption The palisade illusion: a rolling wheel as observed through a

gate

During those years, there must have been many people who knew stories similar to that of young Van Milaan: 'Minnaert would stand in the morning, waiting before the railroad crossing barriers for the local train to Utrecht (Bello), and at the last moment, he would crouch down to study the effect of the spinning wheel spokes through the vertical bars of the crossing gates. For many, it was a comical professorial display that took place every morning for weeks on end, for the benefit of a piece from **De Natuurkunde van 't Vrije Veld.**'

It likely led to the text of 'The palisade illusion': 'A rapidly rolling wheel with spokes, seen through a fence, displays a surprising pattern: it is as if all the spokes were bent.'

On November 16, 1936, Minnaert wrote to the director of the Thieme publishing house that he had completed the manuscript for **De Natuurkunde van 't Vrije Veld**: 'The concept of the work is entirely original: it is a collection of physical observations that can be made outdoors without instruments. The intention is to show that the physicist, just like the botanist or zoologist, can experience joy in the surrounding nature and that even the interested layperson can fully enjoy this field. (...) The book is written in a way that makes it understandable to anyone who has had secondary education and has not completely forgotten it. A few small, more difficult pieces here and there can be printed in smaller font and do not disrupt the overall coherence. On the other hand, so many little-known publications and my own original observations are included that, in my opinion, even the expert will read it with interest.'

Minnaert had formed an image of the potential buyers: 'In these times when education is increasingly emphasizing nature, I expect it will be sold to teachers, school libraries, public reading rooms, scout leaders, readers of **Hemel en Dampkring**, and all amateur meteorologists, members of the Weather and Astronomy Association, voluntary observers of the Meteorological Institute, physicists, tourists, geographers, etc.' The honorarium could not be a problem. However, he did want to retain the translation rights himself. Two days later, he already had a contract from the publisher regarding part II. Minnaert had stipulated that he could have parts II and III published elsewhere if Thieme decided to stop further publication. This quick success must have been encouraging for him during his suspension in Utrecht.

The encyclopedic aspect was in Minnaert's genes. His father, with his aphorisms, had covered the entire world, and his godfather, Gillis Desideer, with his **Geesteswereld en schoonheidszin**, had wanted to offer Flemings a

general development, a **Leekenspieghel**. In nature, Gillis had found order, coherence, and harmony everywhere. For a long time, he had marveled at the richness of form and color in nature: 'Climb a hill or dune top, from where the beautiful natural scene unfolds before your eyes.' He had written about flowers, trees, birds, butterflies, and plants, much like Jacques P. Thijsse before his time, but also about mountains and rocks. His godchild had inherited this mindset: he merely needed to change 'the plan of the creator' into 'the laws of the universe.'

Minnaert could, moreover, mirror himself in his older friend. In 1917, the astronomer Anton Pannekoek had published **The Wonderful Structure of the World**, which 'unveiled the foundations of the astronomical worldview.' He had illustrated the texts himself and, just like Gillis Minnaert, wrote for laypeople. The communist Pannekoek had wanted to serve a political purpose: 'Ever larger masses of people are rising from the traditional faith of their fathers to a scientific understanding of the world. If they wish to orient themselves well in the current struggle of worldviews, they must also form a clear understanding of the actual structure of the universe.' Minnaert had thoroughly absorbed this last sentence.

A magic wand touching the reader

Minnaert had not pointed out these sources of inspiration in his manuscript. He began his book with a quote from **Farbenlehre** by the German poet and naturalist Johann Wolfgang von Goethe (1749-1832): 'First and foremost, we consider the experiences related to this matter in full daylight. We bring the observer into the open air before leading him into the confines of the dark chamber.'

Just like Minnaert, Goethe had spent many years botanizing and drawing before dedicating himself, as a universal man, to mineralogy, chemistry, optics, meteorology, and literature. Goethe's physiological theory of colors, which at the time had been dismissed in physical circles, was considered by Minnaert as a necessary complement to Newton's optics. In his breakthrough as a solar physicist, Minnaert had greatly benefited from his **Fingerspitzengefühl**, which suggested that a difference in color could also make a difference in the image on the photographic plate. That the phenomenological

"Goethe's view of nature, which was also Minnaert's, could have been promoted by his studies in biology and zoology. Minnaert would always draw attention to primary worldview, sensory perceptions of smell, color,

and form—thus qualitative aspects. Not only of living things, but also of seemingly dead nature. Respect for creation was instilled in Minnaert playfully: he later found it in the writings of his father and uncle, as well as in Goethe.

A long-term collaboration began between author and publisher. At the end of 1937, part I appeared with the subtitle *Light and Color in the Landscape*. The book received enthusiastic reception from both the public and the press. The publisher sent Minnaert the reviews. Minnaert wrote that he had read Dijksterhuis's appreciative review in *De Gids* 'with great pleasure,' as he was 'a rather demanding critic.' In December, Thieme decided to publish part II, *Sound - Heat - Electricity*: it only came out in 1939. By the end of 1938, a reprint of part I had already been made and work on part III, *Rest and Movement*, had begun. There was talk of a German translation, which the publisher discouraged because he feared competing prices. The English translation of part I took place in 1939. In September, Minnaert heard that a translation had appeared in Poland: at that time, World War II had broken out in that country due to the invasion by Germany and the Soviet Union. Part III appeared in November 1940. Four years of feverish work on proofs and experiments, correspondence about photos, drawings, layout, captions, and dust jackets were behind him. In the first reprints from the early 1940s, Minnaert consistently improved passages and incorporated criticism and suggestions from readers, friends, and colleagues.

Minnaert writes in his foreword about nature experience also in words reminiscent of the American poet Whitman: 'Who loves nature observes its phenomena as he breathes and lives; from an innate deep urge. Sunshine and rain, warmth and cold are equally welcome opportunities for observation; he finds his interest in the city and in the forest, on the sandy plain and at sea. Every moment presents him with new and significant events. With an elastic step, he wanders over vast lands, eye and ear ready to capture the impressions coming from all sides, deeply inhaling the scent of the air, feeling every temperature difference, sometimes stroking a shrub along the way to be in closer contact with earthly things. In this way, he feels like a lively human being. Do not think that the infinitely varied moods of nature lose any of their poetic quality for the scientific observer: the habit of observing refines our sense of beauty, and enriches the emotional background against which individual facts stand out. The connection between events, the causal relationships between parts of the landscape, create a harmonious whole out of what would otherwise be merely a sequence of disconnected images.'

The human being does not notice much more than the things he already knows. Therefore, the book had to become a magic wand that touched the

reader with the 'knowledge of what I should pay attention to.' Biologists had their floras and faunas; now physicists had an equal counterpart. Observations in the open air also served as a didactic guide: 'They help us in our increasing effort to connect education to life: they provide a natural reason to ask thousands of questions and ensure that what has been learned at school is continually rediscovered outside school walls. Thus, the omnipresence of natural laws is experienced as an ever-surprising and impressive reality.'

The book added a dimension to observations with its rational explanations. Indeed: what humans love, they want to know and name. According to Minnaert, there was always a scientific explanation for a phenomenon. If coincidences were encountered, these too were 'governed by fixed laws.' This deterministic view is expressed in every paragraph of the trilogy."

The Last of the Mohicans

The trilogy still makes an overwhelming impression on the reader. On one hand, Minnaert was inspired by works in specific fields such as 'Scenery and the Sense of Light,' 'Waves of Sand and Sound,' and 'Ocean Waves' by Vaughan Cornish, 'Meteorological Optics' by Pernter-Exner, 'On Ship Waves' by W. Thomson, 'Wind und Wasserhosen in Europa' by A. Wegener, and 'Mathematik und Sport' by E. Lampe. Other sources of inspiration included 'Physiological Optics' by physicist H. von Helmholtz, 'Modern Painters' by art historian John Ruskin, Goethe's 'Farbenlehre,' and Leonardo da Vinci's 'Trattato della Pittura.' For Minnaert, physics intersected with painting, physiology, and literature. John Ruskin often speaks at length; his aesthetic views seemed to align with Minnaert's. He also used contemporary dissertations such as Feenstra Kuiper's 'The Green Ray' or P.D. Timmermans' 'Experiments on the Influence of Waves on the Beach.' He processed thousands of articles from journals and noted that most authors were unaware of their predecessors' work.

On the other hand, Minnaert's own incidental experiences seem to determine the depth and scope of the treatment. For instance, a subject like 'Damping of Sea Waves by Oil' begins with statesman and physicist Benjamin Franklin, who read about this phenomenon in Plinius de Oude. The American said, 'I made sure, every time I went for a walk, to carry a little oil in the top hollow section of my bamboo walking stick to repeat the experiment and found it invariably successful.' Franklin thus poured oil from his hollow cane onto the waves and observed its damping effect on the water. Minnaert followed Franklin's example and described the differences in

effects of various oils from the 1930s. Another time, he verified the echo at Chantilly's castle staircase, which Dutchman Christiaan Huygens described in 1693. Then, on page 18, he tells about the walk of his friend Felix Ortt, who between Den Dolder and Huis ter Heide was struck by a whirlwind, a 'little whirl.'

The Minnaert trilogy—soon referred to with this honorable substantive—dedicates tens of pages to 130 poems and quotes from 70 literary figures. This approach strengthens Minnaert's plea for an emotional surrender to nature. Most of the quotes—13 in total—are borrowed from the Flemish poet Guido Gezelle; he also cites his activist friends René De Clercq (5), Felix Timmermans (2), and Wies Moens (1). The names of Georges Duhamel, Herman Gorter, Walt Whitman, Goethe, Paul Verlaine, Coleridge, Virgil, Henriette Roland Holst, and Jacques Perk appear multiple times. Quotes from Fj. Gladkov, D. Merezhkovski, and M. Sholokhov prove that he reads contemporary Soviet literature.

Minnaert seems to want to bring 'lifeless nature' to life, using 19 literary quotes for this purpose. John Ruskin writes about a mud puddle: 'That puddle is not the brown, muddy, ugly thing we think it is; it has a heart like ours, and on its bottom are the branches of tall trees, the leaves of trembling grass, and all kinds of changing beautiful lights from the sky.' Georges Duhamel writes about a rock: 'A stone is a beautiful thing, beautiful in every way: its grain, its color, its fracture, its gloss, its hardness, its many properties that exercise and satisfy our senses, inspiring us to think.' The great physicist Helmholtz muses: 'The advancing waves with their rhythmically repeating motion, which nonetheless constantly changes, create a strange feeling of comfortable rest without boredom and evoke the image of a mighty but ordered and harmonious life.' In Minnaert's work, nature addresses people. Sometimes it seems as if the author attributes consciousness to 'dead nature.'

Minnaert dedicates many paragraphs to describing cloud formation and translates Goethe's ode to Luke Howard, the father of cloud classification:

'But you, Howard, with a clear mind,
give us the noble advantage of your science.
What we cannot grasp or reach, you make accessible
You now hold it firmly for the first time;
determine the indeterminate, confine it, name it aptly.
Therefore, the honor is yours!

As clouds rise, fall, and gather together, one gratefully remembers your name!

Someone who acquaints themselves with the physical backgrounds and transitional forms of Cirri, Cumuli, and Strati can daily enjoy a glorious spectacle! Where Henriette Roland Holst saw the spiritual characteristic of Holland in those 'swelling cloud processions,' compatriots who pass them by miss something invaluable.

The astronomer H.G. van Bueren emphasized, when asked, the cultural-historical aspect of Minnaert, the longing for completeness and systematics reminiscent of the 19th century: 'Minnaert approaches nature in a way that lies between science and art. He enters nature with sketchbook and pen in service of physics. The atmosphere he evokes is unique. He reminds me of John Ruskin and, in my opinion, Goethe. With that, he is a great man: the last of his generation; the last of the Mohicans. His trilogy makes me think of Jakob Burckhardt, of Bernard Berenson. He was a remnant of the past. That atmosphere is reflected in his writing style and books. Minnaert is both an artist and a scientist. His **Natuurkunde van 't Vrije Veld** reminds me most of D'Arcy Thompson's **On Growth and Form**. Minnaert could have written that as well.'

How can one adequately convey the impression this epic still makes on new generations of readers, who can now read the first part in Russian, Hindi, Swedish, Finnish, Romanian, Polish, German, and English? Imagine that Minnaert travels from Utrecht to Zandvoort in June 1937 to take measurements along the waterline and returns late in the evening to Bilthoven. Multiply the sensations of this day by a factor of 150, and you will start to see the contours of Minnaert.

From Utrecht to Zandvoort and back to Bilthoven.

It promises to be a sunny Saturday. Minnaert walks at seven o'clock after a night of working with the microphotometer of the Physics Laboratory along the canals to Central Station. He stops for a moment on the side of a bridge. The rippled water surface reflects the light of the low sun and forms a network of curves on the vault. Where the surface curves outward, the rays diverge and light-poor spots appear on the brick arch. The concave surfaces converge and create strong light patterns. This mercury-like spectacle on the span always fascinates him.

He goes to Zandvoort to measure the difference in water levels between low tide and high tide. Owning a vehicle is a waste of time, pollutes, and

disrupts the city. He listens to the sound of the train from that time. The rumble arises because the wheels receive a jolt when transitioning from one section of rail to another. The rails expand in warm weather, so the gaps between them must bridge the difference between winter minimum and summer maximum. Sometimes the rails are shorter, and the number of jolts per unit of time increases. The seasons also create varying sound patterns. He thinks about what his comrade Wies Moens once wrote: 'The song of the wheels has comforted our great sorrow so many times.' The rumble is a mixture of many tones, so the passenger can listen to any desired melody. When the train stops, he hears the screeching sounds of objects rubbing hard against each other without lubrication: these are relaxation vibrations, like those of chalk on a blackboard.

\figcaption Measuring acceleration on a train

He has conducted many acceleration tests on trains: he then uses a vertical pendulum attached to the luggage rack as measuring instrument. Today, he observes physiological effects. When the train brakes, he looks at chimneys, houses, and other vertical objects: it seems as if the verticals lean forward, especially when the train has just come to a stop. The passenger feels as though they are being pushed forward, as if the direction of gravity has changed. Even the horizons of the meadows seem to tilt. Once the train has stopped, everything returns to being upright. At Muiden station, another train departs on the opposite track, making it seem as though his own train is pulling away. When the other train truly starts moving, Minnaert gazes dreamily out the window at the ground rushing by: 'The train stops; and while I am certain it has come to a halt, I still have an irresistible impression when looking outside that it is slowly sliding backward.' The explanation lies in 'our mind,' which has learned to mentally subtract a portion of the speed from every part of the field of view and continues to do so even after the motion has ceased.

The sun is low and shining from the east into the compartment on the left. Minnaert walks back and forth from the left side to the right side of the carriage, comparing. The difference in hue between the grass fields on the sunny side, lit by diffuse light, and those on the shaded side, lit by direct light, is clearly visible: in the latter case, more reflected light can be seen. He uses a small mirror to look at both sides and compares: 'This difference corresponds to the well-known distinction among painters between the green tones of Willem Maris in his backlit landscapes and those of Mauve, who preferred to paint with the light behind him.'

The grass is moist with dew and therefore full of color: as soon as a thin layer of water covers the objects, the surface becomes smoother. The grass

scatters the white light less, allowing its own hue to dominate, making the color appear 'more saturated.' In some places, morning fog still clings to the sunlit slope of the railway embankment, while the shaded side remains free of mist. The dewy earth on the sunny side releases water vapor, but the air above it is still cold: when the air mixes, the fog condenses due to an over-saturation of water vapor.

\figcapation Near the horizon, Cumulus clouds overlap one another, and one overestimates the degree of cloud cover"

Cumulus clouds are visible in the sky, which will disappear during the course of the day. The cumuli exist at a single altitude: 'When the Earth is heated by the sun's radiation, columns of hot air rise everywhere. Where this air ascends, it cools through expansion until it reaches its dew point, and the moisture it contains condenses into droplets.' Just like morning mist. The underside of the clouds forms a horizontal plane at a similar temperature, where the rising air condenses.

In Zandvoort, Minnaert chooses a walking path to the beach. In the dune area, he looks back at the forest; against that dark backdrop, the light scattering becomes noticeable. The farther he walks away from it, the more 'bluish' the forest appears. The long layer of air between the observer and the forest, illuminated sideways by the sun's rays from the east, scatters light that 'superimposes' itself on the background: in the forest, the contrast between light and dark areas weakens, the light becomes more even and 'bluer.' Minnaert is not yet familiar with the story of the scattering effect of terpenes, the hydrocarbons exhaled by coniferous forests. The vegetated dunes, rising like waves in the sea, ridge after ridge, farther and farther, display increasingly intense bluish hues, 'as one often finds depicted in the landscapes of our 16th-century painters: Van Eyck, Memling.' For Minnaert, these are Dutch painters, just as the highest Dutch churches for him are those in Antwerp and Bruges, not Utrecht or Delft.

Minnaert sees the blue sky above his head: from white light, the short-wave violet and blue rays are scattered the most by collisions with air molecules in the atmosphere, which is why the sun appears yellow. Why do so few people wonder about this? If the air molecules were a bit larger, the sky would be red! Rayleigh's scattering law, which seemed to play a key role in Julius' theory of the sun, plays a role here as well. When the sun dips below the horizon, the green and yellow hues will be scattered more prominently in the longer atmosphere toward observer 38, causing the sun to appear orange-red.

Minnaert is one of the fortunate individuals who observed 'the green flash' dozens of times aboard a ship heading to India, above an ultramarine

sea. Many others have looked for it in vain. On one previous occasion, he managed to extend his observation of the flash by several seconds by running up Zandvoort's 39-meter-high dike: 'It all comes down to perceiving that very last speck of light it emits.' 'The green flash' refers to the emerald-green tint of the sun's final glimpse. Blue and green rays are not only scattered more intensely in the atmosphere but also refracted more strongly than red or orange rays. As the sun sets, one should ultimately notice a green edge. Due to this scattering, blue cannot be part of it.

\figcaption The formation of the green flash occurs when the upper parts of the setting sun are obscured.

On the beach, Minnaert verifies earlier experiments concerning the difference in height between low and high tide. Tidal movement arises because the moon attracts the movable water masses. This attraction changes, among other factors, due to Earth's rotation. In Zandvoort, this phenomenon is not symmetrical. The ebb lasts seven hours, while the lowest water level persists for two hours. Flood movement, however, reaches its peak in three hours and immediately begins to recede. He places a stake with markers by a row of objects perpendicular beach poles along the coastline and reads the height from the intersections with an imaginary line to the horizon. The tidal range of approximately is found to be well reproducible: this time it amounts to 1 meter 55.

\figcaption High and low tide observations with simple equipment.

\figcaption Determining the level of the sea to research tides.

Minnaert has often studied the ripple pattern of the sand waves on the beach, the current ripples. He lets a handful of sea sand, 50 centimeters above the ground, trickle away in a fine stream. Like separating wheat from chaff, the coarse grains separate from the fine ones. The asymmetric pattern of the current ripple arises because the fine sand is eroded upstream by seawater, even at low flow velocities, while the steep lee side consists of coarse, settling grains. When the water flows quickly, this separation can be reversed. At an even greater speed, the apparent wave pattern disappears. Using a small stick, the displacement speed, the creeping movement, of the ripples can be measured. Then it becomes clear that the sand grains do not vibrate around an equilibrium position but actually move. Where the sand grains are all the same size—Minnaert claims this is true for a five-meter-wide strip along the coast—the ripples are absent, and the walker can expect singing sand.

Minnaert addresses the reader about his footprints at low tide: 'Wherever you step then, you see it turn white around your foot, apparently because it suddenly becomes dry.' Does the pressure of the foot compress the sand? But in that case, water should appear on the surface in the capillary spaces, while

the opposite happens. So the foot pressure does not compress the sand but causes it to expand. The sand grains are shaken together as they settle and take on the densest packing. Any change in this arrangement, such as from the pressure of the sole of the foot, causes the sand to expand. The British scientist Reynolds called this phenomenon 'dilatation' in the *Philosophical Magazine* of 1885. Therefore, the water level drops, and the dry footprint appears. When the foot disappears, the sand grains return to their densest state, and the water reappears: 'If one considers the two hundred thousand million men, women, and children who have walked on this beach since the creation of the world and had asked: 'Does the sand under your feet get compressed?', how many would have answered anything other than 'yes' at the meeting of the British Association in Aberdeen in 1885?

The sea is clear, transparent to depths of meters and emerald green. The question arises as to why the interplay of absorption, scattering, and reflection of sunlight gives the seawater above a latitude of 40 degrees that color and not the ultramarine of the seas under a latitude of 30 to 48 degrees. At sunset, the play of light provides the bathers of 1937 with a color sensation like that of the current water in the Venetian lagoon. Minnaert sees the twilight colors over the sky change minute by minute: all stages are effortlessly distinguishable on this cloudless evening. The earth's shadow in the east and the sunset in the west create the transition from gray-blue to orange-red across the sky from east to west, finally to soft purple and yellow-green.

Whoever has never noticed that changing color splendor, that magical word on the sky, that four-quarters-lasting spectacle of colors, truly misses out a lot. The tide is coming in. The surf makes a roaring noise. Where does the pitch of those falling water masses come from? Minnaert was the first to pose this research question and provide the beginning of an answer.

\figcaption Bending of light through the scratches on the windows

The day is over. He takes the train again. Lantern light falls through the scratched windows, and the bending of light forms circles. The temperature in Bilthoven seems to be lower than that in Utrecht. He checks this by holding his thermometer outside the window at the stations of the boemel: 'In a certain case, the temperature of a large city on a beautiful summer day was approximately 1 degree higher than that of its surroundings, while in the evening the city was 7 degrees warmer! Apparently, the nocturnal radiation in the city was less, and the heat capacity of the bricks and the warmth from thousands of fireplaces in homes and factories should certainly not be underestimated.

Minnaert keeps busy, his notebook at the ready for drawings and text, utilizing travel time for calculations involving self-devised physical formulas.

From his earliest youth, he transforms questions into elementary mathematics. Only then can twenty years of observation and study culminate in **The Physics of the Open Field**. Minnaert is perfectly happy with himself and his work. For his fellow travelers, his restless activity may be exhausting, but for the nature lover, it provides an inexhaustible source of inspiration, a magic wand that opens the eyes to the background of phenomena in nature.

Minnaert remains a child and a romantic, endlessly marveling and constantly surprising himself anew. He embodies the researcher as one who must have existed in all times. As a student, he could not inspire his companions with his worldview, as evidenced by the prize question regarding the eclipse. With the help of this book, he effectively conveys his ecstasy about nature to ordinary mortals. Thanks to a formidable effort, he makes himself understandable and creates a classic work.

Endnotes:

1. Part I, 1937, 220, no photo. Part I, 1968, 267, plate XII opposite 241. The last 'halo' is used here.
2. Manuscript with notes, 1920. Astronomy Archives.
3. Minnaert, (1923d). Figure of the setup in Minnaert, (1933b).
4. A 1933 dictation by student M.H. de Jongh mentions ten themes: Rest and motion; Waves, Wind, and clouds; Water and ice; Sound and murmur; Reflection and refraction of light; Rainbows, circles, and coronas; Phenomena resulting from peculiarities of the eye; Colors in the landscape; Electricity in nature. Mechanics, as usual, precedes optics. Eventually, Minnaert reversed this order. The course lasted three months and was given in Amsterdam, Utrecht, and Arnhem at least. Astronomy Archives.
- 5 Drs F.W. van Milaan, the boy next door from Parklaan 50, in a letter dated June 26, 1998. The story about the physiological phenomenon dates back to the mid-1930s and apparently led to the figure drawn by Minnaert in a section of Part I, Afterimages and Contrast Phenomena, under the subtopic The Fence Phenomenon, 111 (1968, Figure 96, I-144).
- 6 Minnaert to Thieme, November 16, 1936. Zutphen Municipal Archives.
- 7 Minnaert, November 18 and 27, 1936. Zutphen Municipal Archives.
- 8 Minnaert, G.D., 1913-1914, I, Conclusion.
- 9 Pannekoek, 1917. Quotes written consecutively.
- 10 The decisive breakthrough in his equivalent latitude was related to the yellow-green catastrophe of the Rowland intensities (Chapter 8).
- 11 Dr F. Boer wrote in a letter of June 8, 1998, about the similarities in worldview between Goethe, Minnaert, and the Swiss biologist Adolf Portmann (1897-1982). This paragraph about Goethe would not have been

written without his intervention.

12 That took place on May 30, 1938. A German edition of Part I, *Licht und Farbe in der Natur*, newly illustrated, was published in 1992: more than half a century later!

13 In the revision of his trilogy (1968-1971), Minnaert introduced Walt Whitman in the Introduction to Part I. In the first edition (1937-1940), he quotes him several times, but Whitman is not yet a kindred spirit. The Goethe quote remained neatly in its place in the revision: at the beginning of Part I.

14 That is present in his didactics book from 1924. Quote from the Foreword to Part I, VII.

15 Interview with astronomer P.J. Gathier from Molenaar, 1998.

16 Minnaert, Part III, Damping of Waves by Oil, 146.

17 Minnaert, Part II, Echo of a Staircase, 28.

18 Minnaert, Part III, 240. From *About Felix Ortt*, The Hague 1936.

19 Ruskin, J., *Modern Painters III*, 496, cited in Part I, 292.

20 Duhamel, G., *La Possession du Monde*, 106, cited in Part III, 199.

21 Helmholtz, H. Von, *Tonempfindungen*, 1863, 388, cited in Part III, 128.

22 Minnaert indeed went further. In *The Unity of the Universe* (1963), he denies that there is a fundamental difference between inanimate nature and conscious organisms. This worldview is implicitly present in *The Physics of the Field* and is part of the enchantment of the book.

23 Minnaert, Part II, 130-131. A brilliant piece by O. Krätz, **Goethe und die Naturwissenschaften**, 1998, is dedicated to Goethe and Howard: Luke Howard, the man who 'distinguished clouds,' with the original poems in German, 188.

24 Henriëtte Roland Holst, *Holland*, Minnaert, Part II, *Cloud Perspective*, 147.

25 Interview with theoretical physicist H.G. van Bueren. Partially in Molenaar, 1998.

26 Plate III, Part I, Refraction of light during the transition from air to water, next to 30 (1968, Plate IIIA, next to I-48).

27 Minnaert, Part II, The sound of a train, 42; Expansion of rails due to heat, 65.

28 Part III, Braking, 34, figure 20, 35. According to De Jager, in the 1930s he measured acceleration during takeoff and landing of an airplane in the same way: his pocket watch was tied to a piece of elastic, and he studied how much the elastic stretched or shortened. None of the members of the study association S-square had flown on the 'giant airplanes' that could carry

a dozen people. Minnaert hardly looked out the window because he was busy with his experiments (1972, better figure, III-48).

29 Part I, Optical illusion regarding position and direction, 134.

30 Part I, Illusions about rest and motion, 137.

31 Part I, The color of green leaves, 314.

32 Part II, Formation of fog and mist, 104.

33 Part II, Cumulus, 138.

34 There is no specific figure of clouds at the same altitude; but it is implicitly used in a drawing about the apparently increasing cloud cover of Cumulus near the horizon in Part II-126.

35 Part I, Aerial perspective, 228.

36 The terpenes were added by Minnaert in the revision of Part I in 1968.

37 Part III, The height of the main Dutch towers, 13. 38 Part I, The blue sky, 227.

39 Part I, The green ray, 58. Feenstra Kuiper, **The Green Ray**, dissertation, Utrecht 1926.

40 Figure of the 'green ray.' The American Andrew T. Young specializes in the 'green flash.' He wrote in **Zenit** about the green flash as a celestial phenomenon, 1999, 248, and maintains a website discussed elsewhere. His critical findings suggest that Minnaert should listened more to geologist A Wegener and

less to his Utrecht colleague Feenstra Kuiper who earned his PhD on **The Green Ray** in 1926 (1968, Figure 68, I-90)

41 In 1968, Taylor and Matthias photographed a sunset with a 'green ray' from an airplane. The photo series appeared in *Nature*, looking just as Minnaert had drawn it in 1937. The authors sent the photos to Prof. Minnaert with admiration. Color print on the back of Molenaar, 1998.

42 Part III, Ebb and Flow, 102, figure 64, 104 (1972, figure 74, I-142).

43 Figure 63, 103 (1972, figure 73, III-141).

44 Part III, The Composition of Beach Sand, 163, figure 88 (1972, figure 98, III-204).

45 Part III, Ripples, 173.

46 Part II, Singing Sands, 57. See also his predecessor Hertha Marks Ayrton (1854-1923), whom Minnaert was unaware of, in the *Miniature of Women* by M.I.C. Offereins in *NVOX*, 2002, April. Long live search engines!

47 Part III, Dilatation of Sand, 169.

48 Part I, The Color of the Sea, 295.

49 Part I, Twilight Colors, 254.

50 Part III, The Surf, 136.

51 Part II, The Murmur of Water, 47.

52 Part I, Bending of Light on Small Scratches, 205.

53 Part II, The Temperature of the Big City, 83.

Chapter 13

Chapter 13

The Man of the New Observatory

'But as he lies stretched out on his deathbed, the machines roar and the electric current trembles through the thousands of wires in his laboratory.'

Appointment in Chicago

The Utrecht astronomer Nijland had been an old-school astronomer, very involved with amateur organizations and always busy with his estimates of the brightness of variable stars. Developments in astrophysics had passed him by. After Nijland's death, the curators wanted to divest the Observatory and abolish the chair. Budget cuts were the order of the day: it made sense that this College would draw this consequence upon proven failure. Ornstein, leader of the physics community, opposed this plan vigorously. ²

The matter started moving when Minnaert received a letter from Otto Struve, Director of the Astronomy Department at the University of Chicago, in March 1937. Struve invited Minnaert to accept a professorship: 'The most important thing is that we secure our university's access to the services of a leading astrophysicist who would take on teaching duties on campus and perhaps teach some other courses.' The teaching load would consist of two courses per quarter, four hours a week. One of the quarters was reserved for vacation and personal research: 'At this moment, our large spectroheliograph is not in great use. I would welcome it if the solar work at Yerkes Observatory were to be expanded.'

Struve could offer Minnaert a salary of \$5,000 and colleagues who ranked

among the world's top astronomers, such as the Indian Chandrasekhar, the Swede Strömgren, the Belgian Van Biesbroeck, and Struve himself. The University would acquire a unique observation post in 1937 with the McDonald Observatory in Texas. The 82-inch reflector would be at Minnaert's disposal, allowing him to have plate material recorded as he pleased: 'Let me add personally that I would consider it of the utmost importance for my own work if you were willing to accept this offer. Your work on growth curves has been particularly valuable to me, and it would be a great pleasure if we could collaborate.'

The next day, Minnaert received a letter from Gerald Kuiper, recently appointed in Chicago, who recalled their collaboration during the 1929 eclipse expedition and the Leiden Student Peace Action. He wrote that astronomer Hale had labeled their spectrograph as the best in the world. There was no solar physicist in Chicago: Minnaert could revive that line of research! The equipment was breathtaking: 'The University of Chicago has invested two million dollars in Astronomy through its Texas project, comparable only to Mount Wilson and the 200-inch institute.' The management was positive about research and approved every reasonable request. A house was ready in Williams Bay, where Mrs. Minnaert and the children would have a wonderful time. There was a primary school and good secondary education available. Lectures and concerts were organized, and there were parks and beaches by the lake: 'It is certain that with the position now being offered to you, the expansion has reached its limit, at least for the coming years.'

Minnaert immediately consulted Ornstein, who suggested that he would advocate for an extraordinary professorship in astronomy. The ordinary professorship would elude him for the time being, which would align with the budget-cutting trend. Minnaert agreed but wanted to transform the observatory into a fully-fledged research institute. He demanded that Julius' spectrograph be relocated. Ornstein concurred.

Minnaert thanked Struve for his offer. He didn't mind the teaching responsibilities at all, as he enjoyed giving lessons. If the appointment were to proceed, he would consider it a permanent position. However, he thought the journey would be challenging for his eighty-year-old mother. He also mentioned plans to improve his position: 'I wouldn't want to make them impossible a priori, especially since I am deeply attached to this University, this country and its people, the career I have built here, and the research initiatives I have undertaken.' The Faculty will meet tomorrow to discuss this matter and will certainly contact the minister immediately; but before any decision is made, some time may pass. I would like to ask you to inform me within what timeframe I need to make a definitive decision.'

Appointment in Utrecht

At the request of the faculty, Minnaert wrote the epistle 'Reorganization of Astronomy Education in Utrecht,' which formed the basis for the faculty board's letter of April 5 to the curators: 'Who will ensure that any successor to Prof. Ornstein will maintain heliophysics as an independent department within the laboratory? What will happen to the work of Prof. Julius? What about the international spectrophotometry work that the Heliophysical Institute had begun?' It was known that the curators were wondering if the Leiden Observatory could take over the solar research. Minnaert wrote indignantly that Utrecht had a spectrograph, which was as essential for an astrophysicist as a microscope is for a biologist! He had reviewed recent volumes of the *Astrophysical Journal*: six out of seven articles relied on own spectroscopic work. Leiden had no spectrograph and no self-recording microphotometers: 'As things stand now, each of the astronomical institutes in the Netherlands has its own territory. None of these fields is better defined than that in Utrecht, none is more important for the modern direction of astronomical research.'

Meanwhile, letters from Struve and Kuiper continued to arrive. On April 12, Kuiper wrote that he was pleased Minnaert was considering the offer. In Chicago, they also collaborated with physicists. The Yerkes Instrument Shop could construct any design: 'Working with the largest instruments in the world in such a climate is a privilege and gives the observer a sense of happiness that a European astronomer does not know.' The dynamic aspects of America made life attractive: 'We all hope that you will join our group.' Kuiper was making it very difficult for Minnaert. On April 20, Struve wrote that he understood Minnaert's circumstances, both in family and scientific terms. He could address all concerns regarding facilities. Minnaert could determine the start date of the lectures himself. Near the Observatory, the University owned a furnished house where Minnaert could spend weekends and vacations free of charge. On the same day, Kuiper mentioned the opinion of a Dutch colleague teaching at Harvard: 'Bok and I feel the same way: America offers such opportunities for scientific work that we cannot return to Holland (or Europe). There is also this point: so much is happening in American astronomy that it is advantageous to be in close contact with it and, if desired, to exert influence.'

Kuiper also appealed to national pride. The Dutch in scientific America set an exemplary family life and, through their idealism, language skills, and travel experience, were true ambassadors: 'I bring up this point because I would not be surprised if someone in their home country (or second home-

land) is not aware of this aspect and could fear harming the country by leaving it. I often feel that the opposite will be true.' A good Dutchman simply could not refuse this position. He really didn't want to persuade Minnaert but merely outline the circumstances: 'Because this decision will be important for astronomy.'

However, it was a run race. The rescue operation succeeded completely. The 10th Royal Decree came on June 16. The Utrecht Daily reported with enthusiasm: 'There was great fear that Dr. Minnaert would follow this call from Chicago, but now that he has been appointed as a professor in Utrecht, this danger is fortunately averted.' Pannekoek congratulated Minnaert and wondered 'that you patiently waited for the end of the official sluggish process instead of immediately jumping to the new world! I wish our Higher Education luck that it now retains a center for astrophysics, while otherwise it would sink back into an outdated position in this field.' It was a toss-up. All love for country and people notwithstanding. But no sluggishness! His faculty, Ornstein, and the College had made a combined effort. A few days after the letter from Chicago, emergency meetings of the faculty board, its chair and secretary with the College took place, which intervened in The Hague within a few days. They reacted swiftly.

Two factors still played a role. The sun's installation on Bijlhouwerstraat had almost become unusable due to city traffic vibrations. And Minnaert's material demands were so modest that the curators could convince the minister that the operation, on balance, amounted to a considerable saving. It earned Minnaert a salary increase of 790 guilders on July 4, 1937, taking him from 4,788 guilders to 5,558 per year: this was roughly what he had earned as a lecturer in 1933, because in 1933 and 1934, two absolute pay cuts of 10% and 5% for all government personnel had been implemented.

Minnaert's inaugural lecture: The project of the sun atlas

In 'The Importance of Solar Physics for Astrophysics,' his stardust sprinkled inaugural lecture, Minnaert outlined his research program. The chair had to be oriented within the national division of tasks toward astrophysics, and thus the research had to be tailored accordingly.

Minnaert mentioned three general aspects of the relationship between the sun and stars: first, the amount of radiation from the sun on Earth is immensely greater than that from other stars. A wealth of data about stellar atmospheres can be gleaned from solar spectra: 'When we have an Atlas on

a large scale, detailing the light distribution across the entire solar spectrum, astrophysics as a whole will certainly benefit from it.'

Additionally, the sun is the only star that appears as a disk of finite size, making it possible to observe segments of the solar disk, from center to limb. The sun could give astrophysics a third dimension: 'It is remarkable how little the difference between center and limb spectra is still understood from a modern perspective; I do not hesitate to label the study of this as one of the most important, specifically solar physics problems.' The samples of matter on the solar disk 'find equivalents in the effective layers of all kinds of stars spread throughout the universe.' Minnaert mentioned research on the corona and chromosphere, sunspots, and prominences, and pointed to theoretical issues regarding magnetic fields and the dynamics of solar material. Based on solar research, a better understanding of the universe could emerge.

Finally, the study of the planets would provide information about the history of the solar system, which would have general significance for the history of stars: 'The Physics of the Sun relates to general astrophysics as the study of the individual relates to that of the community.' Minnaert extended this relationship into a whole network: 'Thus, the Physics of the Sun forms a link between Laboratory Physics, Field Physics, and Earth Physics, and the Physics of the Cosmos.' One of the mentioned physicists he had personally established.

Minnaert invited all his friends to the ceremony, : the activists and Dietse Bond members, the contributors to Chreestarchia and the Bilthoven Workshop, the Esperantists, and his colleagues from the Physics Laboratory. An anonymous individual (X) 14 qualified his appointment in Nieuw Vlaanderen as 'a justification after the fact for those who appointed the 23-year-old lecturer at the Dutch-speaking university, the noble revenge against those who deprived him, expelled him, condemned him, and kept him in exile.' X knew Minnaert from the University: 'His slight forward inclination has become a symbol for one who was fundamentally unyielding, yet bowed over his science, and the homo humanior, full of kindness, listening to the needs and desires of students and comrades.'

X. found a poem by the Afrikaner Cellier particularly applicable to Minnaert:

'I love a man who can stand like a man,
I love an arm that can strike a blow,
an eye that doesn't flinch, that can give a fierce look,
and a will as firm as a rock!

I love a man who honors his mother...'

X. admired the man who, with his telescope, daily studied the peculiarities of the celestial body that his fellow townsman Gezelle had called 'the heart of God,' and hoped that for Minnaert, **vir justus et nobilis**, the motto of Utrecht's Alma Mater might be fulfilled: **Sol Justitiae illustra nos**, freely translated as: 'Sun of justice, shine your full light - on him!' That was a beautiful tribute from this Catholic friend.

Minnaert distanced himself somewhat from the Flemish disputes. The conflicts within his own ranks left him helpless. The truce with God was not only violated by the NSB and VNV but also by his own fist. The majority of his activist friends once again sided with powerful Germany, from which they expected the liberation of Flanders: Thiry and Kimpe, Domela and Picard, Speleers and Jacob, Borms, Van Genechten, and Moens. And also the disabled Roza De Guchtenaere for whom a fund was established in May 1939, to which Minnaert expressed written support. They would make a terrible mistake.

The astronomical practicals

The astronomy education was overhauled. Half of the professor-manager's residence had to be demolished for the spectrograph and the institute, laboratory, library, and workshops. Instrument maker N. van Straten was hired. As head assistant, Minnaert appointed his PhD student J. Houtgast. The library became both a modern study center and a favorite meeting place. Renovations lasted three years: demolitions and renovations; only in February 1940, the relocation of the spectrograph finally took place.

Naturally, Minnaert, just as in Ghent, wanted to put his educational principles into practice undiluted. This brought him an immense amount of work. In 1937, he immediately established a Astrophysics Practical Course. Such a course didn't exist anywhere else in the world! That was no obstacle for Minnaert: it became a mandatory part of the curriculum for all students of mathematics, physics, and astronomy, a breeding ground for astronomers. Minnaert believed that students should experience the 'beauty of the sky' sensorily and emotionally.

The indoor practical course took up one evening a week. With the help of books, 18 illustrations, and photographic plates, students carried out an assignment: 'Often, later in the evening, Minnaert himself would stop by, which further enhanced the special atmosphere in the cozy library through his infectious enthusiasm. No one who experienced such a practical course by

the hissing coal stove in the pre-war years will ever forget that atmosphere.' The exercises included determining the growth curve of several lines in the solar spectrum, determining the shape of the corona from photographic images, deriving the color of stars from double star registrations, or drawing the orbit of a visual double star.

The outdoor practical course on the roof had its own charm. Participants used simple equipment, often made by the workshop: an inclination meter (a small board with a string), a portable telescope, a comet seeker, and a Jacob's staff. Volunteer assistant Aennie Elink Schuurman had organized the collection of sextants. The tasks included drawing a constellation, determining the extinction of the Earth's atmosphere, estimating the brightness of a star with subsequent verification in the catalog, and drawing the Milky Way. They aligned with Minnaert's two main courses: one year on The Earth and the planets, the other on Sun, stars, and the Universe. After passing their preliminary exams, students could take elective courses with Minnaert.

Henk van de Hulst arrived in 1936 and had to wait a year for astronomy classes: 'To our great joy, Minnaert was appointed. A fresh wind began to blow. We really got astronomy with a physics background. After class, we sometimes went up to the roof with the first-years to determine the geographical latitude by measuring the sun's altitude. Later, we were given assignments in pairs. I can still remember Minnaert's disappointment when out of those six groups, only one had worked out their results into a report! Dedde de Jong and I volunteered to check how the other experiments had turned out in practice. My first article in **Hemel en Dampkring** was a report on such an experiment. Minnaert's enthusiasm for nature always stayed with you. He said, 'Really, you should see the sunrise once a week. If you miss that, you're missing so much...' In our third year, we walked to Den Dolder with Minnaert. That's when it became clear how much he knew about biology: not just flowers, but the landscape as a whole. Excursions and practicals were also ways to bring us closer together and share enthusiasm. We once started an experiment around 5:30 PM and wondered if it still made sense. Then Minnaert said, 'It could still be worthwhile.' He had a different sense of time.'

Kees de Jager was also among the first group: 'My first day of lectures began with astronomy. I arrived at the Observatory by bike and met a tall, lanky man with a bushy mustache and tousled hair, whom I asked if I could park my bike next to his in the hallway. The tousled-haired man turned out to be the professor. That week, I attended my first weekly evening astronomy practical session without realizing we were attending the world's first astronomy practical ever. A simple, effective, and didactically excellent

method for measuring the solar constant made a big impression on me. I have the best memories of this practical because of the elementary scientific actions and the insight into the scientific method that I gained there.'

The atlas of the solar spectrum

Minnaert, Houtgast, and Mulders quickly turned the first objective of the research program into a standard work that attracted global attention. Minnaert and Bannier had recorded the ultraviolet part of the spectrum in 1936 using their own spectrograph. A subsidy enabled Mulders to create plates using the best instrument, located at Mount Wilson. Between September 1935 and March 1937, Mulders took plates of the visible spectrum and part of the infrared spectrum. His correspondence allows for a comparison between working conditions in the United States and those in the Netherlands.

The American telescopes were the best in the world, but Mulders was not impressed by how his colleagues operated them. Mulders used Minnaert's step attenuator to determine the true intensities of the spectral lines. His supervisor had expressed skepticism but secretly used the platinum-coated glass slide for measuring their own recordings: 'He then came to ask me about the calibration and became so enthusiastic that he now wants one too. He asked if it was difficult to make himself. Well, 'difficult' isn't the word, but it requires a tremendous number of experiments, and it takes a long time before the process yields a usable and reproducible result. Then he modestly asked if I would write to Utrecht to see if you could make one for him and how much it would cost.'

The astronomer Mitchell had him measure eclipse plates at Harvard. Mulders wrote disapprovingly about his developer recipe: 'I must honestly say that someone using this developer for intensity work doesn't have much experience with such measurements. You can imagine how the films look when treated with such an active developer in tropical heat: they are brown and heavily fogged, also covered with dirty spots and fingerprints.' Someone who had learned the trade from Ornstein and Minnaert apparently had no reason to be ashamed in the United States.

Mulders passed on messages from Chicago: 'Chandrasekhar asked me why we stopped sending him prints a few years ago. He really wants them... Do you know what he thinks is the most beautiful piece you've ever published? The article on resonance and water droplets in *Philosophical Magazine* a few years ago! I remember it so well, that we did experiments, usually on Saturdays at 12 o'clock, when we had time to play a bit with tuning forks

and buckets of water with tubes in them’.

In the spring of 1937, Mulders’ plates were in Utrecht, and Minnaert and Houtgast were in charge. The registration was laborious: after all, the transmission profiles of the microphotometer had to be manually converted into the true 24 intensity profiles. In 1938, Houtgast managed to improve the microphotometer so that it directly provided profiles with the true intensity. The plates of the spectrum that needed to be recorded were a total of 13 meters long: the line profiles produced by the photometer were 120 meters long. Together, they formed the core of the Atlas. Minnaert spoke enthusiastically about this work: ‘We usually worked at night because the microphotometer was free then. You were alone in the building, in the silence of a dark room, under the dull red light, developing. And there it slowly appeared, out of nothing, as if by magic, the profile of the cyanide band on paper, or the atmospheric oxygen lines; never before observed in their true, quantitative form.’

The Atlas was completed in January 1940 due to their hectic work. It was published in both English and Esperanto. The beautiful cover with intaglio printing and gold-edged paper shows that the creators were aware of the exceptional nature of their achievement: ‘a magnificent piece of work that for decades after the war contained the basic material for the systematic study of the solar spectrum.’ The Atlas would bring project leader Minnaert the highest astronomical honors.

An unusual promotion

Minnaert’s career progressed extremely successfully in the late 1930s. However, there were developments in his family and in the world that contradicted this success. On December 12, 1938, Miep Coelingh graduated as a doctor in physics and mathematics under the chemist Kruyt on Optical investigations into the liquid-vapor equilibrium in capillary systems. She had studied the structure of the drying agent silica gel and conducted measurements on water absorption and release. The chemist Van Bemmelen had preceded her by four decades in measuring the water content of the gel under variable water vapor pressure. One time, he started with completely dry material that he moistened by increasing the water vapor pressure, and another time with fully moistened material that he slowly dried. Sometimes it took weeks for equilibrium to establish itself, which he could measure. Miep Coelingh cleverly avoided this.

Her measurement method was highly unusual: ‘The reason was a bottle

discovered by chance, which, probably due to weathering, was covered on the inside with a beautifully uniform layer of a initially unknown substance.' That substance remained unknown, by the way. When the steamed bottle was almost completely filled with alcohol, the non-moistened upper part of the bottle wall was covered with a layer of alcohol vapor that displayed brilliant interference colors. She considered the weathered layer to be an extremely thin, homogeneous layer of gel. Attempts to produce a similar layer on other bottles failed. Therefore, 'most experiments were done with this one bottle.'

She assumed that changes in water vapor pressure would affect the gel layer; for example, part of the capillary-bound water would disappear at a lower temperature and vapor pressure, and the layer would then display a different interference color according to the ring pattern described by Newton. In contrast to Van Bemmelen's measurements, she used her quick color measurements. She found, unlike her colleague, not only gradual transitions but also two sharp color changes. She assumed that the pores of the layer were either fully or completely drained. She did not have quantitative data on the water content of the gel during these changes.

Miep Coelingh had built a device herself for the measurements. The color changes of the layer in the particular bottle were reproducible and sometimes preceded by 'speckles' which she interpreted as 'evaporation nuclei,' whose existence she had 'demonstrated with certainty.' She had photographed, traced, and colored several interference colors.

It was a curious investigation. She based herself quantitatively on the theory of capillary forces and worked with a formula from 1871 by Thomson, with which they converted color changes into an estimate of the diameters of the gel pores. The dissertation was not outstanding, but it was patient and creative work. There were no acknowledgments to Kruyt or to people in her immediate surroundings in the thesis. However, friends of the Minnaerts reported that the couple had discussed the thesis a lot and had also worked on it together.

Her friend Greet Miessen remembers that at Miep Coelingh's graduation dinner, the menu cards were made in the colors she had observed on the glass surface. Minnaert noted: 'Miep graduates, much acclaim and interest. The boys are allowed to sit at the meal, which they remember fondly.'

The psychological problems of Miep Coelingh

Minnaert's appointment meant that they would move to Utrecht. It remained unclear when the family would occupy the professor's house. In December 1938, the house on Parklaan was sold for fl. 8,000,- at a loss. The move became a plaything of the curators' and beauty committees' approvals regarding renovation, relocation, and reorganization. Cards from 1939 show the concern of friends and family members. From sister Wil and Marius in Norway: 'How are you, Miep? Still so tired and exhausted? You should come here to recover!' In August, friend Truus wrote from Bergen (NH): 'What about the moving plans? Otherwise, I'll rent a house for you in August! See you soon...'

Miep Coelingh was under pressure. She had difficulties with raising the boys, to whom she could give little warmth, and the boys reacted with cleanliness problems. She must have felt guilty. Her relationships with her mother-in-law and her own mother had not improved. Her husband continued to care for his own mother, who lived on the estate, and was involved in various time-consuming projects by the late 1930s. His lectures for amateur groups and folk universities continued as usual. The nights were reserved for the Atlas and De Natuurkunde van 't Vrije Veld. He must have been largely absent for his wife. His career was all-determining: it decided whether the family, including her, would move to America or Utrecht.

Her obtaining a doctorate had been extremely progressive, but it was unclear how things would proceed further. It is possible that Miep clung to her degree for some time. However, obtaining a doctorate was merely a reprieve. Legislation in conservative Netherlands prohibited married women from paid government work after the age of 30. Her subject was unconventional, so she had little chance with private institutions. She was too proud to take on a role in her husband's shadow. The brave, unconventional, and combative Miep Coelingh could no longer cope.

In 1939, Minnaert noted in his diary: 'Miep must be treated by Dr. Rümke. Initially, two months of rest in Utrecht.' After her return to Bilthoven: 'Miep must constantly write down her dreams, which takes up a large part of her day; also read and work on psychological books.' Rümke was a colleague of Minnaert and a pioneer of psychotherapy in the Netherlands. Miep had to create a life story and describe her dreams. It had struck Rümke that her mother was absent from her life story. Miep's friend Greet Miessen, who sometimes babysat the boys and was allowed to read her notes, remembered that they also dealt with her husband and sexual issues. The approach used in Rümke's psychotherapy makes this likely as well. Fur-

thermore, it is questionable whether the problems with her mother were not reactivated because Miep had to confront her mother-in-law on Parklaan.

At the end of 1939, on December 18, Jozefina Minnaert-Van Overberge passed away. The ban on visiting Belgium was lifted earlier because he wrote: 'The children strongly feel the loss, even though we tried to take away their fear of death. We are all going to Ghent for the funeral; during the ceremony, the boys will stay with the Mahy family.' His children shared his feelings; his wife was included in the word 'all.' His mother had reached the age of 83 and passed away 37 years after her husband Jozef.

Suddenly, the decision was made. A week after the funeral, Minnaert rented the property at Bijlhouwerstraat 1, directly across from the Physics Laboratory. In January 1940, they moved. On February 1st, the last moving truck arrived in temperatures of minus ten degrees. The diary states: 'The Pegus heating in the new house is wonderful. The boys are attending the Montessori school in Utrecht, which doesn't quite suit them. Now we can have lunch together every day; I save a lot of time.' On that same day, the renovation and relocation of the spectrograph to the future home on Bolwerk also began.

Miep could resume her tasks. Minnaert wrote: 'Koen is often very troublesome. We are also having him treated by Dr. Rümke, which seems to help. Especially his relationship with Bou is a weak point. We're taking Bou to see Dr. Carstens because he complains a lot about headaches and 'stomach pain.' However, this doesn't seem to have any particular meaning. Since there are indications of general weakness, a metabolic investigation is recommended.' The trust in medical expertise grew in line with the disbelief in his own psychological abilities. Half of the residential house was allocated to the Observatory: 'These first few months are terribly chaotic and very makeshift, but gradually one can see everything taking on the forms we had imagined for ourselves.' That house had recently been the subject of a curious and ominous poem by the poet Hendrik Marsman, **The Zodiac of the Dead**. He described the memories of an adolescent about this bastion with an ever-observant father and a mother in mortal distress."

"He no longer strays. Without him knowing it,
A magnet has redirected his step
Toward the wavy bulwark
Where the old house lies on the modest hill.
The moat forms a lasso around the park,
The morning lingers under the elm's night

The swans drift asleep in the canal.
He walks around the house
And feels the wall;
Here was his room,
Here his mother lay in her agony;
Above that tall window on the bastion
His father every starry night
Would aim his binoculars from the beach of the horizon
Along the deserts of the firmament."

A year later, Marsman drowned when the ship carrying him to England was torpedoed by the Germans. During those wartime days, Minnaert, who had to guard the bastion with his family, wrote: 'We sleep together in the Observatory, which is being renovated; the boys are a bit scared in the strange environment, creaking doors. Evacuation is being prepared; Miep would be an acting group leader. - A large cloud above burning Rotterdam on Sunday; the sun has a blood-red color, soot particles and pieces of burnt paper swirl through the streets. - The German troops' entry takes a long time, along Ledig Erf.' War had broken out.

Ornstein removed from his laboratory

For Minnaert, it was a foregone conclusion that scientific work had to be continued, especially during wartime. In an anecdote from the first day of the war, instrument maker Van Straten arrives at work around half-past eight. He sends one of the apprentices to Bijlhouwerstraat: "Professor, what should we do?" Minnaert: "What's wrong, Jan, have you run out of work?" For Minnaert, science was the highest cultural asset and, as such, a weapon against fascism. Maintaining it was an act of resistance for him, a mission in the struggle for a better world. Yet it also seemed as if he retreated into his scientific domain to defend himself against the hostile outside world.

On September 1st, the house on Bolwerk became habitable, and they moved. On December 7, the Observatory officially came into operation. NRC provided an impression of the renovation ordeal. The spectrograph tower was initially supposed to extend eight meters above the roof but ultimately placed on the flat roof in a movable metal shed when the plans finally met the requirements of the beautification committee and the department found the costs too high.

Classes resumed at the beginning of the academic year. Various anti-Jewish measures came into effect. Jews had to register separately. Jewish butchers were barred from the slaughterhouse. The antisemitic film **The Eternal Jew** was screened. Posters reading 'Jews not wanted' appeared in the city. On November 25, 1940, Jewish professors were formally banned from entering the buildings: at Minnaert's faculty, this affected Ornstein and the mathematician Wolff.

At 10 a.m. that day, twenty first- and second-year students arrived for class at Sonnenborgh 35. According to De Jager, the atmosphere was tense: 'Minnaert opened the class with an unforgettable speech in his magnificent Dutch. He expressed his deep indignation over the recent measures against Jewish professors and shared his conviction that in the end, the forces of darkness would be defeated by the positive forces of progress, culture, justice, and civilization. The seemingly weak forces of the researching scholar, seeking truth and accuracy, would ultimately triumph over crude intimidation, brutal force, and the racial delusions of the oppressor. He concluded with a reference to his own professor MacLeod, who once addressed his Flemish students: Students, work! In your study rooms, you are invincible!'

The speech did not gain the recognition of those by Leiden jurist Clevringa or Utrecht botanist Koningsberger, who addressed larger audiences. Ornstein bitterly resigned as chairman of the Dutch Physics Association and even terminated his membership. He withdrew and no longer received visitors at home. The dynamic researcher and Zionist was a broken man at 36. He passed away on May 20, 1941.

Minnaert had undertaken all sorts of things with Ornstein for twenty years. Together, they had established the teacher training program from scratch. Minnaert owed no small part of his fame to the 'world center of photometry' that Ornstein had created. On the front page of the Utrecht Faculty Gazette of May 23, Minnaert wrote an In Memoriam for his Jewish colleague: 'A man of great stature has left us. (...) Sorrow fills us when we recall all that he had to endure in recent months. But as he lies on his deathbed, the machines hum and the electric current flows through the thousands of wires in his laboratory. His deeds live on. His work cannot perish. His memory will remain unforgettable for us all.'

Minnaert was indirectly involved in Ornstein's succession. The faculty board asked him if he aspired to the position of the physicist Ornstein, as he could claim it as an extraordinary professor. Minnaert declined the promotion. The faculty board was pleased with this and wrote a letter on its own initiative to the curators, advocating for Minnaert's appointment as a full professor. Following this, J. Milatz was appointed as professor-director.

Conference and arrest

In June 1941, Minnaert organized a three-day meeting of astronomers, PhD students, teachers, and students. The first Dutch Astronomers Conference (NAC) took place at the Maerten Maartens House in Doorn. The goal was to promote a sense of shared fate and resilience: strengthening the morale and cohesion of the astronomical community. Astronomist De Jager recalls that Minnaert, during an evening conversation, proclaimed the argument that when international interest conflicts with national interest, the former should take precedence: 'A strange remark in those bizarre times, when the world consisted of only two types of people: ours and the enemy.' However, Minnaert's stance distanced him from the second Flemish collaboration. This NAC proved to be a viable institution.

The nocturnal observations of the moon were ideal above the darkened city of Utrecht. During the war years, Minnaert would intensively study the moon: the only celestial body where 'individual points' could be considered. The brightness of the lunar surface during changing phases and angles of observation indirectly reveals information about the geometric and physical properties of the lunar soil. Minnaert made original use of an optical theorem by the physicist H. von Helmholtz from his **Theorie der Wärme**: the principle of reciprocity. Assuming that significant parts of the lunar surface have the same composition everywhere, he could predict points of equal brightness on various locations of the lunar disk using this principle. He then checked whether those places on the lunar surface, whose brightness he had determined photometrically, were indeed covered with the same type of material. Minnaert's argument aroused interest due to the broad applicability of the principle he uncovered.

In 1941, his **The reciprocity principle in lunar photometry** appeared. 'A systematic investigation of all published data is now being undertaken and will be published later.' With this, he had another extensive project underway. On photographic plates of the lunar surface, he selected several areas of the same type, either 'plains' or *mariae*, or 'mountainous landscapes,' *terrae*, whose brightness he compared. Subsequently, building on the work of many observers, he derived collections of points with equal brightness: *isophotes*. He transformed these curves, which largely follow the meridians, into hypotheses about the photometric properties of different types of lunar surfaces. According to the *Utrechts Dagblad*, during the lunar eclipse of March 3, 1942, Minnaert made 30 photographs of the moon's surface in various stages of eclipse. Testing Minnaert's hypotheses against such photo series resulted in an extensive publication about the presumed condition of

the moon's surface.

Sometimes it seemed as if the war didn't concern Minnaert at all. Utrecht, like Ghent, was far from the front. Scientific activities completely occupied him. Yet he had spoken out publicly at least twice against the injustice done to Jewish colleagues. It didn't seem to matter much to the occupiers. Until they arrested him in Rotterdam and took him away in a van to Brabant via the still-unopened Maas tunnel.

Endnotes:

1 Notes from the Curators of October 27, 1936. Archief-Curatoren. De Jager, 1993, 75.

2 Struve to Minnaert, March 6, 1937.

3 Kuiper to Minnaert, March 7, 1937.

4 An extraordinary professor received the salary of a lecturer.

5 Minnaert to Struve, undated.

6 Minnaert, handwritten to L. Rutten, undated. 7 Kuiper to Minnaert, April 12, 1937.

8 Struve to Minnaert, April 20, 1937.

9 Kuiper to Minnaert, April 20, 1937. Bok is Prof. Dr. Bart Bok, who worked at Harvard with Donald M. Menzel.

10 Utrechts Dagblad of June 17, 1937.

11 Pannekoek to Minnaert, June 20, 1937. 12 Het Utrechts Archief, number 464, employee salary statements university.

13 Minnaert, 1937. The little blue book was sprinkled with gray drops, so the cover seemed like a starry sky. This discovery was accidentally repeated on the ceiling of the study room in the Minnaert building (1998).

14 Nieuw Vlaanderen, November 13, 1937.

15 Dedeurwaerder, 2002, 573.

16 Hugo Claus' *Het Verdriet van België* deals with this, beautifully depicting Flemish sorrow, and Erwin Mortier's (nota bene!) *Marcel*.

17 De Jager, 1993, 76.

18 De Jager, 1993, 78.

19 Minnaert's lecture notes: *The Earth and the Planets and Sun, Stars, and the Universe*. These were very progressive at the time.

20 Interview with Henk van de Hulst.

21 Interview with Kees de Jager. Also **A Man After My Own Heart**, for a Studium Generale in Utrecht, in Haakma (1998).

22 Minnaert and Bannier, 1936e.

23 Mulders to Minnaert. File with letters from 1936-1937 in the astronomy archives.

- 24 Minnaert and Houtgast (1938c).
- 25 Minnaert's retrospective on **Fourty Years** in: De Jager, 1965.
- 26 De Jager, 1993, 49.
- 27 Coelingh, 1938.
- 28 Wil Coelingh and her husband Marius, undated from 1939.
- 29 Truus Van Cittert-Eymers to Miep, August 3, 1939.
- 30 Her bosom friend Truus Eymers was dismissed in 1938 when she married her colleague Van Cittert. M.I.C. Offereins: Johanna Geertruida van Cittert-Eymers, NVOX 8, October 1997.
- 31 Diary, March 29, 1940.
- 32 Hendrik Marsman, **Tempel en Kruis**, 1939.
- 33 De Jager, 1993, 44. 34 NRC, December 8, 1940.
- 35 De Jager, 1993, 45.
- 36 Heijmans, 1994, 156. Van Walsum, 1995, 43, claims that Ornstein committed suicide.
- 37 In the professional journals of 1941 and 1942, respectful biographies of Ornstein by Kramers and Moll were published.
- 38 Signed by chairman W. Barrau and secretary V.J. Koningsberger.
- 39 De Jager, **A Man After My Own Heart**, in Haakma, 1998.
- 40 The NAC has become an institution; now together with Flemish colleagues. The 1993 conference was dedicated to the 100th anniversary of Minnaert's birth.
- 41 Helmholtz, **Theorie der Wärme**, 1844, reprinted in 1922. 42 Minnaert, (1941).
- 43 Utrechts Dagblad, March 4, 1942.
- 44 These must have been processed in a review article by Minnaert (1960) in the astronomy series of his friend G.P. Kuiper: **The Photometry of the Moon**.

Chapter 14

A Prisoner-of-War Camp as a People's University

'Skilled engineers will find work in abundance: the world is waiting to focus on peace and start rebuilding, and it will be wonderful to be able to contribute to that.'

Hostage and resistance

On May 4, 1942, the Germans had arrested Minnaert. On May 8, Miep wrote to Minnaert's niece Marie: 'At 12 o'clock, they took him out of his final exams in Rotterdam and brought him together with 80 other South Hollanders; at 5 o'clock, they were loaded into large trucks and driven to North Brabant. He had nothing with him: no toothbrush, no pajamas, no food.' She suspected that 'former friends' had put him on a list: 'I am experiencing a lot of kindness, both from friends and acquaintances and even from complete strangers. If anything can teach us Dutch people a sense of solidarity, it's these methods!' She thought of collaborating nationalists who wanted to settle a score and, when asked, said: 'I went to the Sicherheitsdienst in The Hague and asked to speak to the head of the department for 2.50 guilders, which I visibly stuffed into a small hand towel. I was allowed inside. I provoked them: 'I don't understand why you've arrested my husband. He is not anti-German.' That was true, because he was anti-fascist. Then the SD officer picked up a thick book, looked it up, and said: 'Your husband made a communist fist at De Clercq's funeral.'

Minnaert's arrest was no coincidence; neither was the entire operation. The occupiers arrested 600 men who played a significant role in society

and brought them together at the Beekvliet seminary in Sint Michielsgestel. Something similar had already happened shortly after the conquest of the Netherlands. The first group of hostages, initially detained in Buchenwald, was meant to prevent the Dutch government from taking revenge on Germans in the East Indies. After Japan's conquest of the island kingdom, that motivation disappeared. Still, in the spring of 1942, a new group was added to the 'Indische gijzelaars' (East Indies hostages). For the Germans, both groups, who stayed together in Beekvliet for several months, served as insurance against spectacular resistance actions and a popular uprising. The Germans could as reprisal measure execute an arbitrary number of hostages.

The hostages lived in groups in the rooms. Minnaert's group of four called themselves the kongsi. The professor was extremely sociable, shared the contents of the family and observatory packages, and cleaned the toilet every morning before dawn. Roommate Roest once received two large turnips, cut them into pieces, cooked them, and found them inedible. The kongsi watched in amazement as the scholar devoured the turnip with relish. A caricature of Miel Prager added to the fun afterward. Camp life was sheltered and in no way comparable to the situation in concentration camps.

Immediately upon his arrival, Minnaert had known what he had to do. His mission was to forge the gathered group into a solidary community through study. The Romanist Brugmans wrote: 'Minnaert had become accustomed to the idea of a long stay and noted names in a small notebook with very tiny letters. Names and subjects. For lectures, courses, and lessons. He always had a new collaborator and his eyes sparkled when he nodded vigorously and noted: "Yes! Yes! Very interesting, really VERY interesting! So we'll arrange..." Some laughed at him when he made plans for three months ahead. But if one is used to thinking in light-years, oh...' His equal was Robert Baelde, a descendant of a Rotterdam aristocratic family, former student of the Erasmiaans Gymnasium, leader of the Volksuniversiteiten and the Nederlandse Unie.

Minnaert became chairman and Baelde adjutant of the lectures and courses committee. As early as May 9, the writer Anton van Duinkerken gave a lecture on Brabantse humor. Brugmans: 'We laughed. Hearty and unselfconscious. But also with something triumphant, something challenging, as if we wanted to demonstrate that they couldn't break us.' The adage from Julius Mac Leod, 'in your study space you are invincible,' it came true: the entire camp became a people's university. The foundation for the later 'spirit of Michielsgestel' was laid in those first weeks. On May 11, registration began for the many dozens of lectures, courses, and films. By late May, Minnaert asked the people from his workshop to manufacture brackets with

which he could mount blackboards on the walls. He provided the instrument maker N. van Straten with precise measurements and working drawings.

After the August 1942 bombing of a railway line in Rotterdam, the Germans carried out the first executions. On August 14, this involved the Rotterdammers Robert Baelde, Chris Bennekers, and Willem Ruys, along with Otto Count of Limburg Stirum and Alexander Baron Schimmelpenninck van der Oije. Minnaert had feared for his life and made this known to the people at the Observatory: 'The tension here is naturally very great, but people are keeping themselves dignified and composed. One cannot know how this will end. My best wishes are with you; may your activities at the Observatory bring you good fortune and much satisfaction.' These words had caused great consternation.

Before the executions, Minnaert had spoken at length with the Flemish photographer and writer Paul Guernonprez, who had become his best friend in the camp: 'We have considered where we, atheists, must draw our strength from. We sat together with a few people. When he spoke about his wife, he could not control himself. We are mortal - our actions live on, they are immortal, insignificant when viewed individually, important within the complex of the great whole.' That had been Minnaert's comfort. The death of Baelde had moved Minnaert deeply. Who would be next in line for new executions? Minnaert had reason to suspect that he was at increased risk: former associates like NSB leader Robert Van Genechten, who had become an Officer of Justice in The Hague, could easily take revenge on him.

Minnaert and the circle work

The Utrecht journalist P.H. Ritter jr., like Brugmans a flamingant, wrote that Minnaert's nature easily maintained itself in the camp: 'At Beekvliet, I met him reading, writing, noting, measuring on the edge of sloppy tables, amidst deafening noise. Surrounded by gesticulating, chattering, smoking, and billiard-playing people, this work saint stayed as if in an invisible chapel of attention.' Minnaert always moved at a trot, rushing from one task to another. In Ritter's loving and slightly idolizing sketch, it is clear that Minnaert devoted much energy to personal assistance, which he considered part of his duties in Michielsgestel: he uplifted people and unwaveringly showed faith in a better future.

He continued his moon research, which he could pursue thanks to the many shipments from his assistant Houtgast, edited the 'Astronomy' series from publisher Servire, and contributed to Oosthoek's encyclopedia. He cor-

responded intensively with his wife, children, friends, and colleagues. With his friend Jan Burgers, he began a philosophical correspondence on 'free will.' As in Utrecht, he was short on time.

He gave a 45-lecture course on astronomy in the camp. According to Brugmans, Minnaert became a defining figure in the camp also through these lectures. He contributed to the course 'The Origin of Earth,' where his colleagues J.J. Kloppert, V.J. Koningsberger, and N. Tinbergen presented as well. The lectures on 'Modern Painting' by Dr. G. Knuttel Wzn., director of The Hague Municipal Museum, inspired him to give a lecture on 'Artificial Light and Architecture,' drawing from the dissertation of his friend Truus Eymers. In addition to courses in navigation, he taught Swedish to both beginners and advanced learners and assisted with H. van der Heyden's carpentry course. Using slides, he held talks on topics such as 'Light and Color in the Dutch Landscape,' 'The Moon in Folk Life and Science,' 'Balloon Flights in the Stratosphere,' 'Does Music Have Meaning?,' 'Selma Lagerlöf's Gösta Berling,' 'The National Anthem Through the Ages,' and 'Musical Instruments.'

On New Year's Eve 1942, the appreciation of this community was expressed in play of Thomasvaer and Pieterneel:

T: 'But aside from entertainment, as is said in the country, many have dedicated themselves to study here. A chief study coordinator will therefore certainly not be lacking, for they must have looked out for a professor for that purpose.'

G: 'It is Minnaert, who is however called the course coordinator, an astronomer, also appointed as a darkening specialist. Besides darkening the windows of the lecture rooms, he works with Sanders on countless courses together.'

T: 'Thus, many who previously knew neither God nor sour apples will soon leave the camp as all-around encyclopedists.'

In the second camp year, the 'circles' were formed, which would map out post-war Netherlands. Co-opted groups of politicians, industrialists, and civil servants discussed party formation, education policy, and political renewal here. The transitional Schermerhorn cabinet was formed here. Minnaert participated in the circle on education policy and was also a member of Knuttel's Arts Circle. This group consisted of seventeen selected participants, including composer Hendrik Andriessen, Simon Vestdijk, and classicist Onno Damsté. Minnaert had Ibsen's Norwegian text of Peer Gynt brought over, made his own translation, introduced Grieg's music on the piano, and led the piece with three lectures. Afterwards, it was 'role-wise' performed on a Saturday evening, with Minnaert connecting the roles through

speech. Sanders wrote: 'Seldom have we been brought so respectfully and closely to a work of art.' Others spoke of a hilarious performance. Notably, Minnaert had a preference for Peer and Gösta, the two great rogue figures from Scandinavian literature who sell their souls to the devil and leave their loved ones waiting in vain for a lifetime.

At Easter 1943, the carpentry group organized the exhibition *What Hostages Are Making Now*. The croquet game, 'made by Prof. Minnaert himself in the carpentry workshop,' was considered the highlight. His children gratefully tried it out on the lawn of Sonnenborgh. He was also a member of the exclusive Travel Club, whose members organized lectures with slides: this was the prelude to the public Sunday afternoon lecture *Gestel on Travel*.

Brugmans on Minnaert

All of this can be inferred from publications and correspondences. A more intimate glimpse was provided by a conversation with the Romanist Henk Brugmans. He could vividly recall Minnaert at the camp and found him to be lonely. Brugmans described him as somewhat naive, an independent communist, for whom 'communism' meant that everything should become collective and self-interest should disappear. The joy of labor was lacking due to capitalism. If capitalism were gone, things would be very different.

Minnaert had once approached Brugmans on his own initiative: 'You are a social democrat. . .,' he began. He explained that a new way of living together could only be achieved through revolution. Brugmans responded by saying that a better society could not be realized with the help of a dictatorship. Their opinions clashed, but Minnaert had no problem with that. The conversation broke down on another point. Minnaert had heard that Brugmans had 'become a Christian.' Brugmans confirmed this. Minnaert then said: 'Is that your final word? Then we can end the conversation.'

Brugmans added: 'Minnaert strongly believed that the Catholic Church had condemned Galileo. As an institution, the Church was hostile to intellectual development. The fact that Flemings were Catholic was bad enough. That an intellectual like myself was not an atheist, he found unbearable—I was putting reason aside. He professed atheism; for that, he had faced the stake. As a conversational partner, you were depersonalized. He didn't say: 'Tell me, Brugmans, you're not that foolish, how do you see it?' Otherwise, he was a kind personality.'

Brugmans found Minnaert an excellent teacher: 'In workers' education,

you must reduce difficult issues to comprehensible conclusions without simplifying them. Your listeners want to make an effort, but there must be a result to match that. Minnaert was an excellent popularizer. He had learned this in the Flemish Movement. He wasn't the only one working all day, though. I was working on my book about European culture, which was meant to answer the question of how the German mind could have been receptive to Hitler. The difference was that I engaged in numerous discussions about it, while Minnaert worked in isolation on his publications about astronomy.

According to Brugmans, Minnaert had a close friend, Paul Guermonprez, a photography instructor at The Hague Academy of Arts. They were like a clan of two. I remember a lecture about the Casablanca Conference in January 1943, where the Allies decided to continue until the unconditional surrender. It sounded appealing, but I thought it was a gift for Goebbels. Any opposition would lose its footing. Guermonprez said that National Socialism had to be eradicated root and branch. I can't imagine Minnaert thinking differently about it.

In 1936, Minnaert had described himself as a left-wing socialist; according to Brugmans, he had since moved further along. While authoritarian Flemish nationalism committed suicide by siding with Hitler in the Soviet Union, Minnaert seemed drawn to the ideological principles of communism. The fact that Stalin was engaged in a life-and-death struggle with Hitler likely did not diminish his sympathy. His pursuit of 'mutual service' appeared to align in philosophy, science, and politics with the struggle for a socialist society.

Miep's hospital admission and the family problems

Minnaert would remain captive for two years. During that time, he received three days of leave on three occasions. On February 12, 1944, his 51st birthday, he was allowed to receive his wife and children. His 50th birthday had been celebrated with the group. The occupiers restricted the frequency and size of the censored letters. Minnaert dedicated parts of the letters to his wife for Koen and Boudewijn. His children preserved those strips. Minnaert's letters to Miep's friend Greet Smit-Miessen were also kept. The little that has been preserved provides an image of what happened at home.

The Minnaerts would have gone to Dalfsen that summer. Greet had invited Miep to join her, but during the vacation, Miep had suffered a sciatica attack and could barely move. On August 9, 1942, Greet received a response

to her letter 16 'from Marcel': 'I can so well understand how you feel about psychoanalysis and dream interpretations; for more than three years, I have experienced this myself, and while I highly value the scientific insights of this field, I somewhat doubt its value as a remedy. But ultimately, I don't know much about it.'

In October 1942, Rümke had decided to admit Miep Coelingh to a rest home. Greet then offered, together with her husband, physicist Hans Smit, to take care of the children and the observatory. On December 17, Minnaert wrote to Greet, who had sought his help: 'You ask how we can best help Miep regain her will to live. Rest is first necessary; afterward, she must feel that she can do something, develop self-respect and self-worth. If she notices that others love her, it already helps: When I am dear to someone else, then I am more dear to myself. But something else is also needed to captivate her, something she can do well and with which she can achieve something in not too long a time. I see the most opportunity in the direction of interior architecture.'

At the end of December, Minnaert was granted three days of leave and took stock. He thanked Greet in an open-hearted letter, providing guidelines for upbringing: 'You know that Miep is the great love of my life, which becomes ever more complete and pure. But you have naturally long felt, with a woman's intuition, that I have loved you a little since the first time I saw you. This means that in my friendship for you, there is an added quality that always gives our conversations and correspondence a special charm. Is it any wonder that I trust you where it concerns the upbringing of our boys? Because you understand me, I may occasionally write down what seems to me to be specially considered: you will not regard this as criticism, but as comradely consultation.'

May I then mention two things? 1. Let us give Bou and Koen our full understanding and love. Bou's childlike nature is more immediately striking; I feel a deep connection with him; but my love goes just as much to Koen. At the moment, he misses his father and mother in a more conscious way than Bou; let us respect his first idealistic thoughts and try to make them purer, more beautiful, and more substantial. 2. Let us always represent to them their mother's love as continuously present. For that is how it is. Miep loves them, she loves them passionately, even if you wouldn't say so, and even if she herself denies it. The danger against which I am warning you I have felt threatening myself; I found it so painful that the children had to miss expressions of maternal love that I was in danger of displacing Miep. That must not happen! It would be an irreparable loss both for Miep and for the boys. Yet, do comfort them with all the warmth they have missed for

so long—please do that, let them feel plenty of sunshine around them! But keep talking about Miep, about Miep who will soon return, keep memories of her alive. I have not for one moment noticed that you would act otherwise than in this spirit; I write this only because I know the danger myself.'

Minnaert revealed to Greet the dynamics of his family: he denied any shared responsibility for his wife's illness. About Christmas in the camp, he wrote: 'For us unbelievers, such days are always a bit harder than for others: we cannot join in the great community, which we would nevertheless like to do. I want to write especially now to the people at home, read in *Pan* and work on a sketch about life's problems, in which I try to outline modern man's faith in life.'

On January 6, 1943, Miep Coelingh wrote to Greet that resting was not working out. She wasn't getting anything nice to eat: not even a biscuit, even during Christmas. She made a wish list of food items. In the seven-page letter, there were no questions about the boys: only at the end 'many greetings for you four.' From a few letters, it appears that the relationship between Miep Coelingh and her friend Smit-Miessen became strained at one point.

On January 26, Minnaert wrote to Greet: 'Fortunately, I had already written a note to Koen when a note from Miep arrived, which makes me so gloomy that I need all my strength to endure it.' But, Minnaert wrote, 'the plan of the friends coming to eat and stay is wonderful!!' A birthday party for Koen: perhaps the children had never experienced anything like it. On February 2, 1943, Marcel asked Greet for help organizing his fiftieth birthday in the camp. He needed money to treat the communal meal and added for the *Sterrenwachters*: 'If anyone wants to give me some music, then: César Franck: *Eros and Psyche* (preferably). Or works by Bjørnsen in Norwegian (Arne; Arnljot Gelline), R.M. Rilke: *Die Weise von Liebe und Tod des Cornets Christoph Rilke*, A. Schweitzer: J.S. Bach, *Le musicien-poète*. Or from the *Palet* series: Breitner (I already have *Scorel*).' On February 3, Amice Minnaert received a note from Rümke, in which he wrote that 'Miep' was doing well.

On March 20, Hans Smit wrote a long letter 'to Marcel,' complaining: 'I consider a longer stay of Koen and Greet unsuitable: 1. because I (very simply) do not want Greet to be repeatedly insulted; 2. because the situation that Koen can continue doing this without sharp reactions is educationally incorrect.' Minnaert wrote back that it was useful that he knew about the problems: 'I will do what I can.' He maintained an intensive correspondence with his sons, after all. On March 22, 1943, Miep Coelingh could take charge of the family again. The Smits had held out for five months; it seemed that

it wouldn't have to last much longer."

Koen: the world is waiting for builders...

In over 700 days, Minnaert sent Koen 111 strips of paper and letters. He told him about what he was doing and things that seemed interesting to him for his eldest son. He asked about the twelve-year-old's new gymnasium and the names of his new friends. The children looked forward to their father's heartfelt mail, which they promptly answered so that he could connect with their experiences. Back then, the mail took a day or half a day because there were once two or even three postal deliveries a day. Minnaert reminisced about his own memories, for example, that in Flanders, instead of a pencil case, he had a small container when he went to the atheneum. He drew the equipment: 'It contained a pencil, eraser, penholder, etc. We also had a 50 cm ruler, which was especially useful as a "sword" in fights! And everything together was in a bag with a long strap that we wore over our shoulder. That strap was also very useful; you could swing the bag until it landed on someone's head with a thud! - But today's youth is so much more peaceful, isn't it?' Of course, he continued the relationship he already had with the children. Koen was jealous, troublesome, sensitive, and stubborn but showed scientific interest, which Minnaert skillfully encouraged. On August 31st, he responded to Koen's first Latin sentences. The poor boy had written in the best gymnasium tradition: 'presemus feminis': 'We have precedence over women.' His father: 'That sounds so unpleasant that I can hardly believe you mean it.' Minnaert told about the way he had shown the solar eclipse of September 1942 to the hostages: a pasted-on eyeglass with a focal length of two meters had neatly depicted the eclipse.

When Koen had written that he had borrowed 'Aktaion under the stars' from the library, his father could answer: 'Vestdijk, the writer, one of our best young literary figures, is also here in Gestel.' The figure Cheiron inspired wisdom about life: 'Every human being is actually more or less a centaur. One part of us is wild, wants to devour greedily, fight, be rough; but another part is human, civilized, familiar with art and science. The connection of those two groups of feelings in humans creates all kinds of contradictions, just as the duality of the centaur does.'

At the beginning of 1943, he had consulted his roommate, a Delft engineer: 'I thought you would feel most for mechanical engineering. The future possibilities after the war will certainly be great. Capable engineers will find work in abundance: the world is waiting for peace to start rebuilding, and

it will be wonderful to be able to contribute to that. Especially important is that you grow up to be a decent person who is happy and makes others around him happy, who dares to do something and can do something, who has ideals and strives for them. I promise you that I will do everything I can to help you develop a genuine beautiful technical hobby, and Mother thinks the same way.' Here Minnaert followed in the footsteps of both his parents and repeated patterns from his childhood. For both boys, he wrote in May 1943 a 'history of mechanics' in six installments with numerous drawings and portraits. The story began on May 22, 1543, exactly 400 years ago, with Copernicus and Rheticus, and continued through Galileo, Tycho Brahe, and Kepler to Newton. He honored the commemoration of the Pole in the camp. These strips were a rich possession, and it's no wonder that both boys preserved them.

Minnaert wrote to Koen about the carpentry course that was organized. The students had to saw a piece of wood perpendicularly, straighten one side of a plank, mark and straighten a cross-section with a carpenter's square, make the surface of a plank smooth, and learn how to make wooden joints. Then you could make a letter stand: 'Don't you feel like joining that course from afar?' Minnaert sent Koen the drawings and told him stories about them. He also sent two caricatures of himself.

In June, exactly two years after the German invasion of the Soviet Union, he replied: 'What do I hear? Have you read Max Havelaar? That knocks me over! I think it's a wonderful book, but I didn't expect you to appreciate it at your age. Wonderful—the story of Saïdja and Adinda, the speech to the chiefs of Lebak, the chapter about the buffalo, and Reverend Wawelaar. And then that brilliant ending! What a writer, what a man! Do you know where he wrote the book? In the cafes on the Grand Market in Brussels. Multatuli once gave a lecture in Ghent. He was wearing a top hat when he entered the hall. Suddenly he threw the hat on the ground and kicked it!' Then he wrote about his friend, the journalist Philippus Roest, who had asked him to create an ex libris with a Latin inscription. 'I came up with all sorts of ideas. From my proposals, he chose this one: Paululum Ride (= laugh a little from time to time). Roest is quite a joker, which seems suitable for him. You see what Latin is good for! It's really a language to express something briefly and powerfully in two words.' After the intervention of the classicist Damsté, it became paulum rideas.

From the vacation address in Hardenberg that Minnaert had been able to arrange through a fellow inmate, Koen had written about his unfamiliarity with 'praying before meals.' Minnaert wrote that this was an 'old custom': 'Even here in the camp, my fellow prisoners always pray before eating, and

of course I wait until they are finished so we can start eating together pleasantly. You must understand that in such an old custom, especially among country people, there is something very human and even poetic to be felt: the farmer imagined that the rain and sunshine were controlled by God; he knew nothing of the natural laws that determine the weather.' Minnaert managed to continue the education and give the children the warmth and attention they deserved. Intimacy was part of this: 'You would probably look up in surprise if you could take a look into the little hut where we sleep and if you were to open my cupboard. Your eye would immediately fall on your portrait and Bou's, and underneath lies a list of your classmates, family birthdays, and Star Watch. In my wallet is Mother's portrait - that's what I always want to carry with me; and along with those two photos from when you were little. That way, I continue to live in thought with you.'

On August 20, 1943, Koen received a model of the gearwork of Eise Eisinga's planetarium in Franeker, which Minnaert had sketched and built for a lecture. This was a rich gift that the sensitive, technically gifted boy must have appreciated. Koen also received a family tree of the Minnaert family with the comment: 'You know there are people who attach great importance to their family tree and spend a lot of money on genealogical research. We don't feel that way about it. What matters is whether a man is decent and good, not whether his ancestors were rich or famous. Preserving those family memories is therefore interesting in our eyes, but not in such a way that you could see from it what we are worth. Similarly, we find all the pride of noble families inappropriate: these people are no more valuable than others just because their ancestors were knights.' After Koen told about the funeral of his rector, Minnaert wrote: 'For a long time, people there have seen something ghastly, gloomy, and mournful in funerals; only in recent years has one begun to turn such gatherings into something beautiful. Isn't it truly beautiful to think together once more about the one who has left us? To remember everything he gave us in terms of kindness and camaraderie? And when you return, you feel the need to enjoy the life you've been given: you want to set your hand to work in the spirit of the man you just commemorated.'

Minnaert even once called Koen for help following something he had heard 'in our educational circle about Montessori schools. The advantages and disadvantages were examined. There was something that struck me; there were people who claimed that you don't learn to listen at a Montessori school. What do you think about that? Now that you've come to a Gymnasium after a Montessori school, you can certainly notice the difference. If it's truly the case that Montessori students don't know the art of listening, then

by all means make an effort to master it soon! It's essential to fully immerse yourself in what the teacher is saying and explaining, and ensure that your thoughts don't wander off in the meantime! Especially at the University, this art of listening is of the utmost importance.' It is remarkable that this objection could surprise the educationalist Minnaert so much. Koen's response has not been preserved.

Cataloging Father's bookcase

On November 30, 1943, Koen proposed to his father that he catalog his bookcase, after Minnaert had earlier pointed out its contents to him and Boudewijn. He responded hesitantly: 'My books are indeed a precious possession for me; they are for me what the saw and the chisel are for the carpenter: tools to work with, thinking tools! I highly appreciate your willingness to take good care of this valuable collection. You will receive further instructions about it.' A few days later, Koen received a guide on how to catalog a field, such as physics or astronomy: 'I imagine you leave all the books as they are but write down all the authors' names on a scrap piece of paper. Then you number them in alphabetical order. Then you take the script and write the names with titles alphabetically according to the names. If you prefer typing, you could take writing paper sheets that will later be compiled together.' He asked Koen what he thought of the proposal. Koen readily agreed.

With his father, Koen had ended up in a serious project. After several letters, number 41 promptly stated: 'In your last letter, you write that I misunderstood you, that you proposed organizing the catalog alphabetically by authors. For curiosity's sake, I'm sending you back your penultimate letter; you'll see that nowhere is there any mention of a catalog organized alphabetically by authors. The etiquette—which you so eagerly want to learn!—requires that in such a case, you write: 'I fear I did not express myself clearly enough,' even if you might think the other person didn't read carefully! Organizing alphabetically seems fine to me. But then per subject. You really have no idea how much work it is to create such a catalog. That would cost you so much time that school, music, or hobbies would seriously suffer from it. If you start with the whole thing and abandon it halfway, we won't get anything out of it. However, if you do one subject, maybe a second later, the catalog already has use. For expansion: a rule open after each book. Is that right?—So everything is then well agreed upon.' That was quite a reprimand for a 13-year-old. What did Minnaert actually care if the

boy stopped after a few attempts? The father seemed to take it even more seriously than the son. Maybe Minnaert thought it was good to teach Koen discipline. Anyway, Father Minnaert suddenly forgot to approach Koen as a child, while he had done so perfectly in his strips for a year and a half. Koen, however, was brave and didn't give up. This cataloging became the main theme in the correspondence.

At the beginning of 1944, Koen received a thick insufficient grade in Latin. Minnaert admonished: 'In these times, when the world is upside down, it is absolutely necessary to use the period of quiet learning and working 100% efficiently, because you don't know what the future will bring, and only if you are good at your work will you stand strong in the world later. And now we shake hands, look each other in the eye, and agree that the next report will be a good one. Won't it? Warm regards from Father.'

The first round of Koen's titanic work was crowned around Minnaert's birthday with a typed catalog. Father thanked him for the eight-page letter: 'I've already enjoyed looking at the catalog; it's truly a beautiful achievement. May I mention one small thing to pay attention to in the future? Nouns in German should be capitalized! But that doesn't hinder practical use, it's just a minor flaw. It's nice that you managed to get a new sheet ready for Mother's birthday.' It's remarkable that his mother didn't point out those German capital letters either.

Koen's Easter report had no failures. He had three eights and good grades 44 in the languages. There was a six for mathematics, which needed to improve if Koen wanted to advance in technology: 'Don't think there will be time later to work on it more. No subject shows such strong internal consistency as mathematics; if you don't know the basics very well, it will come back to haunt you again and again.' 45 Also, the last two letters to Koen were about the catalog. On April 20, Minnaert was unexpectedly released from the camp. With that, the project was likely off the table. It's striking how the relaxed tone of the correspondence with Koen became more businesslike when the child entered the father's territory. Koen's intention was considered, his effort incorporated into the 'program' of the father, and coolly assessed for its practical use. It seemed as if Koen, who had turned 14 had accelerated into adulthood. How different the correspondence with Boudewijn would develop!

Boudewijn: 'no need for earned conversations'

Of the strips and letters to Boudewijn, 122 have been preserved. It seems Minnaert approached his youngest, who was one year younger than Koen, more openly and dared to be more vulnerable. He evoked more memories and appealed to shared emotions: 'Do you remember our house in Bilthoven, and Oma, and Miss Anna, and how we were treated on Sundays? And our walks and bike rides, so many over all those years, making all those roads and paths as familiar as dear friends? And our trips, the highlights of the year: Zandvoort, Wageningen, and The Hague? I also think of our little home celebrations, with St. Nicholas, New Year's, and birthdays. Your first bike, swimming, ice skating. That time you came to pick me up from the boat in Amsterdam after my trip from France. Boy, did we have a good time.'

He also envisioned the future for Bou: 'More than once I dream that you've become a geographer, wandering the world, enjoying nature everywhere, observing and drawing with sketchbook and compass in hand. It's a wonderful profession... But I can also imagine our Bou differently. For instance, as a literary figure. Beautiful stories would emerge from you without you knowing it; you'd see the heroes and heroines of your tales come to life before your eyes. The more you think about them, the clearer you'd hear what they say. And then you'd write it down... There's so much beauty and wonder to be found for anyone willing to roll up their sleeves!'

A few days later, he returned to 'something very close to both our hearts: enjoying nature. If only I could explain how much happiness I've had in my life thanks to the surrounding landscape, observing plants and animals, traveling, and wandering! Could you but understand how much happiness I have owed to the landscapes around me, to the observation of plants and animals, to travel and roaming!'

The simplest way to enjoy nature is to go out into it without worries, with sandwiches in your bag, wandering through rain and shine, across hills and plains. Then there's no need for learned conversations, just observe, listen, smell, and feel how beautiful the landscape is in all its forms, whether in the morning, evening, or afternoon." Minnaert shared his own experiences: "You start paying closer attention to the plants and flowers, and then you discover that each cluster of flowers is like a tiny world unto itself; each flower is like a city, with streets, squares, and beetles walking around as if they were inhabitants. All these flowers together pay attention to one another, opening one after another, ensuring they don't take too much light from each other. Flora, like the works of Heimans, Heinsius, and Thijssse, not only tells you

the names of the flowers but also encourages you to examine the entire plant thoroughly; once you've carefully observed a plant, you'll never forget it. I could also tell you how much I love clouds, fossils, and erratic boulders, and so on."

After that, he switched to what Bou would probably love to hear: "The most complete form of nature enjoyment for me is traveling. And on such a journey, you're not just looking at nature but also at what people have created: their farms, churches, dikes. Also their dialects or language. Gradually, you begin to feel how all these things belong together. I could only dream of the Mediterranean coast with a French- or rather Italian-speaking population; along with that come plants that love sunshine and a mild climate, and villages on mountains with narrow streets and picturesque church towers. And so every country forms a whole. People often say, 'As many languages as you know, as many times you are human.' I would say, 'As many countries as you know, as many times you are human.' A journey is a highlight of life; I'm certain that until my old age, I'll enjoy the unforgettable memories of the beautiful world, which holds new charm in every country.' This is the third letter, and there's a more intimate tone: it reveals a romantic, wandering Minnaert who dares to allow himself and his son desires. He wrote: "When I read your letter, I had the greatest urge to grab you and give you a kiss." Then again, he asked Boudewijn to fetch the photo books: "There are only a few pictures where you'll see me in them. Judging by the photos, you might almost think I wasn't there at all. But you know better. Later, especially, you will understand how happy I was when we made our trips together, how much I enjoyed your childhood, and how a little of my love for you is connected to each of those snapshots."

His wife perhaps asked him to enlighten their twelve-year-old sexually. Minnaert, 50, promised, "to tell you about such things as love, marriage, having children, etc. Of course, you've already heard some things about it, we've even talked about it together before, but still, it might be good for you to read everything all at once." In three letters, he enlightened his son, starting with plants and moving on to humans, ending with mammals and birds. An original order. It was a clear biological story, written honestly and respectfully: "That's how all of this works. There's much more to tell about it. For now, don't discuss this with anyone other than your mother. And you should already understand this: it is such a beautiful thing to have a child that you are only allowed to do so with a woman you care deeply for. It's incredibly wonderful how two people together can create a new human being. How is it possible that some people or schoolchildren laugh about these things or tell silly stories about them!" If Bou didn't understand

something, he could write to his father or ask his mother: "You know you can always count on an answer." He was touched because Bou had just written that his letters meant a lot to him.

Minnaert heard about Bou's choice to attend the gymnasium but thought he would be happier at a school that demanded less: "Well, I hope you'll do well there." When school began: "I hope you will make good friends, who will also be of value to you later. Don't first look at whether a boy is a bit funny; don't just look at whether he's particularly handsome; but look at whether he has character: that's what determines someone's worth. I mean: become friends with boys who are honest, cheerful, and brave." He casually suggested, "Do you already know your way around the bookshelves? Ask your mother if you are allowed to sniff around. Pay attention to how the books are arranged according to subjects. Even within each individual section, there is a more or less fixed order; so try to put the books you take out back in their proper places each time. For example, you could look at Astronomy or Dutch, or Botany and Zoology: just look at titles that interest you, check out the pictures or the table of contents, so you know what you can find in such a book.' Unlike Koen, Boudewijn ignored this invitation. In the fall of 1943, Minnaert wrote a series of letters about his memories of his father and mother and his youth in Flanders. He had never told about the outcome: 'We were sentenced to prison, but since we were gone, this had no effect, only we could not return to the country.'

Bou had received a four in Dutch during the winter of 1943, probably mainly due to spelling mistakes. His father commented: 'Your letters are just as welcome to me with 100 spelling mistakes as if they were perfect; perhaps even more so.' Koen would not have gotten away with that! He wished Bou for 1944: 'That there may be a good peace, leading to a happier and safer world. That Mother would fully recover, as she already almost is, and that she wouldn't have too much trouble.' While Minnaert's correspondence with Koen became more impersonal, the one with Boudewijn seemed to become increasingly confidential. He shared a lot about himself in both correspondences: the children could certainly count on his attention and care. Conversely, this correspondence was a means for Minnaert to continue influencing and directing the world of Sonnenborgh. He also remained very precisely informed about the management of the Observatory while in the camp.

The Observatory and Michielsgestel

At the Observatory in 1942, the staff included head assistant J. Houtgast, secretary Ch. van Sminia, assistant-promovendus W.J. Claas, instrument maker N. van Straten, two apprentices, and the cleaner. Minnaert maintained close contact with Houtgast: they exchanged 158 letters and packages. A few weeks after the hostage-taking, Houtgast graduated cum laude under the theoretical physicist Leon Rosenfeld, a Waloon, and a former colleague of Niels Bohr. After his promotion, Houtgast wrote: 'Your absence has deeply moved everyone, professors and audience alike, and no less those who congratulated me in writing, so you have been even more in all our thoughts and on all lips than would otherwise have been the case. All professors came to the reception in gowns in your honor, bringing 57 congratulations.' His German friend Unsöld complimented Minnaert on his dissertation.

Minnaert also arranged for his replacement as a lecturer in didactics and methodology. For twelve years, he had taught this course unpaid, wrote the faculty board to the curators: 'Professor Minnaert wished not to hand over this task to anyone else until a suitable person could be appointed for this purpose.' From Beekvliet, Minnaert announced that W. Reindersma, former rector of the Nederlandsch Lyceum, wanted to succeed him: 'Someone entirely suited for this task in all respects.' Houtgast proposed to Minnaert that summer of 1942 that they would start measuring the Atlas. With the help of the planimeter, they could begin manually measuring the equivalent widths of all line profiles: 'Claas starts with the lines needed for his research. The position of the continuum is indicated by a pencil line so that one can always check later what has been measured.' Minnaert welcomed this initiative.

On February 6, 1943, German soldiers raided the University building and took 116 students hostage. After several months, they were released. Students had to sign a loyalty declaration. In Utrecht, only one in eight students signed it. This was followed by mass hiding and cessation of education. Students went into hiding at the Observatory, such as Kees de Jager, Dedde de Jong, Hans Hubenet, and Wim Claas, while Henk van de Hulst was appointed as an assistant on Minnaert's proposal. The more people went into hiding, the faster the Sisyphean task progressed: a 'work community for measuring the Atlas' emerged.

Sometimes it seemed as if the many activities made Minnaert forget that there was a war raging. For instance, it became clear that he, as chairman of the IAU spectrometry committee, had pressed for decision-making regarding the international standardization of his equivalent width. His astonished

Swiss colleague W. Brunner responded to Prof. Dr Minnaert, Block VII/1, Lager St Michielsgestel: 'I would like to inform the reachable members of the committee about what you wrote regarding Dunham's proposal for the unit of equivalent latitude. However, I also fear that a definitive introduction of the proposed unit by the end of the war will not be possible due to the current disorganization of international scientific cooperation.' Minnaert had sent the letter to Brunner during the week of the executions: the tendency to seek refuge in science must have been great.

He arranged for Houtgast to send him materials for lectures and scientific work and gradually took over part of the management of the Observatory. This way, he wrote the Annual Report for 1942. On September 9, 1943, after a year and a half of captivity, Houtgast wrote ironically: 'Your last letter with guidelines for various activities reminded me of the general discussions we used to have, where the result was that I carried out my work more carefully and supported by your ideas.' Minnaert replied: 'Our correspondence is always a great pleasure for me and gives me the impression that I am still somewhat present at the Observatory from time to time.' He maintained control over events, which strengthened his morale. Even after Van der Bilt refused to replace him, he continued to prepare and review all written exams.

Minnaert continued with the photometry of the moon, incorporating data from his PhD student Claas. He owed this to the caricature and poem by the classicist Onno Damsté:

'Vitia ne quaeras lunae, doctissime Minnaert,
Neve velis liberas vituperare artes!
Nonne vides noctis reginam dulce ridentem?
Quod, vir docte, putas saxum esse, illa ridet.'

In 1943, he completed two extensive articles on the moon, which could fill an entire issue of the irregularly published *Recherches de l'Observatoire d'Utrecht*. He kept instrument maker Van Straten continuously working on the photometry plates. He studied the latest literature on the corona, calculated Venus's atmosphere, and determined the temperature of Halley's Comet.

He converted these studies into articles for the magazine **Hemel en Dampkring**. In the fall of 1943, Minnaert began to seriously worry about the lack of international publications from the Observatory, while material from himself, Houtgast, De Jong, and Van de Hulst was indeed publishable. In February 1944, Minnaert turned to his French colleague Chalonge with the question of whether he would like to print their 63 treatises. The Frenchman

informed Houtgast that he was pleased that Minnaert could 'work toward satisfaction. Please tell him that we would be very honored and happy to publish articles by him and his collaborators in **Annales d'Astrophysique**. If these articles are sent, he can be assured that they will be accepted without further ado. We will even give them priority as proof of the special sympathy we hold for him in the current situation and of the admiration he inspires in us through his attitude.' Even this correspondence had an air of detachment from reality; Minnaert acted as if scientific channels with Paris could still function in a France where shortly afterward, the second Allied front would be established.

In March 1944, a high barbed-wire fence was erected around the Observatory for the construction of a massive bunker 100 meters from the Bolwerk: the center for the German Nachrichtenstelle. Also, an air-raid shelter was built in one of the casemates for German female military personnel who were housed in building Hieronymus, across the singel. At that moment, not only Minnaert but also his family were behind barbed wire.

On April 20, Hitler's birthday, Minnaert was suddenly released. Van de Hulst wrote **Het Weerzien**, which began with:

'Two years father has been away
And suddenly: He is home again!
His daughter sings throughout the house:
It's a celebration, it's a celebration!'

On April 24, there was a celebration at the Observatory. The joy over Minnaert's return was immense.

Endnotes:

- 1 Miep Coelingh to Marie Minnaert, Marcel's niece, on May 8, 1942.
- 2 Interview with Miep Coelingh, 1989.
- 3 Philip Roest jr, 1946.
- 4 Memorial Book Beekvliet, 1946, H. Brugmans, Good morning, gentlemen! Today the following will happen, 142-151.
- 5 Keizer, 1979, does not mention Minnaert.
- 6 Minnaert to Van Straten, May 1942.
- 7 Minnaert to Houtgast, August 14, 1942.
- 8 Memorial Book Beekvliet, 1946, Paul Guermonprez, The murder of five hostages, 76-88. A memorial book about Baelde appeared in 1947 with a selection of his articles: the contribution from Michielsgestel was by Wim

Banning. Guernonprez was released on July 30, 1943, and executed in Amsterdam on June 5, 1944. Vitrine, 2000, 6, 14-19 writes about Guernonprez as a photography teacher at The Hague Academy. The article draws a parallel between Guernonprez's themes and the Flemish painter James Ensor.

9 Minnaert, in his Diary of 1944, retrospectively.

10 Memorial Book Beekvliet, 1946, P.H. Ritter jr, Meetings at Beekvliet, 131.

11 For Servire, he edited works such as G.B. van Albada's The Construction of the Interior of the Stars, P.Th. Oosterhoff's Star Clusters, J. Houtgast's The Sun, and H. Groot's Cosmogony.

12 The Memorial Book Beekvliet provides an overview of lectures and courses, 153, 173. Minnaert's correspondence also provides clarity.

13 Memorial Book Beekvliet, 1946, L.A.H. Albering and W. Kok, 128.

14 Memorial Book Beekvliet, 1946, P. Sanders, Relaxation in Beekvliet, 186.

15 Interview with Brugmans, 1989.

16 Minnaert to Smit-Miessen, August 9, 1942.

17 Minnaert to Smit-Miessen, December 17, 1942.

18 Minnaert to Smit-Miessen, December 26, 1942.

19 Coelingh to Smit-Miessen, January 6, 1943.

20 Minnaert to Smit-Miessen, January 26, 1943. 21 Minnaert to Smit-Miessen, February 2, 1943.

22 Rümke to Minnaert, February 3, 1943.

23 Smit to Minnaert, March 20, 1943. Greet copied the letters she sent and kept them.

24 Minnaert to Smit, April 1, 1943.

25 Minnaert to Koen, July 14, 1942.

26 Minnaert to Koen, August 31, 1942.

27 Minnaert to Koen, September 14, 1942.

28 Minnaert to Koen, September 26, 1942.

29 Minnaert to Koen, January 25, 1943.

30 Ten years later, he led a Copernicus meeting at the University of Amsterdam.

31 Minnaert to Koen, May 4, 1943.

32 Minnaert to Koen, May 19, 1943.

33 Minnaert to Koen, June 22, 1943.

34 Minnaert to Koen, June 30, 1943.

35 Minnaert to Koen, July 1943.

36 Minnaert to Koen, August 3, 1943.

37 Minnaert to Koen, August 20, 1943.

- 38 Minnaert to Koen, fall 1943.
- 39 Minnaert to Koen, October 5, 1943.
- 40 Minnaert to Koen, November 17, 1943.
- 41 Minnaert to Koen, December 16, 1943.
- 42 Minnaert to Koen, January 27, 1944.
- 43 Minnaert to Koen, February 4 and 18, 1944.
- 44 Minnaert to Koen, April 9, 1944.
- 45 Minnaert to Koen, April 11 and 17, 1944.
- 46 Minnaert to Boudewijn, August 20, 1942.
- 47 Minnaert to Boudewijn, August 2, 1942.
- 48 Minnaert to Boudewijn, September 4, 1942.
- 49 Minnaert to Boudewijn, September 24, 1942.
- 50 Minnaert to Boudewijn, April 16, 1943.
- 51 Minnaert to Boudewijn, April 27, 1943.
- 52 Minnaert to Boudewijn, August 31, 1943.
- 53 Minnaert to Boudewijn, May 21, 1943.
- 54 From this series, use was made in chapter 1.
- 55 Minnaert to Boudewijn, December 22, 1943.
- 56 Minnaert to Boudewijn, December 29, 1943.
- 57 Unsöld to Minnaert, September 26, 1942.
- 58 Letter of June 11, 1942.

59 Minnaert to Brunner, August 17, 1942. The year before, he had managed to reach his colleague Menzel at Harvard and was informed in a letter dated June 24, 1941, that establishing the new unit did not need to await the outcome of the war. After Pearl Harbor, the Americans also set different priorities.

- 60 Houtgast to Minnaert, September 9, 1943.

- 61 Minnaert to Houtgast, January 27, 1944.

62 Onno Damsté, January 23, 1943. The classicist's own translation: 'Do not seek so, Minnaert, learned sir, / How faulty the artists render the moon's image / Do you not see the smile on the face of the night queen? / She takes pleasure in being mistaken for a stone!'

- 63 Chalonge (Paris) to Minnaert (via Houtgast), February 26, 1944.

64 The remains of the one-meter-thick concrete layers were cleared in the winter of 2000-2001."

65 Archive-Astrophysics. Greet Smit-Miessen, by the way, remembered that Van de Hulst told her during a walk in the winter of 1942-1943 about his calculation, which indicated that there must be radio radiation from hydrogen particles at a wavelength of 21 cm: this was the beginning of radio astronomy.

Photosection

\figcaptions

Father Joseph Minnaert.

Mother Jozefina Van Overberge.

Uncle Gilles Desideer Minnaert.

Marcel around 1900

Domela preaches around 1910 in the Protestant church in Ghent.

Jet Mahy, the first female student of the Flemish University.

Julius Mac Leod, Marcel's promoter and teacher.

Marcel Minnaert around 1914.

National meeting of Jong-Vlaanderen circles, 1912. Minnaert in the middle back.

Minnaert, middle back, as a teacher at the university opened by the Germans, 1916.

Frederik Gerritson, alias Geerten Gossaert; Dutchman in German service.

Hippoliet Meert, teacher and activist after 1916.

Cesar De Bruyker, Mac Leod's right-hand man.

Roza De Guchtenaere, student of Jozefina Van Overberge.

The Utrecht Physics Laboratory in 1922. Notable personalities include Lily Bleeker top left and from right to left at the front Minnaert, Van Cittert, Julius, Ornstein, and Moll.

At the microphotometer, among others, Minnaert, Moll, Ornstein, and far right Burger."

Pannekoek and Minnaert during the successful eclipse expedition in Lapland.

The Physics Laboratory in honor of the German quantum pioneer Arnold Sommerfeld in 1923. Seated from left to right: Burger, Lily Bleeker, Dr. Riwlin, Ans Huffnagel, Sommerfeld, Moll, Ornstein, Minnaert, and H.B. Dorgelo.

Minnaert at work during the eclipse expedition in Sumatra in 1926.

Marcel Minnaert.

Miep Coelingh.

Minnaert with Koen (left) and Boudewijn (right), around 1937.

The graduation dinner on December 1, 1941, for Ornstein's student R. Dorrestein (second from the left). At the back right, wearing glasses, are Hans Smit and Greet Smit-Miessen.

The Sonnenborgh community in the library on July 31, 1944. Front row: the Houtgast couple, Lady Van Sminia, and Minnaert. Second row: Dedde de Jong, Hans Hubenet, the cleaning lady, Aennie Elink Schuurman, E.

Sijthof, Nico van Straten, and Mrs. F. Cruys-van der Kuip. Back row: Joop van den Broek, Henk van de Hulst, Kees de Jager, Wim Claas, apprentice Gijs, and Miss B. Braak.

Minnaert and Houtgast set up the coelostat of the solar spectrograph on the roof.

Minnaert and his wife receive a Russian delegation in 1953, which will visit a Groningen conference. Second from the left: Victor Ambartsumian. Far right: Boudewijn Minnaert.

Minnaert in action in the lecture hall of the Observatory: 1942.

Minnaert in action: 1968.

Having tea at Sonnenborgh with Joop Damen Sterck, Minnaert, Hennie Trappermann, P. Proisy, Kees de Jager, Jean-Claude Pecker, and Aennie Elink Schuurman.

Minnaert's farewell symposium 'The Solar Spectrum' with three great figures of half a century of solar physics (1918-1963): Charlotte Moore-Sitterly, Minnaert, and Albrecht Unsöld.

Koen Minnaert, 1963.

Els Minnaert-Hondius, 1963.

Minnaert around 1966 in Eindhoven with his grandchildren.

Minnaert at his desk on Zuilenstraat.

Minnaert recovering from surgery, Maliesingel, around 1967.

Minnaert drawing with chalk in his sketchbook during one of his many travels.

Minnaert at the Vietnam demonstration in December 1968."

Chapter 15

Freud and Free Will

'But almost always, upon closer analysis, such a leap of thought turns out to be connected to processes in our subconscious.'

Minnaert and citizens on Free Will

Minnaert intensively engaged with philosophical questions about life during his time in Michielsgestel. According to Guermonprez, he delved into the comfort an atheist could derive from life. He told Greet Smit that he was working on a publication about Life Problems. Ritter Jr. recalled Minnaert's philosophical discussions with the Catholic anatomist-biologist Barge, 'always circling the small pond.'

With his friend Jan Burgers, he began a debate on 'free will.' Burgers had written an article on the concept of 'entropy,' as he found it unsatisfying that in many philosophical publications, such as those by P. Jordan, N. Bohr, and H. Bergson, 'life' was reduced to 'a series of processes exclusively governed by statistical causality.' After becoming acquainted with the work of British mathematician and philosopher A.N. Whitehead, which opposed a positivist separation of facts and value judgments, he thought he had found a solution to the problems of science, morality, and society that had long occupied him. Minnaert read that article in Michielsgestel and was amazed that Burgers invoked Heisenberg's uncertainty principle to introduce 'conceptual elements' that could 'intervene' in protein formation.

Minnaert wrote to his friend that organisms are just as strictly determined as inanimate systems. This view led Burgers to object: 'It leaves out, so to speak, half of the world from the connection it establishes.' In his opinion, Burgers had succeeded in placing responsibility for the future of society

within the physical worldview. Since his early acquaintance with Spinoza, he had attempted this and believed that he had now succeeded better than the many philosophers and biologists he had consulted. Minnaert, who was surprised, decided to go through the publications cited by Burgers and took a lead on the outcome: 'I have no need for "free will"; it is, in my view, the last thing a biologist may assume; all other possibilities must first be conclusively excluded.'

After several months, Minnaert had familiarized himself with Jordan's ideas on quantum biology and numerous publications on 'life'. This is evidenced by a stack of notebooks containing notes and summaries. They confirmed his preconceived opinion that 'the uncertainty relation for living beings is no different than for inanimate ones' and that it otherwise has nothing to do with the question of 'free will.' He added a remarkable view to this: The theory of evolution can explain why living systems are more complex than inanimate ones: 'It is inconceivable that something fundamentally new could suddenly appear in this evolutionary chain. Therefore, I must assume "consciousness" in all kinds of degrees, descending to the most latent in the "inanimate" atom. This consciousness undergoes various impressions that accompany life phenomena but does not exert the slightest influence itself.' The implication is that, in Minnaert's view, nature knows gradations of consciousness, a stone just as much as a flower or an animal, a star system just as much as an anthill. In retrospect, he had already implicitly expressed this vision in **De Natuurkunde van 't Vrije Veld.**

Burgers ignored this unexpected turn. He wanted to hold on to his idea, derived from Bohr, that 'quantum reactions are channeled by certain mechanisms, causing reactions of a size perceptible to us to appear.' Under certain conditions, a reaction involving a single atom can cause a result important for the entire organism: not all uncertainties of atomic reactions are averaged out in living organisms. Such 'thought flashes' could be caused by these quantum reactions. Sudden transitions, such as those at the origin of language, convinced him that when moving from non-living matter to organisms, 'something fundamentally new' had indeed emerged. Physics overlooked processes 'directed by purpose.' Human mental activity embedded 'an awareness of values' in every thought formation: 'My conviction is that these value judgments do play a role in determining the outcome of an elementary process, at least in those processes significant for real life.' The issue of 'free will' was thus resolved for Burgers. After all, alongside physics, relationships focused on the future play a role, presenting themselves to us as value judgments. He had created space for human 'freedom' to make judgments, to distinguish between good and evil, and to live responsibly.

Freud is indispensable for understanding 'free will.'

Minnaert understood that Burgers' tinkering with physical indeterminacy had led to far-reaching consequences. He set his continuity thesis aside and began a polemic: 'The biological phenomena studied best are becoming increasingly understandable; acausality seems to hide precisely where we still know little. That is suspicious. I completely reject your 'thought flashes.' That is an important example! If an 'acausal' atomic reaction were the cause of this, the mental leap would have to be much crazier than it usually is. But almost always, upon closer analysis, such a mental leap turns out to be connected to processes in our subconscious. Freud has mentioned so many incredibly beautiful cases of this kind that it seems impossible to me to say, for a specific example: A causal psychological explanation is impossible here.'

Burgers' concept of 'goal-orientedness' also came under fire: 'I would strongly oppose the idea that life processes are determined by a goal, especially if "goal" implies "future." When we act with a purpose, it means: we form some representation (of an imaginary thing we call the future) and this representation becomes the cause of our actions. Thus, it is always the past that determines the future, never the other way around. In human actions, I consider the entire concept of "goal" to be something that exists only in our consciousness; it is a particular way in which impressions and memories group together and combine before leading to acts of will.' Minnaert also rejected Burgers' notion of 'responsibility': 'A person can no more be held responsible than an animal. I see it this way: we create the myth "responsibility" and all the emotions associated with it to prompt others, through the utterance of that word, to reflect, exercise caution, compare their actions to what has been instilled in them as an ideal, and so on. To achieve this, we suggest to them that they are autonomous.'

He therefore dismissed Burgers' attempt to connect physical indeterminacy with moral issues: 'You assume that all physical-chemical laws apply, but you want to put free will into action within quantum uncertainty. And this freedom is the ability "to distinguish between good and evil." Question: what is "good" and "evil"? My answer is: they are myths imprinted in us during early childhood through education, yet they correspond to no reality whatsoever. Certain actions promote the survival and happiness of society. Over the centuries, people have made an "ideal" out of this, which is presented to every child until it becomes their ideal self (Freud). The so-called voice of conscience is nothing but feelings of pleasure or displeasure that we experience as a result of our upbringing, depending on whether our actions align with these instilled norms. One can track the emergence of

conscience step by step. If we wish to explain how the evaluation of good or evil influences our actions, then in principle, this is physically and chemically explicable. Education has shaped our brains in such a way that normal environmental influences guide us to socially useful acts; however, opposing influences also work, and sometimes they prevail.

The discussion went back and forth until the arguments began to repeat. In a final attempt, Burgers appealed to Minnaert's own life stance: 'I believe that your entire life is at odds with the idea that your responsibility would merely be a myth. You are a living person who longs to do good things, who puts a lot of effort into helping others; you do this naturally, partly as a result of a certain inclination, but always with a purpose—to help someone, to be of service to someone, and so on.' Burgers felt morally obliged to seek a worldview in which physics was connected to values and obligations: 'If we do not do this and instead present the world at this moment with the idea that all sense of responsibility is merely a myth, then we will never find the leverage needed to help it move forward right now.' With this, Burgers revealed the core of his motivations: as a human being and as an educator.

Minnaert refused to embrace a false belief afterward, even if it were intended to inspire good deeds: 'No, we do not want to invent fairy tales or resign ourselves to old delusions just because they might be pedagogically useful. First and foremost, I want to determine what the truth is; afterward, we can discuss how to popularize it. But for my part, I am convinced that the truth is infinitely more beautiful and life-affirming than the most beautiful fairy tales (certain philosophical theories, religions) that one could devise with a moralizing purpose.'

He now also laid his cards on the table: 'We want to analyze what goes on in someone who makes a decision. I claim that they exclusively pursue their own happiness. This is a condensed expression for the causal sequence that you yourself have worked out very precisely in your letter. We form ideas about the possible consequences of our actions; these ideas arise from past experiences! (1) The pursuit of happiness and the avoidance of pain can be very simple; for example, when I move my finger further away from the stove to prevent it from burning. (2) In some other cases, we act 'good' because we fear that our fellow humans would otherwise inflict suffering upon us, or because we want to earn their respect and love. (3) In certain actions, we feel such sharp pain in our 'conscience' that we would rather face death than continue to endure that pain. These are three stages of increasingly broad concepts. I now want to specifically examine the last case, which is fundamentally the most important. For 'good' and 'evil,' I believe there is no better definition than being in agreement with or in conflict with our

conscience. And that helps us more for understanding than one might say. Because that 'conscience,' we do know it well, thanks to Freud's work! It is nothing other than the Über-Ich, the Ich-Ideal, whose origin Freud has extensively investigated. It turns out that it is almost entirely a product of upbringing, especially at a very young age. This process is later forgotten, and people then believe that conscience has been instilled in us by some mysterious power! That 'must' of yours is what you have learned from your father, mother, educators, perhaps also from reading.

In the past, I thought that there was also a strong hereditary component here, developed through evolution. According to Freud, it seems that this is much smaller than I once thought. Research on identical twins can shed light on this matter. The fact that our educators present us with certain concepts of 'good' is because they have inherited these from their own educators; however, changes have also been superimposed due to individual life experiences. In this way, the ideal of 'goodness' gradually adapts to the demands of society. But even if a part of conscience were hereditary, it is still purely causally determined. How can you say: 'Natural selection is a misunderstanding, choice implies purpose...' Isn't that just a critique of words? In the mechanism discovered by Darwin, which is now irrefutably proven, everything works causally; 'it is as if nature chooses,' but this happens just as purposelessly as a chemical reaction. You may not say that there is no reason for evolution: there is cause, but no purpose. Do you find it troubling that life might not have a purpose? That seems to me like someone asking, 'What is the Moon for?' Biologists haven't asked about the purpose of a bodily structure for a long time; when we say, 'The wings of a bird serve to fly,' we mean nothing other than 'as a result of evolution, birds have developed wings that enable them to fly. And so in every field. However, you cannot say: 'therefore, every world order is equally good.' Beware! That's where we go off track. One world order will bring much happiness to humanity, another much suffering. Good and bad, in the sense of bringing happiness or unhappiness to humans, make complete sense; thus, the choice between world orders also affects our personal happiness, insofar as we feel connected to the happiness of all people. Therefore, it does matter to us!

Both friends had gone to great lengths to explain the backgrounds of their positions. Minnaert grounded his choice for a better world order through psychological means, as a choice for a societal system that promised the most happiness. They would meet again in 1945 as founders of the Union of Scientific Researchers, which sought a constructive role for science in future society.

Endnotes:

- 1 Ritter jr, P.H., Beekvliet, 1946.
- 2 Burgers, VNAW, 1941.
- 3 Somsen, 2001, 218.
- 4 Minnaert to Burgers, May 23, 1943.
- 5 Burgers to Minnaert, May 26, 1943.
- 6 Minnaert to Burgers, January 17, 1944. Many notebooks contain excerpts from publications by, among others, P. Jordan, N. Bohr, A.J. Kluyver, P.I. Helwig, W.F. Wertheim, E. Bünning, F. Zernike, A. Frey-Wyssling, B. Dürken, and H. Driesch. History Archive.
- 7 Burgers to Minnaert, January 21, 1944.
- 8 Burgers' side of the debate in Burgers, 1944, later elaborated in Burgers, 1956.
- 9 Minnaert to Burgers, January 26, 1944.
- 10 Burgers to Minnaert, March 6, 1944.
- 11 Minnaert to Burgers, March 11, 1944.

Chapter 16

Astronomy and Humanity

Without the resonance of great humanity, the melody of science would sound poor and faint, and eventually die out.

Miep Coelingh takes charge again

Upon his return, Minnaert found a woman who had been running the household for a year. They had maintained an intense correspondence together. Miep Coelingh had undergone psychoanalysis for five years and was hospitalized for nearly a year. This therapy had made her more independent from her parents and her husband. She had converted the large bedroom into a living space where she could shower and cook using a small gas stove. Minnaert had to move into an unheated room with a Spartan bed.

What must the 38-year-old Miep Coelingh have realized during the therapeutic process? As a young woman, she had struggled in her parental home and had jumped onto the luggage carrier of the older Minnaert, whom she admired as a student. She had married a man who, like her father and herself, was obsessed with science. In 1939, she had become overworked and depressed. Nowadays, her 'neurotic decompensation' would be the reason for an investigation into the system, involving Minnaert himself. At the time, treatment was individual, and Miep Coelingh must have harshly confronted him with the results of her awareness process.

Miep Coelingh's crisis must have been related to the symbiotic relationship between Minnaert and his mother. When Jozefina Minnaert went on vacation with her son and Miep stayed home with the babies, it became painfully clear that Minnaert could not resist his mother. The fact that Minnaert remained a child between two women must have been an immense

disappointment for Miep. Her depression in 1939 may have been a cry for attention. Minnaert, however, was devoted to his work in the late 1930s. For Miep Coelingh, other disappointments followed. She lacked the emotional qualities for raising the boys and repeated the cool relationship she had experienced with her own mother in her parenting. For a long time, her dedication to science had kept her going. It is not unimaginable that the termination of her promotion and the realization of being excluded from science as a married mother contributed to the crisis. The variety of physical ailments may have played an independent role.

In a 1939 letter to Hans Smit, she apologized for not visiting more often. The 'returning to work' was disrupted by household chores, childcare, stoking the stoves, and commuting: 'Starting work again suddenly brought on a massive psychological depression, unexpected for me but apparently not for Rümke. I'm somewhat over it now.' She wrote that she had been in bed for ten days with a bladder infection and a stomach bleeding: every sip of water caused her pain. According to Minnaert's Diary, in the late 1930s, she was tormented by shingles, facial conditions, sores, back pain, and sciatica.

Miep's frustration in her social roles could have turned inward as 'pent-up anger' and manifested as depression. If Rümke's therapy made her aware of the course of her life, she would have longed for a more independent position. She may have discussed with Rümke Minnaert's intense correspondence with the children and how she felt pushed into the background. She must have shared her anger with Minnaert. A common result of psychotherapy is that old conventions no longer fit, relationships become stuck, and need to be redefined. Minnaert agreed to separate beds. It is not known whether he shared or understood her psychological insights. The couple shared a strong desire for a better world with greater social justice. They likely read the resistance newspaper **De Waarheid** during that last pre-war year. They redefined their relationship and became companions.

Astronomy and humanity

In the summer of 1944, Minnaert wrote **De Sterrenkunde en de Mensheid** (**Astronomy and Humanity**), which he dedicated to his wife. He began with a fascination from southern Canada in the 1930s: feeling immersed in the marbled starry sky. 'The spaces and times that astronomy has revealed to us bring us a first inkling of what infinity and eternity mean. The irresistibility of the forces expressed here fills us with awe for the lawfulness of nature. And the human condition, which otherwise fills us with care, be-

comes insignificant in the face of this reality.' For many, such radiant starry beauty was a religious experience, evoking in all people a 'premonition of immortal Beauty.'

Minnaert began his book by describing the working conditions of the astronomer: observing, calculating, making instruments, and theorizing. The passion for the starry sky gave the astronomer the energy for a life of intense work. Often, he had to work alone at night, after which he spent months measuring and calculating the observations. The observations in the domes take place at outdoor temperatures because temperature differences before and behind the lens cause deviations in image formation: it is often intensely cold during this work.

Afterward, he gave an impression of the place of astronomy within science. It describes the geography of the universe with attention to the individual forms of planets and stars but also considers the physical-chemical structure of matter: 'It is precisely this mixture of the general and the particular that gives astronomy great beauty.' It allows us to enjoy the firmament as we would the flowers in a meadow. By understanding the vastness of the universe, it teaches humanity humility. Of all the sciences, it is the oldest, having been the first to learn that the movement of celestial bodies obeys natural laws. The romantic Minnaert wrote in that final year of the war: 'A science that thus transcends the boundaries of time cannot be divided by the demarcations between countries or peoples. Of all the sciences, astronomy is the most universal; international cooperation is a necessity for it.' Astronomers often think about nature in its grandest manifestations and therefore naturally contribute to world peace and true brotherhood.

Minnaert conducted a debate in the manner of Galileo between an idealist and a utilitarian view on 'the utility of astronomy.' Only the indirect utility could be convincingly demonstrated. Finally, he himself spoke as a philosopher, uttering the redeeming, dialectical words: 'If someone discovers the rotation of the Milky Way system, then spiritual enjoyment remains an egoistic privilege of the few professional astronomers unless education and popularization make our beautiful science accessible to the many.' Science should spread from the university to the entire population, like mountain water flowing into the valleys. Minnaert derived from this the obligation of the expert to proclaim the field, support amateurs, and collaborate free of charge with the work of people's universities and amateur observatories: 'Without the resonance of humanity, the melody of science would sound poor and faint, and ultimately die out. It is both our pride and joy to contribute to a science that inspires all of humanity to reflect on the structure of the universe, the place where we live, the origin, and the evolution of all that is

visible.'

He expressed his righteous indignation about the school subject of cosmography, the one-hour class that was killing astronomy. Alongside mechanics, cosmography had also fallen victim to the epistemological approach: 'For a long time, the teaching of astronomy in high schools has been a classic example of how one can ruin a beautiful science through academic pedantry. The beauty of the starry sky was replaced by a system of circles and coordinates; the radiant celestial bodies became exercise objects for trigonometry.' Minnaert therefore advocated for a new course where, step by step, the modern worldview would be constructed: 'Modern astrophysics and the structure of the universe must take center stage.' Naturally, it should be the physicist, not the geographer or mathematician, who teaches this subject. In his curriculum, 'astronomy' looked attractive and modern. He rightly pleaded for an introduction to the subject in primary school and for a 'refreshing' of the teacher training college curriculum.

Finally, Minnaert tackled astrology. The particularity of his polemic against 'the horoscope drawers' was that he extensively addressed their arguments before formulating his objections. A stumbling block were the prophesied solutions to the World Riddles, of which he reviewed about twenty. A special place was given to The Doctrine of the Great Pyramid, which through the book **The Stones Speak**, had gained popularity. He addressed his opponents: 'Astrologers, my friends, do not think that I am insensitive to the courage and poetry of your belief in the stars. It was a grand, dramatic theory, connecting humans to the universe, attempting to create harmony in what seemed like chance... But it was wrong. True beauty can never flourish on the foundation of falsehood.' Astronomy indeed invited respect and emotion. To achieve this, one did not need to resort to the pseudo-scholarship of astrologers but should instead draw inspiration from great poets. Therefore, the book concluded with references to the poets Ovidius, Byron, Hugo, Verwey, and Gorter.

Unlike in the 1920s and '30s, Minnaert connected astronomy to society during this time. It is an inspiring publication that exudes confidence in the imminent liberation of humanity. That Minnaert would live to see this liberation was not a given.

From the Hunger Winter to Liberation

The final year of the war brought great hardship to the cities. There were no more coal supplies for the central heating at the observatory: a single stove

burned in the workshop, with individual desks arranged around it. Food shortages became dire. Like many others, Minnaert had to go on hunger journeys by bicycle. On October 26, 1944, Greet Smit-Miessen wrote about a potato expedition to Leerdam, across the Lek River: 'Once I lay in a ditch with Minnaert for three quarters of an hour while German cars were being set on fire. Our wooden tires made a bothersome noise. The rowboat across the Lek had to be muffled (our feet floated). A memory from Minnaert was also preserved: 'I regularly have to undertake expeditions to try to buy all sorts of things from farmers. First between Utrecht and Montfoort; later up to the Lek; then, as the area becomes more grazed, to the Betuwe near Leerdam (25 km); even later to Tiel (35 km). Sometimes this is done with small rowboats at Vianen or Everdingen, other times via ferries at Beusichem, Culemborg, or Wijk bij Duurstede. Finally, in December, the Betuwe is blocked, and the trips must take place northward. As a result, there are several multi-day trips to Weesp, Zwolle, Dalfsen, and Hulshorst. In principle, these trips are straightforward; however, almost always, major difficulties arise due to technical faults—especially because my bicycle has solid tires and the spokes keep breaking, while the road resistance is also significantly greater than with pneumatic tires. Other significant difficulties arise from headwinds, rain, later: frost, snow, thick fog. Lastly, all kinds of restrictions and bans imposed by the Germans."

The expeditions to Tiel in February 1945 were the last ones. A former Ph.D. student had to leave his edible supplies at home: 'Because a lot of snow has fallen, the trip becomes extraordinarily heavy. The axle of one of the bicycle wheels under the cart breaks twice; with difficulty, we manage to get the cart to the northern bank of the Lek. A few days later, I try to retrieve it on a sled, but I'm forced to limit myself to dragging half of the load. Once the snow has melted, removing the cart becomes much easier. On the other hand, compared to others, we have relatively many food supplies; we are among the lucky ones. The meals taste like feasts, the boys are always hungry and can eat endlessly. Koen looks sturdy and strong; Bou not so much, but we do our best to feed him a bit more.

Almost all conversations revolve around food: 'Further on about the war and reconstruction. The jealousy among the boys towards each other is still a painful point that causes us a lot of worry. It manifests itself in all sorts of trivial matters; they keep trying to treat each other with indifference and hostility. It's not possible to leave them alone at home or send them both on an errand. We still hope that this will change over the next few years, as seems to happen in many other families. Apparently, the main thing is to make them feel that our love flows abundantly towards them and that they

don't need to fear competition.'

Minnaert noted that he was at the end of his strength: 'The trips have demanded a lot from me; my resistance has diminished significantly, probably also due to certain nutritional deficiencies. I can perform much less than six months ago; my leg muscles in particular have no strength; I am constantly cold; skin wounds do not heal. I am very emaciated.'

On March 12, he took a new initiative. Because everyone had to provide their own food and men under 50 were fair game, hiding was no longer possible. Minnaert still wanted to provide his dozen loyal supporters with weekly news and had "De Sterrenwacht-Post" printed in multiple copies. In the first issue, Minnaert reported that Pannekoek and he were working on problems related to the post-war society, such as the reorganization of the university. The third issue could not be published on time. On March 24, 1945, Wehrmacht soldiers inspected the house. They used the discovery of a prohibited radio set as an excuse to order the evacuation of the workshop, living quarters, and instruments. According to a report by botanist Koningsberger, Minnaert wanted to move the contents himself and put the equipment in safety. This effort was too much for the malnourished Minnaert, who had to be admitted to his colleague De Langen's clinic on Schoolstraat on March 25. Minnaert's weight had dropped to 53 kilograms and his body temperature to 35 degrees Celsius. The children helped move the furniture and instruments to Koningsberger's Botanical Laboratory. After 14 days of being fed, the danger to Minnaert's life had passed. The family moved to an aunt of Miep Coelingh on Oudwijkerlaan until after the liberation. The "Sterrenwacht-Post" of April 17 reported on the seizure and Minnaert's recovery.

According to Minnaert, they were comfortable at 'Aunt Gerre', who died on May 13. He wrote in his diary: 'The arrival of the Canadians is unforgettable. Bou and Koen riding on Canadian vehicles with bunches of children, driving through the city. Our house is vacated by the Germans, now occupied by the English Red Cross. Two weeks later, they leave, we can return. The famine is at its worst around these days. Finally, planes appear, dropping food packages.'

In *De Sterrenwacht-Post* of May 5, Minnaert wrote: 'Peace. - An immense joy rises within us and wants to break through. But at the same time, grief and sorrow emerge for all those who have fallen, for the enormous cultural values that humanity has lost. And the question arises as to how far the liberation will truly lead to the construction of a better world order..... - But still, overwhelming everything, overflowing, unstoppable: j o y !' He invited all staff members to a pleasant gathering on Monday, May 7.

After the liberation, Minnaert pursued the confiscated goods like a terrier. He managed to track them down in several garages and a storage facility. With the help of the curators, the Rector, and the Canadian Military Authority, he succeeded in retrieving them. On May 18, he invited the entire community to restore the equipment and bring the Astronomical Institute back to life.

Snapshot 1945: Minnaert in the Netherlands

The Minnaert of 1945 is different from the Minnaert of 1919. In the first snapshot of **Minnaert in the Netherlands**, we see Minnaert making a name for himself in the country. He focuses his immense energy on a scientific career, which is impressive. He is extremely fortunate to land in a laboratory where two professors have created an environment tailor-made for him. It is to his credit that he quickly produces creative results and proposals. His "conversion" to Julius's theory of the sun characterizes him. In this, he continues his uncritical veneration of his teachers and shows himself willing to oppose everyone and everything to make **his master's voice** heard. On scientific ground, he eventually overcomes that unproductive "resistance attitude." He is helped in this by Pannekoek and Ornstein, who both become his friends. In the 1930s, he becomes a versatile scholar who, nevertheless, continues to defend elements of Julius' theory. He proves capable of choosing long-term goals to which he persistently dedicates himself for decades which makes exceptional achievements possible, such as the *Atlas* and *De Natuurkunde van 't Vrije Veld*.

This broadening of his scientific perspective does not directly translate to other areas. In 1928, he strongly distances himself from Dijksterhuis' views on physics education. During his lectures on didactics in the 1930s, he portrays sitting physics and mechanics teachers as an inert mass and places his hope exclusively on newcomers. Psychological mechanisms are at work here that led him to extreme activism in 1914.

On Flemish-national issues, his stance is that Flanders must become independent and free, if necessary with outside help, and that people and nation must necessarily coincide. At the same time, he proclaims that nationalism coincides with pacifism and that all violence must be rejected. Then comes September 19, 1936. He refuses to believe that comrades, even if they have since become fascists and nationalists, will disrupt the tribute to De Clercq. When this does happen, he impulsively chooses a solitary anti-fascist protest. This tears apart the truce.

During the war, he publicly protests against the occupier's measures against his Jewish colleagues. He seems sympathetic to the communist worldview, which he partly bases on Freud's views on conscience. He works on a worldview in which there is no room for 'free will,' but where everyone's social and moral choices are of the utmost importance. He succeeds in this, which is an impressive achievement.

His personal development appears to be largely determined by his upbringing. He continues his 'resistance attitude' in the Netherlands, although the sublimation in science and culture during the interwar period is the most striking image. The lack of separation from his mother casts a heavy mortgage on his relationship with his younger wife. The children grow up in a rational environment. Minnaert loves his children and goes on outings with them, but does not have the time to accompany them intensively. In his Diary, unlike his father, he keeps a great distance. This changes after his imprisonment. The boys then deal with an absent father who is more than ever present. They are 12 and 11 years old, the same age at which Marcel lost his father.

In his correspondence with his children, Jozef Minnaert's Diary subtly shines through. He casts a web of future expectations over them, going further than Jozef himself. He draws Koen into his scientific domain; Boudewijn ignores the obvious invitation. Besides his disposition, competition may also play a role for Koen: he then chooses the position of 'chosen son' who follows in his father's footsteps. This correspondence maneuvers his wife into the background: she actually disappears from the children's lives for half a year. In 1944, Miep Coelingh presents the bill for the lack of reflection on his own youth and emotional life. They still share their progressive ideals.

The 52-year-old Minnaert, who participates in the liberation of the Netherlands, finds himself in a very different situation than the 26-year-old Minnaert who fled from the liberation of Belgium. He has gained great authority in science and is part of a small minority of the professorial corps that has expressed a spirit of resistance, democracy, and tolerance and also has ideas about the democratization of the university.

The post-war ideals

In the last issues of *De Sterrenwacht-Post*, dated May 1, 8, and 15, Minnaert addressed the issue of Science and University after the war. In compact form, he presented several program points for 'the reconstruction of universities.' On May 1, for him, the restoration of international contact between all as-

tronomers was at stake. The situation after the First World War, when the scientific world was divided by political strife, must not repeat itself: 'We must place ourselves above the fray, switch off feelings of revenge, and honor the great minds that exist in every country. Precisely because we ourselves have suffered in this war, our voice in this matter will carry some authority.' Students were henceforth to gain international experience; after their doctoral studies, this should even be compulsory.

He recommended his colleagues with the **Blätter für Hochschulpädagogik** for the improvement of their study methods and the necessary shortening of their examination material.

On May 8, he observed in **De toegang tot de universiteit** that children from higher social classes were highly privileged. Due to the extension of the study period for affluent students, access to the university was being blocked. Stricter selection and shorter study durations were supposed to provide relief. A modest allowance for every student would be an excellent measure 'to provide sons and daughters' of simple people with a modest livelihood.' Here and there, Minnaert already heard his colleagues object that such simple young people lacked lifestyle and civilization: however, such qualities were relative and could be developed through a **studium generale** and courses in philosophy and the history of science.

Minnaert optimistically and resolutely took an advance on a better future. He had begun collecting poems about stars in Michielsgestel. A select few he included in **De Sterrenkunde en de Mensheid**. The first place he reserved for ten lines from Ovid's **Fasti I**. Minnaert had translated and renamed them **Lof der Sterrenkundigen** (In Praise of Astronomers). Huygens had engraved the ninth line, **admovere oculis distantia sidera nostris**, on the lens with which he discovered Saturn's ring.

'They did not know the thirst for great wealth and riches.

They brought the distant stars closer to our eyes,

encompassing the universe through the power of their genius.'

The selfless dissemination of the blessings of science seemed to him indeed the noblest and most important profession that existed. He did not yet consider giving Walt Whitman's relativizing **The learn'd astronomer** a place of honor. That would only happen in the late 1960s.

Endnotes:

1 Coelingh to Smit, October 23, 1939. She addressed Hans Smit as one of the few who had shown interest in her dissertation.

2 Minnaert's book was not published until 1946, in his *Servire* series on astronomy.

3 De Jager explained that Minnaert provided an account of the discussion at the First Dutch Astronomers Conference (1941) between the Christian student Van de Hulst (the 'idealist') and the Marxist student Walraven (as the 'utilitarian'). The 'philosopher' was Minnaert.

4 Minnaert continued his crusade from 1928 against Dijksterhuis et al.

5 Vecht, 1939.

6 Greet Smit-Miessen to C.H.M. Braat in Roosendaal, October 26, 1944.

7 Van der Meer, 1936.

8 The *Starwatch-Post*. Issues 1 through 7 in the Observatory Archives.

9 Minnaert's Diary.

10 Minnaert, 1946, 118-119. Minnaert, 1949, 150, 209. See the translation of this 'Praise of Astronomers' at the beginning of Part II, before Chapter 7.

11 Lines 8 to 10 are repeated here.

Part III

(1945-1970) Man of the
Cosmos

Pioneer of 'Science and Society'

The astronomical lecture

When I heard the learn'd astronomer,
When the proofs, the figures, were ranged in columns before me,
When I was shown the charts and diagrams, to add, divide, and
measure them,
When I sitting heard the astronomer
Where he lectured with much applause in the lecture room,
How soon unaccountable I became tired and sick,
Till rising and gliding out I wander'd off by myself,
In the mystical moist night-air, and from time to time,
Look'd up in perfect silence at the stars.

Walt Whitman

Chapter 17

Science, Politics, and Society: Euphoria and Disillusionment

'The only adequate solution is the realization of a new form of society that automatically eliminates war. With this goal in mind, we must find a *modus vivendi* for the transition period in the literal sense of the word: atomic energy control can contribute to this.'

From Flemish Nationalism to Internationalism

In *The Astronomy and Humanity*, Minnaert had dealt with numerous points of contact with society. Together with Pannekoek, he had delved into the renewal of the university. During the war, he had not been involved with the Flemish issue, although his captivity had been directly related to it.

Most of Minnaert's activist friends in the Netherlands and Flanders had collaborated with the German occupier for the sake of the Greater Netherlands cause. Leader Adolf Hitler had made it possible on September 6, 1940, that under Borms' chairmanship, a 'commission for the implementation of restoration ordinances' was established. This commission had reinstated many former activists in their rights, as a result of which they received significant amounts from the Belgian state funds in 1942.

Robert Van Genechten, as an NSB leader, had become a prosecutor at The Hague court and committed suicide in 1946 with apologies to the Dutch people. The image could arise that Flemish collaboration with the Germans had taken terrible dimensions. In hindsight, it can be soberly established that collaboration in Wallonia was just as extensive, and in the Netherlands,

it was much more widespread.

Belgium counted hundreds of summary executions in 1944 compared to a single one in the Netherlands of 1945. Belgian courts sentenced 2,900 people to death: 242 were actually executed, including 105 Flemings. In the Netherlands, 123 death sentences were pronounced, of which 38 were carried out. The Belgian state once again mixed punishments for treason with the deliberate repression of Flemish desires. Just as after 1918, the Flemish Movement temporarily disappeared from the scene. Prominent individuals from the army and security services were responsible for blowing up the IJzertoren twice: on March 16, 1946, it lay in ruins. The death sentence against Borms, which had been suspended in 1919, was finally carried out in 1946. This tempted Elsschot to write his controversial poem, in which he expressed sympathy for the elderly flamingant who had been enchanted by Hitler. In the 1950s, another amnesty movement began.

After 1918, Minnaert had acted as a spokesperson for an anti-Belgian faction of the Flemish-nationalist movement in exile. After 1945, he remained silent in public about his Flemish-nationalist ideals and avoided questions about his past. He was on the other side of the political spectrum. He mourned his Jewish colleagues Ornstein and Wolff and attended commemorations for fellow prisoners like Robert Baelde and the Fleming Paul Guermontprez. Natural science would later offer him, through the Bruges-born Simon Stevin, the opportunity to continue expressing his love for Flanders.

Ideological socialism, mutual aid, had always been an essential aspect of his philosophy and now became its core. As fervently as he had fought for an independent Flanders, he now devoted himself unwaveringly to peace and scientific cooperation. He connected these ideals with a 'science and society' movement, with the self-organization of scientists. This was a new phenomenon in the Netherlands. Minnaert felt called by this movement, which aimed to eliminate war, poverty, and hunger through science and a world government of the United Nations. In this field, he developed significant activity.

The Union of Scientific Researchers (VWO)

In England, the social interest of scientists after World War I led to the establishment of an Association of Scientific Workers (ASW), which had joined the Trade Union Congress and the Labour Party. In the 1930s, the ASW had developed a blueprint for 'Science and its Social Relations.' They criticized capitalism for frustrating much research and imposing futile purposes, such

as expertise for biological and chemical warfare. With the Labour government at the helm in 1945, this ASW called on colleagues in other countries to organize similarly.

During the Interwar period, Minnaert had not been involved with the issue of science and society. However, the war had given an impetus to the idea that science should be employed in constructing a better world. In 1945, organs of the United Nations (UN) were established, such as the World Health Organization (WHO) and the Food and Agricultural Organization (FAO), where the application of scientific insights was a starting point. UNESCO was meant to promote worldwide cooperation among people in education, culture, and science.

In 1944, the Danish theoretical physicist Niels Bohr had argued to British leader Churchill that the atomic bomb was a suicidal weapon, obliging a 'qualitatively new way of thinking.' The use of the atomic bomb against Japan in August 1945 dealt a blow to the post-war ideals of scientists. On October 27, 1945, the Physics section of the Royal Netherlands Academy of Arts and Sciences (KNAW) unanimously adopted a resolution from physicist Burgers, who, following Hiroshima, called on 'all sister institutions in other countries' to 'express their desire to bear direct co-responsibility for the outcomes of science and to make their knowledge and expertise available to develop the applications of science into beneficial results for humanity.' At the first FAO conference in November 1945, Scottish chairman J. Boyd Orr declared: 'The fight against malnutrition worldwide must be our answer to the atomic bomb!' In December, American scientists joined forces in the Federation of Atomic Scientists (FAS). In their publication **One World or None** (1946), the American-Hungarian physicist Leo Szilard advocated for establishing UN world authority to ensure 'atomic control.' To avoid a nuclear arms race, he urged 'giving up our own atomic bombs and setting aside our production capabilities.'

Many scientists felt called to enter the political arena. The reform of the university was seen as an urgent issue. From the lecterns of the universities, moral resistance could have been preached, while the actual defense usually came from students. At the 1946 Amsterdam University Day, historian Jan Romein criticized the 'far-reaching political naivety and social incompetence of the Dutch intelligentsia' and pleaded for his Faculty of Political and Social Sciences. Others had high expectations for a Studium Generale or mandatory philosophy courses. The authoritarian management structures were also criticized. Minnaert himself had addressed the one-sided composition of the student population. In 1946, the Schermerhorn government established a commission for the Reorganization of Higher Education. This commission

was also tasked with reviewing the scholarship system 'so that all Dutch people have equal opportunities for university education.'

In this progressive climate, Dutch researchers responded to the call from the ASW and established a sister organization called *Verbond van Wetenschappelijke Onderzoekers* (VWO), a literal translation. The initiative came from various quarters. A national group of university 'staff members' demanded more money for research and democratization of the management structures of universities and research institutes. Several dozen researchers from Philips' *Natuurkundig Laboratorium* wanted to share their knowledge of the implications of technological developments with a broad audience and sought support from intellectuals in the humanities and churches. A third core consisted of established scholars such as Burgers, Minnaert, and Leon Rosenfeld, who were concerned about the issue of political control over atomic energy. The latter was a Walloon, a close collaborator of Niels Bohr: he had taught theoretical physics in Liège and was appointed in Utrecht in 1940.

Representatives from these groups discussed the organization's objectives and methods. Who did the *Verbond* aim to reach: primarily natural science researchers or should it address all scientists, including those in the humanities? The British ASW and the American FAS both had a 'narrow' base, which meant they could make statements with scientific authority. Minnaert's aversion to the humanities explains why he and Rosenfeld opted for a narrower approach. Burgers, on the other hand, found collaboration with people from the humanities indispensable. In light of the defeat, Minnaert proposed a federal association of 'sections' with their own initiative rights, which could be more or less representative of the profession. Of those present at the constituent meeting, two voted for a 'narrow' approach, twelve for 'Minnaert,' and twenty-one for a broader basis. The deadline was the establishment in London on July 19 and 20, 1946, of the World Federation of Scientific Workers (WFSW), to which ASW had taken the initiative. The week before, the VWO was founded, and the delegation was determined.

The theoretical physicist Rosenfeld had been elected chairman of the Union. The staff members dominating this board saw him merely as a figurehead. However, at the founding congress of the WFSW, Rosenfeld was elected vice-chairman and member of the Executive Council. The present staff members noted with surprise that the WFSW was dominated by left-socialist and communist prominent figures such as French nuclear physicist F. Joliot-Curie, British crystallographer J.D. Bernal, and Canadian physicist N. Veall. Their pride was significantly tempered by their reservations about the political course. In his book **The Opening of the Atomic Nucleus**, Rosen-

feld would write that year: 'The World Society will be a Socialist World Union or it will not exist.' The WFSW received accommodation in Paris from British science historian J. Needham, leader of ASW and UNESCO, at the headquarters of that UN organization.

Minnaert's Board and the Cold War

The Union aimed 'to strengthen the social position of the scientific researcher, to achieve the greatest possible deployment of scientific research, and to deepen the sense of social responsibility among researchers, so that science will achieve its highest yield for humanity and society.' However, people like Minnaert who wanted to advocate for UN control over atomic energy did not receive support from the board, as their efforts were thwarted by Cold War. Rosenfeld therefore created autonomous work committees. He chaired the committee for foreign contacts and established a subcommittee on atomic energy under Minnaert's leadership, which organized dozens of lectures on atomic energy.

On April 13, 1947, they jointly provided instruction to a group of introducers, distinguishing three aspects of the atomic question. The economic potential and military danger made a monopoly by the United Nations necessary. In the long run, the UN should develop into a socialist world federation: 'The only effective solution is to realize a new form of society that automatically eliminates war. With this goal in mind, however, we must find a *modus vivendi* for the transition period in the most literal sense of the word, and control over atomic energy can contribute to this.' A second aspect was that both political superpowers were unwilling: the United States wanted to maintain its monopoly, and the Soviet Union abused its veto power in the UN. In the common view, only the Soviet Union was obstructing. Moreover, Minnaert and Rosenfeld held a special view on the position of the Netherlands: it could 'pursue an independent policy together with other small countries, and use its great intellectual power to foster better understanding between the major nations.' They praised their colleague Hans Kramers in this regard, who chaired the UN's technical committee on the atomic question on behalf of the Netherlands. Both instructors had previously publicly expressed support for the approval of the Linggadjati Agreement between the Netherlands and the Republic of Indonesia, which could prevent a colonial war.

After Rosenfeld was appointed in Manchester in 1947, Minnaert accepted the chairmanship of the VWO. He immediately formed a more balanced

board. From the Central Planning Bureau, he brought in sociologist F.L. Polak. The major departments such as Amsterdam, Eindhoven, Groningen, Leiden, and Wageningen each elected a representative. The Amsterdam jurist-sociologist W.F. Wertheim proved to be a kindred spirit of Minnaert's. On November 22, 1947, the chair could host a prestigious conference on the organization of pure scientific research in Amsterdam. At this conference, VWO, through Polak, argued for a drastic increase in the ZWO budget and structural funding for the humanities.

The colonial wars with Indonesia and Vietnam, as well as the now-erupted Cold War, limited the flexibility of organizations such as VWO and WFSW. This would ultimately lead to the dismissal of leftist dignitaries from WFSW from their government positions in their respective countries; they even subordinated themselves to the policies of the Soviet Union. Organizations like the Federation that wanted to remain independent were hampered.

The first test came with the coup in Prague on February 20, 1948. Political parties expressed their disgust, except for the CPN. The Dutch Student Council completely ignored the Netherlands' colonial war but now collected signatures from professors protesting the violation of academic freedom in Czechoslovakia. This provoked a reaction from physicist J. de Boer and historians J. Romein and J. Presser, all VWO members. They had not signed without hesitation: 'We may, with appropriate modesty but with some emphasis, bring to your attention that we have championed these principles even in a time when it involved much greater risk than now and when many who now loudly blow the horn of righteousness observed a safer, yet no less eloquent silence.'

These members undoubtedly expressed the opinion of chairman Minnaert. A majority of his board had rejected making political statements about the war with Indonesia and the British occupation of Greece. Why then suddenly take a stance by the Federation while the country was filled with indignation? His board members exerted pressure to issue a statement. The chemist M.G.J. Beets wrote to Minnaert: 'Personally, I would have liked to see VWO take a clearer position on Greece, Argentina, and other countries at the time.' He proposed offering hospitality to fleeing colleagues and formulated a compromise: 'The General Board of the VWO, moved by the events in Czechoslovakia, Argentina, Spain, and Greece, considering that there is a possibility that similar events will occur in other countries, makes an urgent appeal to its members...'

At the board meeting on March 17, 1948, a motion drafted by Wertheim in this spirit was indeed unanimously approved. The Federation also 'made an urgent appeal to scientific researchers in the Netherlands to keep their

heads cool and not be carried away by a sentiment in which a new war is regarded as inevitable and even useful.' Finally, it called 'on all scientific researchers around the world, both in the East and the West, to join forces in the struggle for human values, for the freedom of science, and for the preservation of world peace.' Therefore, the Federation defended a cooperation that most politicians and media had already written off.

This did not remove 'Prague' from the agenda. The WFSW board believed it had to hold its General Assembly in Prague in September 1948. The three chemists on the board, R. Schmidt, H.C.J. De Decker, and M.G.J. Beets, concluded that the WFSW had become an instrument in irresponsible hands. They desired consultations with the FAS to establish a new International Federation. Such a split was being promoted at the time in the field of trade unions, women's organizations, and even regarding the United Nations. Moreover, the VWO had to declare, in addition to the Prague motion, that it 'also considers Russia, Romania, Yugoslavia, Estonia, Latvia, and Lithuania as countries where intellectual freedom is restricted.'

Minnaert found these proposals unacceptable. The Leiden secretary A.N. Gerritsen, an experimental physicist, wrote in retrospect: 'It will be difficult to find anyone who has shown as much enthusiasm for the Federation's objectives as he did, for whom it seemed most important that the Federation was active. He himself set an example in this regard.' The Eindhoven members regarded Minnaert's resignation as 'inevitable, given his overly naive political stance' and turned to Wertheim with the rhetorical question: 'We can't just let VWO sink back to the level of a debating union, can we?'

Ultimately, a coalition emerged that kept Minnaert in power, which led Schmidt and De Decker to resign their memberships.

Meanwhile, the Union had been involved with the monthly magazine *Atoom 22* (1946-1948) and from 1949 onwards had its own periodical, *Wetenschap en Samenleving*. Despite political disagreements, it experienced significant growth. Local working groups brought national attention to the professionalization of disciplines focused on society. The Union had a mission. From Utrecht, Minnaert contributed with his working group 'Social aspects of student recruitment.'

'The social aspects of student recruitment'

The 'external democratization' of the university was advocated from many sides. However, in 1948, the conservative KVP minister Gielen from the red-room cabinet-Beel proposed increasing tuition fees to curb the influx of

students. In response, the Utrecht VWO department started a working group consisting of astronomers Minnaert and De Jager, physicists H.A. Tolhoek and H.J. Groenewold, dentist Martha de Boer, chemist W. Terwiel, and mathematician H. Freudenthal. The working group argued in its publication 'The social aspects of student recruitment' that 'all those who have the ability to study should be given the opportunity.' Their report showed that 44% of students came from the 8% highest-income groups, while only 1% came from the 23% of working-class backgrounds. These were shocking figures: 'Students from higher social classes are thus proportionally 242 times more likely to attend university than those from working-class circles.'

Minnaert took this as the starting point for his first contribution to the anthology. He distinguished between 'intellectual factors' and 'financial barriers.' He cited studies 'from all countries' that proved that intelligence levels are linked to the social position of the family and that intelligence arises from the interaction between a child's innate abilities and their environment: 'Of course, there is a strong variation in inherited traits among individuals; but there is no research that demonstrates a clear difference in average ability between large social groups; many of the best authorities are convinced of the opposite. Of the 6,000 children with high IQs in primary school, 4,500 reached secondary education and 2,000 higher education. Two-thirds of the highly gifted were lost to scientific work: 'The drop-out of 1,500 between primary and secondary education is certainly largely a group of working-class children.' There was a considerable reserve of intelligence, allowing the number of students to be doubled and the level raised. Higher social classes produced many poor students who, after years of delays, obtained their diplomas, while excellent students from lower classes were excluded.

Minnaert assumed that a student cost their parents hfl 2,000 per year: 'How could such high sacrifices be made by 74% of Dutch families, whose incomes now amount to perhaps hfl 1,500 to hfl 3,000?' Financial barriers must play a major role: 'Freedom is a concept that resonates strongly in every Dutch heart; well, studying at the university is free according to the letter of the law, but practically forbidden for large social classes. This creates a very questionable contrast between proletarians and scientists: a contrast that leads to misunderstanding, distrust, or worse.'

What was to be done? In England, it was considered undesirable for students to work alongside their studies: they would then do unskilled work while needing relaxation. 'Interest-free advances' were also unsuitable because academics had to repay them when they wanted to start a family. In 1921, Wageningen professor A. Blaauw wrote **The Socialization of Education as Duty and Solution**, in which he proposed a 'study wage': the student

'receives what is necessary for modest living, enough to dedicate themselves calmly and focused to their studies and general development.' It made no sense to first have students pay tuition fees and then provide them with the same amount as part of the study wage.'

The 'study grant' could amount to between fl. 1,200 and fl. 1,600: for 20,000 students, this cost the government 30 million per year. 'In return, the introduction of the study grant will result in a purer selection, greater average talent, while the student can fully devote themselves to their studies; the drop-out rate during the course of study will therefore be smaller than it is now, which represents a very real economic gain for society.'

Minnaert deliberately chose to provide study grants to all students. There were well-off parents who refused to let their children study. The study grant ensured economic independence and moral equality: 'The legislator has the ability to make the education tax progressively arbitrary in the way that seems most effective to them, so that wealthy families will have to repay a significant portion of what they received for their studying children.' The study grant was a 'mutual study insurance for the entire population, ensuring that all talented individuals will have the opportunity to develop themselves, regardless of the family into which they were born.' The University could certainly benefit from an injection of talent from the working class: 'The tradition of labor, mutual service, and solidarity is particularly strong in their demographic group. Their healthy strength and life energy form a beneficial counterbalance to decadent individualism. Can we not hope that the best qualities of our people will develop when young individuals from all backgrounds live and study together during the most wonderful years of their youth?' Minnaert linked the ideal of mutual service to a social class.

At the end of December 1949, Minnaert opened a VWO conference in Amsterdam on 'Admission to Higher Education.' A Committee of Recommendation united all Rectors Magnifici. The Secretary-General of the Ministry of Education, Culture, and Sciences, H.J. Reinink, joined the problem statement: if research in the U.S. showed that 32% of all children could pursue higher education, why, according to psychologist J. Luning Prak, was this only 2% in the Netherlands?

The Utrecht report was attacked by a sociologist from VWO ranks: Fred Polak. He mocked the 'idealism' of the compilers who were squandering hundreds of millions from the state treasury. Minnaert replied: 'Consider that through the lenient use of the word "idealist," reforms are being opposed or no effort is made to change anything!' He was so indignant that he directly confronted another participant, asking, "Are you in favor of or against study grants?" When the bewildered man said he didn't know, Minnaert exclaimed

that opponents ‘express their criticism in this way and thus divert attention from our plan.’

The Labour Party and the Humanist League asked Minnaert for discussion contributions. The student association Politeia produced the report *Democracy in Higher Education*, in which they advocated for study grants. Minnaert wrote a contribution for the 1951 Politeia Congress, which focused on *The Social Aspects of Student Recruitment*.

In ‘Socialism and Democracy’, Minnaert emphasized that study grants were necessary for scientific manpower. The obstacles of this class system were ‘a major source of bitterness among workers.’ Through the one-sided composition of the student body, influential positions remained in the hands of the higher classes. It made a huge difference whether such an issue was addressed by a conservative or a progressive scientist: ‘The former always tends to argue that the current situation is linked to unchangeable hereditary traits or the (in his view constant) intelligence quotient. The latter starts from the conviction that one can achieve immensely much by purposefully choosing education and environment. There is no doubt that the second method is infinitely more fruitful and inspiring. May the future show that the optimists were right!’

Minnaert’s working group consisted of progressive natural scientists, so that their unanimous report would shore up the dykes. He had never had any need for hesitant psychologists and cynical sociologists. Nevertheless, the working group referred to *The Rise and Fall on the Social Ladder* by sociologist Van Heek (1945). His ‘Hidden Talent’ would later empirically substantiate the assumptions of the working group.

A Constructive Science for a Better World

In the fall of 1948, Minnaert opened the congress *The World’s Food Supply*, organized by Wageningen VWO. For the Wageningers, it was a first step toward technical agricultural assistance. Current issues surrounding the UN and the Dutch contribution to the FAO were presented to Minister S. Mansholt and FAO Director A.H. Boerma. The latter brought up the cooperation in agriculture between Western and Eastern Europe, but the former pointed out the final separation between East and West.

On May 26, 1950, The Hague VWO organized a congress on Scientific and Technical Assistance to Underdeveloped Countries. Everyone who mattered was present: agricultural economist E. de Vries, legal expert H.G. Quik, Minister without Portfolio L. Götzen, and numerous representatives from sci-

entific associations. In the background, De Vries' attempt to transform the Ministry of Colonies into a Ministry of Development Aid was underway. The establishment of the later NUFFIC, the collaboration organization of Dutch universities in the field of development aid, was taking shape. According to Minnaert, the congress tied into an initiative by the UN. The backwardness of a number of countries led to an imbalance in world development, which would be accompanied by great tensions: 'What is more reasonable than that scientifically and technically advanced countries make their knowledge available to less developed countries to accelerate their evolution?' He pointed out 'how for a century it was said that one wanted to pursue the well-being of colonial populations, while primarily exploiting these countries for their own benefit. Science has brought significant technical progress during this period, but on the other hand, it has also been used as an instrument to maintain economic or political power over these regions.' A poignant question came from Götzen to De Vries: why did the United States offer their technical assistance through their own Point Four program and ignore the UN? Even in this area, the schism between West and East had occurred.

This series of VWO meetings, which also addressed the renewal of university governance structures (Leiden), the quality of science journalism (Groningen), or the potential avoidability of military research (Eindhoven), promoted the role of scientists in a world dedicated to reconstruction and development. That was what Minnaert wanted to focus on! He was adamantly opposed to a new atomic weapons race and the war preparations that would accompany it.

It is notable that there was no conference addressing the issues surrounding atomic energy and armament. In early 1947, Rosenfeld had designed a conference titled 'The Necessity of International Atomic Control,' but his board rejected it out of fear of controversy. Minnaert provided an overview in 1949 of forty lectures that were nonetheless organized. The League screened the film **One World or None** at such gatherings, which the American FAS had produced in 1946, before the Cold War. Minnaert continued to emphasize what the Netherlands could do independently and ignored the confrontation between East and West. At the end of 1950, he wrote to 'amice' Wertheim about the lack of response to President Truman's decision of January 31 to produce the H-bomb: 'It is actually unheard of that we have not made any statement during this turbulent period; I had drafted a proposal some time ago but was hesitant due to the ever-looming divisions. Maybe I was wrong!'

Minnaert in the Firing Line

Minnaert's commitment to his League was uncontested. However, his political preference seemed to lean toward the Soviet Union, making him less suitable as chairman. His rapprochement with the CPN, in particular, aroused suspicion. In April 1947, he became a board member of the Netherlands-USSR Association, which was seen as a front organization for the CPN.

In November 1947, Minnaert attended the 'Science and Society' conference organized by the Church and World group, where PvdA politician W. Banning, former minister G.H. Slotemaker de Bruïne, and he himself delivered introductory speeches. 'It was a closed conference where about fifty prominent Dutch individuals from various religious, political, and scientific backgrounds openly discussed the issues,' wrote H.J. Vink, a chemist from Eindhoven and a board member of the VWO, in appreciation. Minnaert spoke about Humanisme and pleaded for a worldview based on reason. When asked if it could exist 'without God or religion,' Minnaert replied, 'It works even better without religion.' Minnaert advocated for mutual service: make people happy, love people; do unto others 'as you would have them do unto you.' From this, civic duty and all refined feelings between people could be derived, which were simply the product of humanity's history. He continued his exploration of 'free will' and found a platform for it within the Humanist League.

The marginal extension of his presidency had not made Minnaert more cautious. He took the liberty of appearing publicly as he saw fit. In Prague, the World Federation of Scientific Workers had decided to hold a World Peace Congress, in close consultation with policy circles in the Soviet Union. The leaders of the WFSW became the leaders of the World Peace Council, with F. Joliot-Curie and J.D. Bernal at the forefront. In 1949, under the editorship of Marcus Bakker, the young secretary of the Dutch Peace Council (NVR) and later a CPN member of parliament, the first issue of the periodical **Vrede** (Peace) appeared in 500,000 copies. In it was a handwritten appeal by Minnaert: 'I value expressing my support for the purpose and organization of the World Peace Congress. I am pleased that you have made contact with broad layers of our population, and I conclude from this that there is a strong and general desire for peace.' On page 33, a thick peace dove painted by Picasso appears next to Theun de Vries' **The Dove Takes Flight**. The poem asked the Americans, on behalf of all inhabitants of the Earth, for peace. Exclusive accusations against the West would characterize this 'peace movement.'

The board had to deal with external reactions to this public appearance.

For example, they had asked the Second Chamber for a quality seat in the ZWO administration. The PvdA member J. de Kadt had casually remarked in the Second Chamber on October 7, 1949: 'If the VWO is an organization (...) that also concerns itself with organizing 'peace congresses,' it seems less desirable to me.' The year before, he had called VWO board member Wertheim a Stalin lickspittle. On November 12 and 13, Minnaert delivered an introduction at the Dutch follow-up to the World Peace Congress. Other speakers included Utrecht school director H.J. Jordan, his Amsterdam colleague C.P. Gunning, and Groningen romanist J. Engels. Minnaert advocated for the establishment of a 'peace scientific institute.' The PvdA had called for a boycott because 'the communists are the driving forces behind the scenes.' Dutch newspapers, with the exception of the communist daily *De Waarheid*, were unanimous in their scorn for this 'peace activity.'

The WFSW, which was supposed to provide researchers with a window on world politics, fell into disrepute in the West. Partly under the influence of the American CIA, a pro-Western International Confederation of Free Trade Unions (ICFTU) had previously split from the World Federation of Trade Unions (WFTU). In 1950, the WFSW decided to join this WFTU. The Confederation then decided to withdraw: the cancellation letter of July 1950 was signed by 34 Minnaert and secretary Gerritsen: 'Your recent decision to make a contract with the World Federation of Trade Unions (...) is not an impartial act.'

Meanwhile, the general board and the chairman were under fire at the Union's member meetings. There was a flood of motions of disapproval. For example, a motion from the Eindhoven branch regretted 'that the general board has adopted a wavering attitude toward communism.' A new course would be set at a January 1951 member meeting. Minnaert observed that most motions favored Western Europe: 'It is said that science in the Soviet lands is not free enough. But the Catholic Church and orthodox Protestantism also impose dogmas; and in Western countries, the social structure exercises great power over science.' According to him, the two groups into which the world threatened to split were not related as good and evil: 'A Federation of Scientific Researchers should not align itself on one side, not even on the side that seems generally more favorable. It can take a position on any specific issue, but it must not a priori bind itself to one of the two parties.'

Minnaert thought that against those who regarded Russia as a threat to humanity and science, there were others, 'equally selfless, skilled, and idealistic, who believed they saw progress in that direction.' His considerations written for the annual meeting could not convince those present. He

therefore decided to relinquish a second term as chairman.

An absolute majority was required for an election. The members elected only four out of twelve candidates: Minnaert received the most votes with 43 out of 65. Clearly, the members did not doubt his integrity and must have appreciated that he made his chairmanship available. Sociologist Polak, by then a professor, was non-removable and succeeded Minnaert. Wertheim disappeared from the board with 27 votes.

In his Diary, Minnaert wrote in early 1951: 'I stepped down as chairman in January. There was continuous opposition to "communist tendencies," which strongly hindered effectiveness. As a reward for much work and concern, I received suspicion.'

The BVD and the Man from Moscow

The Alliance had become a subject of investigation for the new Domestic Security Service (BVD) in 1949. After all, it acted against the secrecy of scientific work and in favor of keeping open the channels between East and West. The BVD saw this as a declaration of intent to unilaterally transfer secrets. Agent D wrote on December 21, 1949, about the VWO members: 'Whether they are all aware that a group of the most prominent members, with every activity, have their eye on a refined form of propaganda, opening themselves up to abuse of scientific data exchange and creating opportunities for espionage or its preparation, is very much in question.' The Service could hardly see the natural tendency of scientists to share information as anything other than propaganda for the other side.

A BVD informant and VWO member concluded after the aforementioned members' meeting: 'In my opinion, even after the heated debate at this last general meeting, it has once again failed to steer the course of the VWO from neutral to positively anti-communist': only Polak succeeding Minnaert was 'a major improvement'. The BVD appeared to promote 'professional bans' for members of the Union: together with other agencies, they 'constantly tried to keep unreliable persons—to the extent known to the Service—out of the most important laboratories and institutions.' The Service had employed agent provocateurs who attempted to persuade VWO members to engage in scientific espionage: so far without success. The informant considered the Union an important target for observation because intellectuals, after the Warsaw World Peace Congress, 'became actively involved in the Soviet offensive against the non-communist world.' He believed that the world peace movement, originally perhaps intended as a protest against the atomic

bomb, should now be regarded as having a complete mission: neutralizing the active resistance forces of the West as much as possible. They would try to achieve this with regard to intellectuals in the Netherlands, among other things, within and through the VWO. The word 'with' in the last sentence implies that the Union had become an instrument of the opposing side. For Minnaert, this was the second time he, the man of the cosmos, had become the Man of Moscow.

Agent C5 characterized Minnaert on June 15, 1950, as a 'fellow traveler': someone who followed the policy of the Soviet Union. The BVD agent found the Union a creepy affair: 'Although by no means all VWO members can be directly classified as part of the communist camp, attention should be paid to the fact that the Union is represented in the Netherlands in every laboratory, university, etc., by one or more VWO members.' After this, C5 listed the names of dozens of VWO members who deserved the Service's attention.

With the 1951 Korean crisis and the push for rearmament, professors Minnaert, Wertheim, Freudenthal, and Burgers were responsible for extensive files. The mathematician Freudenthal said when asked: 'Everyone around Minnaert was being watched. I had a friend, a chaplain, who told me that someone had come to him in Maastricht. That BVD agent said: "We consider everyone who receives study pay to be a communist." Then the chaplain said: "We've had that in the Catholic Church for a long time: our studies are paid by the Church."' Such an incident is typical of those years of cryptocommunism, an important term. The physicist Casimir, director of Philips' Natuurkundig Laboratorium, was not a member of the VWO: 'Someone who sought scientific contacts with Eastern Europe was already considered 'fellow traveller' by the BVD'.

In 1951, the American embassy denied Minnaert a visa for the US, considering him an individual associated with Eastern Europe. In his diary, he wrote: 'A painful story that really puts one's nerves to the test.' Nevertheless, in 1952, Minnaert welcomed a delegation of Russian astronomers at Schiphol Airport. The BVD archives on individuals are currently closed to researchers.

The agents in the 1950s likely judged Minnaert, who they saw as unchangeable, very harshly. Gerritsen, secretary of the VWO and later professor of experimental physics in the US, said afterward: 'Minnaert was one of the best people I've ever met in my life. But he couldn't think socially the way he could about solar physics. Every now and then, I would say to him: 'Minnaert, you know that the Earth is flat.' He often interpreted things subjectively and used phrases full of judgments like 'wrong,' 'bad,'

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and 'incorrect.' Still, Minnaert could be convinced if you could explain to him rationally where his stance would lead. I considered it a privilege to have been one of his friends.'

Endnotes:

1 Minnaert, *Poets on Stars*, 70.

2 Dedeurwaerder, 2002, 718.

3 De Jong, Part 12, Epilogue, 545. Van Genechten wrote that he had offended the Dutch people as a result of his 'bitter intellectual arrogance.'

4 Blom, J.C.H., *The Netherlands under German occupation*, 70; Eenoo, R. Van, *Belgium in international politics 1940-1944*, 43-46; *General History of the Netherlands*, Volume 15, Haarlem 1982.

5 Luykx, 1969, 405.

6 Geyl, P., *Why I spoke at the Yser Pilgrimage*, August 19, 1962, in: *Figures and Problems 1*, Amsterdam-Antwerp 1964. 7 *Museum Guide*, Diksmuide 2001, 8. 8 Willem Elsschot, *Borms*, 1946.

9 Wolff died in 1944 in Bergen-Belsen.

10 Beekvliet, 76, and De Jong, Part 7, 948.

11 Molenaar, 1994, 23, 29.

12 Molenaar, 1994, 47. 13 Molenaar, 1994, 39.

14 Given the publication by Zondergeld in 2002, an exception must be made for VU. 15 Molenaar, 1994, 47.

16 An early formulation of the ideology behind the 'Hollanditis' of the seventies and eighties.

17 Declaration of December 3, 1946.

18 Minnaert was approached at the end of March 1947 by C.J. Gorter, the new director of the Leiden Kamerlingh Onnes Laboratory. For a biographical sketch of Gorter, see Molenaar, 1994, 75.

19 From Wageningen, it was the agricultural expert S.J. Wellensiek, and from Groningen, the physiologist M.N.J. Dirken. Eindhoven provided the chemists C.J. Dippel and H.J. Vink. 20 Molenaar, 1994, 97.

21 Molenaar, 1994, 99. The young politician Joop den Uyl advocated in 1948 for the dissolution of the United Nations and the establishment of a Western splinter group.

22 Even Zeno, then Science, Technology, and Society, and after half a century, disbanded at the end of 2002.

23 VWO-Utrecht, *The Social Aspects of Student Recruitment*, Utrecht 1949.

24 Minnaert, (1949a).

25 Minnaert, (1949b).

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26 In post-war France, the student union UNEF called it a *présalaire*. Minnaert had access to that information.

27 This sentence has been retained because that absurd practice is now common. 28 VWO Congress on Admission to Higher Education, Amsterdam, December 9 and 10, 1949. Utrecht, 1950. 29 Minnaert, (1949c).

30 VWO Congress Wageningen, The World Food Supply, October 8 and 9, 1948, Wageningen 1949.

31 Minnaert to Wertheim, March 28, 1950. Molenaar, 1994. 84-94.

32 The date is April 5, 1948.

33 Picasso's later doves were elegant. The first dove didn't look good: it resembled a bomber.

34 Minnaert remained a personal member of the WFSW, as did Wertheim and the physician L.H. van der Tweel.

35 Minnaert, Consideration, January 10, 1951.

36 Minnaert, Diary, 1951.

37 Interview with the mathematician H. Freudenthal.

38 Interview with the theoretical physicist H.B.G. Casimir.

39 The author viewed the BVD reports on VWO and its leaders from the early 1990s in connection with his dissertation on the history of the Verbond. Efforts from the Tweede Kamer to make the archives more publicly accessible have resulted in the archive now being hermetically sealed for researchers. A regrettable development.

40 Interview with experimental physicist A.N. Gerritsen.

Chapter 18

A Passion for Traveling

'I see the human spirit, where life reaches a pinnacle, creating art and science, reflecting on itself.'

The family at Sonnenborgh

After the war, the Minnaerts could finally enjoy their home to the fullest. It towers like a fortress above the singel. On the ground floor, the kitchen, bay window, and study opened into a living room with a large side window. Miep Coelingh brought in chrome steel chairs and tables. She chose square seaweed matting for the floor, which allowed dust to fall through and eliminated the need for a vacuum cleaner. She had three cabinets built next to the front door, each accessible by the milkman, baker, and greengrocer with their own keys. She placed an order note inside. She could collect her groceries from these cabinets. The kitchen, where Minnaert would never set foot, had a hardwood counter and electric stove. It housed one of the first dishwashers in the Netherlands. The bay window was Miep's domain: it held her birchwood Rietveld desk with chairs by Mies van der Rohe. She looked out onto a small garden with pear and plum trees and currant bushes.

In Minnaert's study, there was a black piano and a desk: the walls were filled with books. He played classical works, particularly by Beethoven, Schubert, Brahms, Rimsky-Korsakov, and other Russian composers. Boudewijn noted that the piano could be heard throughout the house: 'When Mother was late with dinner, Father would start playing the piano.' They often went to concerts together. In the living room on page 341, the children played and guests were received. The bedrooms were on the first floor. One room was reserved for musical instruments, which Minnaert occasionally demonstrated

to visitors; the rest of the collection was in the attic.

The Flemish Rudolf Mahy sometimes stayed there: 'My own parents remained in love - arm in arm. The Minnaerts seemed like two good acquaintances. The interior was *Neue Sachlichkeit*. She cooked so deliciously that I forgot the soyballs in the soup were meatless. Koen and Bou were immediately drawn into their conversations. I remember a remark directed at me: 'You should read P.J. Schmidt's 'Geld en krediet' once.' Minnaert explained the tube system of the sun viewer to me: it was as if you already knew it. When we went for walks, he kept asking 'why...'

Also, Hanneke van Konijnenburg, the daughter of Truus van Cittert-Eymers, often came by. She had to say 'Marcel' and 'Miep,' even though she didn't particularly like that: 'Minnaert didn't mind me walking around. Miep was reserved at first. She was stubborn and had to completely trust someone before she opened up. Then the warmth would come too. On the other hand, I've never seen a milder person than Marcel! Their relationship wasn't good or bad: they led a completely independent life.'

According to Boudewijn, his parents didn't attach much importance to appearances: 'Clothes weren't important. Appearance wasn't important. They taught us table manners and talked about the Bible. We had to know what it was about. We learned bridge as a social grace.' He quickly noticed that his parents had a pronounced political preference: 'A few days after the liberation, I said, 'We'll take a subscription to *Het Parool*.' Then Mother said, 'No, we're subscribing to *De Waarheid*.' During the war, you were either good or bad. I learned that there were apparently nuances within 'good.' They explained to us why they took that attitude. They weren't strict, and we never got a slap. They exercised psychological pressure: this is what you *ÓUGHT* to do and that is what you *SHOULDN'T*. They gave clear messages.'

Miep Coelingh often felt disgusted and tired. When her helper Corrie got married, she started doing the household herself again. She received very few visitors. In the summer of 1946, her father passed away, and she was fully involved in family visits and aftercare. In 1949, she arranged for her mother to be admitted to a nursing home.

Koen's love for studying and Bou's wandering blood

In 1945, Koen had become a member of the Dutch Youth Association for Nature Study (NJN). He went out every weekend, gave lectures, and organized summer camps. In 1947, he took an excellent final exam. The rector asked

him to give the annual address, but he skipped it because of the NJN. At the observatory, he set up a 'chemical room.' Minnaert observed: 'It's nice how he quickly becomes more handy and develops a style in experimenting.' In the summer of 1948, he cycled to *Nos oiseaux* in Evolène, Switzerland.

He went to study in Utrecht and lived at home for the first few years. A library card shows that at the age of nineteen, he immersed himself in spectral analysis, his father's specialty. He chose chemistry: that must have been safer than physics. He got a girlfriend in the NJN, Corrie, but it suddenly ended between them in 1951. Minnaert wrote: 'What went wrong, we don't know' and 'he leaves around Easter.' He later turned up on the Riviera. That summer, Koen had to go to Malmédy for the NJN camps and obtained his *cum laude* degree.

His friend Theo Quené, later an urban planner and chairman of the SER, said when asked: 'Koen wore a khaki military uniform and thick glasses. He had an expensive pair of binoculars, which he used to watch birds. Those binoculars and he were inseparable. We felt like the elite of the NJN and came together on the board: him as secretary of summer camps and me as chairman. Koen believed that the real work lay in organizing the eighteen camps. Once, he had rented cooking pots from a rental company. He noticed that the thickness of the pans was 18 millimeters instead of the agreed 16 and mercilessly stood his ground. That summer, he stood with a sealed shipment at customs in Eijdsen and refused inspection. I handled it over the phone. Later, he said: 'That Theo is a fixer.' There was something admiring and something condescending about it: you were 'just' a diplomat.' Quené found *Sonnenborgh* a deserted place: 'You never saw father and mother. The kitchen was spotlessly clean. Koen made an omelet, and then we went to his room. I exchanged no more than three sentences with his mother. She didn't know who his friends were. His father knew a bit better but seemed distracted. When we returned from Belgium, the light in his study was on. Koen gave him a handshake: 'Father, you need to go to bed. It's four o'clock in the morning.' Minnaert gave the impression of being a scholar: distant but friendly. Where a woman often brings warmth to a household, that wasn't the case at Koen's home. He told me his father had received the 'Nobel Prize' for astronomy. An extraordinarily clever father can become an idol.' Koen was sexually uninhibited: 'The NJN, as a mixed movement, could only be chaste. We saw his girlfriends from outside the NJN as delayed puberty. He was an attractive man, engaging and sharp-witted, rivaling and challenging, erudite when he talked about Menno ter Braak.' He could talk friendly and engagingly with young people for hours. That was his hidden side.

In 1945, Boudewijn had become a sea scout: that summer he went to a Scout camp. At sixteen, he was allowed to go alone to acquaintances at Lake Walen. Minnaert wrote: "He helps pick berries, herd goats, and makes trips as well. It's nice how well he has studied Switzerland in the Baedeker and how much he loves it." In 1949, he passed his gymnasium exams with seven straight sixes, six minuses, and a five for Greek. He chose to work in the travel industry: "My first job was at the Dutch Travel Association. I rented a room in The Hague and that worked out well. I received an allowance from home. My desire to travel was also a result of the lack of freedom during the war. Father had told stories about foreign countries, which sparked my interest. Through Father, I became a tour guide in Lugano, later in Lausanne. Every weekend we went into the mountains. That was an eye-opener: I was independent, away from parental supervision. I got a job with the Royal Java-China Packet Shipping Lines. First, I trained at a stevedoring company because I knew nothing about shipping. After that, I traveled the world."

The choice of his youngest son also encouraged the father. In the summer of 1948, Minnaert arranged with Boudewijn to meet after an IAU congress in Zurich. They walked together—17 and 55 years old—over the Furka, Grimsel, and Scheidegg passes. Minnaert noted: "Everything by hitchhiking or walking, sleeping in stables or barns, on hay or straw. We enjoyed it immensely. In many ways, we share the same taste and way of traveling." The following summer, Minnaert repeated the joint hiking trip before a hydrodynamics colloquium in Paris. They made trips near Montana, slept in the Cabane des Violettes, and near Zermatt in the Garnergrat and in Saas-Fee in the Britannia refuge. 'A trip we will never forget. We also grew closer than ever before. The colloquium in Paris was exhausting; I felt only half at ease there.] A scene from a poem by the American romantic Walt Whitman, which Minnaert himself published in **Poets on Stars**, irresistibly comes to mind.

Whitman's **The Astronomical Lecture**.

In Sint Michielsgestel, Minnaert contributed to the **Friend's Book** of a fellow camper. He was asked to express what he loved and found most beautiful. At the time, he created a 'festive symphony,' an incomparable celebration of the 'unity of the universe':

'In my mind, I see the utmost refinement of atoms, clouds of electric charges swarming around at incredible speeds. In the dark vastness of space,

I see the waving veils of spiral nebulae, with their millions of silver-shining stars. I see life blooming as part of this nature: colorful beauty of forms and graceful, flowing changes. I see the human spirit, where life reaches its peak, creating art and science, reflecting on itself.'

Here, Minnaert revealed himself as a pure romantic. In the camp, he had begun collecting poems about stars and planets. Many friends helped him. He gathered three hundred titles, translated most of them, and selected 94 poems from all over the world. The anthology **Poets on Stars** was published in 1949 by the literary publisher Van Loghum Slaterus. It began with twenty Dutch contributions: the first by a man from Ghent. There were more subtle nods throughout. He translated a poem by the Frenchman Louis Aragon about an August night full of 'falling stars.' A footnote explained that the surrealist Aragon was a communist resistor, a poet of 'young France.' The meteor shower was a metaphor for 'the memory of the fallen, the announcement of the great turning point.' He could have added that this poet was one of the leaders of the World Peace Movement.

The German and English poems remained untranslated; the 1948 reader knew those languages. For the French poems, Minnaert's translation was added. The others Minnaert had translated himself from Latin, Greek, Swedish, Italian, Spanish, Portuguese, Danish, and Russian, because 'where no translator is mentioned, I am responsible for it myself.' Minnaert loved languages: the anthology must have been a delightful project. His retired friend Anton Pannekoek wrote from 10 Wageningen: 'Heard with pleasure that you sent Jet Holst your Poets.'

However, a poem chosen by Minnaert from the American romantic Walt Whitman gives rise to speculations about Minnaert's own state of mind. It deals with the kind of lectures that Minnaert himself had given so many of:

'The astronomical lecture

When I heard the learn'd astronomer,

When the proofs, the figures, were ranged in columns before me,

When I was shown the charts and diagrams, to add, divide, and
measure them,

When I sitting heard the astronomer

Where he lectured with much applause in the lecture room,

How soon unaccountable I became tired and sick,

Till rising and gliding out I wander'd off by myself,

In the mystical moist night-air, and from time to time,

Look'd up in perfect silence at the stars.'

It seems that Minnaert identifies with both figures here. He was the learned astronomer, recounting his stories everywhere to grateful applause. He was also the bored and almost nauseous listener who, in the damp night air, surrendered to the mystical experience of the starry sky. Did these two figures merge for the 55-year-old? Had he gradually distanced himself from his earlier fixation on astrophysics? His note at the Paris colloquium makes that likely.

Following his Charles Darwin lecture in the summer of 1947, Minnaert embarked on a 12-day trek through Scotland. Writing from Oban, he described 'a landscape already possessing the northern purity of color and line, with the sea penetrating everywhere between the mountains and forming long lochs.' In 1950, he took advantage of a conference in Zurich to make a hiking trip over the Corsican Alps. Reporting from Ajaccio: 'Monday morning, the driver and his assistant swore ten times that I would have my backpack in Piana by evening. By Wednesday, it still hadn't arrived. Unreachable by phone. So I returned 75 km to pick up the backpack: they had forgotten it. Voilà, c'est tout. First, you get angry, then you understand it's part of the country. And never have I traveled as free and joyful as during those three days without a jacket and with a thick beard. I sleep wonderfully, without headaches, eat almost nothing, am healthy as a fish, and jump from one adventure to another. And warm! And beautiful! Those colors of water and rocks.' He felt perfectly happy with himself in nature.

The boys moving out

Within his biochemistry specialization, Koen devoted himself to spectrometry. In 1953, he interned at the Vlaardingen site of BPM. He wrote: 'This week I had night duty; it's wonderfully quiet. You only hear the hum and hiss of the pipes and a faint sound of pumps. Around four o'clock, you climb to the top of the distillation column (35 meters high) and slowly watch the day break; you see how the water changes from a dark strip to a light one, and then in the distance, you see the Waterweg flowing together with the Oude Maas, and far away – Maassluis and Hoek van Holland. And so the day begins.'

He had moved into rooms. He lived at various addresses, including a Corpshuis on Springweg 53. He enjoyed photography, pottery, and singing in the Student Choir. He behaved like a bohemian and, influenced by Du Perron, played the role of an anti-bourgeois, erudite intellectual. Yet he was

shy. He needed friendship, but people could be put off by his clumsy and merciless honesty.

In the summer of 1956, he graduated cum laude. He could pursue his Ph.D. under biochemist Slater and moved to Amsterdam. He was athletic, went on winter sports at the age of 14, and walked a lot. Minnaert wrote to his girlfriend Jet Mahy: 'Koen works hard but believes little in life and ideals. The young generation has noticed how many of our "ideals" were empty words and they want no illusions; I trust that soon they will realize that not all principles and ideals were meaningless, and then their skepticism will have had a healthy and purifying effect.'

Koen's rebellious period ended when he fell in love with Els Hondius, a psychology student and, according to Minnaert, a gifted violinist. She was not very approachable, and his NJN friends sometimes wondered if it clicked between the sensual Koen and his bride-to-be. Theo Quené spoke of a 'young, quiet, stately, reserved woman of cool beauty.' They married in Overveen on July 1, 1959. A year later, he earned his Ph.D. on the respiratory enzyme Cytochrome C oxidase. He prepared the enzyme from horse hearts obtained from the slaughterhouse, cut them into pieces, ground them in a meat grinder, centrifuged them, and collected the fluid. He exposed it to light of variable wavelengths and recorded the spectrum with a spectrophotometer. His promoter thought Koen had made an original proposal to explain the bizarre reaction mechanism: he belonged 'to the small select group of people who truly belong in a university environment.' Koen's solution would even endure as Minnaert-IV in biochemical reaction kinetics.

Koen applied for a NATO scholarship to further qualify himself. On the recommendations of professors Slater and Westenbrink, he eventually received a ZWO grant, allowing him to work for a year in the U.S. under Professor Lucile Smith at Dartmouth Medical School in Hanover, New Hampshire. The following summer, Els became pregnant, and they returned to the Netherlands. Koen could not start working with Slater and took a position at Philips' Physics Laboratory. He joined the 'photosynthesis' subgroup of the biology department, which was led by J. Voogd and consisted of 16 people. At that time, they were already considering developing a biological basis for process technologies. He continued his university research there. Els and he moved into an apartment in Eindhoven. They named their child Paul Alexander Marcel. Two years later, in the summer of 1963, Els was expecting her second child.

Boudewijn left in 1954 as a trainee helmsman on the 'Straat Bali'. In Hong Kong, he became the second-in-command in the 'passages' department of his shipping company. In 1956, he used his vacation to travel through

Indonesia. He was transferred to Japan, where he lived in a traditional house in the imperial city of Kobe. After four years, he received six months of paid leave and briefly visited the Netherlands via America. He spent two weeks with his parents in Spain and returned to Hong Kong via Athens, Egypt, New Delhi, and the Himalayas. There, he was instructed to depart for Sydney to prepare a new liner service.

By the end of 1958, he had joined forces with an architect at Contemporary Constructions Ltd. His father wrote prudently: 'It is indeed risky to give up such a secure, permanent position.' The project ultimately failed. He became a seller of cigarette machines—one of those blue moon jobs—and ended up at a travel agency in Sydney in 1961, which was a subsidiary of a company in Melbourne. Minnaert noted: 'Modest, but he's the boss. Meanwhile, he had met Noortje Steenbeeke; they loved each other but could not marry because Noortje's husband refused to divorce. In July 1961, they finally decided to live together.' Years passed without the parents seeing their youngest child. They only knew their daughter-in-law from letters.

In the 1950s, cats came into the house, which became especially important for Miep. Minnaert: 'One evening in July 1953, a small black cat lies in the kitchen. Presumably pushed inside through the open window. We decide to keep him. He grows quickly, becomes a center of attention in the family; especially Miep is very attached to him.' In Minnaert's Diary, there are mentions of the favorites: 'Our cat had four kittens in the spring: three black and one striped. The three are given away, the striped one we keep; it's Pietje. In the fall, another four come, which, on the advice of the veterinarian, must be put down. The 'cat' and Pietje remain and are a source of concern and interest.'

Minnaert, during this period, went to play music on Saturday evenings with Gré Westenbrink, the wife of his chemistry colleague, and improved his Russian in weekly lessons with Mrs. Kortsjagina.

Minnaert's passion for walking and traveling

His wife did not like the hours-long walks and was no more suited for it. Minnaert therefore traveled alone, sometimes with his son or a friend. He likely avoided company unless he had to guide them. At Easter 1954, he went to Sicily with Marieke van der Meer, the widow of a PhD student. In 1956, he undertook a tour of Norway with her, including day trips, 18 walks, much by bus and boat. Minnaert: 'One very beautiful trip. Lots of clouds and quite a bit of rain. Marieke gets tired quickly and isn't entirely resistant

to the trips.' At Easter 1959, they went to Greece: 'Small disagreements with Marieke about hotel price classes, etc.' Minnaert did it as cheaply and simply as possible. On the boat, he studied Modern Greek to manage. They saw a lunar eclipse at the Acropolis and visited Crete.

In 1960, he traveled to Yugoslavia with Kee Proost-Thoden van Velzen, a graduated astronomer, his companion on the Sumatra expedition of 1926 and by now the widow of Karel Proost, the leader of the Rotterdam-based *Ons Huis*. She found the trip, which you completely devised and prepared, unforgettable. Minnaert noted something about 'glowing glowworms'; this time, criticism of the partner was absent. She once asked him to look at the slides together: in the Netherlands, it seemed that 20 of them were no longer there. Kee addressed him in her correspondence as 'dearest Marcel.'

Most of his travels he undertook alone. Sometimes he visited friends or went on a day trip with conference attendees. In 1959, he spent more than two months abroad: after 1961, that became the minimum.

In 1955, he combined a lecture in Helsinki with a tour of Scandinavia. On October 15, he wrote to Koen from Stockholm: 'Of everything I've seen so far, certainly the most beautiful is the sculpture by Milles, a modern Swede who died two weeks ago. His house, magnificently situated, he has turned into a real museum where one can admire about a hundred of his works. It's truly impressive. Particularly striking is, among other things, the statue of your colleague Scheele.' On October 18, he wrote to Bou from Finland: 'The biggest surprise for me were the brilliant autumn colors of the birches against the dark spruces.' A few weeks earlier, he had combined an IAU congress in Dublin with a hiking trip on the west side of the island. On September 8, he wrote to his wife from Caskel: 'The food is primitive: every day large potatoes in their skins and one-centimeter peas, without salt or sauce. But it tastes good.'

In 1957, he made a long journey through the United States, which he had prepared with a Baedeker travel guide from 1900. He visited many astronomers and emigrated Dutch and Flemish people. On August 16, 1957, he wrote to his wife from Ann Arbor: 'The colleagues are everywhere equally cordial and almost every evening I'm invited somewhere.' His PhD student Mulders showed him the nature parks. In Mount Parks in Denver, he saw a performance of Wagner's **Die Walküre** amidst impressive rock formations. He visited his childhood friend Jet Mahy: 'That sensation that Jet opened the door and that I saw her face and eyes again!'

The following year, a trip was scheduled in connection with the IAU congress in Moscow. This time, his wife was joining him. On August 18, Minnaert wrote to Koen: 'The congress is going wonderfully. We all feel

that we are experiencing a unique event, a true demonstration of the unity of science (and humanity) above all borders. - There is so much to see; we get lost in the immense distances and buildings. Here you see the university, with 22,000 rooms. Have a good trip and success in Vienna, and greetings to Els. Father.' After visiting Samarkand, Tashkent, Kiev, Vladimir, and Gorki: 'A strange feeling, traveling completely alone through this country, which is so ancient and yet remarkably rejuvenated.' He visited the observatory of Ulugh Beg, the Uzbek astronomer who, centuries before Copernicus, had concluded from his observations that the Earth revolves around the Sun.

In the fall of 1958, **De Natuurkunde van 't Vrije Veld** appeared in a Russian translation, soon followed by a Romanian one. Instead of royalties, he spent a month traveling through Romania. On a trip to an IAU congress in the United States, he had decided to stop in Iceland and wander around for a week. The plane was filled with Swedish conference attendees who, as he wrote to his wife in 1961, 'fortunately flew directly to the US.' He took the bus and enjoyed the treeless landscape. In Palo Alto, he visited Jet Mahy again. Later, he wrote to her: 'If you were closer, I would love to talk to you about life's problems and gatherings. I am certain that you would let me benefit from your feminine wisdom and understanding. Even at this great distance, I feel safe because we will not forget each other and we will help each other by wishing the best for one another.'

Traveling became a passion to which Minnaert dedicated himself, alongside many other activities, all pursued with equal energy.

1 Interview with Rudolf Mahy.

2 Interview with Hanneke van Konijnenburg-van Cittert Eymers.

3 Acknowledgment to D. Coelingh, secretary of the Dutch Natural and Medical Congresses from 1905 to 1941, who passed away on September 4, 1946; Yearbook NNG 1947, 53 Minnaert was in the United States at the time of the funeral.

4 Quotes from Minnaert's Diary.

5 In 1949, Koen borrowed, among others, the book by Ornstein and Moll: *Objective Spectrophotometry*.

6 Interview with Prof. Dr. Th. Quené.

7 Interview with Boudewijn Minnaert.

8 Minnaert, Diary.

9 A letter from P.J. Waardenburg, son of Minnaert's fellow sufferer, provided this quote. Minnaert wrote this in April 1943.

10 Pannekoek to Minnaert, June 7, 1950.

11 Minnaert, 1949, 70.

- 12 Postcard from Minnaert in the Hondius archive.
- 14 Minnaert to Jet Mahy (USA), December 24, 1956.
- 15 Letter from E.C. Slater.
- 16 The socialist J. Voogd was a prominent member of the Union of Scientific Researchers.
- 17 Interview with Boudewijn Minnaert.
- 18 Hondius archive.
- 19 Kee Thoden van Velzen, *Liber Amicorum* for Minnaert.
- 20 Hondius archive.
- 21 Minnaert to Jet Mahy, November 2, 1957. Mahy Archive.
- 22 Minnaert to Jet Mahy, January 27, 1962.

Chapter 19

The Highest Astronomical Honors

'There is hope that we will discover complete harmony in Nature, which begins with the simplest atom or the far more complex star, and finds its completion in us, mankind, humanity.'

Minnaert as a Phenomenologist and Determinist

Minnaert had written in *The Astronomy and Mankind* how a 'theoretical' astronomer works and must have given an image of himself: 'From a processing of measurements that represent the brightness distribution across the solar disk, the theoretical astrophysicist has deduced that an unexplained difference with existing theory remains. Cautiously, he probes how our understanding of the sun's atmosphere should be adjusted to achieve a better connection; his imagination moves back and forth, he sees difficulties on all sides, one possibility seems still open. He now calculates quantitatively what the consequences would be of the new assumption. Such calculations are usually done with letters, and only at the end are these replaced by known numbers to see if the result meets expectations. Often, attempts must be repeated many times before a satisfactory result is achieved. Our theorist must continually follow the development of modern physics as well as astronomy; mathematics is the tool he learns to handle fluently.'

Minnaert, who here describes the process leading to the explanation of his growth curve, was close to the phenomena and experimental data. The astronomer H.C. van de Hulst believed that Minnaert had a tendency to understand a problem 'as elementarily as possible.' In this context, he re-

ferred to a meeting in Chicago in 1946: 'I still vividly remember how Chandrasekhar and Minnaert met at Yerkes. I was in the library. Minnaert had just arrived to give a summer course and was browsing through the shelves of books. Then Chandra came in and soon their conversation turned to Minnaert's lectures: the spectrophotometry of planets. Minnaert had discovered a method to determine the homogeneity of planetary atmospheres by comparing photometric data from two points on the planet's surface using the reciprocity principle. Chandra had also encountered reciprocity in recent work on radiation transport, and thus a lively discussion ensued.

Then came the moment I remember sharply. Minnaert held his left hand as if it were the planet's surface, pointed to it with a finger of his right hand, which was supposed to represent an incoming light ray, and said, 'Let's consider it in the simplest way.' Chandra looked at that finger, but his brain worked differently. A minute later, I saw him pointing to the table as if it were filled with mathematical formulas. I heard him say, 'It's quite simple. This matrix is symmetrical.' Both experts referred to 'simplicity' as a bridge to mutual understanding, but they had different notions of simplicity. Minnaert always tried to make the problem intuitive; his conversational partner operated within a framework where such intuitiveness played no role.

The astronomer H.G. van Bueren also noted, when asked, that Minnaert's descriptions align with Ornstein's tradition: 'Minnaert worked semi-quantitatively. He was a phenomenologist; he wanted to explain phenomena in terms of processes. That was the Utrecht tradition: line intensities were measured experimentally and not theoretically predicted. Minnaert also wanted to map the solar atmosphere using 'models' that increasingly approximated the phenomena.'

In the 1950s, Minnaert had a correspondence with the theoretical physicist H.J. Groenewold, an employee of his study grant project, who had been appointed as a lecturer in Groningen. Groenewold had noted in his inaugural lecture that over the centuries, there had generally been a shift in physics from a more intuitive image to increasingly abstract formalism. Everything indicated that in the future, there would be further detachment from intuitiveness. Minnaert congratulated him on his 'very interesting lecture' and praised him. However, Groenewold had provoked him: 'You present it as if physics is continually becoming more abstract, more formalistic, less intuitive. This may be true for the last 50 years. But over longer periods, one sees a back-and-forth swing from the concrete to the abstract and back. It is certainly true that the introduction of kinetic heat theory meant a strong increase in intuitiveness. - So I do have some hope that we will now move toward intuitive forms again.' Minnaert did agree with Groenewold that

one had to continue working with formalism, which had already yielded so much positive results: 'The possible development must occur from within; emotional preferences do not help here.'

In the same letter, Minnaert pointed out that intuitiveness was important, but rather that the question of whether phenomena are determined or not was even more crucial. Groenewold replied that he believed these two aspects were inseparable for Minnaert. In the late 1950s, Minnaert gave a lecture on this topic under the title 'Prediction.' He had taken the stance that 'principle predictable' was a challenge for every natural science. The meteorologist W. Bleeker opposed this view, summarizing Minnaert's position as follows: 'If we know the initial state of the atmosphere with sufficient accuracy, and we understand the laws of nature, then we can calculate the state at any arbitrary future moment. We do not need to consider uncertainty relations, because it is a large system. And after all, there are electronic computers!' Bleeker recognized in this vision the 19th-century deterministic worldview of Laplace. On the other hand, Bleeker believed that Minnaert's conditions could never be met in principle: 'The 100% reliable weather forecast will never arrive.'

In smaller circles, Minnaert thus revealed himself as a phenomenologist, but even more so as a committed determinist. The latter he would still publicly uphold.

The Gold Medal of the Royal Astronomical Society (1947)

In the late 1940s, Minnaert no longer directly contributed to groundbreaking work. According to astronomer De Jager, he never fully regained his old scientific fervor: 'He no longer had the patience or inner peace to immerse himself in a long-term program.' De Jager also believed that observational instruments and computational techniques were evolving in ways that required a new generation. Minnaert still occupied himself with a few astronomical projects, such as measuring the Atlas of the solar spectrum and the photometry of Venus and the moon. His doctoral students, such as Van de Hulst with his radio radiation and De Jager with his refined solar models, drove groundbreaking developments.

However, in the 1930s, Minnaert had sown abundantly and could look forward to a rich harvest after the war. In 1946, he was appointed as a full professor and as a member of the Royal Netherlands Academy of Arts and Sciences (KNAW). He became an advisor to Keesing's Historical Archive, an

editorial board member of the First Dutch Systematically Arranged Encyclopedia (ENSIE) and a board member of the Utrecht Studium Generale and the Volk Universiteit. At the request of his colleague Oort, he gave a teaching assignment in astrophysics in Leiden. He became a member of the Hollandse Maatschappij der Wetenschappen and the Advisory Board of the Utrecht community of the Humanistisch Verbond. His international reputation kept pace with his involvement in global cooperation.

On March 10, 1946, he attended a 'nuclear congress' of the International Astronomical Union (IAU) in Copenhagen, which succeeded in restoring international collaboration: 'All participants were so happy to see each other again after those difficult years. Even the Americans and Russians came, totaling 25 people. I'm busy translating.' He must have been one of the few who could effortlessly switch from English to French and also spoke some Russian. In the summer of 1946, he spent several months in the United States, where he gave guest lectures in Chicago and made photographic plates. Until 1948, he chaired the IAU Commission 36 on The Theory of Stellar Atmospheres and from 1948 to 1951, Commission 12 on Solar Radiation and Solar Structure.

British astronomer Eva Gorst thanked him in a postcard for 'the wonderful and interesting evening in Utrecht' and added: 'We want to congratulate you on the Gold Medal awarded to you by England, the highest honor in the astronomical world.' Indeed, he received this medal in 1947. On May 9th, he delivered the Charles Darwin Lecture to the Royal Astronomic Society on The Fraunhofer Lines of the Solar Spectrum. It was a historical summary of advances in solar research, revisiting the asymmetric redshift in line profiles. Later, he had received plates from American astronomer Evershed showing a shift toward violet: 'A true asymmetry of the Fraunhofer lines, sometimes mentioned in literature, cannot be accepted unless confirmed by very precise experiments.' He himself had worked for years on the quantitative determination of this alleged redshift. Minnaert missed the opportunity to revisit this topic after twenty-five years with a witty remark: self-deprecation was not his strongest suit.

Of course, he discussed his 'equivalent width,' which the IAU had just elevated to an international standard. The Utrecht team was working on a Table of measured values of the equivalent widths of 20,000 line profiles: 'I can inform you that the infrared spectrum, in the first order, is practically ready for publication.' His colleague Babcock had told him that the Americans also wanted to create such a Table. The efforts could be combined: 'The IAU is considering publishing a table of transition probabilities based on the Fraunhofer lines, using data from experimental physics and theoret-

ical calculations. This would be of the utmost importance for physics and astrophysics.'

Indeed, this project got off the ground under the leadership of Minnaert and Charlotte Moore-Sitterly from the National Bureau of Standards in Washington. The Fraunhofer lines thus became Minnaert's life's work: his equivalent width dated back to 1923, the growth curve to 1929, the Atlas was from 1940, and now the Table followed, which could occupy them for another ten years. He thereby followed in the footsteps of Kirchhoff and Rowland. He was not named after either the 'equivalent width' or the 'growth curve.' That Minnaert had designed these everyday tools is eventually forgotten in a dynamic science. By 1947, that was not yet the case, and it had earned him the Gold Medal.

The conclusion of his speech was triumphant: 'The main goal of all our work must be to reduce a great diversity of seemingly unrelated facts to the logical consequences of a few fundamental laws, with the ultimate result being: the relative concentrations of the individual elements. At this stage in our science, we recall a statement by August Comte in his **Cours de Philosophie Positive** from 1835: "There are questions that will forever remain hidden from the human mind, such as, for example, the composition of celestial bodies." Time and again, we see that no one should attempt to limit the great sweep of science or human progress.' Minnaert had no need for philosophers who a priori defined the limits of what is knowable. He would use his next major prize to venture into the philosophical domain himself.

The Catherine Bruce Medal

In 1951 Minnaert received the second main prize of astronomy: the Catherine Bruce Medal from the American Astronomical Society of the Pacific. The winner is nominated by the directors of six leading observatories, three of which are in the United States. Minnaert could not collect the prize because the U.S. government, in the heat of the Cold War, denied him a visa as a 'fellow traveler.' His American colleague Struve heard his speech in Utrecht, presented the medal, and published the remarkable text.

Minnaert wanted to refute philosophical statements that hindered the development of biology in **The Significance of Astronomy for Biology**. Considerations about stars and other celestial bodies were usually not included in philosophical debates about 'vitalism.' Minnaert compiled a list of characteristics typical of living organisms based on biological textbooks. It

turned out that 'living' systems have many properties also found in 'lifeless' systems like a star. Therefore, Minnaert suspected that a living organism could be understood as a physical system of very great complexity.

Every star has a striking 'individuality,' just like an organism. The hierarchy in the organs of living beings finds its counterpart in the hierarchy of the astronomical sequence: satellite, planet, star, stellar system, and cluster of systems. A star has an individual 'past': its mass and chemical composition are the result of its history of origin and determine its development. A star does not rotate too quickly, as this would eject too much matter; if it pulsates, a damping mechanism automatically occurs. A star is 'a whole' with interactions between the individual parts, which, when damaged, can provide an impulse for recovery. If part of the material is removed, a star can restore its spherical shape. All of this seems 'intended' to allow the star to survive. Yet no astronomer would claim that there is an intention behind it. So why do many biologists do so?

Some might object that a star does not possess individual consciousness or 'soul.' The question of the star's soul raised the issue of the soul of other organisms, comparable to those of a fungus or a mussel: 'There is indeed an important difference in this regard between the organic and inorganic nature, but this difference is not fundamental, just as differences in form, organization, and hierarchy are not. These are differences that develop over the course of evolution and gradually become more significant. To claim that consciousness begins at some point in the chain of evolution contradicts, in my view, all principles of continuity. If we know from direct experience that we possess consciousness, then we must conclude that even the simplest organisms possess this consciousness; and not just them, but also individual atoms, albeit in the most primitive and latent way.'

Minnaert repeated here what he had earlier written to Burgers. People had to free themselves from the idea that there is a fundamental difference between living and non-living nature: 'There exists the hope that we will discover complete harmony in Nature, which begins with the simplest atom or the far more complex star, and finds its fulfillment in us, humanity.' This deterministic view also implied that if knowledge and instruments were sufficiently developed, a living being could be made step by step.

Actually, Minnaert was not fighting against vitalism here but against dialectics. The philosopher and dialectician Hegel had provided numerous examples in his **Wissenschaft der Logik** of quantity transforming into quality, and vice versa. His followers Marx and Engels had followed him in this regard. In the Netherlands, few scientists engaged with dialectics. Struik and Pannekoek, personal friends of Minnaert, were exceptions to this rule.

Pannekoek had responded extensively in a 1950 letter to this continuity thesis. When moving from atoms to things, his mentor Minnaert had warned, it involves a difference of the order of 10 to the power of 20: 'Quantitative differences of this magnitude are unimaginable to us, manifesting as the most fundamental qualitative differences, which appear to us as entirely incomparable worlds.'

Minnaert's continuity thesis implies that physical concepts expressing 'intensity,' such as pressure, temperature, or viscosity, do not exist because they have no meaning at the atomic level. The reverse reasoning, concluding from the 'fact' of human consciousness that atoms possess a primitive form of consciousness is curious. Chlorine gas is yellow; a chlorine molecule is not. If so many physical 'qualities' disappear in the transition from object to molecule, why would a more complex quality like 'consciousness' remain?

Minnaert gained significant international prestige in astronomical circles after the war, even beyond the scientific domain. In the 1950s, Minnaert became vice-chairman of IAU Commission Physical Studies of Planets and Satellites and chairman of Subcommission 14a on Intensity Tables. In 1951, he was appointed as a respondent at the Portuguese University of Coimbra and as a member of the Royal Flemish Academy. He was pleased with his appointment to this Dutch-speaking academy: 'I consider it a great honor to be one of you. May your work thrive and benefit our beloved Flanders and humanity!'

He spoke in Brussels about The Surface of the Sun. He discussed Rupert Wild's physical discovery (1939), which had led to a paradigm shift in the interpretation of the continuous solar spectrum:

'Relatively recently, it has been shown that the radiating gas is a very special negative ion, consisting of an H-atom that has bound an extra electron. Such a negative H-ion forms, for example, during the electrolysis of NaH; it has not yet been possible to produce it in gaseous form, but its properties can be calculated. It is then found that it must emit virtually uniform continuous light across the entire visible solar spectrum and into the near infrared.' The mystery of how a radiating gas ball could produce a continuous spectrum with Fraunhofer lines was finally solved!

Minnaert's standing in Science

Minnaert often had the ability to accurately sense which direction astronomical research was taking. He published compilations, such as his Charles Darwin Lecture, which opened up the field for the new generation. In his

1952 lecture Astronomy to the Dutch Society of Sciences, he championed a historical view of the universe and the Milky Way system, the sun and the planets. If a geologist wondered how the Earth's crust was composed, he inevitably had to consider the forces that had worked in the past.

Therefore, the theoretical method of astronomy itself had to be extended so that it could look back into the past: 'If the celestial body had a simple structure at a certain moment in prehistoric times, we must go back to that moment and, following all the behaviors of matter from there, rediscover the entire complexity of the current state. This detour of the theoretical method is thus a valuable tool for us to solve the most inaccessible problems of the present, while also bringing us to a piece of science about the past that is highly important in itself.' The first results of radio astronomy had opened up a view of the universe and removed this creation history from the realm of Science Fiction and placed it on the scientific agenda.

Time and again, one had to ask: 'How did all this come about?' The biologist answered with the concept of evolution, the astronomer with the concept of cosmogony: 'In the last ten years, a remarkable boom in this branch of science can be observed. It is my personal conviction that it will soon become the central astronomical theory, in which many now separately developed parts of our science will find their place - just as the theory of evolution has been, in a certain sense, a synthesis of paleontology, comparative anatomy, embryology, systematics, and biogeography.'

It was now established that the stars were not all created once and for all in a distant past, but that new stars are continuously being formed, almost before our eyes, most of them as double stars. There might have been a pre-stellar stage of the universe, in which matter was extremely densely packed at a very high temperature. Opinions were divided, but optimist Minnaert stated, 'Simply asking the question about these such fundamental things testifies to the audacity of modern astronomy and our confidence in the scientific method.'

Minnaert was convinced that there are countless 'habitable' worlds in the Milky Way system, let alone beyond it: 'The biologist will probably not doubt that many of those habitable planets are indeed inhabited.' Interplanetary travel was technically conceivable, although 'military purposes had already been associated with such experiments beforehand, which are a contamination of the exalted, benevolently pure essence that has always been inherent in astronomy.' Therefore, he emphasized the need for international cooperation between East and West. With a nod to current panic stories about mysterious space radiation, he suggested 'that this truly international orientation of astronomers might well be due to a very special,

beneficial radiation from outer space.' It was, in fact, a well-known fact that many leading astronomers in the international community had a left-wing or far-left leaning: Pannekoek, Minnaert, and De Jager formed the guarantee for a respectable branch of this camaraderie in the Netherlands.

Minnaert was involved in his friend Gerard P. Kuiper's prestigious series on the solar system. In 1953, Part I about The Sun appeared in Chicago with an article by Minnaert titled The Photosphere. In such an article, he overviewed the field and sought to do justice to his own contributions as well as those of his students. An important role in this article was reserved for the discussion of recent solar models by De Jager.

Work on the tables for the Utrecht-Washington project continued steadily. Minnaert, Houtgast, and other staff members proceeded with a pre-publication in 1960 because astrophysics urgently needed these values to compare the intensities of stellar spectra with those of the sun. This Preliminary Photometric Catalogue on Fraunhofer Lines contained values with wavelengths ranging from 3614 to 8770 Å, covering ultraviolet to infrared. The three columns provided, for all lines, the wavelengths, equivalent widths, and 'reduced widths,' which are the equivalent widths divided by the local wavelength.

In 1960, Minnaert contributed to Kuiper's Part IV on The Planets with the original article The Photometry of the Moon. No celestial body offered such an excellent opportunity to utilize the range of photometric methods. His argumentation notably featured a practical approach, which had also characterized his choice of solar research. He included space for his own contributions and the recent dissertation by his doctoral student J. van Diggelen. Together, they had wondered how the specific scattering and absorption of sunlight on the moon's surface could be explained. Numerous common formulas had not led them further. This had tempted Minnaert to choose a new starting point: 'The photometric properties of the moon are primarily determined by the shadows of millions of irregularities on its surface.'

Van Diggelen had tested numerous surface models: 'The moon's surface is apparently an assembly of tightly packed holes of various sizes, next to and on top of each other, carved out in dark material. These model experiments confirm the results obtained through theoretical calculations.' They had compared the degree of porosity of the lunar surface with biological material such as **Cladonia rangiferina**, reindeer moss. The photometric properties of this moss almost matched the observations: 'As a result of the weakness of the moon's gravitational force, very loose surface formations can be created, with properties close to our model.' His fascination with the geophysical structure of the lunar surface was striking. The celestial body exerted a

special attraction on the romantic Minnaert, who could speak about the beauty of the moon and become enraptured by it.

Against divining rods and flying saucers

Minnaert's enthusiasm for spreading knowledge and science found its counter in the fanaticism with which he opposed 'pseudo-science.' In **Sterrenkunde en de Mensheid** (**Astronomy and Humanity**), his declaration of war against astrology had also been included. Minnaert had argued for a structural responsibility of the Physics department of the KNAW in this regard and had found support.

When a hype arose in the late 1940s about the religion of the Great Pyramid, **De Stenen Spreken** (**The Stones Speak**), Minnaert had responded on AVRO radio with **Spreken de 25 Stenen?** (**Do the 25 Stones Speak?**). He repeated what he had earlier explained: 'The dimensions, interpreted in the right way, would indicate all sorts of numbers from astronomy, numbers that the ancient Egyptians could never have known. The pyramid would have been built under the direct inspiration of God. If you convert those measurements into time spans of years and days, he claims that the entire history of humanity can be read from the pyramid, including predictions for the future and all kinds of wise advice.' Minnaert amusingly demonstrated how numbers can endlessly be manipulated. This criticism by the atheist Minnaert was warmly supported this time by religious authorities.

When new fads emerged in the 1950s surrounding earth rays and dowsing rods, the Academy, and Minnaert himself, were ready. For instance, J.G. Mieremet had established the First Dutch Bureau for Dowsing Rod Research against Health-Damaging Soil Influences and designed a portable device with which one could register 'earth ray tracks.' The Physics Department of the KNAW formed a committee under the leadership of physicist J. Clay, with members S.T. Bok, G.G.J. Rademaker, and Minnaert. This committee reported in 1954:

- That the dowsing rod had not proven its reliability as a detection tool for either known or unknown phenomena in any of the cases examined;
- That the existence of so-called earth rays had not been demonstrated or made plausible in any case;
- That convincing evidence had been provided of the worthlessness of the examined devices for 'destroying earth rays or neutralizing their effects';
- That it was desirable for the government to provide protection against the activities of manufacturers of anti-earth ray devices, especially when such

activities operated in the medical field.

A working committee under the leadership of medical physicist L.H. van der Tweel had conducted 28 experiments, during which, apparently, there was quite a bit of laughter. Minnaert, the only one who took the work very seriously, believed that Mieremet's challenge to test his devices should be accepted. The working committee outright refused. The ink of the KNAW report was barely dry when Mieremet promised new 29 wonders. He used the report as propaganda: 'For nineteen years, I have had to fight, and the devastating statement from the KNAW remains fresh in everyone's memory.' He had designed a better device: 'It will no longer be possible to avoid the necessity of protecting hospitals, sanatoriums, dormitories, schools, offices, many homes, barracks, and apartment buildings from these overdoses. Stables and farms as well, because with the aforementioned instrument, we can now demonstrate that horses, cows, pigs, and poultry become restless and sick in certain places. But especially for cancer treatment, our work will prove to be of great value.' These resounding reports could count on pages of text in regional newspapers.

After the Report, the committee was dissolved and no new one was established. More useful was probably the action in *Het Vrije Volk* from November 1954, where editor L. Velleman, together with professors Oort, Minnaert, and W. Bleeker, tackled the 30 Flying Saucers: 'The article aims to deal with Flying Saucer madness before it spreads to our country.' The astronomers provided sensational descriptions of observers with commentary and pointed out natural phenomena such as meteors, fireballs, comets, auroras, perspective distortion, sun dogs, moons, and mirages. In a TV broadcast from December 1954, Minnaert himself critically questioned a KLM pilot who had observed an opaque 'light ball of orange or pink color.' These debates were likely more effective than the KNAW committee's report.

May 5th and the Humanist Youth

Halfway through the 1950s, Minnaert gave a welcome speech at a meeting of Humanistische Jongeren (HJG) on May 5th. He urged them to commit themselves to the free, unbiased 'growth of truth, unencumbered by preconceived opinions.' The authorities tried to obscure the commemoration of May 5th because the Federal Republic had to be able to rearm. Young people should not take the path of least resistance: there was no reason to look at the behavior of the majority!

Other youth groups had religion as their central idea. In the program

of the Humanistische Jongeren, it was only stated that they did not want to commit themselves to religion. Minnaert found this too negative. It was about seeking truth honestly. Some suggested that the highest wisdom lies in showing that we know nothing for certain. The young people had to resist that. It was about 'scientific truth,' which largely stood firm, even though science continued to evolve. In this growth, it was hindered by religion and the church. When that institution finally had to give in, it claimed that science 'has nothing to do with faith.' The young people had to liberate themselves from the arbitrary commands of the church. The great societal truths, the laws and commandments of society, and the notions of 'good' and 'evil' were not given by God but originated in society.

The humanistic youth had to act on principle and radiate certainty where appropriate. That was not fanaticism; rather, it was a conscious resistance against weakness and indifference: 'What now seems hopeless will soon become achievable and self-evident. The conditions in the world are changing at great speed.' Peace had to be preserved. In their later lives, they had to remain loyal to these fresh convictions. They had to give meaning to their lives and 'not live in vain': 'Only those who do something for it deserve happiness, freedom, and life.'

Minnaert also continued to play a role with his stance on the 'social aspects of student recruitment' in the discussion among progressive youth about university reform. In the mid-1950s, he led a working group on behalf of the board of the Humanist League, which produced a policy document advocating for 'study grants.' By 1963, the torch was finally taken up by the student movement itself.

The First Public Observatory in Oudembosch

In **Sterrenkunde en Mensheid**, Minnaert also argued that professional astronomers should serve the work of amateurs. They should not ask for compensation for this. He therefore gave numerous current lectures for the Association of Weather and Astronomy. These stories often ended up in magazines such as **Hemel en Dampkring** and the **Nederlands Tijdschrift voor Natuurkunde**. His lectures were accompanied by beautiful slides, which he naturally called 'lantern slides.' Entire folders are filled with the lectures, which every time, were updated with recent events and developments.

The stories alternated between The Sun, The photosphere, Sunspots, Contemporary issues concerning Fraunhofer lines, The Corona, Clouds, Halos, The origin of Earth, Aurora borealis, Disturbances in the ionosphere,

The ozone layer (since 1938!), Cosmic phenomena in the atmosphere, The moon in folklore and science, Jupiter, Sputnik, Is atomic energy a curse or a blessing?, The physics of comets, The evolution of stars, Meteors and meteorites, Stellar radiation, Binary stars, Nebulae of gas and dust, Magnetic fields in the Milky Way, The structure of the Universe, Radio waves from space, and much more. New topics were constantly added, such as quasars and results from satellite images in the 1960s; old ones were updated. If he held two lectures of this nature per week for forty years, he must have spoken at several thousand gatherings with dozens of interested individuals about weather, natural history, and astronomy. He was a propagandist proclaiming the salvation of science.

As a popularizer and board member of the Utrecht People's University, Minnaert became involved in an initiative by J.A.F. de Rijk, alias Bruno Ernst. In 1959, De Rijk had visited a friend in Switzerland. That evening, in the garden, his friend's wife enthusiastically told him all about the stars. De Rijk had just published *The Atlas of the Universe*, with a foreword by Minnaert. The curious guest learned that the hostess's interest had been sparked by a visit to the Zurich People's Observatory and concluded: 'Then it would be worth starting a similar initiative in the Netherlands.'

Shortly before, inspired by the attention surrounding Sputnik, Minnaert had created the booklet *Getting Acquainted with the Starry Sky* for the Current Topics series, which aligned with De Rijk's plan. He was enthusiastic and encouraged the idea wherever he could. De Rijk wanted to name the observatory in Brabant's Oudenbosch, just a stone's throw from the scale model of the Roman St. Peter's Basilica, after Professor Minnaert, but Minnaert declined. Instead, Minnaert suggested naming the institute after Simon Stevin, his fellow citizen from Bruges with whom he interacted daily at the time. And so it happened.

On January 14, 1961, Minnaert opened the People's Observatory Simon Stevin with a glowing speech in which he outlined the joys of personally observing the starry sky. Indeed, 'amidst all the tensions and threats in human society, the perfect beauty and regularity of the great Universe stand as a comfort, an encouragement, a timeless harmony.' Since there had been much fuss around the opening, De Rijk felt a sense of anxiety when climbing the monastery tower that Minnaert would be disappointed if he saw the observation platform measuring four by four meters with its meager main instrument being a 10 cm diameter refracting telescope and then the small room for slide presentations with its sixteen chairs. When he addressed Minnaert in that vein, Minnaert had paused on the stairs and said: 'That is precisely the way to begin something great. A mighty oak also starts as a

small sprout.’

The People’s Observatory relied on volunteer work and funds collected through De Rijk’s talent for fundraising during its first years. He sought subsidies for a paid staff member. Minnaert accompanied him to the ministry to convince the officials of the importance of this observatory for public education. The lobbying was successful. Later, De Rijk received the Silver Carnation from the government for founding the People’s Observatory, with Minnaert acting as his *paranimf*: ‘When I saw how such a mark of honor was being awarded, it gave me the idea to establish my own token of merit for the popularization of astronomy and space exploration. It became the Simon Stevin Telescope.’ De Rijk asked Minnaert if he would accept this, and Minnaert assured him it would be an honor. De Rijk garnered much publicity when Minnaert accepted the second Simon Stevin Telescope; a gilded Dutch telescope that provided double magnification.

Initiatives from dedicated amateurs could count on Minnaert’s support. He exemplified this attitude for his students, PhD candidates, and staff. This helped ensure that the Utrecht Observatory remained the center of the Dutch amateur astronomy and meteorology community.

1 Minnaert, 1946, 11.

2 Interview with astronomer HC van der Hulst. Also found in: Meeting Chandra, Leiden Observatory, undated.

3 Interview with theoretical physicist H.G. van Bueren.

4 Congratulations from Minnaert on February 25, 1954; response from Groenewold on March 1, 1954. Provided by Aart Groenewold. For a biographical sketch of H.J. (Hip) Groenewold, see Molenaar, 1994, p. 200.

5 His opponent referred to this lecture in Bleeker, 1962.

6 De Jager in the SG lecture, ‘A Man of My Taste,’ in Haakma, 1998.

7 Many diplomas and honors in the Minnaert archive at the Utrecht University Museum.

8 Postcard from Minnaert. Hondius Archive.

9 Postcard from E. Gorst in Castle Combe to Minnaert, February 9, 1947.

10 Minnaert, (1951).

11 He repeated the core of his argument in lectures on Astronomy and Biology for the Humanistisch Verbond and Volksuniversiteiten. Summary statements from a lecture on April 23, 1953, for ‘Pyramide’ have been preserved. History Archive.

12 Astronomer E.J. Öpik labeled Minnaert’s philosophical position as ‘animistic’ in ‘Life and its evolution from an astronomical viewpoint’, which he sent to Minnaert with compliments: ‘The Irish Astronomical Journal’,

2, 1952, 9. Such controversies did not hinder friendships; on the contrary. History Archive.

13 Minnaert often mocked Hegel, whom he, like Comte, dismissed as a dogmatic thinker.

14 Hegel, G.W.F., **Wissenschaft der Logik**, 1832-1845, Frankfurt 1969. Marx, **Das Kapital I**, 1867. Engels, **Dialektik der Natur**, 1883.

15 Pannekoek to Minnaert, April 19 and 20, 1950.

16 Commentary on this passage from science philosopher Dr. E. Glas of TU Delft was utilized.

17 From 1952-1955 and 1958-1964.

18 From 1955-1958.

19 Minnaert (1952), with a speech from November 9, 1951.

20 Kuiper's work on **The Sun** in 1953,

21 De Jager in Drummen, 2001, p. 38.

22 Minnaert and J. Houtgast, Preliminary Photometric Catalogue on Fraunhofer Lines, *Recherches de l' Observatoire d'Utrecht XV*, 1960. Contributions came from Claas, Hubenet, Van de Hulst, De Jager, and the assistants J. Blom and M. Dekkers.

23 Kuiper's work on **The Planets** and the Moon's photometry in Chicago, 1961."

24 Van Diggelen, 1959. Minnaert, (1941).

25 Minnaert for AVRO, August 17, 1950: Do the Stones Speak?

26 The KNAW committee was officially called the Investigation of the Divining Rod and Earth Rays Problem.

27 Report of the KNAW Committee on the Investigation of the Divining Rod and Earth Rays Problem.

28 History Archive, Dowsing Rods and Earth Rays folder.

29 History Archive. Mieremet clipping.

30 L. Velleman, *Het Vrije Volk*, November 1954. The TV broadcast with pilot H. Dill from Blaricum took place on December 1, 1954. There were hardly any television programs yet: Minnaert was an early adopter of the new medium.

31 Note of the welcome speech at a meeting of the HJG. Undated. History Archive.

32 Humanist Alliance, Report from the Study Grant Committee, 1957.

33 Astronomy Archive.

34 Letter from J.A.F. de Rijk, alias Bruno Ernst, alias Brother Erich, dated January 6, 1995.

35 B. Ernst, *Atlas of the Universe*, 1958. Ernst also wrote a well-known publication about the graphic artist M.C. Escher.

36 Manuscript opening of the Public Observatory in Oudenbosch. Astronomy Archive.

37 The installation later moved to Hoeven as the 'National Public Observatory.'

38 Drummen, 2001, chapters 13 and 14.

Chapter 20

The Solar Wind of the Cold War

'Therefore, you are already introducing McCarthy's methods (that's what it is!) and thereby perpetuating the evil that one seeks to combat. The witch hunt has begun.

Minnaert and Coelingh as Peace Activists

The sixty-year-old Minnaert, meanwhile, supported the work of World Peace Congresses and the related Dutch Peace Council (NVR). This peace movement opposed the atomic weapons race, against the American atomic bomb and German rearmament. The 'activists' saw this as a struggle against resurgent fascism and militarism. However, the movement was hierarchically structured along the lines of national communist parties, with the Soviet Union determining the course. Minnaert was aware of this and apparently considered it the lesser evil. He remained in resistance.

He believed it necessary for a peace movement to be fueled by popular activities. The World Peace Congresses had produced the Stockholm Appeal of March 1950, which under the leadership of his French colleague F. Joliot-Curie had grown into a worldwide campaign against atomic weapons. The wording played on the threat of an atomic war over Korea: 'We will regard as a war criminal any government that first uses the atomic weapon, against any country whatsoever.' The campaign could count on support from painters Picasso and Chagall, the Russian writer Ehrenburg and the American singer Paul Robeson, West German Thomas Mann and East German Anna Seghers, architect Le Corbusier, and Finnish President Kekkonen. In the Netherlands,

the NVR, with logistical support from the CPN, collected more than a million signatures of support. The campaign was fiercely opposed by other political parties, particularly the PvdA.

In 1951, action was taken against the planned rearmament of West Germany. This aroused aversion in the country itself, in neighboring countries like France, and in the Soviet Union. NATO considered this rearmament a necessary defense against communism. The Stalinist executions in the 'People's Republics' were the perfect catalyst for this arms race after Korea. The World Peace Congresses ignored the show trials and repression in Eastern Europe and thereby took sides.

Minnaert supported the initiative for a peaceful solution to the German question. He was present at an International Conference on this topic in Paris. The secretary of the Dutch group, communist artist Hermine Lataster-van Hall, came to Sonnenborgh to discuss it with him. Miep Coelingh later said: 'They were trying to win my husband over when I entered with coffee. Someone asked, 'Don't you have any interest?' They invited me to speak at the World Peace Congress in Vienna. I became a member of the Dutch Peace Council. Whenever Irène Joliot-Curie needed to be somewhere in the Netherlands, she stayed with us.'

She attended colloquia on The German Question, where Germans from West and East began discussions on preventing rearmament. In the Netherlands, a petition campaign was started, supported by the magazine **Vrede**. On August 22, 1952, the front page featured 'Miep Minnaert-Coelingh,' who argued that it must be prevented that a German army would rise again under the leadership of 'Nazi generals.' The arming of the West would provoke the arming of the East. Only a peace policy based on reason and justice had a future.

The first Conference had to be postponed until late 1952 due to the denial of visas for East Germans, moving it from Paris to Odense, then to Stockholm and Basel, until it could finally take place in East Berlin. Out of 200 'delegates,' 46 came from West Germany, 26 from East Germany, and 35 from 'Greater Berlin.' Minnaert-Coelingh, along with Lataster-van Hall and Sita Anderson-Cochius, became the leader of the Dutch campaign against the European Defense Community. She gave speeches everywhere, wrote for **Vrede** and other magazines, and lent a hand or provided support. She found herself in a whirlpool of contacts and foreign trips. She participated passionately and disciplined in the activities: she had a new calling. Both spouses eventually had an equal relationship: not in science, but in the peace movement.

The Minnaerts in the Soviet Union

In March 1952, Minnaert and Coelingh together received an invitation for a scientific trip to the Soviet Union. This was likely connected to their role in the peace movement. They visited Prague, Minsk, Moscow, Leningrad, and Crimea. Amidst the ruins of Leningrad, Minnaert gave a lecture at the Poelkovo Observatory. They visited the Academy of Sciences, the Lenin Library, the House of Scholars, and the Planetarium. His lecture at the Sternberg Institute in Moscow attracted a hundred interested attendees. In Armenia, he met astronomers like Ambartsumian who wanted to exchange publications and participate more actively in the work of the IAU. He noted: 'insufficiently reversed.'

The discussion contributions after Minnaert's lectures consistently started and ended with quotes from Lenin, Stalin, Engels, or Marx. He wrote: 'uncertainty.' In his view, they constructed an artificial opposition between 'Soviet science' and 'Western science.' He decided to point out the ideological nature of their interventions: perhaps it was because they maintained insufficient contact with the scientific outside world. At the time, it must have been partly uncertainty and partly self-preservation, as the KGB always and everywhere made notes.

He observed that his conversation partners feared scientific results that seemed to contradict communist ideology. In the fields of heredity, cell formation, and cosmogony, scientific theories were rejected a priori. Everyone should be able to agree with some minimal starting points, Minnaert thought:

- every theory that can be scientifically justified has the right to exist and must not be attacked for ideological reasons;
- experience, observations, are the foundation of science;
- one must not attack Western science (if it is serious), but rather certain philosophical, erroneous conclusions;
- many Westerners present all sorts of things as established in their popular works, which is more like 'self-promotion.'

He chose a position that clashed with the 'theory of two sciences' that party ideologist Zhdanov had decreed in 1948. Following this, there was the canonization of the biologist T.D. Lysenko, who had placed the primacy of all science in 'dialectical materialism.' Incidentally, the views of Lysenko's astronomical counterpart, Ter-Oganesov, had dominated in the 1930s had lead to the death of his Russian correspondent at Pulkovo, E. Perepelkin, and the latter's boss Gerasimovitch. Minnaert seemed unaware of this.

According to his hosts, there was an insurmountable opposition between 'materialists' and 'idealists.' The use of this terminology was new to him,

although he had encountered it before with De Jager. Minnaert had upheld his 'idealism' in the matter of study grants against Polak. In the Soviet Union, the term had a negative connotation. Minnaert found it surprising and 'extremely interesting.' The couple made a wonderful trip and gained a positive impression of the country and its people.

A Utrecht polemic about the GDR

Minnaert sometimes became involved in polemics in the Utrecht university magazine **Sol Iustitiae**, such as the one about study grants with his colleague Hijmans van den Bergh, who accused him of state dirigism. Equally fierce was a 1953 polemic over an action by the University Asylum Fund for East German students, involving Minnaert, Miep Minnaert-Coelingh, and student A.W. Burger.

Burger had criticized the lack of intellectual freedom at the East Berlin university: the state scholarships for workers' children, the compulsory Marxist philosophy curricula, and the mandatory membership in the Freie Deutsche Jugend (FDJ): 'Every lecture must be submitted in writing beforehand and presented to the university leadership for approval, to ensure it aligns with Marxist-Leninist doctrine and communist self-satisfaction.' He also reported that 30% of all students suffered from serious illnesses, particularly tuberculosis, and that 25 girls had recently been deported to Siberia.

Minnaert thought Burger made no effort to understand the complicated situation. Most students in the GDR lived on scholarships. The young state wanted to quickly establish an intellectual cadre. That deserved appreciation rather than contempt. Burger seemed to reject all forms of study financing, whereas Minnaert was in favor of it. Additionally, he questioned whether the alleged abuses were truly as widespread as claimed.

Two weeks later, again across the entire front page, Burger responded. The study included political exams that one had to pass. The police surveilled students: 'Children from bourgeois, educated families are barred from the university unless they have clearly demonstrated their political zeal.' The East German student was not given time to think and judge: 'This is how one would create an intellectual proletariat willing to follow the regime in everything.' Ironically, fifteen years later, 'activist' students would make the same claims about studies in Utrecht, Paris, and West Berlin.

Minnaert found Burger's vision exaggerated. Since his wife was going to Berlin, he asked her to present Burger's criticism to people she could meet at the university. On June 12, he approached the editorial board with a letter

from his wife containing 'some data proving how cautious one must be with one-sided information.' That letter also adorned the front page. She had presented healthcare statistics to a West Berlin doctor. Tuberculosis control was more effective in East Germany than in West Germany. At the Peace Congress, she met the Dutch filmmaker Joris Ivens, who had been expelled from the Netherlands because of his film *Indonesia calling* and found that the freedom to work in the East was greater than in the West. She spoke with people involved in student housing who provided an explanation for collective facilities that didn't even exist in the Netherlands. A conversation with two non-Marxist philosophers revealed that it wasn't entirely unreasonable to engage with Marxist ideas.³⁷⁴ This polemic illustrates how things were done at the time. Burger's criticism covered both East Germany's efforts to create healthcare and education as well as the state's ideological terror. Miep Coelingh praised the facilities and, considering the circumstances, had understanding for the ideological pressure. Minnaert had publicly criticized that pressure during their visit to the Soviet Union. He would continue to do so, as in his speech commemorating the Polish astronomer Kopernikus, better known as Copernicus.

The commemoration of Copernicus (1953)

After Stalin's death and Khrushchev's rise to power, a brief 'thaw' occurred in 1953. The World Peace Council had drawn attention to Copernicus (1473-1543). Indeed, the war had prevented the commemoration of his death. Minnaert was the speaker at a gathering in Amsterdam where representatives of the diplomatic corps from Poland and the Soviet Union sat fraternally next to the Rector Magnificus and representatives from politics and science.

Minnaert condemned the Roman Inquisitors who had embittered the lives of Copernicus and Galileo. Copernicus had distanced himself from the Earth as the center of the universe and replaced it with the heliocentric worldview. Galileo had defended his views. According to the spiritual authorities, this was heresy: 'Galileo was forced to retract his statements and was broken for the rest of his life. Copernicus's book was placed on the Index of forbidden books in 1616, which could not be read until they were amended.' Science had forged its own path. When the Church officially lifted the ban in 1822, it no longer mattered to anyone.

Minnaert praised the courage of this 'free spirit' and advocated for the freedom of research, which also includes the freedom to hesitate. In the usual biographies of such scientists, it was as if they knew exactly what they were

doing, as if they had discovered the truth through a series of systematic investigations. In reality, science was a process of wonder and searching, with concentration and dedication being necessary conditions.

In recent years, that heliocentric worldview had, in turn, been brought down to Earth. In the cosmos of Kapteyn and Oort, the Sun was an insignificant star: 'We are part of an enormous lens-shaped swarm, a kind of flat disk consisting of about 100 billion stars. One of these Milky Way stars is the Sun, around which the Earth orbits. It is relatively far out in the system; closer to the center, the stars are packed more densely, but there is no 'central star.'

Thinking of Copernicus, and likely also of Flanders and socialist Poland, Minnaert sighed: 'How few have the imagination needed to fully think through a new idea, the goodwill to embrace it, the courage not to shrink from the new!' This is indeed also the reason why various social reforms take so long to come about. And for this reason, one can also understand that practitioners of the exact natural sciences, trained in the pursuit of truth, are often socially progressive, just like poets or politicians. Imagination, a good will to examine new ideas, and the courage to accept them when they prove to be good—these are the characteristics of the truly progressive person, both in science and in societal life.'

Minnaert now also theoretically linked the practice of exact natural sciences with social progressivism, although on this occasion he had also included politicians and artists. He called Copernicus a symbol of 'struggling and victorious science' and thus shook off the Catholic **ecclesia militans et triumphans**.

His diary mentions a trip to Poland, where he visited his niece Helena and astronomical institutes and observatories. Among his colleagues, in addition to Russian reference works, he saw publications from all parts of Europe: "While they energetically build on the development of their own Polish science, they can also play an important connecting role in bringing East and West into contact with each other. We think with great sympathy of that reborn country, which has directed itself toward a new future through energetic work, and we send our warmest wishes to the scientific workers there."

Just as he assigned a peace role to the Netherlands as a small country within the Western camp, so too did he propagate such a role for Poland within the Eastern Bloc. His view of the role of the Netherlands had earned him a file with the BVD (the Dutch security service): would his view on Poland be less controversial? This message was between the lines and will have completely escaped most people. Attentive listeners, however, could

interpret these elegant sentences as an invitation to Polish politicians to fulfill a bridging function between East and West during this time of détente.

A hidden polemic?

Minnaert received a letter from sculptor J.W. Havermans, a board member of the CPN (Communist Party of the Netherlands), following his lecture on Copernicus. His speech had dealt with 'the struggle for the freedom of science against the dogma (and thus the compulsion to limit) of the Church.' Havermans believed that Minnaert had suggested that society would always cause resistance. As a result, he had created a basis for attacks on the Soviet Union, 'where the Central Committee of the communist party expresses its preference for a particular interpretation or interpretations in a branch of science on points that are of major importance to society, based on the circumstance that science and society form an unbreakable unity.'

He interspersed his views with a selection of quotes about 'historical materialism.' One of them came from F. Engels' **Anti-Dühring**: 'It is not nature and the realm of humans that align with principles, but rather the principles are correct only insofar as they correspond with nature and history.' Havermans feared accusations that could be made possible through Minnaert's speech. He had consulted with the prominent communist Sebald Rutgers, a pioneer of heavy industry in the Soviet Union, who shared his concerns.

Minnaert acknowledged that societal conditions direct researchers' interest toward certain subjects, encourage or hinder boldness: they influence the way humans engage in science. However, science **itself** must free itself from this: 'Everything that does not align with experimentation is simply dismissed by science, entirely independent of societal wishes or tendencies. It is therefore wise that historical materialism opens our eyes to many things that were previously accepted unconsciously as self-evident, while in fact societal influence was at play; in this way, a salutary critique is exercised, and we are able to free ourselves more swiftly from these prejudices.'

However, Minnaert had observed that communists believed that 'historical materialism' provided them with a magic formula to dictate scientific guidelines, **even for natural science**: 'There is no such thing. The statements of historical materialism in their classical form are completely outdated and incorrect.' The Russian Communist Party had 'committed the greatest errors and mistakes in this regard. Worse than these errors is the fact that ignorant individuals are granted the right to judge matters they

know nothing about, and whose judgments are clouded by misunderstood societal views and emotional prejudices.' Nature would soon call Russia to order: 'I can do no better service to Russia than by honestly stating where they are mistaken.' Minnaert referred to the history of Lysenko as a mistake that would heavily exact revenge in agriculture. Similar issues existed in chemistry and physics: 'This drive does not stem from serious scholars, but from individuals of limited expertise that have not been properly schooled in the scientific research method.'

Havermans' quotes from Marx, Engels, and Lenin made no impression on Minnaert. One could extract whatever one wanted from their work: 'Wouldn't we rather rely on our common sense?' These men had lived long ago, and since then much had changed in philosophy! They too could be mistaken: 'However, I gladly agree with your quote from Engels, which states that principles are not the starting point of research, but that they must adapt to nature. That speaks to my heart.' If scientists in freedom could conduct their work, the chance was greatest that free minds would find a direction that at that moment would be considered anti-social and yet prove to point the way to a new society: 'Thanks to Copernicus!'

Minnaert felt connected to the artist's line of reasoning but considered his positions and those of the CPN [Communist Party of the Netherlands] fatal. Havermans was right: Minnaert had indeed sent a signal that would not have gone unnoticed by Polish and Russian authorities and the leaders of the CPN.

Resurrection of the Union

Minnaert, as a board member of the Union of Scientific Researchers, continued to follow its activities. Chairman Fred Polak set a different course. The arms race around Korea, in his view, had made cuts in education and research inevitable. In an NRC series from April 1951 on Culture and Defense, he had come up with the egg of Columbus. He wanted to allocate part of those defense expenditures to 'culture,' thereby connecting cultural and military resilience. This trick was intended to secure additional funds for scientific research.

Minnaert felt compelled to respond to this cuckoo's egg. Totalitarian aspects lurked: collaboration between defense and education had characterized Nazi Germany. American colleagues, on the other hand, wanted to take the funds out of the hands of the military and had established the National Science Foundation for that purpose: 'How can someone lull themselves into

such illusions at a time when our defense has simply become a small part of the Atlantic Pact, where political and economic forces play an enormous role!" Was that really the stance of the chairman of a Federation that had wanted to engage in battle with the powers seeking rearmament?

A few members within his Federation, such as Beets, Wertheim, the philosopher H.J. Pos, and the ethnologist P.J. Meertens, were at that time involved in the establishment of the peace movement **The Third Way**, but Minnaert did not join them. Their manifesto rejected both the Atlantic Pact dominated by America and the Kominform controlled by Russia. Minnaert would have placed the primary responsibility for the Cold War on the West. This reorganization nevertheless served as an anchor for the revival of the Federation, within which the left-wing sociologist Wertheim could evolve from a tuned administrator to chairman within three years.

The international thaw created space for criticism of the arms race. Minnaert joined the opposition within the Federation that manifested itself with the Amsterdam report **The Frustration of Science**. The conclusions of that report were presented by Wertheim and Pos at the 1954 conference on **Freedom and Bondage of Science** in The Hague, attended by Queen Juliana. Minnaert had covered the event: 'If scientific freedom in the Soviet Union is in danger, we must oppose it, just as when it is threatened by fascism, Catholicism, Calvinism, or American witch-hunts. But it is improper to exploit certain mistakes of the Soviets regarding science to simultaneously combat a social system that has brought new happiness to millions of "the wretched of the earth" and which, in principle, conflicts no more with scientific freedom than "true" religion does with true science. Scientific freedom must not be used as a weapon in the disastrous Cold War "to defend a social system that is faltering" (Pos).'

He participated in the revived criticism within the Federation of the nuclear arms race. Two American hydrogen bomb tests on Bikini Atoll had led to the contamination with radioactive fallout of the inhabitants of the Marshall Islands and Japanese fishermen. *Wetenschap & Samenleving* issued a call to 'the most prominent scholars' to share their insights regarding nuclear weapon tests. Minnaert sounded the alarm; only the geneticist M.J. Sirks had preceded him. He ultimately read the American Bulletin of the Atomic Scientists, which had raised the storm flag a few months earlier. With symposia like *Danger to Mankind* and actions against Civil Defense—the government's plan for an unprecedented building program of atomic shelters—philosophers and scientists such as B. Russell, H. Bethe, H.C. Urey, L. Mumford, J.R. Oppenheimer, L. Pauling, and A. Schweitzer engaged in the public debate. In April 1955, American nuclear physicists led

by the Dutchman S. Goudsmit launched an attack against McCarthy's accusations and the government's visa refusals. They established a Scientists' Committee on Loyalty and Security, which declared that fear could not be a good advisor in defending against any 'ism.'

The Dutch initiatives ran parallel. Minnaert called for 'the establishment of groups of scientific researchers in many countries around the world, with the aim of warning humanity about the immense danger threatening us.' He pointed out that his Verbond had idly watched while the Federation of Atomic Scientists remained steadfast. Albert Schweitzer had appealed to the researchers: 'They alone oversee the dangers; they alone have sufficient authority to make it clear to humanity that such tests must stop.'

Minnaert pleaded for the establishment of a movement of researchers and experts who would strive to halt the arms race and initiate mutual disarmament of weapon capabilities. The Verbond organized a meeting on April 2, 1955, for two hundred members and interested parties about The dangers of current atomic weapons. The speakers were the theoretical physicist Tolhoek, the biologist De Haan, and Minnaert.

The societal consequences of nuclear weapons

Speeches were compiled in the book **Scientific Researchers Warn Against the Use of Nuclear Weapons**. Out of a print run of six thousand copies, three-quarters were pre-ordered by the Dutch Peace Council. Minnaert's activities within the League and those of Miep Coelingh in the NVR aligned with the same goals. In the foreword by Wertheim, it was stated that 'scientific researchers cannot better fulfill their shared responsibility for global events—at this decisive moment in world history—than by helping to prevent the one great catastrophe that could render all further human activities meaningless.' Tolhoek described the physical effects of a hydrogen bomb and the genetic consequences of radioactive fallout. De Haan expressed concerns about the waste from future 'nuclear reactors.'

Minnaert's speech on **The Societal Consequences of Nuclear Weapons** was comparable only to that of theoretical physicist Leo Szilard in the United States. Science and technology were harnessed in the nuclear arms race: 'The joy of discovery is soured by the awareness that every advance will soon be used for greater destruction.' The arms race created an iron necessity to anticipate the progress of the opposing side. Every party wanted to possess more and better bombs and superior defense systems. Civil defense exercises created a sense of security, making 'civilian defense' part of the race.

The American slogan **Peace through Strength** suggested a feeling of safety, while humanity approached the abyss with eyes closed: 'The fact that such a large portion of humanity watches and waits relatively passively and indifferently is, in my opinion, a reason for the greatest concern. Apparently, the threat is so great that people feel completely powerless against it and try to make their lives bearable while disengaging from responsibility for the future.'

Nuclear scientists and biologists failed to enlighten the public adequately: 'Acquiring and disseminating knowledge of the truth must always be the foundation of our actions. The citizen of a democratic society should not passively endure what happens to them; they must be able to form a conscious judgment about important matters that deeply affect their life and that of the community.' He called exploiting ignorance 'the worst form of public deception.' The international politics had to seek solutions 'that are in the interest of both parties' and gradually dispel the mutual distrust.

Minnaert discussed work of that nature already being carried out by a few scientists: 'But where is the drive of the masses? Why don't intellectuals from all countries unite to take the lead in the popular movement?' A revision of the media's approach was needed: 'From the stream of facts, everything that could contribute to creating a favorable impression of the East is systematically filtered out; a single newspaper taking the opposing view does the same against America. How unwise, how foolish, how dangerous! While before our eyes a grand experiment is being conducted with two social systems, each trying to fully develop their potential, we can do nothing but carp and sow hatred in hearts.' He was apparently referring to the communist daily *De Waarheid*.

Minnaert envisioned a 'convergence theory,' also propagated by an authoritative economist like J. Tinbergen. The society in the East was one-sidedly based on the principle of mutual cooperation, while in the West it was one-sidedly based on competition: 'I am personally convinced that the flaws on both sides of the world will naturally correct themselves through natural development; and that those two halves will inevitably converge toward a common societal form—at least, if no war occurs to disrupt this entire development.' Minnaert still adhered to the view that 'mutual service' formed the foundation of the relationship between the Soviet Union and the 'People's Republics.'

People should not look for what divides us, what is ugly, small, and bad, but for what unites us, what is beautiful and good. No contribution could be missed: 'One person feels more drawn to direct action, another to participating in a new mindset. As long as many, as long as everyone

participates, while there is still time. And as long as everywhere, in all hearts, the awareness awakens that life is sacred, and that, ultimately, it is equally terrible if the hydrogen bomb strikes people in the East or in the West. For here as well as there, joy and suffering are known, here as well as there, people work and love, and mothers and children exist everywhere in the world.' Renewal of the Peace Council In 1955, the World Peace Council, under the leadership of F., began..."

Renewal of the Peace Council

In 1955 Joliot-Curie launched a campaign for a summit of The Five—namely, the United States, the Soviet Union, France, England, and China—to peacefully resolve mutual disputes. Within the Dutch Peace Council, the 'thaw' created space for reflection on its sectarianism and the democratization of the organization. Secretary Nico Luirink wrote to Minnaert: 'Many of us believe that your insights, elaborated in the VWO magazine, are correct and a guide for our work.' Minnaert's joining could be significant: many people were waiting for each other, and a breakthrough would strengthen the peace movement. Minnaert noted in the margin: 'Yes.'

Luirink asked whom he would like to have by his side in that case. Minnaert specified: 'Three professors, several doctors, pastors, jurists, teachers, union representatives, workers, etc.' At the same time, Minnaert-Coelingh was in Helsinki, where the leadership of the Dutch delegation at the World Peace Congress had been entrusted to non-communists like Reverend Lazonder. The independent space offered to her in the peace movement since 1951 was partly occupied again by her husband. The movement seemed to replicate daily family relationships, with Minnaert in political leadership and Coelingh in the working committee.

The Peace Council achieved success in those years through an activity focused on a common goal, to which the organization was subordinate. At the end of 1955, Elske de Smit-Kruyt initiated a petition among doctors calling for 'a general ban on experimenting with and using atomic weapons.' It was a great success: 524 doctors signed it. Subsequently, the NVR designed an Appeal requesting the government and parliament to urge the United Nations 'to stop the arms race; cease nuclear weapons tests, condemn their use, and limit armament.'

On January 11, 1956, the Committee for the Cessation of Atomic Bomb Tests (CSA) was formed 'at the initiative of the NVR, which, however, completely withdrew afterward and left decision-making to the meeting.' All

present agreed that 'NVR board members should preferably not serve as chairman or secretary of the Committee.' Wim van Dobben, a Wageningen biologist and treasurer of the NVR, could participate, but the then-secretary, theologian Feitse Boerwinkel, could not. The Committee received support from several members of the PvdA, Rabbi Soetendorp, theoretical physicists like Tolhoek and Nijboer, and liberals such as Kappeyne van de Coppello were involved. Much of the executive work was handled by the NVR. The CSA made its public debut on May 15, 1956, with a publication involving 384 prominent individuals, including Minnaert, who presented it to Prime Minister Drees.

In April 1956, the famous congress of the Communist Party of the Soviet Union took place. Khrushchev had condemned Stalin's crimes in a secret session, paving the way for a relaxation of internal repression and his own 'collective leadership.' The CPN wanted to initiate criticism of the personality cult within its ranks, which affected the core of its functioning. In this situation, the Daily Board turned to several intellectuals, asking them to respond to their new assessment of the international situation. Minnaert responded positively.

Minnaert to the Daily Board of the CPN

He began his letter by explicitly stating that it should not be published, 'neither with nor without a signature.' However, the Daily Board's sudden change in insight prompted serious criticism from Minnaert: 'Firstly, it is striking that your change in perspective precisely followed the changed insights in the USSR. This reflects a very limited independence of thought and speech; it is remarkable to hear you, at this juncture, claim how independent the CPN is from foreign influences. You may mean that no one dictates to you—this is possible—but then you are, at least spiritually, unconditional followers of the Soviet Union. Clearly, many among you have long held the thoughts now being expressed; but they have spoken and written differently than they thought. Who assures us that you truly mean what you say now?

You have consistently approved everything that happened in the USSR. I challenge you to show me a single article from *De Waarheid* in recent years where you have fundamentally criticized any action of the USSR.

Even now, you are continuing entirely in the same direction; for example, you have not considered critically discussing the latest decision of the CPSU and pointing out its weak points. Is there really no one among you who wishes to defend Stalin against what he is accused of? You no longer want

to take a stand on internal events in other countries 'if they escape your judgment.' The misfortune is that one can never determine when an event escapes judgment and when it does not. In this way, strictly speaking, one would never be able to publish foreign news. Therefore, you must be guided by the best possible assessment of available reports and an impartial weighing of the facts. And this is precisely where you have consistently failed. Out of a desire to provide a counterbalance to the bourgeois press, you have presented a distorted image of events in the opposite direction. It now becomes clear how you have blindly approved and defended all sorts of things that happened in the Soviet Union, while everyone could plainly see that they were wrong. I remind you of the history of Lysenko and certain trials.

The principle of exercising caution in judging foreign affairs is not sufficient. A global opinion must form about events in other countries, whether they bring humanity more happiness and prosperity or violate human rights.

Taken altogether, my criticism of the CPN amounts to: a lack of independent thinking and a lack of love for truth, both toward yourselves and in your statements. And now I fully understand how you arrive at these actions. Under the pressure of conservative groups, you feel compelled to close ranks more tightly. In the face of threats from capitalist countries, you feel compelled to support the USSR, the bastion of socialism. These considerations are correct and good. However, they must never result in distorting the truth. For ultimately, truth prevails. Then you must revoke your previous statements and disavow what you have maintained for years. Moreover, people no longer believe that you yourself think what you say. I have the impression that you would be stronger if you were to think and speak more purely and honestly. After all, there are significant differences in the positions of the social democratic parties of individual countries. It seems to me that there should be more freedom of personal opinion among your party members: why shouldn't someone be allowed to think differently from the party leadership about Stalin, about birth control, about emigration, etc., without being immediately regarded as a traitor?"

Minnaert showed himself at the end of his argument to be wary of provocations, precisely because the new course was a step in the right direction. The Russians had finally made heroic efforts toward 'true democracy': 'Hands off the Soviet Union at a moment when it is making a turn in a direction we all welcome!'

The revelations about the crimes of the Stalin regime, the extermination of the party cadre in the 1930s, and the millions of victims of hunger and terror must surely inspire the peoples in the brutally subjugated satellite

states to rise up, even if rational Minnaert considered it inopportune in light of global relations. After the bloody November of 1956, the renewal of the CPN was temporarily off the table. Not because it was 'historically necessary,' but due to factors Minnaert had pointed out in his analysis.

The witch hunt has begun!

The thaw came to an end when the Soviet Union suppressed the Hungarian uprising. At the same time, the Suez Canal, nationalized by Egyptian President Nasser, was seized by the British and French with the help of Israel. These bloody events put the 'Spirit of Geneva' back in the bottle. Minnaert wrote in his Diary: 'The events of November 4, 1956, in Hungary bring confusion and concern. It is difficult to hold the Peace Council together. Whoever thinks differently from the masses is suspect. The idea of coexistence is being abandoned by many. Miep and I are mainly in agreement, although I go further and disapprove of the Russian action. But our great goal remains: to preserve peace; it was wrong to start an armed uprising at the time when there were real opportunities for improvement. We supported each other a lot.'

Two anecdotes may further illustrate Minnaert's response. The first comes from the communist Luirink shortly after a crowd in Amsterdam stormed the Felix Meritis building, where at the time the CPN leadership and the daily newspaper *De Waarheid* were housed. In Utrecht, too, homes of communists had been attacked. He wrote: "Miep Minnaert and her husband, both at the door of their house by the Observatory. Concerned, very concerned about friends. How are you? Did they harm you? And your family? How are they, with her, with him. Do you need food? And then, after finally believing, or so it seemed, that we were really managing reasonably well, the question: What are we going to do? Not a word about their doubts. Whether they would continue. Questions that many others had asked themselves. What are we going to do? Should we perhaps issue a statement or something similar? It is after all a serious situation. And then - somewhat shyly, perhaps hesitantly - we have already made something, if you agree with it..."

The second anecdote concerns the working atmosphere at the Observatory. His then Ph.D. student Aert Schadee: "I experienced the Hungarian uprising as a brutality and found it terrifying. A mood arose that we didn't dare look each other straight in the eye. Houtgast asked directly: 'Professor, what do you think of the events in Hungary?'" Minnaert said that the events

were taking a course he could not approve of. That took the pressure off.

For Minnaert, a delayed reaction to Hungary emerged in the privacy of the Utrecht Senate Hall. Unlike Houtgast, his colleague Koningsberger dared not ask him how he stood on the developments. Minnaert would become Secretary of the Senate in 1957 due to seniority and Rector Magnificus the following year. Koningsberger had previously opposed Minnaert, as in the late 1940s when he himself called for the preservation of the Indies for the Netherlands. He believed he had to protect Minnaert from himself. If the Russians were to invade the Netherlands, Minnaert might collaborate. He contacted several colleagues who would follow Minnaert in line. Just before the Senate meeting with the decisive vote on the appointment, Koningsberger informed Minnaert. His defense gives an idea of the havoc caused by Koningsberger's action. Minnaert turned to the rector:

'You have informed me that the five colleagues who will next come up in sequence for the rectorship do not wish to collaborate with me as Secretary; they do not want to see me become Rector because they object to my political views. Under these circumstances, I do not intend to make myself available for the rectorship. To fulfill my task properly, the Rector must feel supported by the trust of his colleagues. If a group under You is unwilling to give me that trust, then I do not covet the rectorship. But I do have something to say to these colleagues and to those who might agree with them. What they reproach me for is mainly that I continue to cooperate with groups whom people fear would suppress free speech if they came to power. Therefore, you are already introducing McCarthy's methods (for that is what it is!) and thereby perpetuating the very evil one seeks to combat. The witch hunt has begun.

Well, I stand on the ground of coexistence, the necessity of dialogue and negotiations, in the conviction that by doing so I promote the cause of freedom more than You do. Breaking off contacts, which You would want from me and which You wish to impose on me with boycott methods, do You know what it is, do you recognize this? It is part of the Cold War.

You who do not wish to engage in joint consultation have no other alternative to offer than this Cold War and the accompanying arms race, which drains all the strength of nations and leads us to the abyss. If a third world war were to break out and atomic bombs were to fall, ask your conscience whether you have done all you could to avoid this war, or whether you may have contributed to it in some small part.

I oppose the fact that the university is being misused by you here to push through your political views. Do not tell me that it is about universal human values. Human values are as dear to me as they are to you; we only

differ in the way we seek to realize them. You push your own approach and, in doing so, enter a slippery slope. For what is now being done to me will soon be repeated against other minorities in the Senate. All the less do I think of breaking off the contacts that you reproach me for, because it is about cooperation to preserve peace and oppose atomic weapons between people who are each among the warmest advocates of peace within their own groups. It will not happen again that peace movements fall apart at the very moment when the danger of war looms!

Dear colleagues, I sincerely wish those who will later become Rectors may be able to do fruitful work that brings satisfaction and promotes the flourishing of our university. As for me, I have stability and peace in the belief that the world is progressing and that new forms of society are emerging, where war will be a thing of the past, where everyone will share in life's happiness, and where freedom, which is as dear to you as it is to me, will also be realized.'

Minnaert's strong words were listened to in deathly silence. His friend Freudenthal felt guilty: 'What I regret afterward is that I did not request a recess at that moment. After Minnaert's words, spoken in his beautiful voice, everyone was impressed. If only I had asked for a recess after that and then asked Koningsberger whether those who had refused to collaborate with Minnaert would be willing to stand up. At least one of the first five assured me he had not said 'yes.' These are moments where you fail.'

The professors Van der Blij, Endt, Van Hove, Nijboer, and Smit, together with Freudenthal, established at the following Senate meeting that, 'knowing Minnaert's qualities as a person, colleague, and official,' they deeply regretted the course of events. They refrained from a revision, 'because we do not wish to question the good faith and sincere intentions of those involved in these events.' These supporters also chose not to address the issue in a principled or public manner. At the Observatory, during his lifetime, no one was aware of what had happened: it remained 'among professors.'

With back against the wall

In the late 1950s, several scientists took responsibility for issues related to peace and disarmament. The Dutch section of Pugwash, led by theoretical physicists like Groenewold, Nijboer, and Tolhoek, exposed the government's information on hydrogen bombs and civil defense, which was called *Bescherming Bevolking* here. With a special informational issue of the *VWO* magazine, of which tens of thousands of copies were distributed, a connection

was made between natural science and the peace movement in 1962, just as in 1956. A new phenomenon was that many church discussion groups placed orders for this issue.

Minnaert-Coelingh remained the spokesperson for the Dutch Peace Council during those years at international consultations. She was part of the presidium of the 1958 World Peace Congress in Stockholm. Chair F. Joliot-Curie cited a quote there from American Henry Kissinger: 'Since the peace movement began with the Stockholm Appeal for Peace in 1950, for which it collected more than 500 million signatures worldwide, it has conducted a well-organized campaign to organize massive protests and actions against the use of nuclear weapons.' The work of the World Peace Council and national peace councils could not be dismissed as propaganda, warned the future minister.

At that congress, Minnaert-Coelingh spoke during the plenary session about the conflict between the Netherlands and Indonesia over Papua New Guinea: 'I myself, like several members, believe that immediate sovereignty should be granted to West Irian. We deeply regret that we must decide that our difference of opinion will be expressed in our voting behavior: some will vote for the resolution, others will abstain. I am deeply sorry because I know that progress does not come from abstaining from voting. I wish our Indonesian friends great success in their future struggle for independence, which is in the interest of both our countries and world peace.' In another version, possibly the spoken version, this passage was omitted.

In the Netherlands, she was involved with action committees advocating for an immediate withdrawal of troops from New Guinea and direct negotiations with Indonesia. She spoke at a National Peace Congress on January 27, 1961. The monthly magazine **Vrede** published her speech to 1,100 delegates on the front page: 'Our country must therefore disengage from all military treaties that create international dangers, foreign aircraft bases and nuclear weapons must be removed from our country, our own army must come under Dutch command, and the unilateral ties to West Germany must be replaced by the old, trusted policy of neutrality, which finds expression in a peace treaty with both Germanys.' The Dutch government thought it necessary to fight the conflict with Indonesia militarily again and was once more called to order by its allies. In August 1962, the transfer to Indonesia took place.

Andries Mac Leod: Minnaert Not a 'Pacifist'

Minnaert considered himself a pacifist. Many people in his environment found this a questionable political stance, but the seriousness of his pacifism was not doubted. With the founding of the Pacifist Socialist Party (PSP) in 1957, as an extension of **De Derde Weg**, a political translation of pacifist ideals emerged in the Netherlands.

Among Minnaert's manuscripts is a speech on War and Peace from 1958 that he delivered at the first action against the establishment of American missile bases in the Netherlands. He began with a quote from Bertha von Suttner's **Lay Down Your Arms!** and outlined a course of gradual steps toward complete disarmament. He explicitly counted the PSP as part of the peace movement, which was previously unthinkable within the CPN. He believed that the PSP and the CPN should work closely together, first and foremost in the field of peace.

Minnaert had maintained contact with his childhood friend Andries Mac Leod, the son of his teacher. Occasionally, he visited him in Uppsala, Sweden. MacLeod 37 contradicted the idea that Minnaert would naturally be an opponent of violence. In their discussions, he defended the position that the use of nuclear weapons is criminal and that there are no circumstances that justify such use: 'Therefore, even if the United States refuses to relinquish nuclear weapons, it is a crime for the Russian rulers to retain their nuclear weapons. It is their duty to declare that they will not use nuclear weapons under any circumstances, even if they were to be attacked with nuclear weapons by the US.' The reverse applies equally.

Minnaert disagreed with this. He believed that if the United States refused to conclude a treaty with Russia banning the use and possession of nuclear weapons, Russia had the right to retain its nuclear weapons and defend itself against a nuclear attack by the US: 'To this, I responded as follows, addressing Marcel: you do not have the right to claim that you are an opponent of nuclear weapons; both parties, the US and Russia, are willing to relinquish nuclear weapons if the other party does so too; your views on nuclear weapons are therefore shared by everyone; you are no more opposed to nuclear weapons than anyone else. This accusation I made was indignantly dismissed by Marcel.'

MacLeod contrasted his principled pacifism with Minnaert's pragmatic pacifism; or rather, the PSP's stance with that of the CPN and the Peace Council. Minnaert did not know how to deal with political reality well and remained too much of a romanticist and a 'theoretical' pacifist. He refused to seriously address his friend's objections.

This observation by his comrade from the Ghent Bollandkring may be helpful in analyzing Minnaert's stance. For his own feeling, he was always a 'pacifist.' Yet his resistance attitude and the identification with the struggle of the 'Boers' and 'poor Flanders' that followed from it seemed to outweigh his pacifism in his early publications. It seems as if after World War II, 'poor Flanders' in Minnaert's worldview was replaced by 'poor humanity,' which he identified with the struggling and suffering Soviet Union. MacLeod's testimony suggests that it was not his 'pacifism' but his militant resistance was the constant factor in his thinking and actions.

To make an omelet...

In 1957, Minnaert's American colleague Otto Struve, who came from a family that had produced generations of astronomers in tsarist Russia, wrote a shocking article in *Sky and Telescope* about his former colleague B.P. Gerasimovich (1889-1937). This leader among Russian astronomers had vanished from the face of the earth: the astronomical community of the Soviet Union had likely gone through the same ordeal as the biological one. The older generation of geneticists, led by S.I. Vavilov, had been eliminated by younger scientists who, under the leadership of T.D. Lysenko, invoked 'dialectical materialism' and state favor. The same seemed to have happened among the astronomers under the leadership of V.T. Ter-Oganezov.

Minnaert had developed a friendly relationship with this new generation of astronomers in the 1950s. For him, at that time, continuing the collaboration between East and West was central. He must have been an eager reader of Struve's journals and thus informed about his revelations. However, there is nothing to suggest that Minnaert fully grasped the implications of this article. He had a tendency to close his eyes to cruelties committed in the service of a greater cause. During World War I, he had ignored the war crimes of the Germans, as they would bring the liberation of Flanders closer. The ultimate goal, the elevation of humanity, was sacred.

Minnaert, as a scientist, had a 'theoretical' disposition. He loved regularity, the harmony of a coherent worldview. This explained why Domela's vision from autumn 1914 and Julius' solar theory had exerted such great attraction on him. As a lover of the big picture, he would not be the first to call out that something was wrong upon the first deviation. He had a tendency to go to the bitter end when he believed a cause was morally justified. He clung to principles when he thought they were correct, paying no attention to what it would cost him or others in practice. The harmonious

goal of Soviet society would have sanctified chaotic actions for him. To make an omelet, you need to break an egg. At least eggs were broken.

In the early 1960s, the United States and the Soviet Union had already silently maintained an impending treaty on atmospheric nuclear tests for several years. Unexpectedly, the Khrushchev government conducted a series of tests that caused explosions with the strength of hundreds of Hiroshima bombs. This greatly upset the Dutch Peace Council. Minnaert proposed to the board to formulate it as follows: 'We must regretfully acknowledge that the Soviet Union was the first to be forced to resume nuclear testing.'

In the 1950s, Minnaert had joined forces with medical physicist Van der Tweel in the fight against dowsing rods and earth rays. When asked, Van der Tweel said: 'Minnaert was a great man, but still a fanatic. He was deeply impressed by what was happening in Russia. I knew him well: as a physicist, on the KNAW committee, and also here at home. He brought mushrooms when he came to eat: that was never oatmeal. He was a good interpreter of Bach, poetically gifted, and *The Physics of the Free Field* is a brilliant book. But fundamentally, he was not open to arguments: he couldn't stand it if you opposed him on that point. I see a pattern there. He had spent his right-wing youth in Flanders and turned around. But I'm no psychologist.'

Endnotes:

1 From May 12 to 14, 1951.

2 Interview with Mrs. Minnaert-Coelingh.

3 Personal notes. History Archive.

4 Molenaar, 1981.

5 Ereemeeva, 1996, 297.

6 De Jager, K., *De bouw en ontwikkeling van het heelal I, II en III*, Politiek en Cultuur, 1950, 5369, 586; 1951, 37. De Jager stated that Minnaert had reviewed these articles at his request and warned him about passages where he made philosophical statements or even referred to 'dialectical materialism.' Minnaert advised him to remove them, but a few remained. Minnaert played for De Jager the role that his own teachers could not provide for him.

7 Hijmans van den Bergh, *Sol Iustitiae*, 1955.

8 Burger, *SI*, April 25, 1953.

9 Minnaert, *SI*, May 2, 1953.

10 Burger, *SI*, May 16, 1953. 11 Minnaert-Coelingh, *SI*, July 4, 1953.

12 Minnaert, 1953. The meeting took place on May 22, 1953. The Poland-Netherlands Association published a brochure titled *Kopernik -

Copernicus* (number 8), which included two articles by Minnaert. It was introduced by the humanist leader S. van Praag. The first article, a lecture, also appeared in four installments in the weekly magazine of the NVR, **Vrede**, under the title **Nicolaus Copernicus** on June 12, 19, 26, and July 3. The publication of the series coincided with reactions to the execution of the Jewish couple Ethel and Julius Rosenberg, accused of atomic espionage, in the United States. A lecture by Minnaert about the Rosenbergs is present in the History archive.

13 Minnaert, M.G.J., **De beoefening van de astronomie in het Polen van heden**, 44. 14 J.W. Havermans to Minnaert on June 16, 1953. Minnaert to Havermans on June 19, 1953.

15 And in astronomy. The article that revealed this was by his Russian-American friend Otto Struve and appeared in **Sky and Telescope** in 1957, titled **About a Russian astronomer**, XVI, 379. It concerned their mutual colleague Gerasimovitch, a victim of Stalin's repression.

16 For a review of this Marxist classic: Molenaar, L., **Politiek & Cultuur**, 1979, 263.

17 Molenaar, 1994, 135. 18 Minnaert, review in **W&S**, December 1955.

19 The philosopher Henk Pos took a very critical stance toward NATO and the reasons for the deterioration of international relations at that congress. Sociologist W.F. Wertheim told the author that Minnaert had also gotten to know the young Pos well during his time in Leiden (1915-1916). Interviews with Wertheim. 20 J.C.G. Nottrot, **W&S**, September 1954. Molenaar, 1994, 155.

21 The biologists Sirks and Minnaert had, before 1914, together in the same volume of the Ghent Botanical Yearbook!

22 Minnaert, *W&S*, February 1955. 23 In the mid-1950s, the prefix 'atoom' was gradually replaced by 'kern,' and an atomic bomb became a nuclear bomb, atomic physics became nuclear physics, and an atomic reactor became a nuclear reactor. This change is maintained here.

24 Molenaar, Szilard, the first polemologist, *Nature & Technology*, September 1989. Fifty years earlier, Szilard and Einstein had drawn the attention of the American president to the necessity of producing an atomic bomb as a preventive weapon against German attempts to produce the weapon. Also on the CD-ROM *Chemistry and Society*, Molenaar, 1998.

25 Two years later, Minister Luns would give a positive answer and then do nothing.

26 Minnaert, letter to DB of CPN from April 1956. Jan Willem Stutje, the biographer of Paul de Groot, came across the letter. CPN Archive.

27 Nico Luirink, *Liber Amicorum* for Miep Minnaert-Coelingh on her

80th birthday (1986). Harry Mulisch described these events in *The Assault* and also referred, which cannot be a coincidence, to Minnaert's *Physics of the Free Field*.

28 Interview with Aert Schadee. 29 From February 9, 1957.

30 Minnaert's defense in the Senate. Freudenthal to the author.

31 Interview with Freudenthal. This story was already made public by C. Bol in *The Restorative Facade: the years 1946-1966* in Von der Dunk's history of Utrecht University, 1986, 75.

32 Statement from six professors of mathematics and physics at the Senate meeting of June 15. Copy provided by Freudenthal.

33 Molenaar, 1994, 171, 202.

34 Introduction by F. Joliot-Curie at the World Peace Congress in Stockholm in 1958. Minnaert-Coelingh Archive.

35 Introduction on New Guinea. Minnaert-Coelingh Archive.

36 Minnaert-Coelingh at the National Peace Congress of January 27, 1961.

37 Andries Mac Leod to L. Buning, November 5, 1970, a few days after Minnaert's death. Buning Archive.

38 After Struve's article, there was deafening silence on this subject, which was only broken by the Moscow astronomer A.I. Eremeeva in 1995. The new generation of astronomers who had occupied the state-run posts was also led by the brilliant Viktor A. Ambartsoemian, the later winner of the Bruce Medal, who in 1938 had turned sharply against his superiors with fierce accusations. Lysenko ultimately proved to be a charlatan; this was by no means true for the Armenian. For the sake of a lightning-fast career, he was willing to step over corpses. Ambartsoemian became personally acquainted with Minnaert, who likely was not aware of his activities.

39 Regarding the generational aspect of Soviet terror within the scientific domain, see Molenaar, 1981.

40 Eremeeva's article makes it clear that a Russian correspondent of Minnaert, the solar physicist E.I. Perepelkin, was killed by state terror in the late 1930s.

41 These formulations are partly the result of a discussion with Boudewijn Minnaert on October 10, 2001.

42 This Jesuit formulation impressed E. de Smit-Kruyt, who still remembered it word for word.

43 Interview with Prof. Dr. L.H. van der Tweel: one of the handful of members who, like Minnaert and Wertheim, had maintained their personal membership in the World Federation of Scientific Workers.

Chapter 21

An inspirer of young astronomers

'Therefore, theory must always be the final stage of research. It must fully absorb, process, and explain the observation so that the observation itself can become obsolete.'

An inviting attitude

There are numerous anecdotes about the inspiration emanating from Minnaert as a teacher. Van de Hulst and De Jager, later leading figures in astronomy in Leiden and Utrecht, testified to this at the beginning of his professorship. Many post-war students remember Minnaert as an enthusiastic, gifted, and even-tempered teacher. He could occasionally get angry on rare occasions.

The radio astronomer A.D. Fokker Jr recalled: 'He gave guest lectures in the 1947-1948 course in Leiden. In one lecture, he explained how transitions between energy levels in atoms work, along with the associated nomenclature.' He expected the students to internalize this and have it ready for the next lecture. It turned out the following time that almost no one had bothered to process the material. That really made Minnaert angry! '

For the physician P. Boer, Minnaert's welcome speech to the first-year students was guiding for his teaching practice: 'In 1956, I started my chemistry studies in Utrecht. After a career as an analyst at Philips, I decided to start a university study after all. I will never forget how we gathered with the incoming students of the Faculty of Mathematics and Physics in the lecture hall of the Physics Laboratory on Bijlhouwerstraat and were addressed

by Minnaert. 'Ladies and gentlemen,' he said, 'your school time with its classroom teaching is now behind you. Ahead of you lies the University with its wide range of sciences in which you can immerse yourself. I strongly advise you, in addition to your chosen field of study, to orient yourselves very broadly and to enjoy this fully.' It sounded like music to my ears. I felt as though he was speaking directly to me personally, and my hesitation about 'the University' seemed to fade away. Someone warmly invited me to join that academic community!

Someone who graduated under the older Minnaert is the astronomer E.P.J. van den Heuvel, now a leading figure in Dutch astrophysics. For him, the astronomy practicals were a stimulus, just as they were for Van de Hulst and De Jager: 'During the instruction of an experiment about the constellations, the assignment was: 'enjoy the beauty of the starry sky'—typical Minnaert. We laughed to each other: have you already completed that assignment? I remember those winter evenings in my first year, on that cold roof, when you were busy with an experiment together with your partner, and Minnaert suddenly appeared out of the darkness next to you, interested in how it was going.'

Van den Heuvel found Minnaert's lectures fantastic: 'I came to Utrecht at the age of sixteen. I had never heard of Minnaert before. His lectures were a pleasure. So clear, presented with restrained enthusiasm, perfectly prepared, and with an excellent lecture script. When I arrived in 1957, he was already 64 years old but in very good condition: a somewhat stooped, tall man with thick, short, upright gray hair. A handsome man to look at. Everything about him was harmonious and genuine—that's what you felt as a student. He had beautiful slides for every lecture. He spoke from memory and never used notes. What amazed us were the perfect circles he drew on the board in one swift motion. When he drew a circle during one of the first lectures, you could hear a collective sigh of amazement.

You had to study hard for the exams. He conducted all exams orally, one hour per student per year of coursework. That meant he quickly had around 120 hours of exams to administer each year, plus, of course, the exams for the doctoral courses. Including preparation and administration, that's a month of continuous work. He didn't give it to you easily; he asked tough questions.

In his 'Planetary Systems' lecture, there was a large section on atmospheric optics and about Earth in general: how they had determined the correct shape of the Earth in the 18th century and how this confirmed Newton's mechanics. It always struck me how far ahead of his time Minnaert was: geologists didn't believe in Wegener's hypothesis of continental drift before the 1960s—it was a groundbreaking revolution when they finally accepted

it. But with Minnaert, you got that in his lectures. A striking example of how original Minnaert was as a thinker can be found in Otto Struve's 1962 book **The Universe**. Struve writes that around 1950, he had asked about fifty-five prominent astronomers what they considered the most important developments in their field for the coming decade. He writes: there was one who mentioned the possibility of launching a rocket to the Moon, and that was Minnaert!

Minnaert's personality also intrigued and stimulated his audience: 'My fellow students and I would talk about Minnaert as a person during our early study years. It fascinated us that he had started as a biologist, later earned a doctorate in physics, he had achieved great things and was now a professor of astronomy. Or that he spoke a dozen languages and, in addition, Esperanto: why Esperanto if you already speak twelve languages?

His breadth — his music and instruments, his languages alongside his natural sciences — served as an example for us. It gave us the feeling that even if you studied mathematics or physics, you could still explore many areas; you weren't trapped in a narrow discipline. Among the professors of experimental physics in Utrecht, there were some intimidating examples: colorless, boring superspecialists who annoyed us endlessly with their nitpicking during lectures. We heard about Minnaert's pacifism, his vegetarianism—he was clearly a very emotional man. That such a great scientist and fantastic teacher also had so many other aspects to him was important for us. It deeply impressed me that when we, the Anti-Militaristic Students' Working Group (WAS), organized an exhibition in 1960-1961 about the dangers of nuclear weapons—it was during the Cuban crisis, when Khrushchev detonated a series of hydrogen bombs measuring many megatons over Nova Zembla—Minnaert was the first professor to visit our exhibition."

Minnaert, like De Jager and Van de Hulst a generation earlier, also determined Van den Heuvel's career: "The perspective you gained from Minnaert's example—that a physicist can also be an artist, a universal person—was enormously important for me and determined my final choice to pursue astronomy. You knew that if you chose astronomy as your major, your only professional prospect was becoming a mathematics and physics teacher: something that hadn't been my first choice. But I decided I would rather spend my study years in an inspiring, interesting environment and then become a teacher than ruin my studies for the sake of broader career prospects by enduring those intolerably mediocre experimental physicists. So I definitively switched to astronomy with theoretical physics as a minor. Minnaert immediately had an interesting research project for me, which even resulted in a nice publication. I have never regretted this decision in my life."

Van den Heuvel would later take over Pannekoek's position in Amsterdam and collaborate on the first biographical publication about this astronomer.

The first post-war PhD students

In 1949, Minnaert outlined his views on the relationship between theory and experiment, the foundation for guiding his PhD students. Observations generate the inspiration to discover a coherence that 'we with our limited imagination would never have conceived.' Observation and theory are inseparably connected but not equal: 'Observation is essentially the establishment of a fact. Theory is the establishment of a connection. Therefore, theory must always be the final stage of research. It must fully incorporate, process, and explain the observation so that the observation itself can become redundant.' The seemingly erratic must give way to regularity, the apparently manifold to unity, and the seemingly confused to harmony. He himself, together with Mulders, had struggled to physically explain the 'growth curve.' He had experienced the triumph of the alignment of observation and interpretation. In a dissertation, theory must always explain and underpin empirical evidence: 'There is a compelling beauty in this struggle of the human mind to reduce the infinite multiplicity and richness of the universe to the simplest natural laws.' If the theory to explain the phenomena did not yet exist, then the PhD student had a problem!

Two of his PhD students would leave their mark on astronomical developments in Leiden and Utrecht. Henk van de Hulst's dissertation on matter in interstellar space (1946), which ended up in Oort's research area 6 during the war, was formally completed by Minnaert. In 1942, at Minnaert's urging, Van de Hulst had participated in a competition on the formation and growth of solid particles in interstellar matter: 'These were related to the age of the Milky Way system. Both Minnaert and Oort had an attitude of 'it's all ours.' There was no envy; they complemented each other and stimulated each other wherever possible. Any secrecy was alien to them.' The 21-cm hydrogen line in the spectrum of stars, predicted by Van de Hulst in 1943, was discovered in 1951 and became the starting point for radio astronomy. In 1947, Minnaert had built an improvised dish antenna on the roof of the Observatory with Houtgast to detect the sun's radio radiation. However, the noise level was too high and the equipment was too insensitive. In 1949, through the efforts of Oort, Minnaert, and J.H. Bannier, the Foundation for Radio Radiation from the Sun and Milky Way (SRZM) was established as one of the first activities of the Pure Scientific Research (ZWO) foundation.

The PTT, which dealt with the influence of the ionosphere on radio traffic, was a partner. This was the first step toward the enormous radio telescopes that were constructed in the Netherlands for this research. Van de Hulst became Oort's successor in Leiden.

Kees de Jager's dissertation provided a detailed model of the solar atmosphere, which was used worldwide for about ten years. He recorded the required hydrogen spectra at the center and edge of the sun using the Utrecht spectrograph. When he wanted to build a new photometer in 1946, Minnaert made him an unusual proposal: 'He said, "It would be good for you if you could make instruments yourself." So, I reported to our instrument maker N. van Straten every morning at 9 o'clock for two years. This later benefited me greatly when setting up space research. I am the only one Minnaert ever suggested this to.' De Jager became Minnaert's successor in Utrecht and the founder of the ZWO foundation, Space Research Netherlands.

As one of Minnaert's most loyal and talented students, he also experienced the patriarchal side of Minnaert: 'After the war, I got a position "without objection from the treasury" with Minnaert. Rosenfeld later offered me an assistantship of 100 guilders a month. So, I went to Minnaert and told him I could get another position. He said, "But Mr. De Jager, life is not about money, is it?" I replied, "I will make sure you don't suffer any inconvenience." I worked for Rosenfeld from 9 to 5 and for Minnaert from 5 to 2 in the morning, sleeping at the observatory. I hardly saw my parents during that time.' In 1950, De Jager placed his nearly completed dissertation on Minnaert's desk. After eleven months, it was still there: 'I was then working on sun measurements at Pic du Midi and wrote him an angry letter.' I immediately received the response: 'It is always a special experience to receive a letter from you.' After that, we intensely focused on the dissertation. Good writing and explanation were of utmost importance to him.

De Jager was deeply aware of his teacher's pioneering role: "We can now determine the temperature, pressure, and their progression with depth in a star atmosphere by studying the star's spectrum. The diagnostics for this purpose were developed in the 1930s by Minnaert and his collaborators."

De Jager and Van de Hulst built remarkable international careers as astronomers and science managers. Wim Claas' dissertation dealt with the analysis of the chemical composition of the solar atmosphere based on weak line profiles in the Atlas. From Sint Michielsgestel, Minnaert urged action on 11 fronts: "Would it not be good to temporarily attempt to determine the concentration ratios for a few elements?"

During and after the war, his colleagues B. Strömgren in Copenhagen

and A. Unsöld in Kiel indeed achieved the first results. This relieved the pressure. Claas, meanwhile, became a physics teacher and had to complete his promotion in his free time. There was usually no more than two days between the concepts of Claas' chapters and Minnaert's detailed responses. The instructions also concerned how to deal with the great predecessors. In April 1948, for example, Minnaert wrote: "You must be careful here and there not to belittle Unsöld too much, constantly investigating whether he deviates from your results, which are taken as the standard. It is rather up to you to compare your findings with his. He has historical priority and is a great master. But of course, this is only a matter of phrasing; logically and scientifically, you have every right to regard your results as better than his."

Claas was in 1951 the first -teacher- to officially graduate under Minnaert. The teachers Wanders and Van der Meer had formally been Ornstein's PhD students in the 1930s: many teachers would follow.

The differences in supervision are striking. One had to wait at most a day for a response; another had to wait a year. One was guided step by step; the other works independently. De Jager is the only one offered a specialized course. Minnaert paid close attention to formulating and embedding the experiments in adequate theory for all three of them.

The Minnaert school (1955-1964)

Before his emeritus status, Minnaert supervised six more PhD students. Piet Gathier's dissertation deals with stars of the same temperature as the sun but with differences in gravitational acceleration: 'In 1946, Minnaert had recorded spectra in the US. He said, 'That's something nice for you to figure out.' After a few months, I let him know I hadn't made much progress. Minnaert said, 'It's also difficult. I'll think of something else for you and assign it to someone else.' I ran back: that wouldn't happen to me! Eventually, I figured it out. At one point, I had a quantified elaboration. He wanted an 'explanation' added. I had to promise him that after my promotion, I would take the necessary spectra in Italy and complete the theoretical part. And I did.' Minnaert carefully read everything: 'He always kept his distance, although there was mutual appreciation. Looking back, despite my criticism, I still think he was a fantastic educator. I was an outsider, but my research was still connected to his solar program. Actually, he wanted a sun with variable gravity.' Gathier graduated in 1955, worked as a teacher in Bussum, and together with the West German company Phywe, designed a 'physics school practical.' He later became a science manager at

the Ministry of Education, Culture, and Science, where he advocated for, among other things, the modernization of mathematics education.

The dissertation of Joop van Diggelen focused on the photometry of the moon. In 1946, Minnaert had recorded unique plate material in the US: ‘He came up with an original idea: the sun shines on the slopes of the lunar surface; then the progression of brightness in the photos should reveal information about the slope. What we developed together as first was clinophotometry.’ Van Diggelen’s texts were meticulously reviewed: ‘You learn criticism for the rest of your life. Every sentence was weighed.’ His 1959 dissertation was reissued by NASA in 1964 with the moon landing in mind: **Photometric Properties of Lunar Crater Floors**. According to him, Minnaert as an educator insisted on publication in an official journal before graduation. Van Diggelen became a teacher and produced many popular-scientific publications about the moon and the 13-planet system.

The dissertation of Frans van ’t Veer in 1960 dealt with the weakening of radiation brightness at the edge of the stars: ‘Minnaert said: “And do you specifically study the results that can be obtained from the light curves of eclipsing binary stars.” He didn’t know much about that. He chose topics he expected would open up new fields. Thanks to him, I could go to work in Paris at the Institut d’Astrophysique.’ For Van ’t Veer, this change of position was a liberation: he could break free from his admiration for Minnaert and his paternalism. Minnaert analyzed each chapter of his dissertation by letter, shared pleasant messages about life at the Observatory: ‘He enjoyed acting as a witness at my wedding to a French astronomer, but I never managed to penetrate the intimacy of this extraordinary man.’

Hans Hubenet’s dissertation was initially going to focus on the ‘transition probabilities’ that mediate between spectra and particle concentrations. That required a quantum mechanical approach that was too ambitious: ‘Minnaert said: “You should try to get that from the solar spectrum.” I then started working on models of the solar atmosphere. My thesis dealt with the influence of uncertainties about the model on the accuracy of determining the chemical composition of the solar atmosphere.’ Hubenet graduated in 1961, became a staff member of the Observatory, and took over Minnaert’s **Astronomical Practicum**.

Aert Schadee’s dissertation focused on the concentration of fluorine atoms in the solar atmosphere. Fluorine did not appear in atomic spectral lines. However, fluorine atoms could be bound in molecules such as barium and strontium fluoride. The lower temperature in sunspots could facilitate the formation of these molecules. Schadee could not find these molecular lines in the spectra of sunspots: ‘Minnaert could unravel a problem and had good

intuition about the steps leading to a solution. My dissertation was about the interpretation of this negative result. It was an original topic. The California Institute of Technology asked me for a year.' Schadee admired his supervisor's 'chilling' erudition: 'He gave monumental standard lectures and then suddenly came up with Extragalactic systems. I still hear him say, 'Sometimes I feel the urge to do something completely different from what I'm used to.' Then he would give a brilliant summary of the state of affairs in 1961. A topic in an unfamiliar field for him, about which he lectured non-stop for 60 hours! You have to be an incredible generalist.' Schadee earned his PhD in 1964 and also became a staff member at the Observatory.

Jacques Beckers' dissertation was a study of the fine structures of the sun's chromosphere: 'Because one lecture was canceled, I went to see Minnaert. He became the leading figure in my academic career. After my doctorate, I went to Australia for optical solar research. This had been arranged independently of him, but I wanted to earn my PhD under his supervision. He examined my concepts in detail and provided quick responses and suggestions. The guidance was fantastic.' Beckers earned his PhD in 1964 and became an astronomer.

The PhD students were involved in aspects of Minnaert's research program. He assigned them topics he felt could become important. Minnaert's supervision, who turned seventy in 1963, was of a high level. A 'theoretical' framework remained a requirement. Over time, there was more work for professional astronomers, also at the Utrecht Observatory. His students carried on the standards and values of his 'school': they strongly committed themselves to teaching physics practicum and consistently engaged in popularizing astronomy and natural science in society.

The last PhD students

After Minnaert's emeritus status, the majority of three more promotions took place. Hans Heintze's dissertation focused on the flash spectra of the outermost layer of the sun: the escaping rays that appear just before a total solar eclipse due to the valleys on the moon's surface: 'In 1954, I participated in the eclipse expedition to Gotland. I helped Minnaert align the equipment. It happened in a consecrated atmosphere: you appreciate the ingenuity in which you skill yourself and at the same time realize the futility of the endeavor against the boundlessness of the cosmos. Using the recordings, I calculated the temperature profile in the outer layers of the sun.' Heintze began teaching physics from his first year of study. His school

was close to the Observatory, so he could work there before and after school: 'When I photometered those flash spectra, I arrived at the Observatory every morning at four o'clock. I had the key. When I temporarily worked in Brussels, we met every other weekend: 'You make an effort, and so do I.' I haven't experienced anything better than with Minnaert.'

Cees Zwaan's thesis, who later became a professor of solar physics, dealt with models of sunspots: 'Minnaert handed me a box: 'Mr. Zwaan, here are some spectral plates of a sunspot that Dr. Mulders recorded at Mount Wilson in 1937. See what you can do with them?' He apparently expected me to find my own way. He would occasionally drop by to hear about the problems. I discovered that stray light in the recordings played a major role, so all spots, even the smaller ones, were almost equally dark. He wanted to be thoroughly convinced, but afterwards, those results pleased him a lot.' It was also Zwaan's experience that he came into his element as soon as text appeared on paper: 'Mr. Zwaan, far too verbose, it sounds like a 1900 physics book. Explain it in simple words: what do you mean?' When I think of a draft text, I still wonder: 'What would Minnaert say about this?' Zwaan found the supervision good.

That was not the opinion of his last PhD student, the electronics expert Tom de Groot: 'Electronics were new to Minnaert, who had thought optically all his life. My research was about short-lived eruptions, so-called noise storms in the radio radiation of the sun, which we detected using a multi-channel receiver. We thought we were capturing a fundamental phenomenon that lent itself to interpretation. However, the noise storms exhibited an unclassifiable unpredictability. Plasma physics provided insufficient support. My dissertation limited itself to a report on the measurement methods and a discussion of the results. I had the idea that he was troubled by the thesis. He found those radio bursts beautiful but believed they needed to be 'understood.' The lack of explanations hindered development, not just for me but in general. He returned my texts weeks later with little commentary. Then he asked for an expansion and went on a trip. Finally, during the literature colloquium, which he had established himself after his emeritus status, he fell asleep. He always had that hurried nature, which made it impossible to gauge his age. He was a vital man! I still have enormous appreciation for him.'

From the memories of his PhD students, Minnaert emerges as a gifted educator who adapted to what they expected from him. He placed his students in situations at the forefront of science. If someone wanted to work independently, that was possible. If someone wanted to be guided, that happened too. The appreciation of his PhD students is great, especially for

the guidance during writing. Some immersed themselves in this microcosm; others ensured they quickly forged their own paths.

Endnotes:

- 1 Letter from radio astronomer A.D. Fokker dated June 24, 1999.
 - 2 Letter from physician P. Boer dated June 8, 1998.
 - 3 Letter from astronomer E.P.J. van den Heuvel dated December 24, 1997.
 - 4 Sijes, B.A., and E.P.J. van den Heuvel, 1976, 198.
 - 5 Minnaert, (1949), 26. Lecture for the Dutch Society of Sciences.
 - 6 Interview with the astronomer H.C. van de Hulst.
 - 7 Bannier was a staff member of Minnaert in the 1930s and became the first director of ZWO in 1949.
 - 8 De Jager, 1993: Van Bueren, H.G., Radio Astronomy of the Sun, p. 114.
 - 9 Interview with the astronomer H.C. van de Hulst. Hulst, 1946.
 - 10 Interviews with the astronomer C. de Jager. De Jager (1952). De Jager, in: Haakma, 1998.
 - 11 Interviews with the astronomer and mathematics teacher W. Claas. Claas, 1951.
 - 12 Interview with the astronomer and science manager P.J. Gathier. Gathier, 1955.
 - 13 Interview with the astronomer and physics teacher J. van Diggelen. Diggelen, 1959.
 - 14 Letter from the astronomer F. van 't Veer of December 16, 1997. Veer, 1960.
 - 15 Interview with the astronomer H. Hubenet. Hubenet, 1960.
 - 16 Interview with the astronomer A. Schadee. Schadee, 1964.
 - 17 Telephone conversation with the astronomer J. Beckers. Beckers, 1964.
 - 18 Interview with the astronomer and physics teacher H. Heintze. Heintze, 1965.
 - 19 Interview with the astronomer C. Zwaan. Zwaan, 1965.
 - 29 Interview with the astronomer T. de Groot. De Groot, 1966. Page 406 Chapter 22."
- Chapter 22

Chapter 22

The microcosm at Sonnenborgh

'You shouldn't send people home filled with uncertainty.'

A warm work climate

Minnaert developed his skills in the social domain after the war, within the Verbond, within the many boards and working communities he was part of, and at the observatory. He created a warm work climate where people could thrive. It was about 'mutual service': creating that atmosphere was his contribution to a better world of labor.

Henny Tappermann was his secretary and can testify to the 'order' at the observatory: 'I came straight after the war and, because not everywhere could be heated in the winter, I got a spot by the window in the workshop. Professor Minnaert pointed out to me how neatly everything was tidied up on Saturday mornings. That's how I learned to work carefully, clean up thoroughly, and archive things. On his desk lay stacks of cards. He made summaries of the contents of articles on cards with the author's name. On my desk, a shelf had been installed, neatly varnished, with drawers underneath and small racks on top. He conducted inspections over the weekends. If he found any irregularities, there would be a note on the relevant desk Monday morning. I felt unhappy when such a note was there.

He was attentive and kind to women. When I got a new typewriter, I could choose between a sturdy black machine and a beautiful green Olivetti. I thought I should go for the robust one, but I got the green one. He said it was much nicer to look at. He bought curtains for my room made of Ploegstof fabric, which he had personally selected: it was the only thing not supplied by the Rijksinkoopbureau. If there was an interesting exhibition

at the Centraal Museum, all staff members would be given a evening tour by the directress. We even went to the Rijksmuseum for the Rembrandt exhibition. One evening, we biked to a cherry orchard. If he had to attend a lecture, he only wanted his train costs reimbursed, possibly with a cup of coffee and a sandwich. He was very approachable. One time, he had to take some measurements somewhere. Someone from the workshop rode a motorcycle, and Minnaert sat behind him. Shortly after the war, gray dust jackets arrived from the United States. They were as happy as a group of children. Along with his wife, he went for a walk wearing them. Another time, the hallways were dirty after the coal merchant's visit. Then they took off their shoes and socks, rolled up their pants, and the professor and De Jager made the hallway presentable.

Foreigners often worked there, such as the Frenchman Jean-Claude Pecker, who had exchanged his home with Houtgast for a year. He recalled the daily zenith of this microcosm in **Le thé d'Utrecht**: 'On nice weather days, people gathered on the bastion's embankment. Tea with milk, cookies... Minnaert, the kind host, gave each person a turn to speak. They talked about the day's work, the rain and good weather, politics, or painting. For me, it was something completely new—these daily communal gatherings that united people of very different backgrounds and interests as if in a family. Later, I attended tea more often at observatories in Copenhagen, Harvard, Boulder, and Hawaii. But nowhere did I encounter the friendly, human warmth that I experienced in Utrecht, which influenced my later attitude in the astronomical world: a striving for group awareness based on a sense of community.'

His PhD student Piet Gathier, when asked, said: 'Around 1950, Minnaert announced that a new staff member would join: Joop Damen Sterck. Joop was homosexual and openly acknowledged it. For Minnaert, that was no problem. Damen's appointment had dragged on a lot at the University Board. During tea, conversations aside from everyday work revolved around concerts and social poverty in the city. Even then, he remained convinced of his beliefs. He never called for anyone to take a pot of soup into neighborhood C, butw ould have been different. His commitment, especially in the first years after the war, was remarkable. He believed deeply in it and made you think."

A priestly attitude

Minnaert was, according to his colleagues, a dominant man who was always on the go and preoccupied with a thousand things at once. Yet he didn't seem tense or rushed and was always punctual—never 15 seconds early or 5 seconds late. He worked late into the night, mailing his letters with the 3 AM post and chatting with staff members who were observing in the towers. He managed fine on four hours of sleep.

Regarding the colloquia, he established a structural collaboration with Pannekoek's Amsterdam Astronomical Institute. The Physical Laboratory staff celebrated Sinterklaas lavishly every year. Over time, the 10:30 coffee break replaced the tea ceremony. Minnaert was deeply attached to community rituals.

To his PhD student J. van Diggelen, Minnaert stood out as a man of high caliber: "Simple, warm, and kind—a sort of father figure. There were professors who didn't even notice you. In church circles, I've met many people, but never anyone as convinced of their principles or as ready to stand by others based on them."

Due to housing shortages, Minnaert had accommodated student Corrie Knoppers in the basement of Sonnenborgh for several months: "In the evenings, I heard piano playing. The first time, I thought it was a radio concert. Sometimes I'd sit at the top of the stairs to listen. After a cold night of observing, he sometimes placed a warm hot water bottle in bed." She also came indoors and was even allowed to address Marcel and Miep informally: "He lived for science but showed definite affection. That's why I find his name so characteristic. He read NRC but didn't know who Tom Poes or Heer Bommel were! Corrie once quoted a piece from Utrecht..."

"A newspaper clipping about the first Sputnik. Miep had said, 'Please put that away.' The journalist had written about a 'tall old gentleman' coming down the stairs. Minnaert would get angry if he read it: he didn't want to be called an 'old gentleman'! Corrie had found Miep very kind: 'Do you know what I do when there's too much dust? I take off my glasses, then I don't see it,' she said.

When Minnaert performed in the evenings, Corrie would sometimes go along to enjoy his lectures. In Amsterdam, he showed her the Wallen 'where ladies sit in shop windows.' She felt that the charming Minnaert was fond of women. At Sinterklaas, Houtgast had once asked her for a strapless black bra as a surprise: 'Minnaert stretched the thing out completely and said, "This must have been lost by the constellation Virgo." He was quite to the point. He was a great scientist and yet remained ordinary and lovable.'

His PhD student J. Beckers told: 'My mother-in-law complained in the hospital that her daughter had married an astronomer: what prospects did that offer? Her fellow patient was the wife of a colleague, and so this complaint reached Minnaert. He invited my in-laws and explained to them that astronomy is a forward-looking field.'

His PhD student Heintze had been invited by Minnaert even as a school-boy: 'Minnaert taught me how to use the Merz telescope. He knew how to inspire young guests! I have taught with pleasure for forty years; that enthusiasm I owe to him. During coffee, the cleaners would sit in—he wanted to put communism into practice and expressed himself in a way they could follow. I never experienced a cleaner who dared not speak.'

This paternalistic atmosphere didn't appeal to Gathier: 'You look behind the scenes of that microcosm. Those colloquia, where you're on duty again too quickly. I didn't get the idea that my future lay there.' In the early 1950s, his wife was still alive:"

"Both were at my promotion dinner. I didn't have much money for my dissertation. Minnaert pointed me to a cheap printing company. However, the proofs were full of mistakes. I had to correct them like crazy. In one of the propositions, the word 'not' had been omitted. During dinner, Minnaert said: 'You can defend everything.' I replied: 'That's true, just look at that proposition: the 'not' has been left out.' Minnaert was shocked: that couldn't be true. His wife was laughing so hard she was bent over the table."

His PhD student C. Zwaan had experienced firsthand how Minnaert upheld standards and values: "I once gave a popular lecture on how scientific insight is established and posed several 'open questions.' He approached me and said: 'But Mr. Zwaan... You must not send people home with uncertainty.' He had an almost priestly view of education: it had to bring the salvation of scientific insight. That explains his drive regarding teaching and didactics: the message had to be spread. The people had to become participants in science."

His last PhD student, T. de Groot, recounted: "Minnaert demanded the same commitment from his colleagues, even though he eventually understood that there were people with different attitudes. He always talked about 'labor.' That word had a sacred aura for many socialists. 'Diligent labor' is characteristic of Minnaert. Take the way he compiled the Atlas, with Houtgast in his wake: that enormous energy in the prime of their lives. Then again, that labor on the Table. I sometimes thought: it's a shame that someone as intelligent as you keeps doing such simple work! The unshakability of his leftist principles could be frustrating at times. But then you would hear him playing Chopin in the dead of night. Fortunately.'

The man from the small institute

In the 1950s, the work at Sonnenborgh was expanded and the staff increased. In 1953, Houtgast became a lecturer and in 1957 De Jager. The latter received 'stellar physics' as his teaching assignment. Radio astronomy required electronic expertise, for which people were recruited. Sputnik proved in 1957 that the West was lagging behind by several months on a militarily sensitive point and created a political climate in which initiatives in the fields of astronomy, geophysics, and space research could count on more than benevolent attention from politicians and funding agencies. The same rocket technology that could bring observation equipment into the stratosphere was suitable for launching spy satellites and nuclear weapons. Minnaert rightly worried about this.

In the 1950s, physics and mathematics institutes sprouted up. Minnaert behaved like a thrifty housefather and let financial opportunities pass by. De Jager: 'You couldn't hammer a nail into the wall without him passing judgment on it. Houtgast once came up during coffee with a rusty wood screw from an eclipse box: 'Professor, do you know where this screw comes from?' It was a joke, but Minnaert knew. He interfered with everything and therefore remained the man of the small institute. We complained that everything his colleague Oort asked for was promised. When I got the chance to start space research, I wanted to grow quickly!'

The mathematician F. van der Blij attended the annual discussions about the applications submitted by Freudenthal, the physicist J. Milatz, and Minnaert on behalf of the faculty to the State: 'I'm talking about the golden years. The number of students increased and so did the financial resources. Milatz would then claim several dozen places. Freudenthal always needed a lot of staff for his labor-intensive practical work. Minnaert then requested a half-time position; once he asked for two positions. The department reduced the requests for natural sciences and mathematics but nonetheless granted many positions, enabling rapid growth. Minnaert simply got what he had asked for: in business matters, he was not at the forefront.'

Radio astronomy advanced. To interpret the observations, knowledge of plasma physics and magnetohydrodynamics was needed. De Jager provided an impetus for this in his lecture *'The Tenuous Stellar Plasma'*. This attracted students and opened up new perspectives. The KNAW established a Committee for Geophysics and Space Research in 1959 under the leadership of astronomer Van de Hulst. One of its goals was to study the corona, which, with its temperature of one million degrees, proved to be a source of X-rays. In 1960, De Jager became a professor and was allowed to address Professor

Minnaert informally as 'Minnaert.' On October 1, 1961, he launched the ZWO-sponsored Working Group for Space Research on the Sun and Stars. Ten years later, this group had its own accommodation with a staff of 13 out of 100 employees.

In 1963, De Jager succeeded Minnaert as director. In 1962, Canadian astronomer A. Underhill started a research group for stellar research, and theoretical physicist H.G. van Bueren was appointed in 1964 to work on the physical foundations of astrophysics. The 'astronomical practical' had been taken over by Hubenet in the 1950s. The solar physics work was crowned when De Jager, Hubenet, and Heintze presented an internationally accepted model of the solar atmosphere in 1963: the Utrecht Reference Model of the Solar Atmosphere.

Minnaert's optical research program from 1937 was largely completed, although some parts would continue into the 1970s. Upon his departure, according to the prominent solar theorist Albrecht Unsöld, 'a small institute had grown, based in part on Minnaert's impulses, into an institution with world fame.'

De Jager later wrote ambiguously: 'In the 1950s, the foundation was laid for growth in the following decade. The increasing prosperity of the country, which had repaired the damage of the war in just over ten years and the growth of the West European economy made it possible to take bigger steps in the 1960s.' De Jager gave Minnaert all the credit and left it unclear who was responsible for the growth of the 1960s.

Endnotes:

- 1 Interview with Henny Tappermann.
- 2 De Jager, 1993, 53, mentions Pecker's quote from 1992.
- 3 Interview with P.J. Gathier.
- 4 Interview with J. van Diggelen.
- 5 Interview with Corrie Sanders-Knoppers.
- 6 The Utrecht Observatory detected the Artificial Moon of October 12, 1957. A respectful interview with Minnaert about an entire page was published in the *Algemeen Handelsblad* on October 22, 1957: The artificial moon is a 'vessel full of contradictions': What perspectives are opening up now?
- 7 Telephone conversation with astronomer J. Beckers.
- 8 Interview with astronomer H. Heintze.
- 9 Interview with astronomer C. Zwaan.
- 10 Interview with astronomer T. de Groot, June.
- 11 Interview with astronomer C. de Jager.
- 12 Interview with mathematician F. van der Blij.

13 De Jager, 1993, 57, 125.

14 Unsöld dedicated his astrophysical synthesis of 1967, *Der neue Kosmos*, to his friend Minnaert.

15 De Jager, 1993, 57.

Chapter 23

Farewell with 'The Unity of the Universe'

'I am deeply grateful for your kindness and friendship, often life-long, which added human warmth to the seriousness of scientific work.'

The sixties and the renewal of the university.

Minnaert had made use of the then-current right of a professor to retire at the age of 70. His views had not become outdated. Thus, he publicly denounced the hazing scandals within the Amsterdam Student Corps and the Utrecht society Tres. Unlike his colleagues, he exposed the psychological mechanisms behind hazing: 'What is it that incoming students learn? To submit without protest to degrading, sometimes humiliating treatment; to abandon their personal dignity; to view sexual matters in their coarsest and most disgusting forms; to drink. And perhaps worst of all: they see with their own eyes how those in power can degrade the weaker. The result of this 'education' can be clearly observed a year later: the victims of then are now the ones in power, tormentors, offenders.' Where people were degraded, they could still count on his solidarity, just as Evariste had been able to do half a century earlier.

In 1963, the Dutch student corps world with its rituals and traditions was shocked by the establishment of the Student Union Movement (SVB). Finally, there emerged a movement close to Minnaert's heart, which sought to advocate for housing, external democratization, and shared decision-making. The SVB endorsed the 'study grant,' which in 1964 became a top priority

on their political agenda under the name *Integrale Studiekostenvergoeding*. Their Democratic Manifesto linked rights regarding material and social provisions to fulfilling obligations: 'Students must be willing to give up part of their freedom; specifically, the freedom not to study, or to study poorly or halfway.' Board member Kees Kolthoff explained that 'the SVB does not regard wasting time at state expense as true academic freedom and considers it an unstable basis for negotiation.'

In 1960, the forward-thinking Minnaert, with his Utrecht branch of the Union, took an initiative to raise the level of educators. Minnaert set up a working group of nine teachers who wanted to reflect on the 'further education' of academics. Every month, people from various departments explained the demands of the future: 'It was encouraging to note that people everywhere are beginning to engage with Post-Academic Education (PAO); the issue is in the air,' Minnaert wrote.

It turned out that two 'groups' were directly eligible for this type of education: teachers and academics in professions or companies outside the university. A separate group consisted of academically educated, married women who 'have devoted ten or fifteen years of their lives to their families but now have their hands free since their children are grown and require less care. They yearn to be re-engaged in societal work. There is, moreover, a great need for their labor force, as many teachers are lacking in higher secondary education; they could also be useful as doctors, dentists, civil servants in libraries, and in many other professions. However, the difficulty arises that they have forgotten much and have not kept up with scientific progress.'

In countries such as the United States and England, much attention was paid to these women, attempting to channel them back in. Place a cover on top, cook for 1 hr 20 mins until the duck is really tender, adding extra water if you need. Lift off the cover and cook 10 mins more until the sauce is thickened, glossy and slightly sticky. Serve with couscous or a rice pilau and a simple green salad. to universities and imparting knowledge and self-confidence so they could return to work. In conservative Netherlands, no such effort was noticeable.

Minnaert championed central didactic institutes per discipline: 'Courses could be organized there where new techniques can be learned; the initiative would be taken to regularly organize courses for teachers; the latest tested instruments and teaching aids could also be made known. It is a form of PAO when teachers work as assistants in scientific laboratories for part of their time, while their number of teaching hours is correspondingly reduced.' In this way, 'at least in a limited field, the teacher remains in touch with

their science in its ongoing development.' Of course, the didactics of this education could be based on self-activity.

In professions such as those in the socio-medical sector, post-academic education would become lively if participants could exchange experiences with colleagues. In practice, much resistance had to be overcome: 'Trying to create a tradition: an academic should keep up with progress.' Minnaert saw little benefit in coercion: 'Rather grant a small salary increase to those who regularly attend the courses, also to show that their efforts are appreciated.'

Much resistance would disappear if PAO were incorporated as a normal part of education and free enterprise: 'The participants should be freed from their usual daily tasks so that real mental refreshment can be spoken of. The possibility that many would have the opportunity once again, at a more mature age, to fully dedicate themselves to study is not as fantastic as it may seem. The institution of the sabbatical year, already fairly normal for professors in the US, completely meets what we were seeking. Perhaps obtaining a half-year period would be easier and yet still be very effective." He cited the example of Danish classical language teachers who, every other year while retaining their salary, were allowed to spend a semester at the Danish Institute in Rome.

At the 1962 annual meeting, Minnaert emphasized that the Association needed to develop visions for the future. Postgraduate education could increase the efficiency of universities and elevate the scientific life of the community: "Imagine that an academic, on average, still has 40 years of work left after leaving university; and suppose that during this time they learn nothing new and forget nothing. Then, as a result (again, on average), scientific activity in our country would operate at a level 20 years behind that of science." If postgraduate education could reduce this gap to 10, perhaps even 5 years, it would mean achieving the same as if we had advanced our country's progress by 10 or 15 years! The Ministry of Education wanted to provide official support for the working group. Pioneer Minnaert was nearly 70 years old and had to prepare for his inevitable farewell. His colleagues at the Observatory were preparing for a grand farewell.

Bibeb interviews Minnaert

The weekly magazine *Vrij Nederland* featured interviews by a writer using the pseudonym Bibeb. Every politician, sportswoman, or author considered it an honor to be selected by her. Natural scientists rarely became her subject, but in late summer 1962, Minnaert was indeed featured under the

title 'Astronomer and Pacifist.' She found Minnaert's voice soft, calm, and melodious. He moved 'long-legged, quickly, yet thoughtfully, his head with white brush-like hair bent forward.' The conversation began with a paternal reprimand because she had immediately wanted to use her notebook at the beginning of his explanation: 'You must not take notes before understanding what you hear.' Advice that was urgently repeated when I tried my luck: 'No, don't write. If you jot things down mechanically, I feel disconnected from you, and moreover... then I could just as well write it myself, and perhaps it would even a bit better.'" A remark that

was softened by his (blushing) bursting into laughter, but which his gaze did not retract. It was mentioned in passing that on the initiative of Leiden resident Oort, several European countries had begun to establish an observatory in the southern hemisphere. Minnaert further praised De Jager's initiatives in space research: "Very important because it offers new opportunities to learn all sorts of things about the Earth itself, where we live, its enviroer. Place a cover on top, cook for 1 hr 20 mins until the duck is really tender, adding extra water if you need. Lift off the cover and cook 10 mins more until the sauce is thickened, glossy and slightly sticky. Serve with couscous or a rice pilau and a simple green salad.nment, and celestial bodies. Rockets and artificial satellites can explore the universe without hindrance once they have risen above the atmosphere. The practical certainty that we will land on the moon, with the possibility of making observations there, is incredibly important for astronomy. The rapid development of science gives the conviction that this will be achieved."

Bibeb noted in surprise that according to Minnaert, the moon landing was a matter of years, not centuries. She asked: "Did you read Jules Verne in the past?" and received the reply: "Not once (eagerly and laughing) but 50 times. I have the original editions in French. There you have someone with great confidence in progress and enormous imagination. I don't mean that the astronomer should fantasize blindly. It's about imagination controlled by science. But you must start by seeing. Jules Verne is very close to space travel in *From the Earth to the Moon*."

She asked him about the influence of astronomy on religion: "Astronomy has freed humanity from a lot of prejudices and all sorts of superstitions. We know how small the Earth is; before, it was considered central. Now we also know with certainty how old the Earth is. There are people who say: the Bible is symbolic. That way you can still justify anything. I don't believe it myself. I find what's in the Bible very poetic and beautiful, but it can no longer be reconciled with modern science." Forcefully, "It's the task of science to show that there are no miracles. I mean: no things happen that

break the laws of nature. However, if I say (looking up, hand above the eyes), 'how wonderful, those stars,' that's something different. You must distinguish between these things, you must be careful.'

Of course, she asked him about his role in the peace movement: 'I believe every scientist should strive for peace; otherwise, he might wonder: should I still engage in science? Every new discovery is soon used for war purposes afterward—that's the terrible part. We must try to prevent this. We all must be members of one of the many associations that combat war. Those who study natural sciences must provide information about the dangers of war that are still insufficiently known. Sociologists must seek the causes of war and help avoid them.' He called for action: 'We must not cross our arms. You won't achieve anything by waiting. People who oppose peace movements should ask themselves what they're doing—they're doing nothing. The mentality of the Cold War must change: a magazine like **Het Beste**, which appears in many languages, doesn't go by without agitation against the Eastern Bloc. Whoever wants to improve the world must start with themselves.'

Her interview also confirmed a shift in public opinion. Fear of communism was decreasing in the early 1960s. **Bibeb** and **Vrij Nederland** took Minnaert's pacifism seriously.

Farewell to the Academy: 'the unity of the universe'

Both the Academy and its Astronomical Institute celebrated his emeritus status in 1963. Minnaert had continued to ponder the consequences of cosmogony for his views on humanity. Occasionally, he had shared fragments of his thought process. In late 1957, he had delivered a radio lecture for VARA as a humanist, titled **Human and Cosmos**. He had presented his vision of the universe, where everything—from the infinitely large to the infinitely small—unfolds in 'a beautiful harmony' according to the great laws of nature.

The assumption of supernatural powers undermines this harmony: 'There is also no reason to seek a purpose for the Universe. Nature knows causes and effects; natural laws determine which changes will occur in the future, but one may not call that a purpose. A human can have a purpose, meaning they imagine something they wish to achieve and strive for it. But the stars do not think and truly do not exert themselves to reach somewhere or to give much light.'

The universe exists and evolves in all its beauty and order, and that is

enough: 'The great laws of nature, which guide the stars in their orbits, also apply to living beings: we do not stand apart from nature but amidst it; we are part of it.' Humanity is the product of a long evolution, and all mental qualities are already present in germinal form in animals. Yet, even though humanity is part of nature, 'this does not prevent us from recognizing that thinking humanity has a life purpose, one that inspires and empowers us with immense strength. The purpose of our lives is to make humanity happy.'

Contributing to this, Minnaert called it the purpose of our lives: 'We do not count on a heaven beyond the stars; we strive to realize heaven here on earth. Much goes awry in this endeavor, there is truly enough to do! And immortality exists for us in this sense, that every deed a human performs always has consequences, for better or for worse, which can never be erased.' The insight that our words and actions are immortal gives us the awareness of our responsibility for the future: 'The future of the world will be what we make it, and each person contributes to it in their own way. This is the most beautiful and noble feeling that can inspire a human to lead a good life.' Here, in a nutshell, is Minnaert's humanistic morality for a non-religious future.

He elaborated on this in 1963 in his speech for the United Assembly of the KNAW. His introduction was truly visionary: 'Before my eyes rises the image by Rodin: *L'âge d'airain*. A human begins to stand upright, laboriously raising their gaze toward their surroundings and the heavens above them. From the mists of unconscious impressions, feelings, and drives, concepts gradually take shape; they begin to discern the relationships between these things, they are on the path to becoming human. In a certain sense, we too still experience this grand awakening to the knowledge of the Universe in which we live. Driven by an irresistible, inner urge to understand, we strive to free ourselves from human limitations and prejudices.'

Minnaert provided examples of the 'grand coherence' between all parts of nature that we 'in principle' oversee, 'but on the outskirts of the already explored territories, hazy distances stretch out in all directions.' Nevertheless, Minnaert perceived everywhere 'the insatiable desire for the coherence of science, unity of the Universe, harmony.' This unity explicitly existed at the level of atoms and other particles that were the same everywhere in the cosmos. Or at the level of the connections between matter: "Everything in this great Universe happens according to simple, great laws of physics, both the movements of matter and the deformations of electromagnetic fields. All of astrophysics is grand evidence for the statement that our fundamental equations apply everywhere in the same way as they reveal themselves here on Earth." With those 'simple' laws and their combinations, 'we command

an enormous and truly boundless terrain of phenomena.'

He made a leap from celestial bodies to everyday objects. The surface of the Earth is covered with a lush carpet of green plants, clumps of cytoplasm, living and moving beings. Together, these cover a billionth part of the Earth's volume. It seemed unlikely to Minnaert that what applies to the rest of the universe would not apply to these objects. Yet, a special concept was traditionally declared applicable to these objects: 'life.' However, the biological investigations of recent decades had yielded two main results. First, matter behaves no differently in a living being than outside of it, provided it is surrounded by the same conditions and circumstances. Also, the elementary laws concerning the behavior of living matter are the same as those that apply elsewhere: "Every day, new victories are achieved in reducing life processes to physical and chemical forces."

There could be no room for old and new forms of 'vitalism': the whole was nothing other than the sum of its parts, if the interactions were considered. If one marvels at the wonderful structure and functioning of living organisms, the prehistory is responsible, which has come about through an evolution spanning billions of years and whose result is embedded in the chromosomes. The line of evolution continues in the body structure and equally mental properties: 'It is impossible to escape the fact that even human life processes are determined by the laws of physics; thus, also his movements, actions, and the still largely mysterious brain processes that form the material substrate for his thoughts. This therefore implies that there can be no such thing as so-called 'free will' that would exist independently of the history embedded in our organism and the influence of all factors currently at work.' One cannot escape this by appealing to the experience of 'subjective consciousness of freedom': 'It seems to me that there would be every reason to carefully examine the feeling of apparent freedom using the methods of modern psychology.'

Minnaert rightly argued that this view must have consequences for the humanities, ethics, and criminal law: 'Concepts such as good and evil, guilt and merit, freedom, originality, responsibility, naturally continue to exist, but they are given a different interpretation. By way of example, I provide an attempt at defining the new concept of "freedom": a person is free when their actions are determined solely by their mental convictions; they are also mentally free if they have knowledgeably considered highly diverse perspectives in a balanced manner.' He also explained his view to astonished colleagues on 'consciousness' that he believed must already be present even in the lowest material forms. He posited his deterministic view that brain content, reconstructed atom by atom with the exact replacement of 10 bil-

lion neurons by conductors and circuits, would think and act 'like us, but would it also feel?'

He concluded with a few romantic sentences: 'Thus we see how the unity of the universe is reflected in the unity of science. Restlessly, each of us works in our field to reduce the fleeting forms of appearance to simplicity and firm lines. And as we progress further, all these lines prove to run from one domain to another and merge together. From my childhood, I remember the lace-makers in the streets of old Bruges, sitting in front of their doors, bent over their lace pillows. The few threads that form the starting point of their work they intertwine while fantastic flowers, vines, and garlands of endless variety arise under their nimble fingers. It is our task to trace the threads from which this infinitely beautiful Cosmos is essentially constructed in the wonderfully intricate lacework of nature. Perhaps it is just a single thread.'

Minnaert was undoubtedly proud of the content of this lecture. He had found a solution to the problem of 'free will' that, on one hand, rested on the 'truth' of scientific views about the universe and humanity, and on the other hand, on Freud's psycho-sociological views regarding conscience and human history. Even if his continuity thesis is set aside—a consequence of his aversion to dialectics, which he had once been introduced to by Bolland—an impressive achievement remains.

In the late 1950s, he had addressed what students could additionally expect from universities; in another article, he raised that question for pre-university students as well. Neither attending a Studium Generale nor a philosophy lecture resolved this dilemma. With **De Eenheid van het Heelal** (The Unity of the Universe), he offered future scientists a humanistic, science-based worldview.

A tribute to the Utrecht phenomenon

The staff of the observatory had organized a symposium on the solar spectrum in honor of Minnaert, attended by all the major figures in solar physics. The mayor of Utrecht, De Ranitz, had called him 'the Utrecht phenomenon.' In his opening speech, Albrecht Unsöld referred to their joint work on the Fraunhofer lines and praised Minnaert's commitment to international co-operation and peace: 'The extremely bad experiences he endured in two world wars would justify any degree of mistrust in reason and human moral qualities, but Minnaert continued to work for the cause of reason, love, and peace.'

Minnaert had put a lot of effort into his lecture on **Forty Years of Solar Spectroscopy**. He attributed the quantitative analysis of the Fraunhofer lines to Unsöld. The discovery of 'growth curves' was his own achievement, and he spoke about it with relish. The simple model from the 1930s, which assumed a single-layer photosphere where the Fraunhofer lines would form, had yielded much but later proved to be an absurd simplification. Naturally, the properties of solar gases varied with depth: 'The pioneer in this direction was Anton Pannekoek, my revered older colleague and friend, who as early as the 1930s—and particularly in his groundbreaking article from 1936—emphasized the necessity of such an analysis and laid the foundation for its application using his developed sense of numerical analysis.' Later, those models, on which his PhD students De Jager, Hubenet, and Heintze had worked, had become increasingly complicated. He also looked back on the problem of the Fraunhofer lines. Unsöld had ultimately been proven right: the explanation for the line profiles had lain in absorption rather than scattering.

He thanked the colleagues who had honored him by presenting their recent work. They had always inspired him: 'In moments of melancholy and doubt, which I have known like anyone else, I withdrew into the silence of our library and began to read the recent literature. You would then address me; new suggestions, new research possibilities came to mind. I was captivated by the beauty of nature, by the logic and beauty of science. I regained confidence in myself, new hope, and optimism. I am deeply indebted to you for your kindness and friendship, often lifelong, which added human warmth to the seriousness of scientific work.'

Minnaert wanted to share with his audience a general theoretical insight he had acquired after a lifetime of research: 'New improvements and refinements in concepts should not be proposed too early or too late. If they come too early, they will hinder progress because they cause unnecessary complications at a time when important results can still be achieved with existing methods. If they come too late, time is lost because one has to work with insufficiently detailed analyses, while greater accuracy would have been desirable. It requires a great deal of intuition and wisdom to apply this trivial moral correctly!'

The foreign colleagues offered him an abstract painting by the Japanese artist Tanaka. No one thought he would leave science alone. He received a handful of standing invitations, such as that from S.F. Smerd, one of the world's most prominent radio astronomers, from the Commonwealth Scientific & Industrial Research Organization in Sydney: 'I am certain that I speak on behalf of all scientists in Australia when I say that we hope to

meet you in the near future.' That would happen. According to an article by Hubenet, Minnaert had accepted invitation for next November.

Liber Amicorum

His colleagues from the Observatory offered him, among other things, a *Liber Amicorum*, in which many praised him in personal memories. For instance, Jesse L. Greenstein, director of Mount Wilson Observatory, wrote: 'In astrophysics, the methods you have developed now lead a long life. The Photometric Atlas of the Solar Spectrum is the standard by which we compare all sun-type stars, and the data collected there are fundamental to our understanding of normal and special stars. The theoretical techniques for analyzing the "growth curve" owe much to your pioneering work.' Greenstein also praised his stance during McCarthyism: 'What seems important to me is your intellectual influence on young people. Through the dark days, you maintained a commitment to science without forgetting that we remain human beings first and foremost, and that preserving the human spirit is our primary goal. Your idealism in troubled times and your optimism have been an example for me personally, and for many others.'

Swiss astronomer Edith Müller praised his dedication to youth: 'The first time I saw you was when I was just a baby astronomer. It was in Zurich at the 1948 IAU meeting. Ten years earlier had been the last meeting, and there was much to discuss. Old friendships had to be renewed and new contacts established. Nevertheless, you took ample time to seek us out, young astronomers at the start of our careers. You encouraged us enthusiastically; you stimulated us; I was deeply impressed. In the past 15 years, this has not diminished. I think there is no astronomer in the world who has had more influence on the careers of young scientists, both directly and indirectly.'

His Leiden colleague Oort praised his cooperative spirit: 'For you, it is self-evident that one can achieve the best by helping each other as much as possible, and your whole life has adapted to this ideal so thoroughly that those of us living around you almost forgot that this kind of cooperation is something special. The beautiful atmosphere you created with this has permeated everywhere in the Netherlands. Your students have had an invaluable privilege in spending their study period in such a harmonious and stimulating 'family' as you have formed in Utrecht."

His friend from Liège, Pol Swings, an astronomer of world class like Oort, added: "Looking closely, we find that among those we admire in our profession, there are not many who are also beloved by everyone. You are the rare

and admirable example of a scholar who excelled in research, made essential contributions and even brilliant innovations, created a 'School' of high international reputation, nurtured Dutch and foreign students who prove themselves worthy of their Master; and yet, you have won the affection of all your colleagues."

Amateur observer P. Kuipers thanked him: "Your simplicity and genuine interest were a great encouragement to us, such small cogs in the vast machinery of science, all the more needed because the material we worked with often went beyond our capabilities or threatened to do so. And when some success was achieved, your pat on the back was an unforgettable reward." Meteorologist W. Bleeker recalled the eclipse expedition to Lapland (1928): "There I came to know and appreciate your extraordinary versatility. Besides discussing the architectural styles of Lübeck and Stralsund, Swedish nature and people (Skansen!), we talked about many other things, even meteorology. I remember your piano playing in our hotel in Gellivare; it was the first time I heard Dvořák's *Humoresque*!"

His socialist colleague Engels entrusted him with a line from Pascal's *Pensées*: "When one sees the natural style, one is amazed and delighted, for one expects to see a scholar and finds a human being." Mary Reule, Julius' daughter, needed only a line from Ovid: "While other creatures have a bowed posture and gaze toward the earth, nature gave humanity an upright stance, to behold the heavens and turn their faces toward the stars."

Musicologist Reeser was pleased with the donation of the largest part of Minnaert's collection of musical instruments: "What strikes me particularly about this gift is not only the inquisitive spirit you demonstrated in assembling these many and rather rare instruments, but above all the love for music that clearly inspired you and made you willing to sacrifice much time and money. It is because of this love for an art that is dearer to me than anything else that I wish to express my deeply felt sympathy." Of course, many Utrecht colleagues recalled how he made an impression on them through his voice, posture, gestures, expressions of empathy, and demeanor. The theologian Van Unnik paid attention to his administrative work for the Utrecht *Volksuniversiteit*.

His mathematics colleague Hans Freudenthal had experienced Minnaert in a jungle of administrative roles: 'How familiar I was, over many years, with the path to Zonnenburg, the winding road to a low building with an astronomical clock in the hallway, where you had to know the right door to reach the old library, which, with its old table and many old printed works on astronomy, was the setting for the most beautiful meetings I have ever known—meetings where, carried along by Minnaert, everyone did their best

to work hard.' Freudenthal also remembered the early years of their association: 'It was after a VWO congress when we, as the Board, dined festively with the speakers. Jan Romein seized the opportunity to address Minnaert in an informal table speech. He told a story from their time as students in Leiden, when they were gathered in a cheerful company discussing, while Minnaert sat at the piano playing classical music. Suddenly, while playing, he raised his head and voice and called out to them through the murmur: 'Friends, just listen how beautiful it is!' Everyone who had collaborated with Minnaert knew they were caught up in the special atmosphere he created.'

His former secretary Hennie Tappermann thanked him warmly: 'No matter how difficult things were privately, because of the warm atmosphere that prevailed at the Observatory, it was possible to stay courageous. That was entirely and solely your merit. You were the confidant for your entire environment, always full of understanding for others, and you have proven that it is possible to lead and yet only be good. Through your example, everyone who worked under you was influenced. And what is possible in a small community must also apply on a larger scale. Personally, you convinced me that one of your greatest ideals must be achievable: that there can be peace in this world when all those in power indeed keep the interests of those who have entrusted themselves to their leadership in mind.'

This Liber, with its 120 contributions, gives an impressive picture of what Minnaert meant, both scientifically and personally, to the people around him.

The professor's portrait upon his farewell

Even the Sterrenwakers wanted to present Minnaert with a portrait. It couldn't be a traditional professor's portrait. It had to depict Minnaert as everyone knew him: active, enthusiastic, teaching, and dedicated. Minnaert was persuaded to cooperate, 'because the community wants it.' A committee, consisting of radio astronomer Fokker and the PhD candidates Heintze and Zwaan, was tasked with finding a suitable painter. Zwaan said, 'We had to suspect, for example, that Professor Minnaert - an art connoisseur who enjoyed drawing himself - would react not only courteously but also very distinctly to intermediate results, and the artist would have to handle that.'

A meeting with the Haarlem painter Kees Verwey turned out to be a complete failure: 'Then we were made aware of Pieter Defesche: a Limburg artist who painted large non-figurative, strongly expressionistic canvases but had, according to our sources, made remarkable portraits during his academy days.' The artist responded enthusiastically to the challenge. He proposed

making sketches while Minnaert was busy in a meeting or giving a lecture. Afterwards, all parties could freely decide based on the sketches how the portrait should look.

After a few months, Defesche had a clear vision of the portrait. He chose a life-size standing Minnaert, full of action, teaching, with a book in his left hand. To make his striking 'head' stand out well, the portrait had to be cut off above the knees. Zwaan had to explain this to Minnaert; he could live with it: 'The active and enthusiastic is not so much expressed through the pose of the portrayed man, who is serious and restrained, but through the bold colors, especially the orange-red part near the head and the deep blue additions to the coat, which seem to leap off the canvas. The gray mustache and white chest hair contrast with those contours, and the unusual canvas creates the impression as if Minnaert could step out of the life-size frame at any moment.'

Defesche remembered his subject well: 'Minnaert had something endearing in his appearance. In any case, something of a man who possessed wisdom. His statements were imbued with the seriousness of life. He had a wide range of interests: current events, scientific, and artistic. He was fascinated by what I did: 'It's starting to resemble Stijn Streuvels.' He could create witty remarks and put things into perspective. He was lively, charming, and presented ideas in a simple way. He sympathized with communism; so did I, no less, as well as my friend Ger Lataster and many others. That was common at the time. I had not painted figuratively for ten years, but it felt fine to me. I fully supported the portrait, though of course it couldn't be revolutionary.

The committee, Minnaert, and the painter were very pleased with the canvas, but its modernity caused a stir among colleagues. That was then in line with the style of the person portrayed. His daughter-in-law later said: 'It's him, but he looks different than usual, sad.' The painting was completed in October 1963, and the *Liber Amicorum* was also presented to him at the end of October.

By then, a dark shadow had fallen over Minnaert's life.

Footnotes:

1 Minnaert, text on hazing. Undated. History Archive.

2 Molenaar, 1994, 190. Minnaert presented the Report of VWO-Utrecht: A program with wishes for the future. The members' meeting of the Union on March 17, 1962, was about The necessity and need for Post-Academic Education (PAO).

3 General members' meeting of VWO on March 17, 1962.

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4 Bibeb, Vrij Nederland, September 15, 1962. 5 Minnaert, Vara-radio, November 24, 1957: Man and cosmos, seen through a humanist lens. History Archive.

6 Minnaert, 1963, KNAW lecture. 7 The Bronze Age. 8 Minnaert, 1951, the inaugural speech upon receiving the Bruce Medal.

9 Minnaert, on what the university should offer students and what VHMO should offer pupils in addition. History Archive.

10 De Jager, 1965, with all contributions to the Symposium The Solar Spectrum.

11 This was also a tribute to Pannekoek, his twenty-years-older friend with whom he had undertaken many things after the war, such as the publication of the Principal Works of Simon Stevin. Pannekoek had passed away in April 1960; Minnaert had delivered a beautiful eulogy for his 'teacher' and honored him with a contribution to the Dictionary of Scientific Biography. Archive-History.

12 Hubenet, H., Please, remember me... Prof. Minnaert loves Life, Algemeen Handelsblad, September 12, 1963.

13 Liber Amicorum for Minnaert. Boudewijn Minnaert Archive.

14 Prof. dr C. Zwaan on the portrait in Fylakra, April 1982.

15 A dozen sketches can be found in Molenaar, 1998.

16 Interview with the painter Pieter Defesche.

17 Els Hondius to Kees de Jager, around 1971.

18 The original now hangs in the Minnaert Building at the end of a corridor that runs from the canteen via the scullery to the hall. One could imagine a better place for it, but it is at least 'in the flow.' Minnaert might have found that quite amusing himself.

Chapter 24

An Irreparable Loss

'Let us help each other to bravely face the future.'

The move to Zuilenstraat

The open community of the Observatory had contrasted with the hermetically sealed professor's house. Zonnenburg 1 had become Miep Coelingh's domain. According to her daughter-in-law, even Koen Minnaert's family didn't visit because the cats were disturbed by their grandson Paultje. Family visits were limited to birthdays. Miep's camaraderie primarily went to her colleagues from the Peace Council, for whom she was a support and confidante. Among them, she found the solidarity community that she couldn't establish in her personal surroundings.

After Minnaert's emeritus status, they bought a top-floor house together at Zuilenstraat 25bis, on the corner of Nieuwe Gracht. The ground floor was already occupied, and the basement by the canal was rented out cheaply to a visual artist. Minnaert lived on the first floor, Miep took the attic. Her peace movement friend Sita Anderson-Cochius remembered: 'On Zuilenstraat, Miep saw her chance for a small apartment of her own. There was a spacious attic with rotten support beams and cracks and gaps in the walls that let through wind and moisture. Hesitantly, Miep asked: could something be made of this? Load-bearing beams, lightweight walls, windows, warmth, light, and habitable? Drawings were made, a thousand wishes expressed. What an exciting time. It succeeded beyond expectations after many long discussions in Stockholm with the architect.' That was Henry Anderson, Sita's husband. Marcel and Miep lived completely separately.

Minnaert had two rooms that served as his living and workspace, a small

kitchen, and a bedroom. In the adjacent library stood a worktable; above the piano hung an abstract Tanaka and a semi-figurative canvas by the Dutch artist De Winter, reminiscent of birds and flowers: a gift from the Dutch astronomers. There was a cast of the Greek goddess Pallas Athena.

It was a good 400 steps from his home to the observatory. There, Minnaert got a study room and continued his research, especially his experiments on surrogates of the lunar surface. After the Solar Symposium on September 9, he had traveled to Italy, participated in a conference in Rome from September 12 to 18 where he was in the spotlight, and went hiking alone along Trieste, Rijeka, and the Yugoslavian coast.

The disappearance of Koen

On Wednesday, September 18, 1963, Koen Minnaert did not return home from work. His wife knew that he had had a meeting with the management that day. Koen had been suspicious in recent weeks, thinking his colleagues were out to get him, and no longer ate lunch at work. Els raised the alarm that evening. The next morning, she investigated what had happened. It turned out that director E.J.W. Verwey had told him that it seemed as if he didn't feel at home. His colleagues thought Koen was being egocentric with the equipment. It seemed to Verwey that it would be best for him to look for another position: at a university or in education. He would still receive a year's salary from Philips. His colleague Hein van den Berg was the only one with whom Koen had spoken afterward. Looking back, he said: 'Koen was driven, had a kind of territorial drive, collaboration was difficult, the relationship with the biology group was strained, quarrels arose. He was awkward, many people found him annoying. He talked about the Nobel Prize. Harassments occurred, such as locking up the equipment for each other, Koen's evening work was sabotaged, the assistants were in tears, the atmosphere was ruined. Incidentally, not everyone was anti-Koen!' Group leader Voogd had not been able to quell the conflicts. Therefore, Verwey thought it necessary to make a decision.

The coincidence of his disappearance and the conversation with the management suggested that this event had been the decisive factor. According to his wife, the conversation must have been a heavy blow to Koen's ego: 'Koen was in a hurry. He had passed thirty and needed to achieve something big quickly. Science was everything to him. He did his best to become the equal of his father in his research or to surpass him. It was certain that he would become a professor. He thought he would only deserve his father's

love if he succeeded in science.' Koen's friend Theo Quené also saw a direct connection: 'Koen thought the boss was an errand boy. When the boss turned out not to be one, it must have hit him hard.'

The next day, Koen's Volkswagen was found near Leende, three kilometers from the Achelse Kluis. The police towed the car away, but Els immediately had it put back with some food inside and a letter for Koen. She must have felt that he was confused and might need something to eat. The forests around Leende were searched by forty officers and soldiers with the help of police dogs, but Koen remained untraceable. It had happened before that Koen would disappear for a while during difficult situations. Els, too, had occasionally lost track of him during vacations, after which he would reappear without further explanation. She hoped that an overwrought Koen had taken a few days off after the loss of face and would show up again. Minnaert was unreachable during those first days. He went for walks, visited cave formations, arrived in Pula on September 27, and traveled back to Milan. That's where he heard about Koen's disappearance. He returned immediately and joined the search. With his assistant Hubenet, he visited monasteries in the area because Koen might have retreated there. At the gate, Minnaert introduced himself as a 'professor' to encourage breaking any potential vow of silence.

The Eindhoven press spoke of a 'mystery-Minnaert.' On September 29, a newspaper reported: 'It is not ruled out that Dr. Minnaert may currently be in a "shadowy state," as a result of which he is not aware of the situation he is in.' All sorts of speculations were circulating. Both the national and Belgian press were occupied with the enigmatic disappearance of the son of the renowned professor.

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Els gave birth on October 20, a month after Koen's disappearance, to a second son. The magazine *Life* wanted to publish a two-page spread of the mother and child through friends of Minnaert. However, the question was: how would Koen react?

After five weeks of desperate searching, Minnaert made up his mind for himself. He decided to keep his promise to the Australian astronomers and attend several meetings in November where he would be the guest of honor. He would combine this with a visit to his son Boudewijn and get to meet his daughter-in-law Noortje. A visit to some islands in the South Seas was also planned, followed by getting acquainted with several countries in Southeast Asia.

Perhaps he found the situation so terrible that, as a man of action, he couldn't wait until others would inform him about the outcome. Or perhaps the desire to be reunited with his youngest son tipped the scales. Perhaps

he simply wanted to keep his promises and felt that there was nothing more he could do for Koen and Els. Likely, he closed himself off from a reality he dare not confront—a pattern that had occurred before.

On October 31, he took care of writing a thank-you letter to the contributors to the *Liber Amicorum* he had received the day before. On the same day, his successors De Jager and Underhill informed the astronomical community that Professor Minnaert's farewell lecture, scheduled for October 31, had been postponed indefinitely 'due to sad circumstances in the family.' The *Liber Amicorum* and the oil painting would be presented at a more appropriate time, perhaps in a very small circle. Minnaert packed his suitcase that day and left the Netherlands on November 1.

He flew via Los Angeles and Tahiti to Samoa. He visited several South Pacific islands and continued to Sydney, where Boudewijn and Noortje picked him up from the airport. From November 12 to 15, he attended the Solar Physics symposium there. From November 19 to 29, he visited radio astronomers in Canberra and spent the month of December with Boudewijn.

Letters to Miep may have been lost, and phone conversations cannot be reconstructed. However, a postcard addressed to Els on November 10 survived: 'Leaving for Sydney tomorrow morning! I still hold the quiet hope of finding news about Koen there. Father (spent two days in Tahiti, three days in Fiji).' On the same day, he wrote to his mother-in-law Coelingh: 'I arrive in Sydney tomorrow morning and will be picked up by Bou. It almost feels like a dream.'

On January 1, he traveled back via Cambodia, where he visited Angkor Wat, then continued to Bangkok, Rangoon, Calcutta, and Darjeeling. He sketched the sunrise on Tiger Hill, visited Ghoom Monastery, drove to Bagdogra by car, took a plane to Banarasi, drew the sunrise on the Ganges, visited Agra and the Taj Mahal, traveled by bus to Fatipur Sikir, and continued by car to New Delhi. On January 9, 1964, he wrote from Bangkok: 'Dear Mother, this is one of the many colorful scenes that flash by on this return trip. Wouldn't you feel like going to the market in such a boat? Lots of love, Marcel (How about Koen?).'

The death of Koen

A few days later, he got clarity. On January 18, while in India, he learned from pathologist J. Zeldenrust that his son's remains, 'nearly fully skeletonized,' had been found in a terrain fold. After fifteen hours of travel, he arrived at Schiphol Airport. The body was discovered by a forester who had

participated in the September search efforts: 'At first, I thought it was a jacket lying there, but as I got closer, I saw it was a man lying face down. By his shoes, watch, and glasses, I knew it was the missing man's body.' The body was difficult to see from a distance, but that wouldn't have been a problem for the dogs. Koen's remains were found after four months, less than 400 meters from his car. His glasses were unharmed; his wedding ring and wallet were present. It was an ending that once again gave rise to speculation. How could a man meet his end in a forest frequented by day-trippers and thoroughly searched by the police? Was it suicide or perhaps murder? When asked, Els said: 'Almost everyone said Koen had committed suicide. I know he was almost paranoid in his last weeks. I discussed this with a psychiatrist friend. If you don't eat or drink in his mental state, you end up in a vicious cycle: everyone is against me, I've lost face. It was very hot weather. He didn't come to his senses. He must have wandered around for about six days before succumbing.'

During his trip, Minnaert had not sent any letters to his daughter-in-law. He arrived just in time for the well-attended cremation in Dieren. In his speech, he repeatedly addressed Koen: 'Young man, who could have ever imagined that you would go before me?' At the end, he had remarked 'that life goes on.' This had disturbed some people. Grandfather Hondius thanked the attendees on behalf of the families. His boss Voogd mentioned in an In Memoriam that Koen 'worked hard, very hard and actually wanted to work even harder.' Koen's actions had been permeated with 'overwhelming seriousness.' He described the two years of collaboration as difficult and heavy, but thought that Koen's criticism 'of some habits and working methods of our laboratory had been useful to us in various ways.'

That evening, Minnaert wrote to Els: 'I forgot to thank you for the beautiful forsythias you sent me as a welcome. They look magnificent in a large vase on my desk, and I am enjoying them while writing this note. You have truly made me very happy by sending those flowers. Count on my unconditional cooperation for anything I can help with. I hope to visit often; only in these first days do I need to exert all my strength to support Mother, as there is still an enormous amount to arrange and organize before our lives return to normal. It was a difficult day for you and for us. Let's help each other to bravely face the future. Farewell, dear Els. Greetings from Mother. Father.'

In a postscript, he mentioned practically: 'We have received large numbers of letters from people expressing their condolences. We will have a card printed to convey our gratitude. Probably, you too have received more letters than you can answer. Have you considered how to solve this? Could we pos-

sibly do it with a standard letter, identical for all writers? Or do you believe that the text should differ for you and for us? Let us know your thoughts with a single word.' Minnaert tried to regain control. Why couldn't these people simply receive a personal letter from his daughter-in-law? His departure for Australia and the associated world trip continued to amaze. His flight from the fate of his eldest son had brought him closer to his youngest son, whose family life he had been able to observe in its intimacy.

Going forward and not forget

In the **Liber Amicorum**, many had noted that they could rely on Minnaert's support during personal difficulties. For them, he was a 'father,' a source of advice, a willing listener, and a confidant. People thanked him for '45 years of warm interest,' for 'charity' and 'helpfulness.' Bram van Heel, the optics professor from Delft, wrote: 'After all, you've given so much to so many!' It had become a moving book: all those pats on the back for his care and empathy at the very moment when he was anxious about his own son!

Why hadn't his son come to him? He kept others at a safe, functional distance. From his Olympian heights, he could serve them kindly, generously, and mercifully. His children were entitled to his love and care. The question was whether Koen believed his father would stand by him, and given Koen's rivalry, his father might have been the last person he could ask for help.

Those around Minnaert observed that Koen's death had deeply shaken him. With even greater passion, he threw himself into his work: apparently, this was his way of coping. He maintained silence about Koen, broken only in rare exceptions. He once told his secretary, Rie Hubenet-Bergman, how terrible he had found it that he had supported so many people while his own son had not asked for help. The population of the Observatory, even if only out of pity for the old man, had to create their own stories. His PhD student De Groot observed that Minnaert continued to display iron discipline: 'He could look terribly gloomy and yet be very kind. He could also explode after Koen's death. I experienced that twice. Once he walked away furiously during coffee. He couldn't handle our camaraderie anymore.'

Minnaert communicated a lot with his daughter-in-law and grandchildren. Els wrote to her brother-in-law Boudewijn, looking back: 'He was so involved with us. I sometimes thought it might not be very pleasant for him to always be reminded here that Koen is no longer around and to see the boys without their father. But if that was the case, he never let it stop him from coming here, and he never showed any sign of it. Except when

he slipped up and called Paul 'Koen.' He was still a piece of Koen for me, somewhat because of the physical resemblance, and he represented the world Koen came from and where he was shaped. When I first got to know your father, I was really a bit afraid of his cleverness. But gradually I noticed that he could also appreciate me without all that knowledge, and then my awe for him faded, and we became more equal, while my respect remained. I have always been proud to have such an exceptional man as a father-in-law, but actually only after Koen's death, because Koen had so many mixed feelings towards Father. De Jager recently said to me: 'Your father-in-law has been like a second father to me.' And I thought of Koen (especially) and thought, you might better see this man as a second rather than a first father. I practically never spoke about Koen with Father again, at least not about his death.'

Minnaert must have had a disagreement with his wife about Els's position. In the first year, the contact between mother-in-law and daughter-in-law had been relatively 'normal.' On the anniversary of his disappearance, they had all looked at slides of Koen together. But over time, things gradually deteriorated. In the background, the question of guilt played a role. Was it the 'fault' of his cold mother, or had his wife shown too little love? With this question, in which Minnaert and Koen were spared, Miep Coelingh burdened the relationship with her daughter-in-law. Her demeanor made it clear that she held her daughter-in-law responsible for what happened. When Paultje was in play therapy in Utrecht for a year and a half, and Els had to be at the Minnaerts' every fourteen days, she dared not visit Zuilenstraat. Miep Coelingh also did not visit her daughter-in-law in Eindhoven.

Minnaert signed his letters with 'Father and mother' and effectively tried to be the guardian he had become in 1964. Both spouses probably could not discuss Koen's death with each other. Minnaert could hardly follow his wife in rejecting Koen's legacy: his wife and their two grandchildren. In fact, Miep renounced her grandmotherhood. She had a conversation partner: her friend Truus van Cittert-Eymers. Her daughter recalls: 'She talked a lot with my mother about Koen's death. They called each other twice a day, certainly for at least half an hour.' For her acquaintances, Miep had a plausible explanation. One of her pacifist friends, Elske de Smit-Kruyt, said: 'Miep said that Philips wanted Koen to work in war preparations. He couldn't go on. Then he took his own life.' His mother elevated Koen among her leftist friends to the status of a victim of capitalism.

Minnaert must have written to his childhood friend Andries MacLeod about Koen. MacLeod reported: 'A tragic event deeply affected him. The loss of one of his sons. That was certainly suicide. From what Marcel told

me, I believe I can conclude that this son was overly sensitive.’ This is a rare testimony to Minnaert’s perspective on the events.

Koen had put all his eggs in one basket: he was determined to become an outstanding researcher. In hindsight, his superiors found that ambition unrealistic. Verwey had not considered Koen a top researcher, but rather an excellent educator. His promoter Slater had described him as a precise worker whose strength lay in thinking through explanations and finding mathematical connections. In his recommendation, he wrote that Koen Minnaert ‘possesses very deeply founded and extensive knowledge of the various fields of chemistry and has the patience and technical expertise to work in areas requiring this level of precision.’ Slater deliberately did not award him a *cum laude* for his promotion.

Koen had set himself impossible standards. His idealized self-image was far removed from reality: the short circuit and ultimate blow to his fragile ego occurred during the conversation with the director.

Did Minnaert ever wonder if he had given Koen too little affirming attention? Was it meaningful to ask such questions? Was it possible to ignore them? Minnaert prominently placed Koen’s photo on his desk. For the first time in his life, he became seriously ill. In April 1964, he spent one and a half months in the hospital for prostate surgery. By the end of 1967, he underwent another operation due to metastasis, during which part of his intestines was also removed, requiring him to stay in the hospital for rehabilitation for an additional month. Minnaert had to accept that he was a cancer patient.

That after Koen’s death, he resolutely wanted to resume his restless life may be evident from a letter to Els, two weeks after the funeral. In it, he promised to visit with a projector and slides of Koen: ‘We are not having an easy time and are overwhelmed with work. Tomorrow, Tuesday, I will go to Deventer to discuss the Stevin publication with the printer; at 4:30 PM, I need to be in Groningen for a lecture; that evening, I fly to Paris for a meeting starting at 10:00 AM on Wednesday. The same evening, I return to Utrecht. On Saturday, a lecture in Leeuwarden. Last Sunday (yesterday) I visited our niece Marie van Zadelhoff, who complained and vented for more than two hours (not directed at me!). - Still no phone! We’re doing our best and defending ourselves as well as we can. Everything will gradually fall into place.’

In the same letter, he mentioned that Koens’ promoter Slater wanted to publish the research conducted at Philips, along with a chapter from Koens’ thesis, in *Biochimica et Biophysica Acta*. The following year, this plan came to fruition. Slater added an editorial note: ‘Let what is good in it be a monument to this talented and meticulous biochemist, whose early

and tragic death is mourned by the colleagues of the two laboratories where he carried out his work.'

The 1960s also brought joyful events. Son Boudewijn and girlfriend Noortje got married in Sydney and came to the Netherlands in 1964. The Minnaerts organized a reception at Hotel De Donderberg near Doorn, attended by over a hundred family members, friends, and acquaintances. Miep saw Noortje for the first time: the women developed a good relationship. Boudewijn met his nephews there.

In 1968, a surprise emerged: Noortje had been pregnant in 1948. Fearful of her strict father's anger, she, assisted by her mother, had given up custody of the child and moved to Australia. That year, 20-year-old Peter Kruiper tore open a distant letter addressed to his foster mother and discovered who his natural mother was. Noortje and Peter accepted each other, and a cordial relationship also developed between photographer Peter and stepfather Boudewijn. Peter visited Zuilenstraat, where he was welcomed as a full-fledged grandchild.

Endnotes:

1 Liber Amicorum for Miep Minnaert-Coelingh (1986).

2 Hein van den Berg.

3 Interview with Els Hondius.

4 Interview with planner Th. Quené.

5 Minnaert, Reizen. Archive-Boudewijn Minnaert.

6 Interview with the astronomer Hubenet.

7 Press releases.

8 As in the autumn of 1918 when activism suffered a defeat, or in September 1936 in De Lage Vuursche.

9 Letter of thanks from Minnaert in archive-Minnaert. Farewell lecture and farewell gift for Professor Minnaert, written by A.B. Underhill and C. de Jager in archive-History.

10 Archive-Hondius.

11 Minnaert, Travels.

13 Minnaert to Els Hondius, January 20, 1964. Archive-Hondius.

14 Interview with Els Hondius.

15 Interview with astronomer T. de Groot.

16 Letter from Els Hondius to Boudewijn Minnaert, October 30, 1970.

17 One inevitably thinks of the poor relationship between mother-in-law Jozefina Minnaert and daughter-in-law Miep, which is replicated in the next generation.

18 Interview with Els Hondius.

19 Interview with Hanneke van Cittert-Eymers.

20 Interview with activist E. de Smit-Kruyt. 21 Letters from Andries Mac Leod to L. Buning, November 5 and 16, 1970. ARA-Den Bosch.

23 Minnaert to Els Hondius, February 3, 1964. Archive-Hondius.

24 Minnaert, K., E.C. Slater (1965).

25 Interview with photographer Peter Kruiper.

Chapter 25

Tribute to Simon Stevin

'My love for Flanders and the Netherlands has remained equally strong, but embedded in the international brotherhood of nations and in social reform.'

The principal works of Simon Stevin

Minnaert had become a member of the Royal Flemish Academy in 1951 and could naturally move freely in Belgium. In 1953, he was to speak at a peace meeting in Antwerp and yet was expelled from the country. His friend Leo Picard: 'He was particularly cordial—I don't know a better word—and brought up all sorts of old stories during dinner at our place about the good old days in Ghent, which he had experienced with me and my wife. The next morning—we didn't have a proper guest room at home and had therefore rented him a room at Hotel de Londres—I went to visit him. He had already been taken away for a long time by the police in connection with an old ban on residence. A second lecture in Bruges was not allowed to take place.'

The incident formed a sad series together with the refusal of a visa for the United States (1951) and the Utrecht rectorship (1957). The conversation with his childhood friends suggests that Minnaert did not shy away from discussing his Flemish years in personal settings. His lifelong loyalty was the reason he spoke at the funeral of his 'erring' friend Domela Nieuwenhuis Nyegaard in 1955. For him, it was about a comrade dedicated to Flanders with whom he felt connected. However, when Dutch journalists asked him about his Flemish past, he could sharply add that they were meddling in matters they had no business with. It stood to reason that Minnaert would seek other ways to express his bond with Flanders. He found it in the

form of a comprehensive tribute to his fellow townsman, the Bruges native Simon Stevin. He even showed concern about the pronunciation of his name: 'Remember: You pronounce Stevin like the Dutch given name Stéven; never pronounce it in the French way with the emphasis on that nasal final syllable; Stevin would turn in his grave!'

In 1938, Annie Verschoor had written her biographical sketch of Simon Stevin in *Erflaters van onze beschaving*. In Michielsgestel, Minnaert had thoroughly enjoyed Dijksterhuis' monograph on Simon Stevin. He had called his book a 'preliminary study' and argued for redeeming an honorary debt: 'This debt can be described in a few words: we must erect the one monument for Stevin, by which one can truly and enduringly honor someone who has laid down the results of their work in writing: we must bring about a complete edition of his works.' Minnaert had become a loyal visitor to the Physics department of the Royal Netherlands Academy of Arts and Sciences (KNAW) after his membership began in 1946. From this position, he could turn the proposal of mathematics teacher and science historian Dijksterhuis into a grand project. He later wrote: 'My love for Flanders led me to strive for a reprint of Simon Stevin's works. It was a great task.'

Stevin (1548-1620) had been a great scientist who wandered around Northern Europe for several years before settling in Leiden in 1581. He had offered his services to Prince Maurice in the struggle against the Spanish oppressors of the Netherlands. Stevin had been a major advocate for Dutch as a scientific language: he designed mathematical terms such as 'everedich' and 'evewijdigh', 'stomphouck' and 'raecklijn', 'driehouck' and 'regthouck', 'noemer' and 'omtreck', 'meetconst', 'wisconst', and 'snijlijn', 'thienich' (decimal) and 'worteltrecking', 'houckmaet' (sine) and 'brantsne' (parabola), 'keghelsne' and 'lanckrondt' (ellipse). The word 'wiskunde' (mathematics) itself originated from him. As a native of Bruges, Minnaert could identify with Stevin in many ways. He himself had enriched scientific Dutch with terms like 'zonnevlam', 'vlamtong', 'groeikromme', and 'equivalente breedte'. De Jager: 'When new scientific concepts from foreign languages were introduced, he would consult with us about what the best Dutch translation could be.'

A Stevin project could contribute culturally and historically to the elevation of Flanders. Therefore, Minnaert and Pannekoek established a committee to realize the publication of Simon Stevin's Works. This happened in 1948: the year of Stevin's centenary. They invited the science historian Dijksterhuis, whose conduct during the war had given cause for further investigation, to become chairman of that KNAW committee. They proposed him as a KNAW member based on his work **The Mechanization of the Worldview**. Minnaert also played a key role in realizing a professorship for

Dijksterhuis in the history of natural sciences. Minnaert therefore came to the defense of someone who had been an outspoken opponent in both his political and didactic views.

In this way, the astronomy duo paved the way for Dijksterhuis' chairmanship of the Stevin committee. Alongside this trio, the science historian R.J. Forbes and the maritime expert E. Crone, director of the Maritime Museum, became members of the committee. Minnaert would permanently hold the position of secretary. The KNAW decided in 1950 to follow the committee's proposal to publish Stevin's Works.

Upon closer inspection, the committee limited itself to reprinting publications in which Stevin developed original ideas: **The Principal Works of Simon Stevin**. Secretary Minnaert handled fundraising, translation, publishing, and printing. For part I of the series, Minnaert was able to secure sufficient financial support in the early 1950s.

In a final attempt to obtain a contribution from Flanders, if necessary symbolic, he and Dijksterhuis turned to the board of the Association for Science in the person of his flamingant friend from youth, J. Goossenaerts: 'In addition to the work of Huygens, Beeckman, and Van Leeuwenhoek, this work by Simon Stevin must also be considered a monument of Dutch civilization.' They suggested an advance that would be repaid 'as the sale of the 500 copies takes place.' Minnaert separately explained: 'It would certainly be extremely regrettable if Flanders did not contribute in some way. We have so far written to: the Royal Flemish Academy, the Flemish Engineers Association, Noordstar Boerhave, the City of Bruges, Professor Peters, the Académie de Marine of Belgium, and we have received nothing from any of them. Now I have some hope that the Association for Science might be able to achieve something. It should be clear that even a small contribution would be valuable, if only as a symbolic token of interest from Flanders.'

A year later, Minnaert wrote to him that the publication of part I was secured, 'but from Flanders we have received nothing but promises. It was a great pleasure for me to be in Ghent and to see you again.' It remained a North Dutch project.

Enthusiast in the history of science

In the early 1950s, Minnaert began exploring the history of science, which must have been encouraged by his frequent interactions with Dijksterhuis and Forbes. Additionally, his friend Dirk Jan Struik had written one of

the first 14 historical publications on the history of mathematics. In 1953, in addition to his articles on Copernicus, Minnaert also wrote the brochure *Sonnenborgh; The Utrecht Observatory and its history; 1642 - 1853 - 1953*.

The Utrecht Observatory proved to be one of the oldest observatories in the Western world. In anticipation of the Peace of Münster (1648), the city council had already converted the Smeetoren into a scientific institution. 'This transformation from a military stronghold into a scientific institution must have made an impression.' In 1853, Buys Ballot established a new observatory on the Sonnenborgh bastion, also incorporating a meteorological institute. Minnaert's residence housed a laboratory for meteorological observations that was moved to De Bilt in 1897.

Minnaert, alongside Dijksterhuis, was the central figure of the Stevin project, which in the 1950s delivered three volumes of the *Principal Works*. On the left page was the photographically reproduced original Dutch text; on the right page was the English translation. In 1955, part I on Mechanics was published by Swets & Zeitlinger with a General Introduction by Dijksterhuis. Stevin appeared here as the founder of the parallelogram of forces and a pioneer of falling experiments. The 'klootkrans' (a decorative chain or garland) with the motto 'Wonder en is gheen Wonder' ('A wonder is no wonder'), which could just as well have been the motto for Minnaert's *Natuurkunde van 't Vrije Veld*, was discussed here, as well as the experiments with lead balls that Stevin and Mayor Jan de Groot of Delft dropped from the tower of the Oude Kerk. Stevin had been a predecessor to Newton and Galileo. Would he have become a greater international figure if he had been able to publish his work during his lifetime? His son Hendrick had been able to publish most work only thirty to fifty years after his death.

Parts IIA and IIB on Mathematics began with an introduction by Struik, who provided the state of affairs in 1600 and analyzed what Stevin had added. Here, Stevin advocated, among other things, for the introduction of a decimal system for measurements and weights and introduced the principle of decimal fractions for the first time. When multiplying by 1,325, he performed the operation with 1325, finally moving the comma three places back. Multiplications with fractions became operations with whole numbers: he was the pioneer. He made an adjustable glass panel for Prince Maurits that converted knowledge of perspective into an estimation of the distance of remote objects. In algebra, he designed a method for the numerical solution of equations of any desired degree.

In the late 1950s, Dijksterhuis suffered a stroke that paralyzed the right side of his body. The committee continued to meet at his home in Bilthoven, but Minnaert had to take over the management. In 1961, part III on Navi-

gation by Crone and Astronomy by Pannekoek appeared.

The Flemish cartographer Mercator had designed maps with fixed courses, aimed at the same compass point, which he had laid out as 'loxodromes' on his sea charts. Stevin explained these methods so that sailors could work with them in practice. In another booklet, Stevin had written about finding harbors, improving a method for determining longitude by his fellow countryman Plancius.

In **De Hemelloop**, Stevin had shown himself in writing to be a convinced follower of Copernicus as early as 1608, even before Galileo (1613). The elderly Pannekoek had just managed to complete this astronomical work. The 'moving earth' was called the 'roe-445 rende eertcloot' in Stevin's 'Duytsch' or Diets; he rightly named the planets 'dwaelders' and used the word 'cortbegrip' instead of 'argument.'

In part III, there was also an excerpt from **De Wijzentijd**. Minnaert explained: 'This is what Stevin called the long-past period in history when humanity would have possessed much more complete knowledge than ever since. While he indicating how a renewed 'Wijzentijd' could be achieved, he provides insight into his ideas about the practice of science, the relationship between theory and practice, and the beautiful properties of the Dutch language, which is so well-suited for scientific endeavors.' Stevin believed, long before Bolland, that Dutch, due to its richness in monosyllabic core words, was exceptionally suitable for expressing the laws of nature: in that 'Wijzentijd,' humanity might have spoken Dutch!

Minnaert also involved himself in the Dijksterhuis vacancy and invited his friend Struik to fill in during the 1963-1964 academic year. Struik, who had written **The Land of Stevin and Huygens** (1957), indicated that he wanted to accept the appointment, 'but the gentlemen should be aware that I have not abandoned my old Marxist convictions.' 'Doesn't matter,' Minnaert wrote, 'come along.' Struik had been a target of McCarthy's campaign in the early 1950s as a professor at the Massachusetts Institute of Technology and had to agree to retire at 65. The appointment in the Netherlands came at the right time for him. Minnaert referred Annie Verschoor to Struik when she asked for advice on finding an author to write the scientific chapter of **On the Fault Line of Two Centuries**, the magnum opus of her late husband Jan Romein.

In 1963, part IV was published under the editorship of Colonel W.H. Schukking, a member of KIVI, about **The Art of War**. Stevin had been Prince Maurits's bookkeeper, quartermaster, and military advisor and had written books on fortifications and the logistics of warfare, such as **De legermeting**. The permanent state of emergency in the Dutch Republic

likely hindered Stevin in publishing his manuscripts!

The Bourgeois Life

In the early 1960s, international recognition of Minnaert's work accelerated. In 1961, Minnaert became a member of the Kungliga Vetenskapssamhället at Uppsala University and of the Société Royale des Sciences in Liège. In 1964, he represented the KNAW at commemorations in Italy honoring the memory of Galileo Galilei. In 1966, he was invited to join the Accademia Nazionale dei Lincei in Rome. In the United States, Minnaert was offered memberships in the Academy of Arts and Sciences (1959) and the National Academy of Sciences (1964). Some of these honors were based on his work in the history of science. He wrote a series of biographical sketches of astronomers for, among others, the *Enciclopedia Biografica* and the *Dictionary of Scientific Biography*.

In 1965, part V of the Stevin Werken was finally published. It included Stevin's contributions to Engineering, introduced by Forbes, as well as Stevin's treatise **Van de Spiegheling der singconst**. The latter is a pioneering work: a remarkably modern discussion of tone frequency relationships, introduced by theoretical physicist A.D. Fokker. This part concluded with **The life of the Citizen: de Vita Politica** or **Het Burgherlijk Leven**.

For Minnaert, this marked the end of twenty years of shared responsibility and nearly ten years of full responsibility for the Stevin project. He could report with relief on the successful completion of the task. Dijksterhuis and Pannekoek had not lived to see this. The publication would undoubtedly stimulate interest in 'the fascinating personality' of Stevin and contribute to knowledge of 17th-century science. Minnaert had remained somewhat in the background for outsiders throughout the project. With his article **Simon Stevin: A Wonder is No Wonder** in the English-language *Delta* of spring 1968, Minnaert reviewed the entire project once more.

He paid much attention to Stevin's **Het Burgherlijk Leven**, which argues that an individual should adapt to the power and authority relationships within the state. If they do not please him, he should move to another country. Claiming political power based on history, Stevin considered a futile endeavor. If one went back to the earliest times of Rome or Gaul, any claim to power could be justified. An opponent of authority would then have to invade the country as a declared enemy, but should abstain from internal undermining of the state.

Stevin's view of religion was equally pragmatic. Religion is simply nec-

essary to instill virtue in children. Parents can punish their children for misbehavior, but as soon as they are absent, the children may revert to unwanted behavior. However, if they learn that God is watching them and will later punish or reward them, this problem of order is solved. Therefore, Stevin recommends that parents instill belief in God in their children, even if the parents themselves are completely irreligious.

Minnaert explained these positions by considering that Stevin lived in a 'post-revolutionary period' of the Dutch Republic, where after decades of war and revolution, it was necessary to consolidate and stabilize the new power structures. Only a central authority could create the conditions for the flourishing trade and prosperity of the young Republic. This is a textbook example of 'historical materialism,' 25 Marxists would say: Stevin's post-revolutionary 'being' determined, indeed dictated, his 'consciousness.'

It all comes down to truth

After World War II, the issue of Flanders had taken on a different dimension for Minnaert. He had begun to look more at the international context. 26 Some statements give an idea of how Minnaert looked back on his 'activism.' Struik: 'When I asked him if he still stood behind the position he had taken in 1915-1918, he said: 'Yes: during the First World War, we had to choose between two imperialist alliances with little difference in principle; the Flemings were entirely justified in using the war to their advantage. But during the Second World War, it was humanity's task to defeat fascism, and this required supporting the Allies, especially since the Soviet Union was part of them.'"

In an interview with VRT, Minnaert confirmed that the activism of Jong-Vlaanderen had been beneficial: 'The administrative separation was already a shock, the state of Flanders an even greater shock. The idea was to achieve something with this shock therapy, and that happened. We wanted to make Ghent University Dutch-speaking, and that Dutch university has come into existence.'

To Picard Minnaert acknowledged that Domela was a vain man, sometimes a dangerous enthusiast, but he didn't draw any consequences for his position as his adjutant.

In the late sixties, he developed an intensive correspondence with Lamert Buning from Drenthe who wanted to write a biography of Domela and therefore was interested in the origins of Jong-Vlaanderen (Young Flanders). After reviewing some conceptual chapters, Minnaert warned the potential bi-

ographer: "Don't let your sympathy for your hero carry you away too much; he also had weak points, which you've almost entirely overlooked. After all, it's about the truth—the only thing that will ultimately remain. Buning remained stuck in the hagiography of a party member.

In the late sixties, Minnaert wrote letters to comrades like Picard and even worried about the archiving of Jong-Vlaanderen. With the Dutchification of Flanders and the federalization of Belgium, with the emergence of Flemish dominance in the federal state, Minnaert foresaw that his ideals would largely be realized. He wrote to Picard: 'What one sees happening at this moment is nothing more nor less than an administrative separation in education. If Brussels were not there, everything would proceed much faster.' The Flemish emancipation remained close to his heart. But as he wrote to Buning in 1968: 'Since my stay in North Netherlands, I have increasingly come to understand the importance and beauty of socialism and the dangers of rising fascism. My love for Flanders and the Netherlands has remained just as great, but incorporated into the international brotherhood of nations and societal reform.'

This phrasing indicates that Minnaert consciously transformed his Flemish nationalism into an internationalist conviction, in which Flemish emancipation remained a crucial point of consideration.

Footnotes:

1 Picard to L. Buning on June 13, 1971, a year after Minnaert's death. Minnaert had written on this to Buning himself on December 31, 1968. Archive Buning.

2 Picard was married to Martha van Vlaenderen with whom Minnaert had been in the management of the Gent ANV youth movement.

3 Announcement by L.R. van Dullemen.

4 Heard from, among others, prof. dr C. Zwaan. 5 De Jager, C., in: Haakma, 1998.

6 Romein-Verschoor, A., Simon Stevin, in: *Erflaters van onze beschaving*, 1938.

7 Dijksterhuis, 1943.

8 Minnaert to Buning, letter of December 31, 1968. Buning Archives.

9 Van Berkel, 1996, 314, 381, 423,

10 In Stevin's time, the physicist Snel, also known as Snellius, provided several Latin translations, then the scientific lingua franca.

11 From the Holland Society of Sciences, ZWO, the KNAW, the Bataafs Genootschap, the Hendrik Muller Vaderlands Fonds, the Prins Bernhard Fonds, the Royal Institute of Engineers, and the Provincial Utrecht Society.

- 12 Dijksterhuis and Minnaert to J. Goossenaerts, July 10, 1951.
- 13 Minnaert to Goossenaerts, May 29, 1952.
- 14 Struik, *The concise history of mathematics*, New York 1948. And *Yankee Science in the Making*, Boston 1948.
- 15 Minnaert, 1953.
- 16 *The Principal Works of Simon Stevin*, Part I (1955), IIa, IIb (1958), III (1961), IV (1964), and V (1966).
- 17 Indeed, the father of Hugo de Groot.
- 18 Van Berkel, 1996, 501.
- 19 Minnaert, M.G.J., *The astronomical and nautical works of Simon Stevin*, Lecture for KNAW, report *Natuurkunde* section, 1, 1961, 11.
- 20 Struik, D.J., *De ‘zaak-Struik’* (1951-1955), *Politiek & Cultuur*, 4, 1992. Chapter from unpublished *Memories*, translated by Leo Molenaar.
- 21 For Struik, forty more active years after his 65th were to come.
- 22 A. Romein-Verschoor, *Omzien in verwondering II*, 275.
- 23 At least the biographical sketches of Hortensius, Hoek, Kaiser, Pannekoek, and Stevin for the *Dictionary* and those of Stevin, W. de Sitter, and J.C. Kapteyn for the *Enciclopedia*. He also delivered a historical lecture for the engineers of KIVI in 1970 on the occasion of 150 years of the metric system, which appeared in both *De Ingenieur* of July 3, 1970, and the magazine *Delta*.
- 24 Minnaert, 1968d.
- 25 The author joins them.
- 26 Struik, *Memories*, unpublished chapter about his student days.
- 27 Minnaert, tv-script J. Florquin, *Ten huize van...*, 1970, 9. The VRT was then known as the BRT.
- 28 Minnaert to Picard, March 3, 1969, AMVC Archive.
- 29 Buning Archive. From August 25, 1968, until his death, Minnaert wrote 21 letters.
- 30 Minnaert to Buning, March 15, 1970.
- 31 Buning, 1975.
- 32 Minnaert to Picard, February 20, 1969. He thought the Antwerp AMVC would be suitable.
- 33 Minnaert to Picard, March 3, 1969, AMVC Archive.
- 34 Minnaert to Buning, December 22, 1968. Buning Archive.

Chapter 26

A Crumb on the Cloth of the Universe

'The country urgently needs teachers in the natural sciences. A wonderful career of great social significance lies open before you. May we expect that you will feel drawn to it?'

The Working Group on Science Didactics

World War II once again stimulated the realization that everything had to be fundamentally different. The New Education Fellowship had become the leading UNESCO body in the field of education. The first conference in 1947, held in Cirencester, UK, was dedicated to The Promotion of Peace through Education. At the time of the first post-war conference of the Dutch section in 1949, the Working Community for Educational Renewal (WVO), with educators Kees Boeke and mathematician Hans Freudenthal as initiators, politics had already put this effort on hold again. Many educators had little inclination to follow the government's lead: weren't two world wars enough? The issues faced by Minnaert's Federation of Scientific Researchers repeated themselves.

Minnaert was involved in both the post-war reform of mathematics education and that of natural and astronomical sciences. On October 6, 1948, he sounded the alarm among his colleagues for the first time: 'The lack of good teachers is becoming a disaster for secondary education and indirectly also for universities. To address this, measures of various kinds must be taken. Our task is to ensure that at least the training of future teachers at the University is properly conducted.' This marked the beginning of a

period of continuous attention under Minnaert's guidance for the training of science teachers in Utrecht.

In December 1949, he opened an exhibition for the Utrecht branch of the then MULO schools, showcasing 'little devices with which physics experiments are conducted.' The driving force behind this was G.H. Frederik, a physics teacher who had written to Minnaert about the two-year teacher training program organized by the MULO associations. They hoped it could lay the foundation for teachers' qualifications: the course spanned two years of 35 afternoons, alternating between physics practicals and theory in biology and physics.

Minnaert made a strong impact at the opening. Everywhere, the natural sciences were recognized as the foundation for technology and agriculture, and for an industrialization that required a higher development of workers: 'If we want to maintain our place in world science and the global economy, this foundation must be laid for Dutch youth. And not just physics education that is pushed into an exam and forgotten the next year...' Dutch education was purely verbal: 'It is the natural sciences that can free our education from such one-sided wordiness. They bring gleaming copper and splashing water into the classroom, the warm colors of the spectrum; the delightful stench of hydrochloric acid or ammonia, or the loud explosion; the tender green shoots of sprouting plants and the wonderful beauty of fish in the aquarium.'

He praised the young people presenting the instruments and commended the cooperation between neutral, Christian, and Catholic education: 'The teacher training colleges seem to see no opportunity to teach their students how to experiment, and a special certificate for natural sciences does not exist - but from all corners of the country, they have set up their own courses. There is no free time available for MULO teachers to practice; well, these young people have sacrificed their Saturdays for two years out of passion for their teaching task and because they are captivated by the idea of bringing a piece of nature into the classroom.' The authorities exploited the idealism of these teachers. A quarter-century after the voluntary work of Soester teachers for his 'physics in student practical' nothing seemed to have changed!

On December 22, 1950, a day of historical significance, the Physics Didactics Working Group (WND) of the WVO was established at the Observatory. The mathematics group of the WVO, led by physicist Greet Smit-Miessen, had deemed the time ripe. As their first study subject, the group chose 'the purpose and function of the practicum': only six(!) schools in the country were found to have a practicum room. The practicum had to be defended against those who saw it as mere tinkering and a waste of time. The members of the working group gathered counterarguments, developed homework

tests, and thought about a new curriculum. Minnaert was one of the most loyal participants: ‘He believed he should decline the chairmanship but made himself available as an advisor.’

The group shared the opinion that physical concepts must first grow intuitively: only gradually should they be named and defined. This stood in stark contrast to textbooks that took definitions as their starting point. Additionally, the WND advocated for the practicum to become part of the final exams. At a joint conference with the mathematics working group in November 1952 on General Natural Sciences, Minnaert discussed a new curriculum for astronomy, while Tatiana Ehrenfest-Afanasjeva and Freudenthal addressed the principles of geometry and mechanics in schools.

In the 1950s, the physics working group gained a foundation of one hundred active members, about thirty of whom attended the monthly meetings.

The Practicals and Teacher Training

In the early 1950s, G.H. Frederik and A.W. Middeldorp’s Test Book with the motto ‘from doing to understanding’ became popular. According to Frederik, the approach followed was ‘inspired by Minnaert’s ideals: treatment took place on the basis of self-conducted experiments, and in processing the reports, students had to pay attention to the interplay between experiment and theory.’ Handy storage boxes with apparatus were marketed by the firm Luctor. A tripod with a large base plate, which Minnaert had recommended back in 1924, made the setup stable and clear. Frederik succeeded Reindersma in Utrecht as a university lecturer in ‘didactics and methodology of physics,’ which made the setup stable and clear. In the late 1950s, textbooks aimed at upper-level education also emerged, such as the three-volume **Handleiding voor het natuurkundepracticum** by Bulthuis and Gathier, and the popular **Doen en denken** by Kelder, Steller, and Zweers.

In addition to practical training, teacher education in the 1950s received more government attention. A Royal Decree of August 28, 1952, confirmed in 1955, mandated ‘a university-level pedagogical-didactic education for teachers following the approach of Utrecht.’ This meant that future teachers had to complete a school internship. This increased requirement frustrated many students who viewed teaching merely as a fallback option; they believed minimal effort for teacher training was more than sufficient. Minnaert addressed these students with a strict ‘personal message’, emphasizing that science and experience play a crucial role in societal life: ‘This is also true in education: the individual must take into account what has been experi-

enced, tried, and thought by many others. Education fulfills such a central and vital function in our society that we can no longer afford to pursue it without systematic preparation. This applies all the more to the natural sciences and mathematics, which are developing so rapidly that continuous revision and modernization of teaching materials are absolutely necessary for scientific progress to continue.'

There was much discussion about the university's social role. For years, students had noted that 'internships,' or gaining experience in schools, was one of the most useful parts of teacher training. Now, however, students were objecting to this component of their education: 'Students of the Faculty of Mathematics and Natural Sciences! The country urgently needs teachers in the natural sciences. A wonderful career of great social significance lies open before you. May we expect that you will feel drawn to it? Do you intend to prepare yourselves for it?'

In 1961, Minnaert delivered a lecture titled **University and Didactics,** in which he looked back on his own *Aha-Erlebnis* in Mrs. Ehrenfest-Afanasjeva's discussion group, he said: 'I believe we then understood that an original thought in the field of didactics can be just as important as a scientific discovery.' On June 28, 1963, Minnaert chaired the committee for teacher education in the natural sciences faculties for the last time. He noted that the four didacticians of the exact sciences at the time were part of the Institute of Pedagogy. Under their leadership, topics being addressed in secondary education were tested. The Physics Laboratory had established a 'didactics' department, and the number of students aiming to obtain a teaching qualification rose sharply. His colleague Freudenthal concluded that Utrecht's central role in the didactics of pre-university education had begun with what Minnaert had achieved for teacher education in the natural sciences.

In the 1960s, the implementation of physics practical work suddenly gained momentum. In 1961, practical work was done in 25% of lower-level HBS and gymnasium classes; by 1965, this had risen to 50%. With new school constructions, practical work laboratories became standard facilities, and funds were allocated for equipment. Commercial companies responded to the growing market for educational materials.

J.Ph. Steller, a Utrecht HBS teacher, approached Minnaert to pursue a Ph.D. in physics didactics. Steller, later a professor of physics didactics in Eindhoven, wrote his 1966 dissertation titled **Handigheid of inzicht?** ('Skill or Insight?'), focusing on 'the value of the physics practical work.' He had surveyed 400 students who had two years of experience with demonstration-based teaching and individual practical work. The majority preferred practical work but believed it made the subject matter more difficult. Steller

concluded that practical work needed improvement while demonstration experiments remained important. Unlike Minnaert's astronomy Ph.D. candidates, this new didactician was not impressed by his promoter's textual criticism. He thanked him ironically: 'Your meticulous care for the smallest detail, which I sometimes found not excessive but still annoying, taught me a lot'. Steller's promotion was nonetheless Minnaert's latest achievement in the field of education.

However, the success of the practical course led to the decline of the WND, as the effort for the practical course had long been its most important *raison d'être*. The group initiated the so-called Woudschoten conferences in the 1960s, which were intended to stimulate the didactic enthusiasm of physics teachers. Minnaert attended the first conferences.

His involvement with the subject 'astronomy' was at least as large, but it ended in a huge disappointment.

A curriculum for astronomy

Minnaert had already been convinced in the 1930s that the school subject 'cosmography' did not do justice to young people's fascination with the starry sky. Just as mechanics had been colonized by mathematicians, cosmography had been taken over by mathematicians and geographers. He therefore designed an alternative curriculum in **The Astronomy and Humanity** (1946). After the war, the Education Committee of the Dutch Astronomers Club (NAC) was established. It consisted of J. Raimond Jr., chairman of the Netherlands Weather and Astronomy Association (VWS), A.J.M. Wanders, a physics teacher, and Minnaert. In the background, there was the threat of abolishing this 'physical geography'. The committee wrote a Report on this in 1946.

On June 6, they spoke with Minister Van der Leeuw. Wanders had not even been granted leave from his Catholic school to attend the meeting with the PvdA minister! They tried to enthuse him about a subject called 'astronomy' with new content: the historical development of ideas about the structure of the solar system, supported by numerous observations to be carried out by students, followed by the main features of the structure of the universe. It was to be entirely separate from physics: the goal was to decipher the structure of the universe. The committee wanted more than the two-hour course of 1920. There should be university lecturers in 'didactics of astronomy' who would cultivate qualified teachers. They were also supposed to be competent in natural sciences and mathematics. In 1946, the

committee sent a circular outlining its principles to all rectors. Shortly after this meeting, the Schermerhorn government came to an end, and the issue was temporarily set aside.

At the beginning of 1950, Minnaert warned that the Ministry wanted to design a new program for Secondary Education. He wrote *'The Astronomy in Higher Secondary Education is in Danger'*, as cuts were being made to smaller subjects. He argued for retaining that one hour: 'Astronomy is a wonderful school to teach us to distrust our naive impressions and, with the help of clear reasoning, build a less obvious but more harmonious worldview. The greatness of this worldview lies both in its immense dimensions, which suddenly make us realize the insignificance of humans and Earth compared to the universe, and in its simplicity and regularity. It is a classic example of a subject not directly tied to practical utility, yet everyone is impressed by its significance for human thought. There is no other subject where such impressive results can be achieved in thirty lessons.'

Finally, Minnaert advocated for a three-hour course over a quarter. This was so utopian at the time that Raimond admonished him. Minnaert also believed that the astronomy subject might have a better chance if it were part of a new general science subject. This required intensive collaboration with other scientific disciplines.

In 1953, Minnaert placed the anniversary of the Utrecht Observatory under the banner of 'the social task' of astronomers. In August, he organized a summer course for teachers in collaboration with teacher associations and the NAC. More than 200 participants attended the lectures and demonstrations. Thus, the anniversary served Minnaert's lobbying efforts for astronomy in secondary education.

The mammoth under a dark star

In the 1960s, the Dutch Mammoth Act would ultimately bring about the abolition of the subject 'cosmography.' This realization gradually dawned on the Education Committee, or at least on Minnaert. The subject of mechanics also fell victim, but it was placed under physics. Minnaert offered his chairman Raimond to write again about the significance of astronomy. The Response Memorandum from February 1961 confirmed his worst suspicions: astronomy had been added to the non-compulsory subjects and thus excluded. Because the HBS (Higher Civil School) was abolished, and therefore pre-university education (VWO) for many students was extended from five to six years, this elimination was even more regrettable.

Minnaert wrote a protest to Secretary of State Stubenruch and demanded a hearing: 'The subject of Astronomy has an unparalleled ideological and broadening significance, making it indispensable for all who follow the atheneum and who will later, at university, inevitably have to specialize.' The audience took place four months later and resulted in a referral to the Departmental Working Group and the Inspection. As the meeting dates stalled and the months passed, faits accomplis were created.

Wanders suggested: 'Wouldn't it be time—third time!—to provide some 'information' about the subject of Astronomy in the teachers' journals? I remember your convincing articles from 1946/47 and later once more, I think around '53.' Minnaert immediately wrote an apology: 'Astronomy is primarily aimed at answering the big questions: Where are we? Where do we come from? Where are we going? It's so rewarding that the most important general insights about this can be shared with students in a limited number of lessons, in such a way that this education becomes a true experience for them.'

The subject could show students through their own observations and considerations that the Earth floats freely in space and moves around the Sun: 'This requires a mental liberation from naive concepts and prejudices, an awakening of the critical spirit, a first unfolding of scientific imagination. The breakthrough of the Copernican worldview is also connected in many ways with the colorful civilization history of the 16th and 17th centuries.' For Minnaert, 'astronomy' had become a philosophical issue: the subject should acquaint prospective students with the 'wonderful structure of the universe.' It was to no avail. The House of Representatives passed the Mammoth Act and eliminated the mandatory subject of cosmography. Astronomy disappeared from the regular curriculum for thirty years, although 'astrophysics' occasionally worked on its own as a special topic within physics.

An observer involuntarily looks back for hidden agendas. Minnaert wanted to dedicate the subject to the new scientific worldview, to the cosmogony of a universe that took billions of years to form, with humans as a crumb on the skirt of the universe. When 'cosmography' still dealt with coordinate systems, zenith and azimuth, Jacob's staff and sextant, angles and trigonometric distance measurements, inclinations and declinations, it was a harmless subject. How eager was one for the new worldview in the Catholic stronghold that the Ministry of Education had become since 1946? Was there a wait there for a subject based on the truths of Galileo and Copernicus, Darwin and Einstein? Within biology, fundamentalist schools still ignore Darwin's truth to this day, and therefore 'evolution' is excluded from the National Examination in the third millennium after Christ. Minnaert's astronomy

placed evolution and cosmogony at its core and wanted to proclaim the 'fresh' results of modern science.

However, Minnaert's involvement in astronomy education was not limited to the Netherlands alone. The Groningen astronomer A. Blaauw: 'When a commission for astronomy education was established within the International Astronomical Union in the 1960s, Minnaert was asked to chair it. Whenever it came to the human aspects of international astronomical endeavors, Minnaert was always the first to come to mind.' In 1961, Minnaert became president of 'Commission 38' regarding the 'exchange of astronomers,' which paid special attention to colleagues from developing countries.

During the 1960s, he would participate in discussions on astronomy and science education. On behalf of the IAU, he sat on an international consultation body (CIES), through which he attended conferences such as in the African Dakar of 1964. His colleague Freudenthal recalled the CIES Congress of 1968 in Varna, Bulgaria, 'where Minnaert passionately pleaded during the closing meeting that astronomical education not be forgotten in the congress resolutions—and it was indeed included—I don't know anyone else who would have been listened to as seriously as Minnaert when advocating for his own field, because everyone knew his field was the entire world.'

That was the world: in the Netherlands, he had lost the battle, although he loyally contributed to the development of a curriculum for schools that would independently choose to offer the wonderful subject of 'astronomy' to their students. Fortunately, there were such schools.

Endnotes:

1 Morsch, the historian of this WVO, wrote in 1984: 'A Boeke redivivus would not feel at home in the current peace conference between the major powers, which essentially only deals with more or less arms control.' How much more would these educators have dismissed the call to start this arms race!

2 Van Dalen, 2001, 201.

3 On that day, Minnaert condemned in another writing the 'shameful' conduct of the curators regarding the appointment of a teacher for mathematics didactics and, with this letter, took the initiative to convene a meeting of the 'members of the committee for teacher training' on December 16, 1948, at the Observatory library. This relatively quickly led to the appointments of teachers Krans (physics) and Van der Steen (biology) for a sum of fl. 250,- per year, almost unpaid. Two years later, Minnaert proposed doubling this amount while also trying to reduce their 26 teaching hours by 6. The

latter finally happened. Minnaert would occupy himself with such matters throughout his life: hence the title of Molenaar, 1998. Astronomy Archive.

4 G.H. Frederik to Minnaert, November 14, 1949. 5 Instead of 'woordenenzijdigheid,' it originally read 'vloek van de woorden.'

6 Hooymayers, H.P., and W.P.J. Lignac, 25 years of Working Group Physics-Didactics, Report WND, 10th Conference, December 19 and 20, 1975.

7 Frederik quote in Van Genderen, 1994.

8 Gathier was a Ph.D. student (1955) of Minnaert; Steller would become it (1966). Steller wrote in 1958 'Why Physics Practicum?', after which he must have joined Minnaert.

9 Minnaert, 'Teacher Training is Not Popular Among Students,' lecture, 1956.

10 Minnaert, 'University and Didactics,' lecture, October 14, 1961.

11 Freudenthal, W&S, 1971, 1-3.

12 Steller, 1966. When Minnaert emerged in the 1920s as the animator of the school practicum, his graduating colleague Lili Bleeker (1928) challenged him with a proposition (8): 'If the plan is implemented to teach secondary school students the principles of physics through self-experimentation, it will probably not achieve the expected results.' Perhaps Minnaert hoped Steller could refute her proposition. See Ginkel, 1997, and Offereins, 1998, for more on Lili Bleeker.

13 Wanders was also a PhD student under Minnaert. Wanders, part II, 1933.

14 Map-Education Committee NAC. Astronomy Archives.

15 Minnaert's letter to the State Secretary of March 31, 1961. The memorandum was titled 'The Importance of Astronomy for VHMO.' Astronomy Archives.

16 Wanders to Minnaert, February 10, 1961.

17 Minnaert, (1961).

18 Meanwhile, the Second Phase offers, for now, within the subject General Natural Sciences, a perspective on the one-hour course that Minnaert minimally envisioned in 1950 and which he wanted to include at the time in the context of, indeed, a new subject called General Natural Sciences.

19 Lucebert, see the cover page and title of the biography.

20 Interview with A. Blaauw.

21 Freudenthal, W&S, 1971, 1.

Chapter 27

I Am Lucky in Myself

'We strengthen ourselves when we watch Sophocles' Antigone being performed, or when we read Gorter's Pan or when Beethoven's Ninth Symphony resonates.'

Bridge Builder Between Generations

Minnaert became a professor when the university was still an ivory tower, where an elite from the higher middle classes dedicated themselves to science and education. [1] After the war, the university underwent a series of revolutionary developments. The expenditures for scientific research in the Netherlands increased from 0.26% of the gross national product in 1948 to 1.05% in 1963. For Utrecht, they rose from 16 million in 1954 to 37 million in 1960; the annual increase in personnel costs was 8%. The Utrecht staff of scientific employees grew from 60 to 900 in fifteen years, but nothing was regulated regarding their rights and duties. Managing the expanding institutions became a problem because professors often were not suitable as managers. Minnaert had also not been a high flyer.

The student population grew from 5,000 in 1946 to 14,000 in 1969, although the social background hardly changed. Parts of the university were relocated from the city center to new buildings in De Uithof. Within the administration, the rector's secretary's apparatus began to play a key role. A creeping reorganization took place: the result was an idiosyncratic large enterprise with amateurish management.

What burst forth typhoon-like in the second half of the 1960s was so surprising for the university administrators because they thought they were fully taking into account the changing society and the challenges of their

fields and education. Beneath the surface of reverence for the academic stars and the untouchable administrators, much resistance and irritation simmered. The minutes of the Curators or Senate do not mention anything about the Student Trade Union Movement (SVB). On the other hand, the student magazine **Trophonios** attacked the Utrecht authorities. A layer of students radicalized quickly; the anti-authoritarian cohort of 1968 no longer believed in the consultation model, unlike the SVB members of the early years, but instead opted for the latest fashion of direct democracy.

A mild Van der Heiden wrote in the university's history book: 'In the midst of the rapid secularization of those years, younger generations reached for new support, for slogans and patterns, often moved and sincerely striving for a better society, but just as often unable to convey ideas to large groups that always failed to show up unless their educational provisions were at stake.' The historian H.W. von der Dunk delivered a harsher judgment: 'The radical innovators, skilled in neomarxist terminology, were even more paternalistic than the elites they opposed. Considering this, the protest can primarily be regarded as an elite youth movement within the higher strata of society. Psychologically, the deepest impulse was to force a change of guard because the old guard clung too much to their positions. This always goes hand in hand with the introduction of a new philosophy and sometimes even a new style.'

The rebellious youth not only attacked hierarchical relationships but also the nature of science itself, which they believed should serve political and social goals. The agitation led to occupations of administrative buildings and occasionally turned lecture halls into political arenas. In the late 1960s, plans for administrative reforms were circulating, and new legislation broke the professors' monopoly on power. According to former student activist K.-J. Snijders, the Senate responded very authoritatively to the self-willed students, though he named Minnaert and theologian De Graaf as exceptions.

During the controversy over an issue of **Trophonios**, in which illustrator Arne Zuidhoek depicted 'Schmeltzer's night' and the fall of Cals as Judas' betrayal of Christ, Minnaert had responded coolly: when asked, he found it in poor taste and urged the editorial board to maintain unity instead. When the student movement caused intense upheaval among colleagues, he tried to reconcile them, as in his 1968 Dies celebration speech: 'With joy but also with fear in our hearts, we follow the student movements across the world expressing a longing for a better, freer, happier future: in Rome and Madrid, Barcelona and Prague, Warsaw, Berkeley, Jakarta, Frankfurt, Leuven, and Berlin; they are active everywhere, sometimes going off track but mostly driven by great idealism, a certain sense of right and wrong that

no diplomacy can withstand in the long run.' Even though some attendees interrupted him with shouts of 'Prague! Prague!'—an echo of 1957—he showed an understanding of the youth's idealism and positioned himself as a bridge-builder between quarreling generations.

He demonstrated an interest in new developments. In early 1966, Minnaert and Miep Minnaert-Coelingh had added a protest to their post-war political statements against the 'state of affairs in Indonesia over recent months': after the mass murders of fall 1965, the communist trade union leader Njono had been arrested by the Soeharto government. The 77-year-old was also present at the key conference of his Union on 'The Ideology of the West' in February 1970, where Western capitalism was put in the dock and examples of Marxist economic theory and ideological criticism were presented. Minnaert's conviction had never been Marxist. However, he engaged in the discussion, which most colleagues feared due to the verbal violence of the students.

The responsibility of the researcher: books for Hanoi

On the eve of these developments, Minnaert was invited to meetings on 'responsibility.' On March 15, 1966, he spoke at the Delft Studium Generale. He often emphasized 'the responsibility of the researcher.' He focused specifically on collaboration in the design of weapons. At a time of chemical and biological warfare in Vietnam, this was a relevant approach. Minnaert believed that everything depended on the researchers: if they refuse to cooperate, there will be no war. Therefore, they bear full responsibility. On the other hand, the researcher has the same responsibility as every citizen: society decides what it wants to do with their work. As an ordinary citizen, he can voice his opinion here. Both considerations lead to the conclusion that the scientific researcher and engineer bear more responsibility than other citizens. For example, researchers have a duty to inform elected representatives about the dangers of biological and chemical warfare. They are best informed about the confidentiality within the company or the motives of the clients. If the latter are not decent, they should not cooperate.

He addressed the students directly: 'I would so much like you to be happy in your life, in your future. The feeling of building something, contributing to the happiness of humanity. That feeling you will never have if you dedicate yourself to devising weapons. Do you want to give your beautiful, flourishing young life to that? Minnaert believed that the university should not maintain ties with institutions conducting military research, accept defense

subsidies, participate in 11 NATO seminars, or keep research results secret. The nobility of the engineering profession required upholding its standards! According to him, the engineer was naturally a 'whistleblower.' Physicians had the Hippocratic oath: 'Why shouldn't engineers make a similar promise?'

In the summer of that year, an appeal to university communities in Western Europe appeared in *W&S* and other journals. A total of 83 professors from nine European countries addressed their colleagues regarding Vietnam: 'We feel responsible for everything that can be done in favor of peace. We stand in solidarity with the very active movement in the United States, where many professors and students are opposing the war waged by their country.' The appeal mentioned the establishment of an international secretariat in Paris to coordinate initiatives: 'The moment has come to give more strength and coherence to the action against the war in Vietnam and to prepare a large-scale movement in favor of peace, based on the Geneva Agreements (1954) and their fundamental provisions: the principle of the withdrawal of foreign soldiers and war materials from Vietnam, the principle of non-participation of Vietnam in military alliances, and the principle of long-term respect for Vietnamese unity.'

Second among the French signatories was Minnaert's pupil and friend from the Collège de France, Jean-Claude Pecker. The 'great names' were limited to Ernst Bloch, Gunnar Myrdal, Jean Piaget, Joseph Needham, Joan Robinson, and Eric Hobsbawm. From the Netherlands, thirteen professors participated, most of whom taught in Utrecht: Minnaert, De Jager, Nijboer, and De Graaf. The first appeal from 1966 by a Dutch committee pointed out that colleagues in Vietnam were continuing their scientific work and youth education: 'French universities have taken the initiative for an international action to raise funds intended for the purchase of standard works, major textbooks, tables of constants, which primarily appear to be needed at the research level. Netherlands will particularly contribute to civil engineering and tropical agriculture.'

The necessary bibliographic data had already been collected: for the books in these fields, an initial amount of fl. 5,000,- was needed. The 73-year-old Minnaert took charge: Zuilenstraat 25bis became the correspondence address. A year later, a letter stated that fl. 9,000,- had been raised: the shipments were on their way. Education in North Vietnam had been continued and expanded with 'incredible energy.' The number of students at universities and colleges had risen from 21,700 in 1964 to 46,400 in 1966: 'One of our French colleagues, returning from a short stay in Vietnam, visited the University of Hanoi in the jungle and found that there was a great lack of modern Western books, while there were quite a few scientific jour-

nals available.' Minnaert wanted to travel to North Vietnam himself for a similar visit, but the floods in the country prevented this.

In a TV interview, Minnaert explained: 'However the war unfolds, the best way to help them is to ensure they have intellectuals, that engineers and doctors are trained. They have little or no contact with the Western world, and therefore we must assist them. The initiative originated from the French universities and then spread to other countries, to Sweden and the Netherlands, and more countries will join. Already now, books worth half a million guilders from European countries have been sent there. These are books of the highest scientific level, because Vietnam is not a backward country.' For Minnaert, the political situation was clear and, as always, black-and-white: 'In Vietnam, justice is entirely on Vietnam's side, and injustice on the side of the Americans.' De Jager wrote later: 'The fact that one could fight a war with books had deep significance for him, and the great resonance his action found among surprisingly large parts of our people did him much good.'

Criticism of NATO and the United States was growing everywhere due to the Vietnam War, the colonial war of NATO member Portugal in Angola, and the colonels' coup in Athens. Meanwhile, Miep Minnaert-Coelingh's activities within the Dutch Peace Council (NVR) came to a standstill. Those years were led by communist and resistance fighter Gerard Maas. Just for him, there was an ashtray on the attic of Zuilenstraat 25: an unheard-of indulgence for Miep. The CPN had used the NVR for twenty years to form coalitions with other groups but gradually became accepted as an independent party. In 1966, a first teach-in about the Vietnam War took place. There, resistance fighter Gerard Maas spoke on behalf of the CPN's executive board.

Additionally, the World Peace Council took a stance that annoyed the CPN. At a 1968 meeting of communist parties in Brussels, the Russian and French parties declared that the Vietnamese should stop the war because a world war loomed. The CPN refused to sign a communiqué to that effect. When the Soviet Union and its satellites also crushed the Prague Spring, the CPN no longer found the World Peace Council an interesting forum. The Dutch Peace Council was abruptly disbanded, and the weekly deliberations between Maas and Minnaert-Coelingh ceased. While the world opened up further for Minnaert and he found himself short on hands and brains, his wife lost the meaning of her existence.

Religion unnecessary for morality and conscience

The criticism of the two superpowers responsible for Vietnam and Prague was widespread. Minnaert spoke on radio and television and gradually became a well-known cultural figure. In March 1968, he discussed on *De Vrije Gedachte*, the Freethinkers' Radio Broadcasting, how as an atheist he could still uphold strict moral standards: 'When we are born, we inherit a series of hereditary traits from our ancestors; or rather: hereditary response patterns, because that is what is actually inherited. An ivy plant does not have the characteristic of the well-known multi-sided leaves. What distinguishes ivy is its reaction to shade by forming multi-sided leaves and to light by forming round leaves. It is the same with humans. What becomes of them will be largely determined through the environment in which he grows up.

The investigations of Freud and many others have revealed how the impressions from the very earliest years of childhood have a very significant influence on the developing human being. During that time, his parents continually instill in him what is good and what is naughty. Later, he is further educated by the friends with whom he plays, by the boys and girls at school, by the workers in his factory, by his wife, by his children... He is influenced by the books he reads, by the works of art that shape feelings about good and evil.

All these influences can work for better or for worse, but on average, they will convey the aspirations of current society to the growing person in more or less perfect ways. This is how his conscience takes shape, that conscience which made such a tremendous impression on Kant and whose origin he could not understand. It is completely unnecessary to invoke the intervention of supernatural powers here, which would have instilled this conscience in us once and for all, ready-made.

Minnaert followed in the humanistic footsteps of his uncle Gillis. With his reasoning, he could uncover both the origin and the mutability of 'conscience' and 'morality': 'The morality that we impart to young people will later be passed on by them to the next generation: in a certain sense, one can speak of a kind of heredity, a pseudo-heredity. But that morality does not remain unchanged; it gradually evolves, there is an evolution, a continuous adaptation to changing circumstances in society.'

Forces from the past and present played their role in shaping morality: 'Christianity has also played a major role, partly by helping shape beautiful ideas that already existed earlier, partly by adding new norms. While some clung rigidly to the letter of Scripture, others strove to bring out the noblest thoughts and feelings from it; the storm of history surged through humanity.

Socialism brought an important new impulse; humanists, animal protectors, scientific workers, and not least the youth, each contributed in their own way to the formation of today's ethics, and that evolution continues unabated.'

Morality arose from people living together, as a set of indispensable rules of conduct aimed at making humanity as a whole happy: 'Kropotkin demonstrated in his book on Mutual Aid in the Animal Kingdom that such rules exist and have played an indispensable role in the history of mankind to overcome the difficulties of existence. We promote the safety and happiness of others, and thereby gain the advantage that they, in turn, contribute to our safety and happiness. But what is encouraging now is that doing good itself gives us such great inner satisfaction, regardless of whether we receive anything in return or not.'

Minnaert had filled in the gaps in his polemic with Burgers from Sint Michielsgestel: "We do good for the sake of good itself and not to be rewarded in any way or to enter heaven. The forces of conscience are apparently very strong within us. Religious people add that, by acting virtuously, they fulfill God's will. This gives virtue, so to speak, a sacred character, and they feel more inclined to live a good life. It seems like an advantage of religion. But this advantage is bought at a high price. The believer thinks he knows what God prescribes or that his church knows it. He can hardly accept that others think differently about it, or that God's commandments change over time or with circumstances. Thus, there is the danger that the natural evolution of morality will be hindered, and morality will become rigid. There is also the risk that future humanity, which will likely have forgotten religion, would come to think that concepts of good and evil are built on shifting sand and can be discarded. Those who listen to sermons on Sundays often get the opportunity to reflect on good and evil and strengthen their feelings within themselves. But the Church is not necessary for that."

It was high time to indicate what a humanistic morality would look like in the future: "We strengthen ourselves when we watch Sophocles' *Antigone* being performed, or when we read Gorter's *Pan*, or when Beethoven's Ninth Symphony resonates. The driving force of our lives is here on earth. We must not seek it in the afterlife or in the supernatural. It is for and with humanity that we live and strive, and all incomprehensible things that people add to it only reduce the value of that all-encompassing principle: humanity is the highest."

He did not come to write a book on Free Will as he had decidedly intended. Nevertheless, Minnaert succeeded in making it clear in a series of articles and lectures how his rejection of free will, as expressed in the discussion with Burgers, could coexist with ethics and morality. Kropotkin was

central again, just as in his 1916 brochure. It is also remarkable that he stated that his Flemish upbringing must have determined his life.

Anti-vivisection and pro-Esperanto

Minnaert also committed himself to activities against vivisection. He condemned the indifference towards the suffering of animals simply considered as 'material' and expressed his doubts about 'the lack of pain sensation in animals.' He wanted to break the silence and 'disassociated' himself from the relevant scientists. Annually, 50 million animals were killed: less than 10% for medical purposes. He condemned an American researcher who had used 150,000 monkeys. Many student experiments could just as well be arranged as demonstrations. He pointed out the numbing effect and the unintended stimulation of cruel tendencies in young people. He condemned experiments on idiots and lunatics, on criminals and incurably ill individuals, which were justified under the guise of science. As an example, he mentioned the polio experiments on mentally disabled children. People did not like to talk about such things, just as they avoided discussing slavery and child labor in the previous century. The public was lulled to sleep by invoking the 'halo of science.'

He remained an ardent propagandist for an international scientific language. The KNAW had decided, partly due to his efforts, that their publications could be summarized in Esperanto as early as 1947. At the IAU Congress in Hamburg in 1964, he delivered a speech in Esperanto. There, he compared the language issue with the problem of measures and weights in 19th-century Europe: 'The longer one waits, the greater the problem becomes.' Science suffered from the lack of a unifying language: discoveries remained unnoticed and energy wasted. The languages of scientists, based on population numbers, would amount to 22% Chinese, 17% Hindi, 9% English, 7% Russian, 3% Portuguese, and 42% other languages.

Such a state would not tolerate English as the dominant language. Moreover, it was not a neutral language but the language of one of the camps in the Cold War. It was the worst possible world language due to the irregularity of its pronunciation: 'How vague, inexact, and poor is English compared to the constructed language.' Incidentally, Minnaert, who grew up with French and German as scientific languages, wrote English well but spoke it so poorly that some wondered if it wasn't an unconscious form of resistance. He found Esperanto sounded remarkably beautiful:

'En la mondon venis nova sento,

Tra la mondo iras forta voko,
 Per flugiloj de facila vento,
 Nun de loko flugu ĉi al loko.'

The pleasure of recognizing these lines, even among laymen, did not lead Minnaert to consider that the 22% Chinese, 17% Hindi, and 7% Russians might not feel much for this Western European constructed language. He believed one should not say the language had no perspective unless they had first occupied themselves with Esperanto. Nevertheless, he wondered why the language did not make more progress. The main obstacle was the conservatism of scientists who had 'no time' for it, raised half-mystical objections to the 'artificial language,' or used the opportunistic argument that 'it wasn't used enough yet.' All supporters had to fight for their conviction, which was the ideal expression of the unity of mankind, brotherhood, and love for humanity! In the late 1960s, he was still working on a pocket dictionary of astronomical terms in Esperanto. A committee of the Academy, of which he was a member, made progress, as he informed Esperantist G.F. Makkink in October 1970.

The completion of two astronomical works

Minnaert's concluded his involvement in four promotions in the second half of the 1960s. He could also put a finish to the editing and secretary work of **The Principal Works of Simon Stevin**. The project with the American Charlotte Moore-Sitterly also needed to be completed. Finally, in 1966, the **Second Revision of Rowland's Preliminary Table of Solar Spectrum Wavelengths** appeared: a liberation for the Utrecht-based Minnaert and Houtgast and their American counterparts. By then, both Minnaert and Sitterly had been working on cataloging the Fraunhofer lines for nearly half a century. His resistance, in the name of equivalent widths, against the overly subjective First Revision of 1928 had been rewarded with prominent participation in the Second Revision. He had kept up with physical literature and benefited from the persistent work of Russians like Kolesnikow and Leskow on transition probability values.

As early as 1960, the Utrecht team had presented an incomplete Catalog. In January 1966, publication of this Table of all Fraunhofer line wavelengths between 2935 and 8770 Å could begin. Like the Solar Atlas of 1940, it was an impressive book. The edition had received support from UNESCO and appeared under the auspices of the IAU at the National Bureau of Standards

in Washington. Enthusiasts could enjoy 340 pages, containing 680 columns with approximately 34 lines per column, thus detailing 23,000 Fraunhofer lines. For each line, the following details were provided: the wavelength in six or seven digits (1), equivalent width (2), reduced width (3), behavior in a sunspot (4), identification of the atom or ion (5), lowest excitation potential (6), and multiplet number, essential for the growth curve (7). For the titanium(II) ion, these values were continuously changing: 4316.802; 38; 10.2; unchanged (u); Ti II; 2.05; and 94.

The German Kirchhoff had created a Catalog of Fraunhofer lines, and the American Rowland the first preliminary Table. Minnaert's name would remain linked to this Table, which would remain the standard work for decades. For Minnaert, it must have been a triumph after fifty years of painstaking work in the tradition of these illustrious predecessors.

It wasn't the only astronomical publication. His colleagues had urged him to convert into a book the assignments developed over thirty years for the Astronomical Practicum. That became **Practical Work in Elementary Astronomy**, which was published in 1969 by Reidel in Dordrecht. The IAU recommended the Utrecht approach in its foreword: students 'had to get acquainted with the sky before they would stare at the blackboard.' The assignments ranged from observing constellations to measuring astrophotographic plates, from working with the gnomon (sundial) to measuring parallax for determining star distances, from setting up a telescope on an object to determining position 'at sea.' Many assignments involved determining orbits: of the moon, Mars, meteors, and satellites. Of course, lunar observations were part of the program, as well as observations of planets such as determining 'the albedo of Venus' or 'the rotation period of Saturn.' The sun gave rise to assignments about its midline, the solar constant, the profile of the Fraunhofer lines, the equivalent width, the growth curve, sunspots and solar rotation, the shape of the corona, and the radio bursts from a solar flare.

Sometimes it involved direct observations, other times work based on prepared photographs. An assignment about sketching the Milky Way under a clear sky is of a different order than determining the dynamic parallax of double stars. The book perfectly matched Minnaert's educational activities for the IAU.

The Apollo landings and moon studies

In the 1960s, Minnaert's original research work was limited to the moon. He had the pleasure of seeing that his 1941 article on the reciprocity prin-

ciple and the photometry of the moon was frequently consulted. Also, the clinophotometric work by Van Diggelen and himself, which had formed part of his contribution to Kuipers' **Planets and Satellites**, continued to attract interest. After all, attention to the lunar surface became part of the practical preparation for the Russian and American moon landings. In 1967, moon expert Z. Kopal wrote in **Measure of the Moon**: 'The repeated failures in attempts to approach the reality of the lunar surface in an acceptable way gradually led to an acceptance of Minnaert's view, namely 'that the photometric properties of the Moon are primarily determined by shadow phenomena caused by countless millions of irregularities on the surface; and that the precise form of the scattering and reflection laws is relatively unimportant compared to the effects of the micro-relief of the surface.' Minnaert also had the satisfaction of seeing his prediction regarding the reciprocity of measurement points confirmed by Barabashev (1962) and Jones (1968).

In 1959, a Sputnik had flown around the Moon, making the first images of the far side of the Moon available. Minnaert was a member of the IAU commission on Venus and other planets. In 1963, he was asked by the French chairman A. Dollfus to join the committee tasked with proposing a new nomenclature for the Moon. The first 'soft' landings of the Luna flights were credited to the Russians, while the Americans countered with the Surveyor missions. The photographs came from both the Russians and the Americans. A subcommittee of three—Russian Mikhailov, American Menzel, and chairman Minnaert—had to make a proposal in the late 1960s. This involved modernizing the existing naming system and also assigning names to objects on the far side. These names needed to be approved by both sides of the Iron Curtain.

This required Minnaert to travel to Dollfus' Institut d'Astrophysique in Meudon, to the Soviet Union, and to the United States: many meetings in hotel rooms and much consultation. One time in Meudon, Minnaert unexpectedly visited astronomer Chriet Titulaer, who had eagerly followed his lectures in the 1960s: 'One afternoon he rang my bell at my flat in Meudon and seriously wanted to talk to me. He told me that I could become a good popularizer or a good astronomer, but that I had to choose. I decided to follow his wise advice and went into popularization.'

Ultimately, the nomenclature proved acceptable to all parties. The differences of opinion focused on the relative importance of the various professions. The designers of the rockets—Minnaert obstinately referred to them as 'fire arrows'—considered themselves just as important as the astronomers and demanded more recognition for their work. It was equally challenging to compare the relative contributions of the many scholars from the past. Min-

naert insisted that the IAU publications on nomenclature should include the correct phonetic pronunciation of the chosen names and took it upon himself to ensure this task was carried out.

Just before the first manned moon mission, Minnaert wrote a summary of the scientific issues at hand: for instance, it was still uncertain whether the Moon's surface had been formed by volcanism or by the impact of meteorites and comets. The bizarre photometric behavior of the porous lunar rock could be the result of countless small meteorites hitting the surface at enormous speeds, causing microscopic explosions: 'Who has ever seen a remotely illuminated sphere that was uniformly bright across its entire surface? This is a sight the Moon shows us repeatedly, except for the dark spots. Equally remarkable is the unexpectedly strong increase in brightness we observe as we approach full moon, especially when only a few hours away from the full phase. - Both effects are characteristic of extremely porous material, and both have been replicated in laboratory experiments, where illumination with a very narrow beam is essential.'

The dark color of the lunar rocks also remained a mystery. Minnaert, however, believed that the 'solar wind,' a continuous tenuous stream of protons, penetrated the crystal lattice of the rocks, reduced the iron ions, and caused strong optical absorption: 'We eagerly await the first on-site observations: the first rock samples, the first moonquake research, the first observations of potential volcanism, the first drilling. Understanding how the Moon is built will help us comprehend how the planetary system originated and how Earth was formed.'

At the observatory, he continued his measurements of the reflection of incoming light on lunar surface simulants and grappled with the mathematical processing of the data. While Minnaert commuted between Paris and Moscow, preparations for the moon landing were daily news. He watched the first moon landing at Truus van Cittert-Eymers' home because he didn't have a TV on Zuilenstraat. In Flanders, Minnaert provided commentary in July 1969 and April 1970 on the historical flights of Apollo 12 and 13. Not long after, VRT dedicated an hour-long biographical documentary to Minnaert in the renowned series **Ten huize van...** by program maker J. Florquin.

The reprint of **De Natuurkunde van 't Vrije Veld**

Publisher Thieme urged Minnaert for a revised edition of his magnum opus, which was no longer available. Starting in 1966, Minnaert worked on this

project. Of course, it wasn't just a cosmetic operation. He added a considerable number of new topics and removed outdated ones. What was the point of discussing the rhythm of towboats in part II if they were no longer towed? Out of a total of 770 subjects, he added a hundred new ones; some old ones were updated. Publications from the past quarter century were occasionally included, and literary quotes were polished here and there. For example, under the topic of river mist, a reference was added to Hubert Lampo's **De goden moeten hun getal hebben** (1969):

'As far as his gaze reached, the broad river was covered with fog. The mist on the stream looked like a dense, neatly rolled mass of cotton, firm as a layer of snow in the high mountains and seemingly solid enough to walk safely over it...'

Minnaert chose an excerpt from Walt Whitman's **Leaves of Grass** as the introduction to his trilogy, recognizing the American romanticist as a kindred spirit. It was **The Song of the Open Road** in M. Wagenvoort's translation:

'On foot and cheerful I take the open road,
 Healthy, free, the world before me,
 The endless brown path before me leading wherever I choose to
 go.
 From now on I will not ask for happiness, I have happiness within
 myself,
 From now on I will not complain, nor postpone anything,
 From now on I will feel nothing lacking, It is done with sitting
 in the house and complaining, with bookish wisdom, with
 useless judgments about others,
 Strong and content I go out onto the open road.
 I think: all heroic deeds, and all free thoughts have found their
 inspiration in the open air,
 I think: here I could work wonders
 I think: whatever I encounter on the way will be welcome to me
 and everyone who sees me will love me.
 I think: everyone I see must be happy...

Before he himself could take the open path, he had many obligations like this revision. He improved several terms: the green 'ray' became the green

'glimpse,' a lorgnette lens became a pair of glasses, and 'earth light' became ionosphere light. Minnaert included recent photos in the reissue of part I, especially from W.C. Livingston, which better highlighted the optical phenomena.

He had raised questions at the time that were later answered. For instance, there was an 'unexplained contrast phenomenon' in part I. An observer described how, on a clear night, he saw the moon 20 degrees above the horizon from his ship and how its light was reflected by the waves like a triangle, from the ship to the edge of visibility. The strange thing was that he also saw such a triangle, inverted and dark, descending from the moon to the horizon. Minnaert had already deleted that text when two writers sent him identical observations. It turned out to be a physiological contrast phenomenon that disappeared when the bright beam of light was blocked by hand.

In the first edition, he had discussed the bluish haze that can be beautifully observed on warm summer days against the backdrop of dark forests. Minnaert had cited the scattering effect of air molecules as an explanation. His colleague F.C. Went demonstrated in 1960 that coniferous forests and heathlands emit multiple unsaturated organic molecules, 'terpenes,' which are oxidized by sunlight and ozone into macromolecules responsible for the bluish scattering. The story about air molecules remained valid for the blue atmospheric perspective over vast distances.

His work for the KNAW committee against superstition could be incorporated into new passages about 'Flying Saucers' with references to the friendly spectroscopist and lunar scientist Donald H. Menzel. He provided instructions for UFO observers but warned: 'Let us not be swept away by fear, war psychosis, or mysticism, but rather remember how many natural phenomena we have described in this book that are perfectly ordinary to explain and that many people nevertheless never noticed.'

Part II was completed by Minnaert in 1969. An interesting detail is that he did not change his remark about the Dutch coast, which runs from Boonen (Boulogne, thus in French Flanders) to Groningen! An added paragraph on *The temperature in a tent* provided an empirical result that it is colder inside a tent at night than outside, which, upon closer inspection, seems plausible. Mistakes were inevitable. For instance, he removed the outdated 'psychrometer' but later used it to determine the height of low-hanging clouds. Revising compact, labor-intensive books with the limited tools available in the 1960s was no easy task.

For the revision of Part III, Minnaert involved physicist Truus van Cittert-Eymers, who had retired in 1968 as director of the Utrecht University Mu-

seum. In the 1942 second edition, Minnaert had already added about twenty topics such as diving, swimming, sailing, skiing, rowing, and bowling, significantly expanding the 'sports and games' section. At that time, he had thanked his colleagues A.D. Fokker for 'spinning top' and J.M. Burgers for 'aerodynamics.' Part III would remain the most intact compared to the other parts. He had to leave its completion to his friend.

The final travels and honors

For his many activities, Minnaert traveled the world: from Moscow to New York, from Meudon to Hamburg, from Dakar to Varna. In 1965, 1966, and 1967, he utilized his knowledge of Russian while organizing and leading tours for amateur astronomers in the Soviet Union. In 1968, at the age of 75, he traveled through South America for a month on the occasion of the festivities marking the opening of the European Southern Observatory in Chile. Astronomers Oort and Blaauw had both played prominent roles; Minnaert was involved as chairman of the committee responsible for providing technical instrumentation. He traveled via Texas, where he discussed moon nomenclature with his friend Kuiper, then to Guatemala and Rio de Janeiro, where he visited the Museo de l'Arte Moderno. Via Buenos Aires and Santiago de Chile, he crossed the Andes to attend the reception on March 21st. On the 22nd, he visited the Museum of Fine Arts and the Natural History Museum to participate in the inauguration on the 25th. On the 28th, he took part in a symposium in Santiago, was in La Paz on the 30th, visited the Valley of the Moon and Lake Titicaca, experienced the Good Friday procession in Cuzco, explored Machu Picchu, Pisac, and the Inca ruins, was at Pachacamac on April 7th, visited the Archaeological Museum in Mexico City, saw the frescoes in the Museum of Fine Arts, the pyramids, and the Anthropological Museum in Chapultepec. He enjoyed it all, as always, with great enthusiasm.

The honors piled up. He was already a member or honorary member of several scientific societies. In addition, in 1965, he received the title of Commander from the French Société d'Encouragement pour la Recherche et l'Invention, an honorary medal from the Free University of Brussels, and membership in the Deutsche Akademie der Naturforscher Leopoldina (1965). In 1966, he was awarded the Prix Janssen with a gold honorary medal from the Société Astronomique de France. In 1969, he received an invitation for membership in the American Philosophical Society. Additionally, he received honorary doctorates from the University of Heidelberg (1965), Lomonosov

Moscow State University (1967), and the University of Nice (1970).

This last honor was granted to him by a French former student who had become the general secretary of the IAU. When Jean-Claude Pecker presented the honorary doctorate at the French Embassy, he referred to the rebellious spirit of both the Flemish *Tijl Uilenspiegel* and the Dutch Erasmus, and succinctly summarized Minnaert's significance for solar physics:

'Minnaert knew how to provide solar research with two fundamental tools at the right time: spectra that were good enough to be quantitatively useful and a theory that was sufficiently developed to have quantitative meaning and serve as an interpretative framework for those spectra. At that time, there were three men who laid the foundation for the quantitative analysis of the universe, three men who put the sun in their test tube: Russell in the United States, Unsöld in Germany, and Minnaert in Utrecht. Minnaert's work is characterized by its practical orientation, by the ease with which it can be applied, while still providing sufficient scientific support. Unsöld was perhaps the most strictly scientific, Russell the most general; but it was probably Minnaert who, more than the other two, opened the way toward a fundamental branch of astrophysics.'

Endnotes:

1 In **Between Ivory Tower & Big Business*. Utrecht University 1936-1986*, final editor H.W. von der Dunk and his team analyzed recent developments.

2 Van den Broek, 1996, uses the term 'cohort' for a defined part of a generation.

3 Van der Heiden, A., **Turbulence and Reorganization; from 1966 to the present day**, in: Von der Dunk, 1986.

4 Snijders, K.-J., **The Student Movement**, in: Von der Dunk, 1986.

5 Minnaert, front page of **Trophonios**, October 25, 1966. The consternation split the editorial board down the middle.

6 Minnaert during the Dies celebration, March 31, 1968.

7 Memory of De Jager. The Prague Spring was in full bloom: the protesters apparently assumed that Minnaert would be an opponent of it.

8 **General Trade Journal**, February 14, 1966: seven people signed, including anthropologist Wim Wertheim, writer Annie Verschoor, and theologian Hannes de Graaf. Also the future chairman of the Medical Committee Netherlands Vietnam, Prof. Dr. J.H. de Haas. 9 Molenaar, 1994, 244.

10 Minnaert, **On the Responsibility of the Engineer**, TU Delft, March 15, 1966. History Archive.

11 Minnaert would today find an Augean stable, given the 2002 campaign by university institutions for the purchase of the Joint Strike Fighter. 12

Molenaar, 1994, 221.

13 Minnaert, *At the Home of...*, J. Florquin, VRT TV script, June 1970, p. 55.

14 De Jager in *De Groene*, Minnaert, a brave man, November 5, 1970.

15 Gerard Maas, W&S, October 1965.

16 Minnaert, *Morality and Religion*, VRO radio address, March 15, 1968.

17 He had made his first communion at the age of twelve and wrote about it to L. Buning on May 31, 1969: 'On scientific and philosophical grounds, I soon came to a complete rejection of all religion, which I then, and still now, consider a relic of ancient magic that is quickly dying out.'

18 *New Utrecht Daily* about the anti-vivisection forum, April 3, 1963. Minnaert spoke in Utrecht on the occasion of 65 years of the Dutch Association for the Prevention of Vivisection. Interview with mathematician F. van der Blij.

19 Minnaert, lecture at the IAU Congress on Esperanto and the Language Barrier, Hamburg, 1964. Archive-History.

20 A new feeling has entered the world/ A loud call is going through the world/ May it go from place to place on the wings of a favorable wind.

21 Minnaert to G.F. Makkink, October 15, 1970.

22 Minnaert, Moore-Sitterly, Houtgast, (1966).

23 Minnaert, 1969.

24 S.M. de Roode in Nieuw-Vennep made an inventory of his functions for the IAU and sent the author a copy on August 30, 2001. In the Paris archive of the IAU are the minutes of the IAU commissions of which Minnaert was a part with his correspondence. These will also largely be found in his own preserved scientific archive; Archive-Astronomy. See under Notes part III the interview with the Groningen astronomer A. Blaauw.

25 Minnaert, in: Kuiper, 1961, 213. Van Diggelen, 1962, 161.

26 Kopal, Z., 1969, 364. In Kopal, 1986, the lunar scientist looks back gratefully at the 'faithful' Utrecht scholars Minnaert, Underhill, and De Jager and condemns the Leiden-Groningen coup against his journal *Astrophysics and Space Science*.

27 Minnaert's functions for the IAU are listed by De Jager in the obituary he wrote for Minnaert for Kopal's journal *Astrophysics and Space Science*. In Brighton, England, where the ill Minnaert was still appointed chairman of commission 17 on The Moon during the General Assembly of the IAU, the curious situation arose that Minnaert had to report to De Jager on lunar nomenclature. De Jager had taken over the general secretariat of the IAU from the Frenchman Pecker.

28 Contribution by Drs. C. Titulaer in Molenaar, 1998.

29 Minnaert, *The Physical Research of the Moon*, 1968. Archive-Astronomy.

30 Minnaert for the VRT, April 1970.

31 Minnaert, *The Physics of the Open Field* 1, 2, and 3, the major revision of 1967-1971.

32 Walt Whitman, *Leaves of Grass*, 1855, reprinted in London 1961. Also for the Ghent graphic artist Frans Masereel, Whitman and Kropotkin were lifelong sources of inspiration: two parallel lives in art and science, it seems.

33 Interview with the Groningen astronomer A. Blaauw.

34 Minnaert, *Travels*.

35 Speech by J.-C. Pecker in The Hague, February 1970."

Chapter 28

Our hero is Prometheus

'The only thing you can do is reason or intuit in which direction it should go.'

The tree of knowledge of good and evil

At the end of 1967, Minnaert was hospitalized for several months due to a bowel operation. He handled his mail from the hospital. He wrote to his daughter-in-law that he had criticized an article about Stokely Carmichael, the leader of the Black Panthers, which she had sent him. He opposed Carmichael's statements about the necessity of armed struggle: 'In my opinion, it depends on the circumstances. It may be that the natural evolution, the healing forces in society, will make injustice disappear without having to fight for it.' He himself felt more akin to the Norwegian economist Gunnar Myrdal, from whom he quoted an article in Trouw: 'Trouw is the only major newspaper that takes an excellent position on Vietnam.'

Minnaert remained a combative humanist until the end. Els had told her children, aged six and four, about the biblical creation story during visiting hours in front of her father-in-law. He had interrupted her abruptly, 'not at all pedagogical! It slipped out before I knew it.' He explained to her why he had to intervene: 'It seems to me that in some cases it makes sense to tell a child stories and immediately afterward explain the true facts. But here it strikes me as particularly unsuitable. First of all, I don't know how you would escape from the concept of a God, a 'creator'... And then the story about Eve being created from Adam's rib. What a nonsense! And then the serpent, the talking serpent! - But the only thing you told me that made me overflow was the story of 'the tree of knowledge': if you know too much,

you are expelled from that wonderful paradise and punished... I now regret for another reason that I didn't let you finish. I would have loved to see you wriggle out of it, especially if I could have asked a few silly questions myself!! - But, putting all jokes aside, when you view this entire story with modern eyes, it is truly nonsensical and even pernicious.'

According to Minnaert, knowledge itself could not cause disaster; only its misuse or the misuse of science could: "Would it have been better if humanity had refrained from seeking knowledge? If we were to tell a story about this, then let it be the story of Prometheus! He is our hero. And as for those gods, we will surely bring them down." Els, however, did not succeed. She could not have chosen a more unfortunate story than the one about the "tree of knowledge" from Genesis, which indeed struck at the heart of Minnaert's objections to the religions "of the book."

Still so much to do...

Minnaert recovered and would make numerous trips and undertake various activities in the three years he had left. He felt a sense of urgency because he still had so much to accomplish while sensing the end approaching. He became a reporter on the moon landings, began work on an Esperanto booklet for astronomical terms, worked on part III of **De Natuurkunde van 't Vrije Veld** (The Physics of the Open Field), and gathered notes for his book on free will. In the summer of 1970, his health condition became critical. Astronomer Kuperus encountered him in July 1970 at the opening of the second radio astronomical observatory in Westerbork. "I greeted him enthusiastically. Minnaert had come from Paris and said, 'I am very tired.' Such a statement was unlike him. We knew he had prostate cancer and underwent surgeries from time to time. But it never occurred to us that he was terminally ill and could die. It came as a shock to me!"

De Jager recounted that in August of that year, at the IAU congress in Brighton, he succeeded the Frenchman Pecker as general secretary. Minnaert had been determined to attend but eventually had to give up due to his illness. The congress appointed him chairman of the commission responsible for finalizing the lunar nomenclature: "At the time, this was such a politically charged issue that they wanted the best man for the job. I attended the deliberations and heard it firsthand. I was asked if Minnaert would accept. I answered affirmatively. Indeed, Minnaert accepted and was quite delighted about it. From the hospital, he sent the letters.

People came by for what would be their farewell visit, such as the Swiss

Edith Müller, a young astronomer who had worked in Utrecht and with whom he had become friends. Boudewijn came from New Guinea in September when his father was still well, 'so I could talk a lot with him while he was fully conscious.' He never complained. He could say things like 'this isn't going so well' or 'that's costing me a lot of effort,' but it was the observation of an outsider. He distanced himself from himself and looked at himself from outside. Kees de Jager and his wife Doeti came by regularly: 'When he felt that he was going to die, he asked me to continue the Books for Hanoi campaign. There were a few hundred regular contributors from all over the Netherlands. The administration and correspondence: he had handled everything on his own.' I remember him during our last visit, a few days before his death. He was sitting at home in a chair. To the left, a tall stack of corrected proofs of 'De Natuurkunde van 't Vrije Veld,' to the right, a new stack. He was very open and enjoyed that we came by. Conversations with him always revolved around important things, never about the weather. He was working on the phonetic spelling of the names of the scholars after whom the moon's features were named. I tried hard to get a Hungarian name phonetically correct. After half an hour, we left: he was 'very tired indeed.'

The last weeks

Miep took care of him at home. Their mutual friend Truus van Cittert-Eymers was often present and discussed the revision of part III with Minnaert. His daughter-in-law Els visited him during those last weeks at home and in the hospital. She wrote down her experiences for her brother-in-law and sister-in-law in Australian New Guinea and drew strength from it herself. Several passages from her letter give a good picture of Minnaert, who had to tear himself away from life.

Shortly after Boudewijn's visit, the bleeding had started, and he had experienced a lot of pain in his lower abdomen: 'Perhaps you could say that he bore it all with dignity. He didn't want to die at all, he wasn't tired of life, and he worked until the very end. I once felt ashamed sitting next to him because he still had such great expectations for the future, while I, being almost 40 years younger and healthy, view the future of humanity as rather gloomy. He was so thrilled about the news that in Chile, the left-wing socialist Allende had received the most votes for the presidency. I feared another American intervention or military coup, which they are so prone to in South America, but he saw a golden future unfolding for the Chileans.'

I'm now so glad that Allende did become president after all. Father said, 'I even shook Frey's hand (the previous president).'

Around that time, he also became a bit eccentric for his standards. He put eau de cologne on a handkerchief and wiped it across his face. He even laughed at himself for doing that. He once told me that when his own father died—he was about ten years old—his mother thought it necessary to initiate him into the mysteries of finance, investments, and bonds. But every time she started talking about it, he would automatically fall asleep; he found it so boring. Mother was very devoted to Father throughout his illness. She looked absolutely terrible during the last days of August when things were critical with Father—pale and with sunken eyes. Lately, she's been looking better. But I've never seen them kiss or even shake hands, not even in recent times, and I totally can't understand that.'

Minnaert had fully recovered by late September: 'He even got out of bed and occasionally sat down to work at the little table in his room. Then there was a period of beautiful autumn weather. A sister had suggested that he might go into the garden. I wasn't allowed to give him an arm because he wanted to do everything on his own strength. It was a terrifying walk. At first, I was afraid he would fall, he walked so unsteadily. Still, we went down the stairs arm in arm because otherwise the risk of falling would have been too great. Once in the garden, he incredibly enjoyed the large old trees in the autumn light. Also the grass, 'Do you smell that grass?' he said. He stroked the flowers. He had never enjoyed nature so much in his life. 'I never had time for it,' he said. He soon sought a bench in the shade, but sitting there wasn't easy either. After five minutes, he sat forward or hung diagonally along the armrest (I thought for a moment he wanted to lie down) because he could only maintain any position for a short time.

Els had visited on a Saturday morning with the children: 'We did go back up with the elevator. He held the door open for me: he wanted to be gallant again, just like before.' He also went to the barber. That was much needed because his white hair was all around him. He described how he had sat down in the chair in the room and how then the white hairs swirled around him like snowflakes. Then he had his head washed thoroughly with some lotion. After that treatment, he looked as if he had started a new life.

Minnaert felt reborn and wrote optimistically to acquaintances: 'Chance has it that there's a real chance of full recovery.' He was allowed to go home at the end of September. Els had visited on Zuilenstraat, on a Monday, the week before his death: 'Father still discussed a gift. He had a whole list of suggestions just like before.' We used the autumn vacation so that Father could give it himself. The visit lasted sixty minutes and that was ten too

many because he couldn't take it anymore."

"He saw white in the distance and sat with a gruesomely unnatural grin, trying to keep himself together. He said: 'So, you're having your birthday, congratulations.' Outside, I tried to wave at him through the window (from the Nieuwe Gracht, I had seen him sitting in that chair by the window) but then I only saw a small patch of white hair, from which I gathered that he was sitting with his head in his hands, extremely tired.

That Thursday, Minnaert was hospitalized again. Els visited him on Sunday morning: 'I held his hand for a while, hoping he would notice I was there, but at one point he pulled away and waved his hand back and forth; that familiar impatient gesture. A little later, he did realize someone was there, lifted his head, and stared through the mist in my direction. Then he faintly pressed my hand, and that was the last time. I stood crying by his bed without him noticing.'

His body for science

In the night of Sunday to Monday, October 26, 1970, around two o'clock, Marcel Minnaert passed away. No family members were present at the time. He had made his body available to science. Apparently, he, whether in consultation with his wife or not, had not wanted a farewell gathering. Miep Coelingh called Els around 7:15 that Monday morning to inform her of his passing. At that moment, Miep also mentioned that her father-in-law would not be buried or cremated.

Els wrote to Boudewijn that she still couldn't understand why he hadn't told her about it: 'You might understand that it's even harder for children to accept something like this, and besides, I didn't have a proper story ready. Only now, after a week, am I starting to come up with one. Earlier, my youngest had once said: 'When Grandpa dies, I want to walk in the procession with the other mournful people.' Not knowing any better, I said then: 'I think it's fine, but we'll have to discuss that first with Grandma.' Now, I would have found it very comforting if Father had also taken us (and especially the children) into account in this regard. We (not just me) are left with the unsatisfying feeling that there was no closure, no gathering of people who had been close to him.'"

From Port Moresby, Boudewijn and Noortje thanked their sister-in-law for the detailed letter, which they had read with mixed emotions. Boudewijn wrote: 'Mother also found it terribly sad that Father would not be buried. I didn't know that was Father's wish until Mother told me when I was in

Holland. But it is so much in line with Father's entire philosophy and his view of life that I believe you must respect his wishes in this regard. He was a man of science, and it was so deeply ingrained in him that everything he believed would advance science had to be done.

It's a shame you didn't know about it; I hope you've managed to give the children some kind of 'explanation' in the meantime.' That Minnaert would make his body available was completely understandable. It by no means implied that there wouldn't be a gathering. His wife took no initiative whatsoever. Minnaert's colleagues, none of whom were in contact with Miep Coelingh, had waited for the family to take the lead. When it dawned on them that there would be no farewell ceremony, the right moment for taking their own initiative had already passed. Minnaert had been so much in control of everything during his life that upon his death, no one seemed prepared to make decisions.

When Pannekoek had died ten years earlier, Minnaert had delivered a well-considered eulogy about the scientific work and social involvement of his 'great teacher and dear friend.' At the end, he had said: 'A magnificent, long, and fruitful life has passed. Is it truly gone? Of course not! Pannekoek lives on—in his work, but also in the inspiration, fighting spirit, and happiness he shared with those around him, which will be passed on to others. Farewell, Pannekoek, we thank you.'

How dearly would De Jager have loved to say the same at Minnaert's funeral!

During those weeks, he wrote more than a dozen loving obituaries for national and international professional journals, academies, and magazines, but that was just on paper. For many people, Minnaert had been a beloved figure. The fact that they couldn't participate in a joint ceremony was painful for many, even traumatic for some. Minnaert wouldn't have understood that, even though he had written to youngest son from Michielsgestel how optimistic and inspiring a funeral of an elderly person should be. For himself, he had waived every farewell: he had simply left. It may indicate his modesty and willingness to sacrifice, but even more painfully clear was that he could not and did not want to put himself in the position of loved ones, friends, and acquaintances.

The following year, the Dutch Astronomers Conference organized a stylish memorial service, where De Jager could bid farewell on behalf of the astronomical community to their leader. On the other side of the ocean, the New York Academy of Sciences and The American Astronomical Society organized a 10 Minnaert Memorial Conference that summer of 1971. Minnaert's Swiss friend Edith Müller, now a prominent astronomer within the IAU,

delivered the memorial speech in New York.

The death of Minnaert in the media: *anima pia*

In Utrecht, on October 28, 1970, the university flag was lowered to half-staff. Astronomer Jacob Houtgast wrote in NRC about A versatile astronomer: 'We heard from intimate friends about the death of Prof. Dr. M.G.J. Minnaert - a man of great style, a great scholar, who during his life was someone from whom everyone he met (and there were countless) could derive much joy.' Even someone like Houtgast, a close colleague, was thus indirectly informed of Minnaert's death. Houtgast emphasized the discovery of the growth curves, 'still powerful tools in the study of stellar atmospheres.' According to him, Minnaert had photographically recorded the facade stones of Utrecht's inner city in the 1930s.

Journalist Gerton van Wageningen chose the headline Prof Minnaert: fighter for popularizing astronomy in Nieuw Utrechts Dagblad and Het Parool. Minnaert had been a committee member during his final exams 'and from that day on, I remembered him.' Later, he met him at the Observatory, always busy yet willing to receive you. This Minnaert from Bruges, who formulated with the meticulousness of the intelligent Southern Netherlander was an intensely moved man: 'Minnaert may have been a rebel in some sense, but it cannot be otherwise—he must have been driven by an exact scientific pursuit of justice and balance. Essentially, he was what the Romans called a devout soul: **anima pia.**' The **Utrechts Nieuwsblad** extensively quoted Minnaert on the responsibility of the scientist, which aligned with 'the spirit of the times.'

In **De Tijd**, A.J.M. Wanders wrote 'Prof. Minnaert: a restless, world-renowned astronomer'. Minnaert had shown heartfelt interest in everyone's fate: 'Even more uncountable, however, are the crowds of merely interested individuals whom he managed to inspire with the wonders of the starry world through his captivating speaking talent and clear expository skills. "No matter how complicated a thing is, it can be made clear in five minutes," was one of his sayings.' Wanders recalled the decline of astronomy as a subject: 'Apart from its many other merits, this unique field of study represented the end of the possibility to offer upcoming natural scientists meaningful counterbalance against an increasingly suffocating "specialization madness" observed everywhere.' Hopefully, more enlightened minds would undo this blunder one day: 'Although the passionate advocate Minnaert himself would no longer witness it. This restlessly active man, in whom there was no

injustice, now rests in peace.'

De Jager called him in his article for the Royal Flemish Academy one of the greatest Dutch astronomers of the century, a man of world renown, known and beloved by many, a true global citizen. In **De Groene**, he wrote that Minnaert, through **Boeken voor Hanoi**, had tried to give something back to the Vietnamese people: 'Minnaert's pronounced ideas, due to their straightforwardness, had a great influence on his students and colleagues. He never polemicized for its own sake or tried to belittle an opponent but always sought the one truth that, he was convinced, should apply to every problem. Those who disagreed with him politically or intellectually he disarmed more through his charm than provoked, and yet they always respected the honesty of his convictions and arguments. He himself, who never discriminated based on political or philosophical beliefs, could be astonished and was more saddened than indignant when such discrimination affected him.' The solar physicist Unsöld wrote in *Solar Physics*: 'There will be no gravestone, but his personality, so kind and versatile, will live on in the thoughts of many of his friends around the world; his scientific work will remain in the annals of scientific research.'

The Flemish magazine *Het Pennoen* noted that 'Minnaert's indestructible idealism was accompanied by an ascetic trait. This gave him the strength to commit his entire personality to the task he had accepted as a calling.' The magazine called him a 'restless seeker of order in nature, who also strove for order in human relations. His attitude was not that of a revolutionary or anarchist. He was a humble worker who, without longing for personal gain, honor, or fame, conscientiously contributed to the evolution of humanity.' A few months before his death, the VRT had given Minnaert an hour-long interview in his armchair on Zuilenstraat: this would become Flanders' farewell tribute.

There was no discord: *nil nisi bene* about the dead. Nothing but good about Minnaert.

Snapshot 1970: Man of the Cosmos

After the war, Minnaert frees himself from the constraints of his upbringing. Gradually, he develops a meaningful, albeit functional involvement with others. In the scientific field, he compiles works that help young people orient themselves to the current state of affairs. He continues to formulate projects that he pursues after many years of diligent work. His work on the Fraunhofer lines, resulting in the new Table, will take another twenty-five

years; his didactic activities for physics education permanently occupy him; his advocacy for the school subject 'astronomy' lasts a quarter of a century; and his Stevin project implies 'great labor' over twenty years. He identifies developments in his field, in didactics, and at the university that will be important in the future. He develops a sense of history, albeit mainly limited to the history of natural science.

Love and dedication to youth and to science, from elementary school to university, characterize him throughout his life. Hence his unwavering commitment to didactics. Odes to youth form a constant in his life. He remains unwaveringly loyal to ideals and people. He refutes the statement: 'Who is not red at 20 has no heart; who is still red at 60 is a fool.' For him, it is rather the opposite. In nature, he discovers solidarity early on through Kropotkin. He struggles with the relationship between his Flemish nationalism and internationalist socialism. He resolves this struggle with his fist in Lage Vuursche. From that moment on, the social aspect begins to play a greater role in his thinking. He discovers the beauty of socialist ideals. Whereas he was initially purely an astrophysicist and educator, he gradually wants to give the social dimension of his profession a full place.

He connects seemingly separate domains. During the war, philosophy also enters his field of vision. When, as a natural scientist, he rejects 'free will,' what then can be the basis for conscience, for societal values and morality? Minnaert accepts, on one hand, the 'truth' of scientific views on brain functions and, on the other, Freud's psycho-sociological views on conscience. His 'solution' shows great consistency, even though he proclaims a curious 'continuity thesis' due to a misunderstanding of dialectics. He demands a place for the intellectual core of evolutionary astronomy in pre-university education: The Unity of the Universe—from the Big Bang to human society.

Minnaert does not uphold double standards. He loves animals, opposes vivisection, and therefore does not eat meat. He calls on students to take responsibility and initiates 'Books for Hanoi.' He preaches tolerance and peace and tries to realize them in his microcosm. He is against air and water pollution and therefore travels by bike and train. He supports women's emancipation and holds his wife in honor. Koen's death shocks him and he accepts responsibility for his grandchildren. The intensity of his views on the 'green time' seems rooted in his youth. He is averse to deliberate humiliation and abhors institutional violence that breeds victims who later become perpetrators. He is not the Messiah: he exhibits strong egocentric traits, as evident in his behavior following Koen's death and on the eve of his own passing.

He becomes a more integrated personality. When Minnaert emerges as a

'bridge builder' in the late 1960s, something new is happening. He could not have been that in 1914, nor was he in 1936 or 1957. At those times, he was convinced of his own righteousness, whether it concerned Flanders or the Soviet Union. Toward the end of his life, he becomes wiser and able to view a cause from multiple perspectives while still maintaining his own opinion—a ability his father had highly praised in his Farewell Letter. Perhaps Koen's death had softened him. In 1968, he has much life experience to offer his colleagues and the rebellious students. The rebellious generation of the late 1960s can rely on people like Minnaert to protect them from turning their absolute beliefs into violence and terrorism.

Acquaintances often say that Minnaert is gentle and vulnerable, kind and helpful, that he honors his name, even if they also consider him paternalistic and patriarchal. Those closer to him experience that he keeps his distance and never reveals himself, that he is fanatic and can be hard as nails. The socialization of his early youth leaves Minnaert underdeveloped emotionally. Initially, science and culture are his anchors; for the middle-aged Minnaert, the social dimension is added. His rebellious stance persists, as seen in his obstinate preference for the youth, in his struggle for Flanders, for the Soviet Union, and for Vietnam, but he gradually learns to channel it into activities accepted by his surroundings. His love for nature and the happiness he finds within himself during solitary travels help him maintain mental stability. His father writes that the Minnaerts are a 'hot-tempered lineage,' his son has learned to deal with it over time. Minnaert sees it as his social duty to give many people a lot of attention. Those who meet him usually experience him as a striking and amiable figure—*nomen est omen*. His parents apparently did not give him the life motto in vain:

'I am Minnaert of pure joy,
of beauty and truth, art and virtue.'

The circle is complete.

Minnaert's Ideals

The TV interviewer had finally asked him during the summer of 1970: 'What is your ideal vision of the world?'

His response: 'The only thing you can do is reason or intuit the direction it should take. It is clear that the great principles must be that all children have equal rights to education and development. That men and women must have equal rights: women must play a much greater role in societal life. Of

course, no racial discrimination, no colonial exploitation of a country. The preservation of the environment is of great importance. We must resist the pollution of air and water, now also of the seas. The means of production must be in the hands of the community. And most urgent: the disappearance of weapons, peace in the world. Society should not be based on competition but on cooperation, on mutual human love.'

In brief, Minnaert presented a coherent vision for the future that can still guide human lives today. This crumb on the robe of the universe disappeared back into the cosmos. His ideas and actions live on.

Endnotes:

- 1 Minnaert to Els Hondius, December 11, 1967. Hondius Archive.
- 2 Interview with the astronomer M. Kuperus.
- 3 Boudewijn Minnaert to Els Minnaert-Hondius, December 5, 1970.
- 4 De Jager recounted: 'After his death, I met an American named Menzel who had taken over the work on the nomenclature. He said: 'What nonsense, there are even people who call me Mentsel.' I told him that Menzel is a German name and you just pronounce it that way. 'Really?' he asked. That's how things go.'
- 5 Els Minnaert-Hondius to Bou Minnaert, October 30, 1970.
- 6 Minnaert to Buning, September 13, 1970. Something similar he wrote to Esperantist G.F. Makkink, who on September 17 heard that he was eager to resume work on the astronomical vocabulary list.
- 7 Boudewijn Minnaert to Els Minnaert-Hondius, December 5, 1970.
- 8 Eulogy for Pannekoek, who passed away on April 28, 1960, at the age of 87. History Archive. 9 De Jager (1970), several obituaries in the literature list. In professional journals also reflections by the Irishman E. Öpik (Irish Astronomical Journal), the Frenchman Pecker (Icarus), his Swedish friend Arne Wallenquist (Astronomisk Tidskrift), J. Ashbrook (Sky and Telescope), and others.
- 10 On August 30, 31, and September 1, 1971, in New York.
- 11 Houtgast, J., A versatile astronomer, NRC, November 2, 1970.
- 12 Gerton van Wageningen, Fighter for popularizing astronomy, NUD and Het Parool of October 29, 1970.
- 13 Wanders, A.J.M., Restless world-renowned astronomer, De Tijd of November 5, 1970.
- 14 Unsöld, A., In Memoriam, in: Solar Physics, 1971, 3.
- 15 Het Pennoen, L. Buning, February 1971.
- 16 An issue of Hypothese, the magazine of the Dutch Organization for Scientific Research (NWO), was dedicated to Free Will in 2001. None of the

scientists interviewed could provide a commentary that came close to the consistency of Minnaert's solution.

17 Molenaar, 1994, dissertation statement.

18 Minnaert, TV script, page 56.

Epilogue

The Family

For Miep, her work in the Peace Council was over. A few years after Marcel's death, Miep Minnaert-Coelingh had herself registered as a member by Barend Schreuders, secretary of district Utrecht of the CPN. Through the CPN, she became involved in the initiative 'Stop the Neutron Bomb.' She opened and closed the International Forum against the neutron bomb on March 18, 1978, with speeches. She proved to be a communist of the old stamp: 'These days, so much is said about human rights. And naturally, we are all in favor of human rights, without question, there can be no doubt about that. It is part of our entire cultural pattern, our traditions, our ideas of freedom and democracy, but we must beware that the talk about human rights does not become a prelude to the start of a new Cold War, and sometimes I do feel that way.'

After her husband's death, she reduced contact with her daughter-in-law and grandchildren. Her grandchild Peter Kruiper organized the celebration of her eightieth birthday in 1986: she too received a *Liber Amicorum*. Friends from the CPN and some peace organizations directly linked their contributions to the activities of the 1950s and the movement against neutron bombs and cruise missiles: their efforts had prepared minds! Her comrade Theun de Vries wrote the poem 'Begroet de mens' for Miep Minnaert, in which he sang about people who, like Miep (and Marcel), consistently turned against the barbarism of armament:

'Steep is the path and long the patience
For those who want to break the malice,
Banish the servitude of the earth.
But the music has sounded,
The word peace has been spoken,

The kingdom of freedom, so often destroyed,
 Is always re-established anew.
 Greet de mens. Greet The fighter.
 Greet His infallible future.'

Miep Minnaert-Coelingh continued to live on Zuilenstraat until she needed care. After a short stay in a nursing home, she was able to return when a caregiver arranged a solid schedule for a group of volunteers, feminists, and party comrades. She passed away on 13 July 1990 on the first floor of Zuilenstraat 25bis, at the age of 84. Marcus Bakker described her as a proud, upright, and serious woman.

Boudewijn and Noortje regularly visited the Netherlands: in the early 1970s, Miep even visited them in Australian New Guinea. Noortje contracted a muscle disease from which she died within a short period in 1997. 'Bou' remained actively involved from Sydney in the biography, which he considers a tribute to his father.

Els Hondius was initially fully occupied with raising the children. Later, she started the publishing house De Els. She wholeheartedly contributed to the biography. Paul Minnaert is married and has a daughter.

His scientific work

Obviously, the International Astronomical Union's honored her leader Minnaert with a crater on the back side of the moon and an asteroid somewhere between Mars and Jupiter. Nevertheless, the memory of Minnaert faded relatively quickly in the Netherlands. This can be understood: due to the scaling up in astronomy, the work of the pioneers was overshadowed. The spectacular rise of radio astronomy and telescopic, X-ray, and space research, as well as satellites and probes, caused excitement that made looking back at the pioneers of solar physics seem antiquated. Some of his articles are still being consulted, such as the one on the reciprocity principle in lunar photometry.

Outside of astronomy, Minnaert was often referenced, especially in the English-speaking world. The American W.C. Livingston, who had been involved by Minnaert in his revision of *Licht en kleur in het landschap*, drew inspiration from it for his 1995 book *Color and Light in Nature*, which he dedicated to Minnaert. In 1999, the Optical Society of America celebrated the fact that they had organized conferences on *Licht en Kleur in het Landschap* for twenty years with the event *On Minnaert's shoulders*. Students

from the Utrecht teacher training college Fontys named their website De Natuurkunde van 't Vrije Veld.

In Utrecht itself, the Astronomical Practicum was abolished in the 1980s as a result of the reduction of the study program to four years at the time. The Astronomical Institute moved in 1987 to the top floor of the Buys-Ballot Laboratory: the Sonnenborgh Observatory became the domain of amateurs, and Minnaert's spectrograph is now part of the museum setup. However, Minnaert's 1969 book on Practical Astronomy gave educators from other institutions an idea. The Czech J. Kleczek published a new edition in 1987, again with Reidel in Dordrecht. Of Minnaert's 74 exercises, 53 remained, and twenty astronomers, including Kleczek, added twenty new ones. Minnaert's book, in this form, met a worldwide need.

The working group on physics education from the Working Community for Educational Renewal also did not forget him and established the biennial Minnaert Prize. Chairman Th. Wubbels motivated the prize: 'Professor Minnaert was one of the co-founders of the working group in the 1950s. We thought it better for the name of the working group that he himself would not be the chairman. In practice, however, he was the great motivating force behind the working group. By linking Minnaert's name to a prize, we want to honor his merits for the working group and the development of physics education.' For the uninitiated, the beginning of this motivation must have been cryptic.

In the wake of didacticians and physicists, Utrecht astronomers finally agreed with the proposal to name the new building for the didactics of natural sciences and theoretical physics after Minnaert. Since its opening in 1998, Minnaert lives on in this popular building by architect Neutelings. Also, the Dutch research school of astronomy (NOVA), the collaboration organization of the astronomical faculties of Utrecht, Leiden, Amsterdam, and Groningen, has had a Minnaert Committee since 2000. And: triumph! The subject of astronomy finally made its entrance in the late 1990s in secondary education as a mandatory part of the new subject General Natural Sciences.

Minnaert could and would not complain about the extent to which his ideas and actions, at least in the first decades after his death, have endured.

Endnotes:

1 Liber Amicorum for Miep Minnaert-Coelingh.

2 Bulletin Stop the N-bomb, March 1978.

3 Theun de Vries, Liber Amicorum. 1986.

4 The Science Citation Index (SCI) provides clarity on this matter.

5 Lynch and Livingston, 1995.

6 Kleczek, 1987.

7 Wubbels, Woudschoten Conference 1987.

8 Neutelings Riedijk, 1998.

Appendix

Anomalous dispersion, Julius' sun theory, and Minnaert's mission.

W.H. Julius (1860-1925) became a professor of experimental physics in Utrecht in 1896. He was an experimental physicist specializing in precise measurements of heat radiation, for which he had designed the instruments himself. According to Einstein, he was 'converted' in the 1890s after reading the book by the German teacher Carl August Schmidt about irregular light bending in the sun. To explain the fact that the sun appears as a sharply defined disk in the sky, Schmidt had suggested that outgoing light rays are refracted back toward the center due to variable gas density. This argument is accompanied by a suggestive illustration.

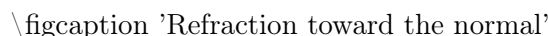
\figcaption The bending of light rays in different layers of the sun, according to A. Schmidt.

Also on Earth, refraction in the atmosphere is a known phenomenon: for example, a star observed in the night sky is actually lower. Since this already applies on Earth due to small differences in density between atmospheric layers, it must surely apply even more strongly to the sun. Schmidt, as an amateur astronomer, had been astonished that no solar theorist took this into account.

\figcaption Due to refraction, the star S is observed higher (W) than it actually stands in the sky.

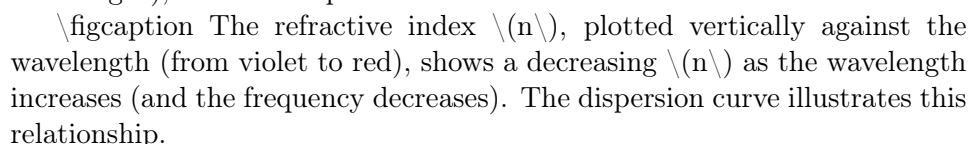
Julius therefore began investigating the refractive power of various gases in his laboratory. Unlike Schmidt, he also assumed that the density in the sun's atmosphere would not decrease uniformly. In his research, he soon encountered curious refraction phenomena already known at the time, referred to as anomalous dispersion.

Dispersion and Anomalous Dispersion

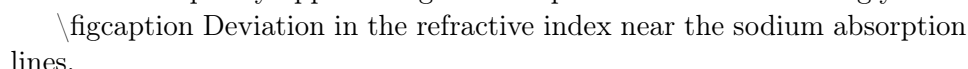
 'Refraction toward the normal'

When light of a specific wavelength falls on a piece of uncolored glass under a certain angle of incidence (i) , it will be refracted at a smaller angle (r) . According to optics, light can be considered as a ray in a straight line within a medium. The law of the Dutchman Snellius provides the relationship between the two angles: $(\sin i / \sin r = n)$. This (n) is called the refractive index. Since $(\sin i > \sin r)$ for this transition, $(n > 1)$.

Newton discovered that a beam of sunlight falling on glass is also decomposed into colors. Each color has a different frequency and wavelength and a different refractive index in glass. The colors that differ most in wavelength are red, with the smallest frequency, and violet, with the highest frequency. The violet ray is refracted more strongly than the red one: for violet, $(\sin i / \sin r)$ is therefore greater than for red. This phenomenon, where the refractive index (n) increases with increasing frequency (and thus decreasing wavelength), is called dispersion.

 The refractive index (n) , plotted vertically against the wavelength (from violet to red), shows a decreasing (n) as the wavelength increases (and the frequency decreases). The dispersion curve illustrates this relationship.

Julius soon became familiar with the work of the Frenchman A.H. Becquerel on remarkable refraction phenomena. In the spectrum of a beam of sunlight passing through a colored transparent substance, one or more spectral bands or lines are always missing. Sometimes even an inversion of the spectrum occurs, as in experiments with violet crown glass. The colored substance in the medium 'absorbs' certain colors of the incident light. Light that has a frequency approaching an absorption line deviates strongly.

 Deviation in the refractive index near the sodium absorption lines.

From the side of longer wavelengths, the refractive index takes on increasingly positive values, and from the side of shorter wavelengths, increasingly negative values (Kundt's Rule).

This phenomenon is called anomalous dispersion. The term 'anomalous' refers to the Greek *ómalos*, meaning smooth or even, and thus signifies 'uneven' or 'irregular.' Forty years later, August Kundt first observed anomalous dispersion in gases: he examined the spectrum of radiating sodium vapor and discovered that the refractive index changed strongly near the prominent double line of sodium. Julius repeated Kundt's experiments and determined the refractive index of the sodium vapor up to just before this

'absorption line.' He was able to confirm that, similar to Becquerel's experiments, the refractive index increased strongly on the long-wavelength 'red' side and decreased strongly on the short-wavelength, 'violet' side. From this, Julius concluded that the width of a Fraunhofer line is almost exclusively caused by light that is anomalously 'broken away' at the edges of the actual central line. Only an extremely narrow core formed the 'actual' absorption line: the widths of the lines observed on photographic plates were primarily due to this anomalous dispersion.

Verification of Julius' sun theory

Julius distinguished two cases of anomalous dispersion near the Fraunhofer lines. Anomalous refraction occurs when the narrow part of a light beam around a specific frequency entirely changes direction. Additionally, light of these frequencies, which have either a much larger or much smaller refractive index, will experience greater anomalous scattering according to Rayleigh's law. Julius clung to anomalous refraction for opportunistic reasons, as the resulting beams of a certain wavelength seemed to have the greatest explanatory power for the physics of the sun.

Astronomers, for instance, thought they saw protuberances—gas eruptions on the sun moving at unimaginable speeds—while according to Julius, it was anomalously refracted light from parts of the solar disk causing something like ripples in the 'solar sea': 'If a broad wave rolls onto the beach and breaks first here, then there, then over there, no one would speak of the "speed" at which the foam propagates along the coast.' Astronomers believed they saw emission lines in the chromosphere, while that too could be anomalously refracted light. They detected flocks or 'focculi' on the solar surface, while it could also involve vortices and density differences spreading like the foam of the aforementioned waves. Julius actually had a solution for all solar problem

Julius published the first version of his theory in 1900. It turned out to be more appealing to physicists than to astronomers. The idea that theories with great explanatory power were superior was more valid than ever at the time. Skepticism grew when it became clear that Julius' suspicions could not be quantified. His ideas about irregular beam curvature, for example, were based on the intuition that the photosphere of the sun would certainly exhibit large density differences. No one knew if that was true. M

oreover, Julius formulated his ideas so ambiguously that no experiment could refute his claims. The conclusion of his argument read: 'The above

may have been sufficient to clarify that in constructing a solar theory, it is necessary to consider not only regular refraction but also anomalous dispersion.' Therefore, Julius could agree to any percentage of his truth from 1 to 99%. If others argued that the chromosphere also involved glowing, strongly radiating gases, Julius' defense was that he had not ruled this out. As the experiment turned out, Julius' theory could be 'adjusted,' was the impression around 1910.

Another disadvantage of Julius' theory was its monomania. It was an optical hypothesis that hardly connected to contemporary discoveries in ionization, electromagnetism, the Zeeman effect, quantum hypothesis, and gravity. The astronomers of the 1910s focused on the order of the day. Julius therefore sharpened his position again polemically: 'When it comes to sunspots, torches, flocculi, protuberances, one speaks as if they are 'objects' whose viewers show us geometrically projected 'images.' It is thus assumed that the curvature of rays in the sun is too insignificant to significantly alter the phenomena.' He almost condescendingly expressed himself about astrophysicists who dared not leave the beaten paths: 'At first glance, it seems as if one would thereby lose grip on solar phenomena, as if all our notions would dissolve into vagueness. But the step must now be taken: and we want to try to show that this does not lead to vagueness, but rather to sharp notions that clearly reveal the coherence of the main solar phenomena.'

Such sentences formed the prelude to Minnaert's eulogy for Julius in 1921.

The necessity of a Heliofysical Institute

When Julius visited his American colleague Hale in Pasadena in 1907, he naturally inspected Hale's phenomenal solar setup on Mount Wilson. He took data with him for building a scaled-down version in Utrecht. After all, Julius had been dependent on foreign experiments. When Julius wrote in 1909 that he doubted whether every aspect of solar physics could be verified using earthly experiments, most astrophysicists permanently turned away from him. Julius was director of the Physical Laboratory and decided to establish a Heliofysical Institute, where he could conduct research with the help of his own spectrograph.

Julius felt compelled to come up with verifiable predictions. According to optical formulas, the effect of anomalous refraction on the long-wave side of the Fraunhofer line was expected to be relatively large due to the strong increase in refractive index. On the short-wave side of the line, the refractive

index had decreased significantly. Therefore, there had to be a pronounced difference, an asymmetry, between the long-wave side and the short-wave side on either side of the center of the Fraunhofer line profile; in other words, more light should disappear on the 'red' side compared to the 'violet' side of the unchanged center. For Julius, this marked the beginning of a quest for line profiles showing an apparent 'redshift' of the wings relative to an unchanging center.

Using the spectrograph, he could create photographic plates himself. The conversion of Fraunhofer lines into line profiles had to be extremely precise. Measurements of the exact surfaces of the two sides of the line profile would have to provide definitive results. For this, the new photometric equipment developed by Julius' colleague W.J.H. Moll was required. This microphotometer was completed in late 1918.

A redshift of solar lines relative to terrestrial lines, Julius noted in advance, had already been discovered by the American astronomer Jewett in 1896; however, this systematic deviation amounted to a few thousandths of an Ångström. Rowland's wavelength scale, which recorded the centers of the Fraunhofer lines, was accurate to within 0.01 Ångströms. Predicting, detecting, and verifying such 'redshifts' therefore occurred at the limits of measurability. At this point, measurements become susceptible to the psychology of the researchers—and, to an amplified extent, that of their assistants. Moreover, did Jewett's results involve an apparent shift around or an actual shift of the line center? This, it turned out, made a great deal of difference. In 1911, it suddenly became clear to Julius that he was not the only one on the lookout for a form of redshift.

Julius and Einstein: Two Claims on Redshift

In 1911, he unexpectedly became engaged in a discussion with Einstein, whom he had to sound out for the vacant Utrecht chair in theoretical physics. For six months, every letter between the two concerned Julius' solar theory. Einstein, to Julius' surprise, also claimed a minimal redshift. However, as a consequence of his gravity theory, Einstein predicted an actual redshift of the line centers, not like Julius, who suggested an apparent asymmetric shift relative to a stable core. After two months, Einstein pointed out that Julius' alleged asymmetry of the Fraunhofer lines could never be the result of anomalous scattering because, due to the square of $(n - 1)$ in the numerator of Rayleigh's law, it was symmetric with respect to the center of the line. Only anomalous refraction could cause such asymmetry. Julius had not realized

this (!) and from then on threw himself into studying anomalous refraction with even greater persistence.

The correspondence ended with Einstein accepting a professorship in Zurich. Nine years later, he became an extraordinary professor in Leiden, and their discussion continued orally, sometimes after musical sessions at Julius' home in Utrecht. Einstein was drawn to Julius' sun model, which could explain many phenomena. Dutch physicist H. Lorentz had strong doubts but, as chairman of the wealthy Belgian Institut Solvay, did not hesitate to approve a contribution for the Utrecht spectrograph. Fundraising went smoothly: components were purchased, and the curators approved the extensive expansion of the Physical Laboratory with a Heliofysical Institute. By the end of 1918, all threads came together. The instruments for the spectrograph had arrived; Moll's microphotometer was ready. Julius struggled with his health. At that moment, Minnaert stopped by to ask if there was any work available: he could immediately start working with the spectrograph and microphotometer to demonstrate Julius' hoped-for proof.

1 Maas, 2001, 43-44, 57-61.

2 Heijmans, 1994, Chapter 2, *De natuurkunde van de zon*, 20.

3 Einstein, 1925.

4 Schmidt, 1891.

5 Minnaert would use his purist term diffraction indicator.

6 Summary of what Julius' theory 'in principal' was about in Hentschel, 1991, 51.

7 Minnaert, (1921a).

8 Romein, 1967, 604.

9 Julius, (1899-1900), final sentences. Emphasis by the author.

10 Hentschel, 1991, Chapter 8: Dispute about the Anomalous Dispersion, 87.

11 Julius, (1909-1910).

12 Hentschel, 1991, 73.

13 Hentschel, 1991, 111.

14 The chair of C.H. Wind, who passed away on August 7, 1911. See Herwaarden, 1971.

15 Einstein to Julius, November 15, 1911. The correspondence between Julius and Einstein is also in *The Collected Papers* 5, Klein, 1993.

16 Lorentz advised Julius at the time to include the anomalous dispersion in his theory! The scattering law of Rayleigh in Minnaert, 1937, 228. Heijmans, 1994, 30.

17 Maas, 2001, 118, points out that the expansion of educational capacity was rejected. The curators unequivocally chose a research laboratory. In

the 1920s, they responded to Ornstein's demands, enabling the Physical Laboratory to truly become a world center for photometry after 1925.

Bibliography

Not translated thus far. Can be glanced from original