Between Academics and Idiots

A Cultural History of Mathematics in the Dutch Province of Friesland (1600-1700)

Arjen Dijkstra

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Voor Margriet

But the mischief is, as I have already hinted, that few Learned give up themselves to that part of the Sciences, tho' it is the most useful and beautiful of all.
Bekker, *The World Bewitch'd*, 257.

A story should to please at least seem true
Be apropos, well told, concise and new,
And whensoe'er it deviates from these rules
The wise will sleep and leave applause to fools
Benjamin Stillingfleet (/Halbertsma).

Wenn dem von Osten Herkommenden es auffällt, wie in Ostfriesland Dörfer und Kirchthürme in so rascher Folge sich aneinanderreihen, je weiter nach Westen hin ist das noch mehr der Fall: vom Thurm zu Franeker herab kann man in einem Umblick an hundert Kirchthürme zumal überzählen.
Ostfriesisches Landbuch – III, 27

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PROEFSCHRIFT

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prof. dr. H. Brinksma,
volgens besluit van het College voor Promoties
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Preface

SINCE THE SEVENTEENTH century, there has been a remarkable change in how the first parts of academic dissertations, theses and other academic print are constructed. In those earlier times it was customary to [1] dedicate the work to patrons (these were often potential benefactors that authors were trying to court) and [2] have friends and colleagues sing the praises of the author whose work followed. The first pages of those works were used by the author to harvest the fruits of his (it was always men) labor. Those pages could help build the public image of the author as a splendid scholar, and often prompted the dedicatee to give him a financial reward. While researching and writing this current thesis, I found this typical Early Modern academic tradition to be a very valuable source of information and imagination.

Today it is customary for the author to thank those who have helped in the enormously complicated process involved in writing a book with a 'Preface' like this one. This seems to be an inversion of what happened in the seventeenth century; contemporary prefaces concentrate on the past, and are not aimed at the future benefits of the author.

It also seems a straightforward source for future historians; the author gives clues as to which people have influenced their line of reasoning and who has contributed with sources, advice and help. The modern day foreword thus seems to accurately map the social and cultural network of an author and can provide crucial information concerning the background of academic life in the twentieth and early twenty-first centuries.

However, in constructing my own version of this typical modern day academic tradition, I stumbled precisely on the same problems I came across trying to interpret the first pages of seventeenth century academic print. It all of a sudden seems very easy to list and thank the famous professor who only gave a small bit advice at a certain point and in the process to forget to name a person who provided a crucial detail. At the risk of making this mistake, I will still try to do justice to all those people who have helped me.

I am grateful, indebted and enormously proud to name all of the following people. Whether they are famous (in the world of History of Science) and powerful, or not, they all contributed and made it possible to put so much time and dedication in this book.

To start at the beginning: the research for this thesis has been conducted as part of the project 'The Uses of Mathematics in the Dutch

Republic', which is supported by a Vidi-grant from The Netherlands Organisation for Scientific Research (NWO) and the University of Twente.

Next, I want to thank the professors that made my promotion possible. I am grateful to my promoter Lissa Roberts for all her advice and comments on the enormous amount of my drafts she had to read. I thank all the members of the graduation committee for their time and efforts, several of which have commented on drafts and ideas in earlier stages as well. Klaas van Berkel – who was also an advisor for my Masters thesis – read (German!) drafts of the first part. I thank Henk Procee, Jan Hogendijk and Arie Rip for their time and efforts. Huib Zuidervaart's work was an inspiration from before I became a university student. During the past years he has contributed to many parts of this dissertation with information, comments and insights. His attitude toward archival material is an example for all historians. Together with Christoph Lüthy, I have, in the past year, tried to literally give the seventeenth century philosopher David Gorlaeus a face. Christoph's work has long been an inspiration as well; collaborating with him on the Gorlaeus project has taught me more than I can express and it helped me realize some childhood dreams. Goffe Jensma shared his vast digital archive with me. Together we wrote an article on Adriaan Metius. I always looked (and continue to look) forward to our meetings in his office at the end of numerous corridors in Groningen. I wholeheartedly support his efforts to keep Frisian alive there.

I want to thank all of my history teachers and I hope to do justice to their work with this book. Hotso Spanninga, Teun Simonides and IJnte Botke were important a long time ago. From more recent times Joop Koopmans stands out among them. He proved to be a splendid teacher and became a personal friend over the past years. I am proud to already have learned so much from him and hope to continue do so in the future. The same goes for the other people employed at the Groningen department of history, including those with specializations in Early Modern themes as well as those with numerous other fascinating subjects of research. I want to thank them especially for the last year, when I was their colleague at the 'fifth floor' of the Arts Faculty, giving me a job and at the same time an academic setting in which I could finish this thesis. I truly hope to return to that floor in the future.

From the times I was a student at that department, I have known Djoeke van Netten. She was a good friend during the past years; her work has proven to be useful and inspirational and she commented on numerous parts of this book. Yet we were not the only PhD-students in the Netherlands with an interest in the history of mathematics; there have long been enough to keep alive a small study group with members from various Dutch universities: GWAD (what the acronym stands for is

still under debate). Steven, Liesbeth, Wijnand, Danny, Janine and Jantien were all members of this friendly and yet critical group of people, which I was very happy to be part of in the first years of my research. A high point was when we organized the Novembertagung – an international conference for young researchers in history of mathematics – at the campus of the University of Twente.

It was that university which granted me a spot in their PhD-program. The university gave me space to develop my own approach and I always had the possibility to choose my own path during the past years. It was something I experienced as true academic freedom. I also found many supporting colleagues, of which Adri de la Bruhèze and Nil Disco stand out with their constant reminders that academic research needs focus. I could not have worked so effectively without the support of Marjatta Kemppainen, Hilde Meijer-Meijer and Evelien Rietberg.

In Leeuwarden I have especially benefited form the very open and friendly environment I found at Tresoar. The entire staff was always cooperative with my endless requests for support and favours. In addition, Bert Looper, Lysbert Bonnema, Jelle Krol, Jacob van Sluis and especially Hilda Top owe special mentioning. In the reading rooms I found fellow 'sneupers' and true scholars in Gerrit Boeijinga, Jarich Renema, Anny Bokkinga and Wiebe Bergsma. Martin Engels has always been supportive; his website is a unique source for the entire history of Friesland. I take it that the countless times I refer to it is proof enough of its great value. Sytse ten Hoeve invited me to his house, which is situated next to the church were Phocylides married. On several occasions, I have benefited from his stories and his unparalleled knowledge of Frisian archives. He introduced me to Wim Dolk and Philippus Breuker; both have helped me with their advice. The people at the Fryske Akademy, especially Peter van der Meer, and the Historisch Centrum Leeuwarden were also always welcoming and supportive. In Franeker at Museum Martena I always had access to the collection. Marjan Brouwer, Manon Borst and Afiena van Zanten were very helpful in that.

There were people who helped me at different stages of writing this book, I am happy to refer to them in the relevant footnotes. I want to specifically mention Thom Verheul, Torsten Schlichtkrull, Christian Hogrefe, Sven Dupré, Hal Cook, Tiemen Cocquyt, Anna-Elisabeth Bruckhaus, Gabriele Urban, Marika Keblusek, Rob van Gent, Rienk Vermij, Han van Ruler, Hans vande Kamp, Jacob Schiphof, Heleen van der Meer, Anton van der Lem and Fritz Nagel who all gave advice or contributed to my work in one way or another. Ferenc Postma pointed me to countless unknown *Franekeriana*. Piter van Tuinen and Baukje van den Berg helped me in understanding some Latin.

Wiebke Wemheuer is by far my best student to date; together we gave one of the presentations I am most proud of. She also made the

German translation of the summary. Next, she introduced me to Rüdiger Störkel, who has helped me in my quest through German archives, for which I cannot thank him enough. Jitske Brünner needs special mentioning because of the good and thoughtful friend she is. Her mother, Pietsje Brünner-Span, made the Frisian translation of the summary. Paul Carls has done a more than splendid job editing my English. His work has made this book readable and it took a heavy load off my shoulders.

The Huizinga Institute in Amsterdam was very important for me. I have especially benefited from my contacts with Anne Hilde van Baal. It was through 'Huizinga' that I became one of a special group of friends, the *Amici Gandavenses*. I could have mentioned Lieke, Matthijs, Nina and Ron in any of the above categories. They helped me with quotes, ideas, their own work, with Latin, English and Early Modern Dutch, with *Wissenschaft als Beruf*, with my own *Bildung* and above all, they are good fun to spend time with.

All this is especially true for Tim Nicolaije. He is one of the *Amici*, a member of GWAD, a colleague in Twente and he read and commented on the entire manuscript of this thesis. We went to numerous conferences all over the world together. I think that by now he knows all my jokes and presentation tricks by heart, but I have never heard him complain even once. I am honoured that he agreed to be my paranimf. Arjen Veenstra, my other paranimf, is a long time friend. Although he lacks almost all the qualities Tim has, he has long been my cycling buddy. There is nobody I would rather spend all those hundreds of hours on two wheels with than him.

Of course my family has been important. I can only hope this book is a worthy successor to the one Anne produced. I also hope that she, Uilke, Minke, Berend, Beatrijs and Matthijs can learn something about the province we all grew up in and which we carry in our accents and/or memories. My parents' house has until today remained a home to me. They have brought me up in a way to always intellectually challenge what I am told and what I read. It was this upbringing that made it possible for me to choose my own path.

I hope to defend this thesis in the Martini Church of Franeker. This was the building that was used by the University of Franeker whenever their own auditorium was too small to house people on days of special festivities. It is this academic tradition that I hope will be honored with my promotion. This was made possible because the *Rector Magnificus* of my own university decided to back the idea. In the best of Early Modern customs I want to thank him for that on these opening pages of this book.

Finally, two people stand out in their help over the past years. First of all Fokko Jan Dijksterhuis, who has always been more than the splendid advisor he is. He has read this thesis more times than I hold possible. His sharp eye has helped my argument, and his numerous comments have caused improvements. Yet he always found a way to voice his criticism in a friendly and kind manner. With that he has shown himself to be both a scholar and a gentleman.

Secondly Margriet. You have helped me enormously during the last years. Your remarks have more than once saved me from embarrassing mistakes. Your love has helped me find the discipline to write, edit and finish the manuscript. You have given me space and time to pull all this work off. Therefore this book is dedicated to you.

Petrus Bast, Prospect of Franeker, *1601.*
Museum Martena, Franeker.

1. Introduction

1.1. Academics and idiots

IN 1601, THE then famous artist Petrus Bast (ca. 1550 – 1605) etched a prospect of the small Frisian town of Franeker, situated in the very north of the Low Countries.[1] At the time, Bast was employed by many city governments to make such skylines and in fact had already made one of Franeker three years earlier, when he probably was commissioned by the magistrate of that town to do so (the actual copper plate with that etching is still in possession of the town of Franeker today!).[2] However, this new depiction was not intended to express praise for the city, which was the usual goal of such etchings. This time Bast put special emphasis on a specific part of the town: the university.

Bast's 1601 skyline of Franeker is highly accurate. It shows all the important buildings, several of which are still in place today. The view of his etching was taken strictly north of Franeker.[3] The main church was a little left of centre, the Martena house, a palazzo of a local nobleman, was depicted in the middle, and, finally, the university buildings were displayed more or less counter balancing the church.[4] This can be taken somewhat philosophically, with the church and academia complementary to each other.

The two men that are depicted in front of the town reinforce the idea that the etching is intended to praise the University of Franeker. They stand in the foreground surrounded by cattle (often present in Bast's etching). The two men seem to be discussing some important matter. The man who has his back turned toward the viewer draws attention to a specific spot in the town. This was a trick Bast practiced often; the people he portrayed could attract the eye of his viewers to things that were important. In this etching, the man with his back shown is pointing toward the entrance of the University of Franeker. This has led art historians to the conclusion that these two are in fact members of the university, or *cives academici*: citizens of academia.[5]

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[1] For details on Bast and an overview of his ouvre, see Keyes, *Pieter Bast*.

[2] These plates are kept in Museum Martena, Franeker.

[3] Bast's first etching depicted Franeker from a more eastern point of view.

[4] Many of the prospects of Franeker that would be fabricated in the century to come would portray the city from the more northern angle, see for example par. 1.3.1. below.

[5] Keyes, *Pieter Bast*, 25, 37, comp.: Bodel Nijenhuis, 'De Leidse graveur', Van der Molen, 'Een Friese' and the posters and invitations for the double exhibition in Museum Martena

Detail of Petrus Bast, Prospect of Franeker, *1601.*
Museum Martena, Franeker.

Academics in the Early Modern period were precisely that, they were citizens of a different state. Whereas the townsmen controlled the town, the academics controlled academia. They had their own court, their own laws and were often exempted from several normal taxes. It only seems fair that the University of Franeker also had its own "marketing" and with that, its own cityscape. After all it was the university that played a dominant role in Franeker city life, through its ability to draw European attention and bring foreigners, trade and distinction. Thus, by and large, it helped build Franeker's reputation, and the academics were also members of the international Republic of Letters. In the end, the etching was a way to advertise both the town and, more importantly, the university in an international market.

Over the course of the seventeenth century many new skylines of Franeker were etched, printed and sold. All of them tell different stories of what had happened to the town and to its buildings. As they tell stories of what was happening in town, and what its citizens and its academics were up to. In particular, they all report on the activities that people thought were important at the time the etching was sold. A famous one depicts two monkeys who mock the university.[6] A rather obscure etching was made by one of the university's mathematics

and Tresoar to commemorate the 200 year closing of the University of Franeker in 2011. I thank Afiena van Zanten for pointing this out to me.
[6] See below, par. 1.3.1.

professors and shows little more than just the skyline. By the mid eighteenth century this trend came to an end. From that moment onwards, views of the city at large were replaced by etchings that portrayed the buildings and people from Franeker in more detail.

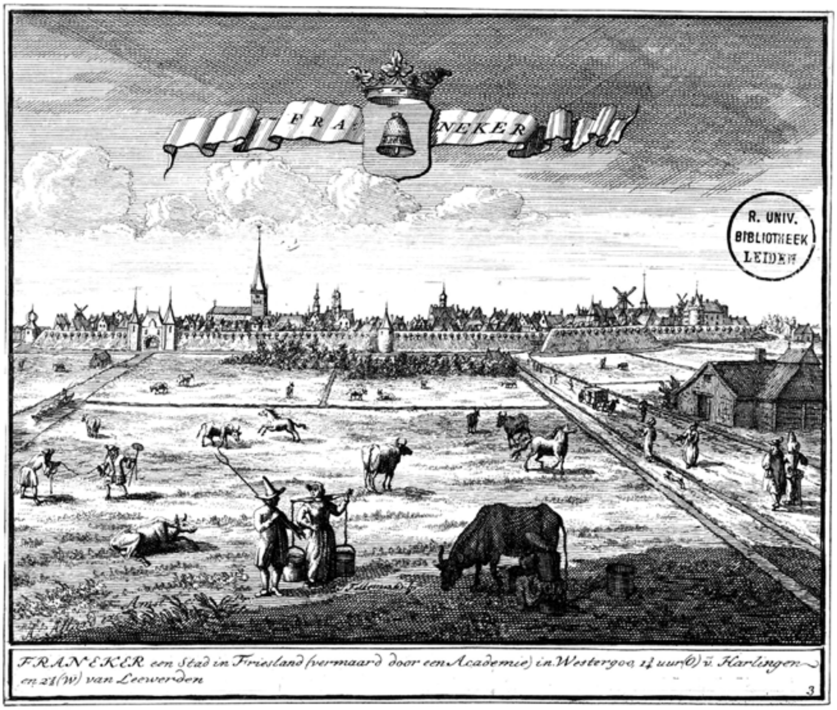
One of the last of these etchings was not made on commission of the city, nor of the university, but it was in fact one in a series of views of the eleven different Frisian towns.[7] It was made by one Jacob Folkema (1692-1767) who, like Bast, was a famous artist in his day. For his view he chose the same position Bast had taken for his etching. Much like Bast, he depicted Franeker as a prosperous city with cattle in the surrounding fields. Folkema, unlike Bast in 1601, depicted many people coming and going to the town. Clearly distinguishable is a farmer who is talking to a woman who is once more carrying milk. There are some bushes in front of the city, signaling that the bulwarks were not kept clear, something that could only take place in a time of peace when the city had lowered its guard. The university is less visible; it is even tucked away a little behind a windmill, but someone who knows where to look can identify it.

On Folkema's cityscape there are two men at the bottom left half who attract attention because they seem involved in a rather odd activity. These men are not discussing, but carrying a long chain and a tripod of some sort. They are land surveyors at work; the chain is for measuring distance and the tripod mounts a surveying instrument.[8] These surveyors were university trained and their presence, like the two men on Bast's prospect, is a reference to academia, even though in general land surveyors are not associated with this institution. Traditionally, academic education was aimed at theologians, lawyers and medical doctors, while schoolteachers and the like often had a few years of university training. At Franeker, however, these surveyors took a more prominent role than at most other universities. Two men, muddling with chains and instruments may not be the traditional image of scholars, but they were an obvious reference to people living there in the early eighteenth century.

Over the course of the century that separated the two artists' etchings, the focus seems to have shifted completely. The university that virtually defined Franeker was no longer represented by dignified academics. That spot was now taken by two practical mathematicians

[7] A complete collection can be found at the Rijksmuseum in Amsterdam and at Tresoar in Leeuwarden.

[8] The instrument mounted on the tripod is a so-called 'Hollandse cirkel', a measuring instrument used to measure angles that could be used to calculate the distance between two distant points.



Jacob Folkema, Prospect of Franeker, *early 18th century.*
University Library, Leiden.

who do not even have a very prominent place in the image.[9] This can, of course, partly be explained by the fact that the two prospects had different purposes. The first was possibly commissioned by the university, whereas the second was made with a more general audience in mind. But at the same time, this shift is emblematic of the shifts that took place in the academic education at Franeker. The university was founded to educate ministers and lawyers, proper academics. On the first prospect they are represented as such. After a century of operation, all sorts of students had left the university; the sole focus was no longer divinity, law and medicine, but many different branches of education had been practiced at the university over that century. On the second prospect, therefore, the university is represented by land surveyors, who are a long way away from those dignified academics.

Because the land surveyors only read mathematics (where most other academics had a much more diverse and difficult program) they

[9] In the caption is a reference to the university as well, but it may be telling that it is put between parentheses. The full text reads: Franeker, a city in Friesland (famous for an Academy) in Westergo, 1¾ hour (E[ast]) from Harlingen and 2½ hour (W[est]) from Leeuwarden.

often did not even know Latin. That language, which was the language that was primarily spoken and written at university, was the most noticeable difference between the townspeople and the Franeker scholars. The mathematics students were thus part of both worlds; they stood out. On the one hand they were a part of academia, while on the other they did not have control over the language spoken there: Latin! For this they received the disdain of the other Franeker students and even of the university senate. When these proper academics discussed the presence of the mathematics students, either they did so with a mixture of annoyance and jealousy and labeled them as 'those who cannot read Latin', or they simply used the Latin denoting this form of illiteracy: *idiotae*.

This book specifically looks at the space between the academics and the *idiotae*, a space that was filled by the professor of mathematics. On the one hand he was responsible for the mathematical education of all ordinary students. He had himself received a formal academic education and was a full member of the university, taking part in all customs that were connected to that institution. He was a proper *civis academicus*. On the other hand this professor was responsible for the education of the *idiotae*; he lectured to them in the vernacular and he wrote and published their study material. He was on the one hand the key to academia for the *idiotae*; he was the one professor who could open the university up for the laymen. On the other hand his students were some of the most mundane products of academia. The professor of mathematics, although a university citizen himself, stood between academics and idiots.

The two prospects give a rough outline of the time frame of this dissertation; the seventeenth century is the main period studied here. Over the course of this century these specific Franeker professors formed a remarkably consistent group of mathematicians. Only in Leiden, whose stability was almost unparalleled throughout Europe, did the professoriate in mathematics show such continuity over that century.[10] By studying the mathematicians who held that chair from within its specific Franeker setting, I want to answer the main set of questions on which this thesis is grounded: how was mathematics used, practiced, shaped, and valorized, and what was its status in the seventeenth century? The answer to these questions will provide my very long definition of what mathematics was in practice. The main argument will thus be that for this time period, a single definition of mathematics does not exist, and that it is impossible to understand mathematics as simple

[10] The only other Dutch university to have the chair constantly occupied was the University of Leiden. However, from 1600 to 1679 the education of mathematics in the vernacular was done in a separated institution, the *Duytsche mathematique*.

Detail of Jacob Folkema, Prospect of Franeker*, early 18th century.*
University Library, Leiden.

arithmetic and calculations.[11] It is instead necessary to look at the broader cultural setting that gave meaning to mathematics and that, to a large extent, shaped the field. Thus, the aim of this study is to come up with a cultural history of mathematics in the seventeenth century. With that history I will provide insight into the world of learnedness and knowledge in Early Modern Europe.

Before I can start building this cultural history, some clarifications and the introduction of some concepts are in order. I will start with an explanation of the choices that lay at the base of this book. The first question that needs to be answered is much more slippery than it initially seems to be: what was considered to be mathematics in the seventeenth century? After I briefly discuss this, I will give a set of explanations of the subjects chosen for this study: Why mathematics? Why the seventeenth century? Why a cultural history? And what precisely is a cultural history? But I will also deal with more methodological issues. How is this cultural history composed? What are the sources that I draw from? And what larger methodological issues are dealt with in this thesis? To which historiographical points does it

[11] There are many histories that do focus on just the mathematics and that only use a broader discussion of what happened as decorum. This is a way of practicing history that is often done by trained mathematicians. See for example Van Maanen, *Facets*.

connect? After this I will give a short introduction of the material: The Dutch Republic, the province of Friesland, the University of Franeker and a recollection of the available histories of mathematics in both Friesland and Franeker. Finally, I will end this introduction with an outline of the book.

1.2. Methodology, historiography and conceptual issues

1.2.1. Beyond the chair in mathematics

The Franeker professors of mathematics were go-betweens; they worked in the space that was found between city and university.[12] Therefore, they offer a route to an intersection between the scholarly world of the university and members of Early Modern society. From that intersection I will explore several roads, which all end up at different mathematicians or different forms of mathematics. The goal of pursuing these roads is to show how differentiated mathematics was and how the world of university mathematics was intimately linked with that of more mundane mathematics. University mathematics was involved in all sorts of exchanges with the developments in the field of mathematics that came from outside university.

This often, but not only, becomes very clear when mathematicians from the 'outside world' met and exchanged with the professors. There were, for example, the students, the Franeker *idiotae*, but there were also writers of ephemeral books like almanacs, teachers of arithmetic, astronomers, translators of mathematical texts, land surveyors, fortification engineers and instrument builders. At the same time there were patrons of these mathematicians who figure in this book: the curators of the university, a local nobleman commissioning a mathematical manuscript, an enthusiast who had an instrument built, a city that wanted its bulwarks strengthened, a printer looking for an almanac calculator. These men, and very occasionally women, could be academics, courtiers, government officials, entrepreneurs or noblemen. What they have in common is their interest in mathematics, and this interest linked them up with the university at one time or another. By exploring their different storylines I will gain insight into the subject these very different mathematicians were practicing: Early Modern mathematics. To do this I follow up on the many forms their practices could take. These 'products' can take many shapes, and include the crafting of instruments, the marketing of ideas, the valorizing of cultural capital, the numerous books they produced, or they sometimes are public arguments on seemingly trivial matters.

[12] On these go-betweens in the Early Modern period see Schaffer and Roberts, *The brokered world*.

1.2.2. *What was mathematics?*

What then was mathematics in the seventeenth century? This is on the one hand one of the main questions of this thesis, but on the other hand there are some short answers and definitions that can provide some guidance at the start of this thesis.

The first thing that is important to note is that whatever the answer to the question of what mathematics is today, it is not the answer that can be given for the Early Modern period.[13] Furthermore, whatever answer is given for Franeker, the university in question, that answer will differ at least slightly from what would be answered in, say, Padua, Italy or Paris, France.[14] In addition to this, over the course of the seventeenth century mathematics dramatically changed it appearance. For example, around 1600 hardly anybody referred to mathematics as a way to obtain 'true' knowledge, while around 1700 it was referred to in that fashion quite commonly.[15] At the same time, at the beginning of the seventeenth century the mathematician was not held in particularly high esteem, while at the end of the century he had acquired status and admiration. This change in the perception of mathematics creates an uncertainty for the historian. While change is one of the most basic principles that allows for any historical research to take place, it is very important to have continuity as a background to such a transformation. Interestingly enough, the divide between change and continuity can be solved by mathematics itself, because although its appearance changed, the disciplinary structure within which it was practiced stayed the same.[16] By 1700 the discipline of mathematics had expanded considerably, but those things that were considered to be mathematics at around 1600 remained present in the field. It is precisely this ambiguity that lies at the core of this book. It is therefore important to start with a description of that framework.

At first glimpse, an answer to the question of what mathematics was in the seventeenth century can be easily given. Mathematics had been studied for ages, books were written on it and definitions had been given. A phrase in the Book of Wisdom (11:21) was often referred to as a description of mathematics: "but thou hast ordered all things in

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[13] For an introduction in seventeenth century mathematics in the Netherlands, see Alberts, 'Mathematics in the Netherlands'; Bos, 'De zeventiende eeuw'; although this article is published as part of a 'cultural history of mathematics', it is something completely different from what I understand that to be (see below); likewise important is a special issue of the journal *De Zeventiende Eeuw* 7 (1991) ed.1, see Van Berkel, 'Ter inleiding'. Further reading is given by Struik, *A Concise history of mathematics*, esp. chapt.7; see also Idem, *The Land of Stevin*.

[14] Wardhaugh, *How to read*.

[15] For examples see the introduction to part I of this book and to par. 9.3.4. below.

[16] Nick Jardine, 'Epistemology of the sciences'.

measure, and number, and weight.” Everything that fell within this phrase could be considered mathematics in the Early Modern period. However, this did not necessarily mean that everyone who worked with them were mathematicians. A market trader who measured and weighed was not a mathematician, but he did use some basic forms of mathematics for his business.

In practice, one of the strongest ‘definitions’ was the one that that can be found at Latin (or grammar) schools all over Europe during the Middle Ages and the Early Modern period. The first focus of those schools was on teaching students the Trivium. This consisted of grammar, logic and rhetoric. After these three were mastered, students moved on to the Quadrivium, which consisted of arithmetic, geometry, music, and astronomy. Together, these two groups formed the seven liberal arts. All four arts in the Quadrivium were considered mathematics and mathematics was considered those four arts. This was still a useful definition at the beginning of the seventeenth century when the ancient, Scholastic structures were still largely in place, and anything that was even remotely considered mathematics could be placed in one of these four arts.[17]

At the end of the seventeenth century a fundamental change had taken place, but surprisingly this had not led to a replacement of that ancient structure. The Quadrivium still functioned as the basic structure for mathematics, although numerous new *mathematics* or ‘mathematical sciences’ had made waves within the mathematical landscape.[18] The result was that the status of mathematics had completely changed. It was no longer a mere subordinate subject, useful to a handful of specialists, and good to master when navigating the sea or designing a fortification or studying the stars; it had instead become a full *scientia*. Mathematics had grown into a mature field on its own, with its own dynamics.[19]

[17] An important study that helps understand the place of mathematics in the Early Modern universities is Westman, ‘The Astronomer’s Role’; see also Westman, *The Copernican Question*.

[18] See for example the definition of ‘Mathematics’ given by d’Alembert and Boucher d’Argis in the *Encyclopedie*. They list Arithmetic, Geometry, Mechanics, Optics, Astronomy, Geography, Chronology, Military architecture, Hydrostatics, Hydraulics, Hydrography or Navigation and ‘etc.’, all as different forms of mathematics. See Diderot, *Encyclopédie*. I have used the online edition of the University of Michigan Library for reference: http://quod.lib.umich.edu/d/did/

[19] Revealing in this respect is a recent study by Goulding, who shows that the mathematicians of around 1700 thought they did something quite special. They therefore wanted to have proper histories of their field written. Goulding shows that such histories had been around for a long time, demonstrating how much those eighteenth century mathematicians were indebted to their predecessors. The point here is that the call for a history of the field was characteristic of an independent field of research growing up, see Goulding, *Defending Hypatia*, xi-xiv and 183.

My focus on this definition does not mean that mathematics only existed inside schools and educational institutions, but it was there that the continuity necessary for a broad approach could be found. The seventeenth century practitioner would associate mathematics with the Quadrivium, and this was a setting where the actual practitioners came together over a longer period of time. In this setting, the professor in mathematics was supposed to teach all of the different subjects that were considered part of the field. His first goal was to teach students in the propaedeutic phase of university, which comprised students' first years of study. Meanwhile, this professor could claim some status and fame because mathematics had acquired a practical status. For example, being the former tutor of a famous explorer, or the teacher of a well-known fortification engineer, was considered an honour. Yet this made the academic position of mathematics ambiguous; it was considered necessary at university, but most of its status could be acquired outside university. To make it even more complicated, there were all sorts of practitioners who were not university trained, but who could claim to work in the field. Mathematics was one of the very few fields where the academics could be challenged by people who had no attachment to the university whatsoever. In other words, mathematics was a matter of exchange between society and academia.[20]

This ambiguous position led, for instance, to long apologies on the usefulness of mathematics, which at the same time stressed that mathematics was a dignified field of teaching for a university professor. The most famous of these apologies was given by the Amsterdam professor Martinus Hortensius (1605-1639), who addressed this in the form of an *oratio*, a traditional public lecture that Dutch professors gave (and give) when accepting a chair at any university or institute of higher education. Hortensius gave a lengthy answer to the question of what mathematics was in an attempt to gain prestige for his field.[21]

If dignity had to be gained, Hortensius gave his lecture at precisely the right time. He addressed his audience in the middle of the 1630s, just when the field of mathematics was entering one of its most turbulent periods.[22] Some authors of the time demonstrated the numerous possibilities that mathematics offered: fortification, the new astronomies

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[20] For a comprehensive study on *exchange* in the Netherlands in the seventeenth century, to which I owe a great deal of my understanding of how 'science' in the Low Countries was practiced, see Cook, *Matters of Exchange*.
[21] The *oratio* was entitled "the Dignity and Utility of the Mathematical Sciences", see Imhausen and Remmert, 'The Oration'; see also: Van Miert, *Illuster onderwijs*, 48-52; and Van Berkel, 'Alexandrië'.
[22] The most important development was that Descartes would publish his *Geometry* in 1637, see Bos, *Redefining Geometrical exactness*. It was also the decade when Galileo published his *Dialogo* in 1632 and shortly before Van Schooten would publish the *Opera mathematica* of Viete (1646).

(Copernicanism), navigation, typography, instrument making, but also algebra and new ways to practice optics. All of these fields seemed to be finding a place under the umbrella of the Quadrivium definition of mathematics. Some of these practices were considered mathematics as early as the fifteenth century, but it took until well into the seventeenth century before this position was challenged. Once it was, there seemed to be no way to stop its development, and ever more fields were added to mathematics. The most famous example is without doubt Galileo Galilei (1564-1642), who acquired the position of court *philosopher*, which gave natural philosophers the chance to start discussing his mathematical works.[23]

Galileo's example sets the scene for an entirely different development, which was that the field was also moving toward a more esteemed audience.[24] This development showed that mathematics was useful to natural philosophy, which meant that the field was acquiring the status of *scientia*. This development became all the more pressing, especially when since ideas of René Descartes (1596-1650), who propagated a mathematical way of philosophizing, started to meet with fierce opposition. Yet the content of that opposition made very clear once again what was happening: mathematics was gaining intellectual status and with that it received a clear cultural lift.[25] After all, if this had not occurred, who would have cared about opposing it?

Because of this, some parts of mathematics became outright prestigious. Young noblemen devoted their lives to solving mathematical problems. For example, Christiaan Huygens (1629-1695), son of the secretary of the Prince of Orange, would grow to be the most famous Dutch mathematician of the entire era. There were others who also sought new ways to define the field. Several authors, for example, pointed at the ancient division between *mathematica pura* and *mathematica mixta*. *Pure* was that part of mathematics that could be proved using nothing but mathematics, and which did not relate to the real, physical world. It was a way indicating the abstractness of mathematics. Of the original four subjects that the Quadrivium consisted of, geometry and arithmetic counted as the two fields that were pure. Mathematics was considered *mixed* if actual physical things

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[23] Dear, *Revolutionizing the sciences*, 64-78; Biagioli, *Galileo Courtier*, 11-101.

[24] Galileo was not alone in doing so, see for example Henninger-Voss, 'Comets and Cannonballs'.

[25] See, for instance, Jones, *The Good Life*, chapter 2; obviously Descartes met with more opposition, which was not just aimed at the role he gave to mathematics. See for an introduction to the Dutch situation Van Bunge, 'Philosophy'; for a more thorough discussion to the philosophical problems that were raised against Descartes around this time see Verbeek, *La Querelle*; on the status of mathematics in the Early Modern period see Dear, *Revolutionizing the Sciences*.

had to be used to build proofs.[26] This is why astronomy and music were counted as *mixed mathematics*. In the nineteenth century this division was severely blurred when a more rationalist purification of mathematics was made. This rationalist purification resulted in pure and applied mathematics, indicating that the second group did not consist of true mathematics. *Mixed* is therefore not the predecessor of *applied mathematics*, however apparent that may seem. The seventeenth century division had a different purpose and allowed all of the mathematical sciences to find a place under the umbrella of mathematics.[27]

Because ever more subjects had to be incorporated into the field of mathematics, the definition of the Quadrivium lost some of its appeal. Still, it remained the best framework that mathematicians had to offer. Within this framework, a division between pure and mixed made sense. This became particularly visible at university. On the one hand the professors at Dutch universities were expected to teach mathematics as prescribed by the Quadrivium; on the other hand they saw the field transforming. They had the knowledge to guide that process of transition, they owned (mathematical) instruments, which they used for research and in class, and they felt that they could possibly contribute to that transformation. Nevertheless, certain things remained the same; the way for them to acquire the most esteem was by tutoring a famous young nobleman, and the way to get the most money was through the education of the oldest son of a rich merchant. Mathematics was in short, 'a heterogeneous affair in which all kinds of people and practices were running all over the place.'[28]

One of the goals of this study is to historicize the concept of mathematics and look at it without reservations. My goal is thus not to understand what strictly fell within the Quadrivium, it is rather to see what was done when mathematics was practiced at a particular time and place. The Quadrivium is a definition, but what was the heterogeneous affair the actual historical persons were involved with?

1.2.3. The Scientific Revolution

Of course such an approach raises the question of why a study into the history of mathematics is of interest. The answer to this question starts with the assessment that the field of mathematics is intriguing in its own right. This assessment gains more merit when one takes into account that mathematics is often seen as fuel for the motor of the Scientific

[26] De Graaf, *Geheele mathesis*, voorwoord, fol. *3 verso.
[27] Dijksterhuis, 'The Golden Age'.
[28] Dijksterhuis, 'Constructive Thinking', 81.

Revolution.[29] The Scientific Revolution can be defined as the period in which the roots of modern science were formed, running roughly from the second half of the sixteenth up to the start of the eighteenth century. The concept of that Revolution has been hollowed and deconstructed in the past decades.[30] Historians have tried to reinterpret it on numerous occasions, although *communis opinio* is that there was indeed an important process, one that, furthermore, is in one way or another connected to what today is known as 'science'.[31]

The reinterpretation of the Scientific Revolution was part of an important 'cultural turn' for the field of the history of science. This turn implied that the study of the history of science no longer focused solely on the content of what was branded science. It also reveals that it is not unproblematic to study science, and that even something as abstract as science can only be understood within its historical setting. Historians like Andrew Cunningham, Peter Dear, Perry Williams and numerous others have time and time again pointed at all sorts of possible difficulties in using labels like 'Scientific Revolution'.[32] Remarkably,

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[29] The classical picture of the Scientific Revolution is painted by the likes of Koyré, *From the Closed World*; I.B. Cohen, *Revolution in Science*; and Butterfield, *Origins of Modern Science.* I am indebted to the discussion of these works by H.F. Cohen, *The Scientific Revolution*, esp. chapt. 7. A study that looked more at the continuity rather than the revolution was written by E.J. Dijksterhuis, *Mechanization*; For the situation in the Dutch Republic and the Netherlands, the work of Klaas van Berkel has been of great importance to my understanding, see Van Berkel, e.a., *A History of Science*. I have also drawn from the studies of Davids, *The Rise and Decline of Dutch Technological Leadership*; and Davids, *Zeewezen en wetenschap*, which was also of importance for details that I discuss in chapters 9 and 10. More recently the Vermij and Jorink have started to answer intriguing questions, which are in close relation to this period. Vermij researched the reception of Copernicanism in the Dutch Republic, which has been a point of reference for my entire research, see Vermij, *The Calvinist*. Jorink looked at the concept of 'the Book of Nature', his study has been especially important for the second and third part of this thesis, see Jorink, *Reading the Book*.

[30] Van Berkel, 'De wetenschappelijke revolutie'; Cook, 'The Scientific Revolution: A Historiographical Inquiry'; For a different view on the matter and an up to date discussion, see H.F. Cohen's, *How Modern Science*, XVII-XX; for a recent overview of the 'Scientific Revolution' in the Netherlands, see Van Berkel, 'The Dutch Republic'

[31] See for example Cook, *Matters*, 1; see also the following footnote.

[32] That modern science was actually 'born' in the seventeenth century is questioned and attacked by numerous authors. Andrew Cunningham is possibly one of the loudest voices to attack the 'Scientific Revolution', and since he started questioning the very existence of it as a process that helped redefine modern science, many have followed. See Cunningham, 'Getting the game right'. Some of the questions Cunningham asked his fellow 'historians of science' are questions that are very close to the ones that are central in this thesis. Cunningham for example asks who counts as a 'scientist' to historians of science and who not (pp.365-366). See also Cunningham and Williams, 'De-centering the 'Big Picture'; Dear, 'What is the History of Science the History of?'; a key publication in this tradition is the edited volume by Osler, 'Rethinking the Scientific Revolution', where many contributions to this discussion can be found.

although this scrutinizing of both science and of the Scientific Revolution has proved to be very fruitful, historians have only recently started to do the same to mathematics and the process of mathematization.[33] Almost all historians agree that, on some level, mathematics was very important for the things that are captured by discussions about the Scientific Revolution, but hardly anybody has taken a long and extensive look at this process from a cultural perspective.

This is of importance for this study because my aim is to understand mathematics. Since historians have long considered mathematics so important for the Scientific Revolution, this study will also contribute to that discussion.

1.2.4. A cultural history of mathematics

The next important question deals with what I refer to as the 'cultural perspective'. Yet, how does this perspective differ from other perspectives, and what does the adjective 'cultural' mean when I use the term 'cultural history'?

A cultural history looks at history the same way an anthropologist looks at societies; it studies the ways meaning is given to practices and vice versa the way practices contributes to the meaning of things. This study investigates the practice of mathematics as a cultural phenomenon. Even the purest form of mathematics – the one that is as much detached from the physical world as possible – needs a cultural setting in which it makes sense, because it will still be attached to that world. However, my study will not investigate that border. I will instead look very closely at the setting in which mathematics was practiced.[34] What do those practices tell us, both about the setting in which they took place, and about the mathematics that was pursued?

In 1995 Peter Dear offered an overview of the various forms the phrase 'cultural history of science' could take.[35] One of the trends he analyzed 'borrowed' from anthropological approaches toward the history of science. Dear showcases Robert Darnton's well-known article on 'The

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It is important to note that when Cunningham first started voicing his criticism of the concept 'Scientific Revolution', he pointed out that what he said about 'science' should also be applied to mathematics. In other words: that we should not look at mathematics from our modern point of view, but instead look for a way to historicize it. In the numerous cases where this is approach is taken toward seventeenth century science, mathematics lags far behind.

[33] The best known example of a historian who did look at mathematics (who looked at nineteenth century Cambridge) in this fashion is Warwick, *Masters of Theory*.

[34] Of course this study also draws from classical works in the field of the history of mathematics, which first started looking beyond the traditional borders like Feingold, *The Mathematicians' Apprenticeship*.

[35] Dear, 'Cultural History of Science'.

Great Cat massacre' in which a 'thick description' is invoked to 'understand an aspect of an alien culture'.[36] To do this Darnton had 'triangulated' on this massacre from 'as many relevant connotations [...] as reasonably possible'. Dear further shows how both he and Lissa Roberts have done so in other cases. This is my goal as well, except that I do not want to understand a massacre, nor science per se. I want to understand what mathematics meant for a specific group of people in a part of the Early Modern period.

Dear offers another important clue as to how to give substance to such a method. He recalls how Charles Gillespie (1935-2008) had once said that 'historians are better than their theories'. Dear also explains what this means: 'Good historical research and writing do not proceed on the basis of some literally preconceived theoretical stance, which the historical material then serves to illustrate; the relationship is much more complex.' It is one side of that relationship that I have scrutinized in this book. I have tried to uncover as many 'relevant' sources on the practice of mathematics at a certain historical site 'as reasonably possible'.[37] By discussing those sources and trying to understand the processes through which they gained their relevance, I will offer many different perspectives on mathematics in the Early Modern period. This results in various stories in which the main hero will always be mathematics and its cultural history.

Although there have been few historians of mathematics who have taken a cultural approach toward mathematics, there are a few valuable examples who were keen to catch that train. Again, Peter Dear needs to be explicitly mentioned. In his acclaimed study on the 'mathematical way in the Scientific Revolution', Dear 'considered socially embedded genres of argument in philosophy so as to understand what inferential moves were taken for granted or contested with particular knowledge-producing communities. Those groups, typically trained within the universities and colleges, prosecuted the literary endeavors that constituted dominant seventeenth-century natural philosophy and mathematical science.'[38] With that approach Dear showed the importance of mathematicians for the understanding of seventeenth century science.

Matthew Jones continued where Dear had left off. In his book *The Good Life in the Scientific Revolution*, he showed how important mathematics was for seventeenth century philosophy. Mathematics, Jones argued, had become a way to 'cultivate the moral person'.[39] But

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[36] Dear, 'Cultural History of Science', 163-164; comp. Darnton, 'The Great Cat Massacre'.

[37] Comp. a more recent article Dear wrote together with Sheila Jasanoff: Dear and Jasanoff, 'Dismantling Boundaries'.

[38] Dear, *Discipline*, 245.

[39] Jones, *The Good Life*, 269.

while he showed how powerful the field grew, Jones had no eye for the other side of Dear's inquiries: that of the 'groups, typically trained within the universities and colleges', those groups that actually succeeded in spreading mathematics as a cultural and philosophical field of study.

The most comprehensible way to start studying this side of mathematics is by studying the social status of mathematicians. One of the first to do so was Mario Biagioli who wrote an article on 'the social status of Italian mathematicians'. Biagioli shows how difficult it is to distinguish between different groups of mathematicians. He solves this by taking a 'genealogical approach'; he traces the similarities of the various different subjects they studied. Through these resemblances Biagioli constructed family-lineage, which he then used to explain the rise in social standing of this 'group' in Italy until roughly 1600.[40] Biagioli's approach shows how hard 'mathematicians' are to group, but it also shows that they did have some similar characteristics: they published and worked on the same material, they referred to each other, and while they did not have similar social positions, they all strove for social recognition.

Biagioli's work stresses that to perform a cultural study of Early Modern mathematics it is necessary to closely monitor the sources on individuals. According to Biagioli, such an approach promises the prospect of interpretive patterns. Ultimately, he convincingly revealed how the mathematicians found a way to notoriety through the use of military tracts and astronomical discoveries. Biagioli worked this out most persuasively in his prominent and much discussed study *Galileo Courtier* (1994), where he shows how Galileo skillfully presented his numerous achievements to maximize his own gains.[41] This revealed that to understand Galileo it is necessary to look beyond the initial frame of research. In so doing, Biagioli demonstrated that Galileo was more a successful courtier than a mathematician.

Stephen Johnston and Jim Bennett, both of the Museum for the History of Science in Oxford, have given examples of how research on mathematicians in sixteenth century England can be done.[42] Like Biagioli, they followed the individual mathematicians, and also like

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[40] Biagioli, 'The Social Status', 41-42.
[41] Biagioli, *Galileo Courtier*; There was severe criticism of Biagioli's approach, see Shank, 'Galileo's Day in Court'; and Idem, 'How Shall We Practice History?'; comp. Biagioli's reply, Biagioli, '"Playing with the Evidence"'.
[42] See Johnston, 'The Identity'; Johnston, 'Mathematical Practitioners and Instruments'; Gerbino and Johnston, *Compass and Rule*; Bennett, 'The Mechanics' Philosophy and the Mechanical Philosophy'; Bennett, *The Mathematical Science*; Bennett, 'The Challenge of Practical Mathematics'; and Bennett, 'Geometry in Context'.
Very recently (2011) Alexander Marr published his *Between Raphael and Galileo*. It arrived too late for me to fully incorporate his views and ideas on the history of mathematics and art, but he does something very akin to my study.

Biagioli, they provide surprising conclusions that offer tools for the study of other Early Modern mathematicians. Basically Johnston and Bennett try to understand what drove the historical mathematician. In a synthetic paper, Johnston sums up that he did so by investigating 'the identity of the mathematical practitioner in 16th-century England'. His conclusion is that there is no such identity and that 'if the [mathematical] practitioners were not readily identifiable as scholars neither can they be grouped together as craftsmen'.[43] This is an important point of departure for my study because it is true for localities beyond England. Biagioli had, for example, skillfully identified numerous different mathematicians, but he could only group them by taking his 'genealogical' approach.

The conclusion that can be drawn from the work of Biagioli, Johnston, Bennett and others is that the Early Modern mathematicians formed no identifiable group, especially not one that resembles the present day scientist, who publishes articles and draws on a chalkboard.[44] In the Early Modern period mathematicians acted as individuals, and they need to be studied as such. This is because there were just not enough mathematicians around to consider them a group. This is why Johnston focussed on their identity and why Biagioli focussed on their output and their place at court. This present study combines such approaches and takes a close look at mathematicians and at the universities where they worked. It looks at both the identities of the professors who were given the assignment to teach mathematics, as well as at their output, their social standing, their students and the discussions they were involved in. Those professors were all mathematicians, but to understand who they were they need to be studied as professors of a university, as burghers of a small town, as citizens of Friesland, as members of the Reformed Church, etc. The goal of this is, of course, to start understanding the practice of mathematics in the Early Modern period, not to argue that mathematics was strictly practiced by those professors.

Another conclusion that can be drawn is that the group has not yet been studied through its individuals. Dear has already shown how this problem could be overcome by studying how mathematics was practiced at the universities and academies; by focussing on those institutions he did manage to trace a 'group' of mathematicians.[45] He brands these institutions the 'local contexts', and they can help in understanding the historic mathematicians. Among others, Angelo de Bruycker has recently

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[43] Johnston, 'The Identity', 115.

[44] For example, see also Feingold, *The Mathematicians' Apprenticeship*; comp. what others have done in the field of the history of science in general, i.e. Shapin and Schaffer, *Leviathan*; and more specifically Shapin, 'A Scholar and a Gentleman'.

[45] Dear, *Discipline*, chapter 2.

showed how this approach could be used when he studied the Jesuit schools in Antwerp and Louvain.[46]

But although Dear and De Bruycker have clearly shown that focusing on these 'local contexts' leads to great advancements in the study of Early Modern mathematicians, studies that have picked up on their lead are lacking. No comprehensive studies that focus on longer periods of time have been made of the practice of mathematics at German universities, French academies or English schools. The approach of Dear has likewise not yet been applied to subjects that encompass non-Roman Catholic environments in which mathematics was practiced. In other words, the historiographical road has been mapped, but hardly anybody has progressed down that road for the Early Modern period.

This current study continues along those lines by taking the approach created by Biagioli, Johnston and Bennett, hinted at by Dear, and partly pursued by De Bruycker. By studying the professors who held the mathematics chair at a Calvinist university, a 'group' of mathematicians who contributed to the larger developments in the field of mathematics is located. It is this approach that ensures a grip on the historical reality. This study does not strictly focus on great names (who were clearly the main interest of both Dear and Jones). Rather, it has a broader view on numerous mathematicians who are not automatically mentioned when the Scientific Revolution is discussed – much like what Johnston has done.

I will thus not present a broad overview, in which vital details are lost. Rather, I will observe very closely the historical figures that had to calculate, measure and observe in seventeenth century Friesland.[47] Descartes, for example, although studying in Franeker in the 1620s, is only occasionally referred to because his time in Franeker did not make a lasting impact on the Franeker chair of mathematics. I thus avoid discussing him at length, not because he is of no interest, but precisely because he is. What would he have found in Franeker? What were the practices in place when the Frenchman came to that town? How was mathematics used at that time? To answer such questions it is necessary to look beyond Descartes himself. The same goes for John Locke (1632-1704) who visited Franeker in the 1680s, for Christiaan Huygens who made a Franeker professor of mathematics the editor of his posthumous works and for Pierre Bayle (1647-1706) who was offered a professoriate at the University of Franeker. None of these 'great mathematicians' are the focus of this book because it is the world in which they participated that is the subject of study here.

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[46] De Bruycker, 'To the Adornment'.

[47] Hotson, *Commonplace*, 11.

To my knowledge, there have been no attempts to write a cultural history of a chair of mathematics, for any European university in the Early Modern period. In that sense this book follows an unknown path. It looks at what can be called every day practice at an Early Modern university: mathematics as practiced by university professors.

1.2.5. Paper trail

To compose my study I have taken an approach that does not focus on the constructions and calculations the historical figures made. This book will not contain many numbers, diagrams and equations. Instead I have taken a more circumstantial approach, or oblique strategy, by studying the history of the persons and institutions that were involved with math and then studying the histories of those histories. When a publication is well read and often referred to, it starts to become part of the past it describes. I will use the concept of 'a paper trail' throughout this book to refer to that history of history. A paper trail is the total of the written accounts of a historical event, person, institution or artifact. This includes examining all possible references to the sources in which these entities are mentioned that can be traced and studied, but also studying the history of the institutions that housed those sources. It is humanly impossible to study any paper trail of a seventeenth century historical phenomenon completely; this has also never been my objective. My main point of entrance to the past was found by including and understanding these paper trails' own history. The study of the history of the history was not a goal; it was the means to an end.

For this present research, the archive of the University of Franeker has one of the most important collections of 'papers'. It was thus vital to know that this archive was rearranged in 1985 (when the 400-year foundation was celebrated) and in the 1880s (when W.B.S. Boeles (1832-1902) published a history of the university), in the mid eighteenth century (when E.L. Vriemoet (1699-1760) published his history) and in the early eighteenth and late seventeenth centuries (when, at the command of the acting professor of mathematics at Franeker, the archive was inventoried for the first time). It was also important to know that parts of the archive were destroyed, parts had gone missing and parts were scattered.[48] Without this knowledge, the archives would not have given away their secrets or the secrets they had given away could not have been assessed critically. Of course it also means that the

[48] See for example Nienes, *De archieven*, 21-22; Ferenc Postma kindly told me that there is more archival material to be found in personal and public archives and libraries across the world.

archives sometimes give away secrets that are completely untrue.[49] A reference to the archive from the middle of the eighteenth century in theory could thus be traced through time and the actual source could sometimes be found. In practice, these journeys through the various versions of the archive sometimes work splendidly, but just as often they remain inconclusive. Even when that is the case, the historian will always have learned something about the archive, presenting an advantage for the next search.

For something as distant as seventeenth century mathematics, a reconstruction of as many sources as possible is always required. When a particular source that once existed is lost (and this is very often the case), the Dutch historian A. Th. van Deursen (1931-2011) teaches that 'we can try to tap into many sources, all of which will only tell little on their own but together they complement and enrich each other.'[50] This is precisely the road I have taken. There was almost never an unambiguous and single source that could be referenced to understand how mathematics was used and valued in seventeenth century Franeker. The Italian historian Carlo Ginzburg describes a similar method in his famous article 'Clues and the scientific method'. In this, Ginzburg shows how a 'detour' is sometimes necessary to come to an understanding of the past.[51] The Dutch historian Edzo Waterbolk (1915-2000) called a similar approach 'enveloping movements'.[52] It is that detour, that methodological challenge, that Ginzburg and Waterbolk pose that I have chosen to take by studying the history of the historical accounts and making this part of a new study.[53]

[49] An example of this is given by Waterbolk, who brands these mistakes a 'historian's fallacy', under reference to the famous work by D.H. Fischer, *Historian's Fallacies*. Although both Waterbolk and Fischer keep the term a little vague, the idea that a reading of historical sources with either too much, or too little circumstantial information, will always lead to a misinterpretation, seems to be quite convincing. I want to add that I think the knowledge on the actual history of a source helps avoiding fallacies in many occasions. See Waterbolk, 'Werkelijkheid of verbeelding'.

[50] Van Deursen, *Een dorp in de polder*, 8. This, of course, recalls what Peter Dear said about cultural history, see above.

[51] Ginzburg's article was republished in a collection of essays, of which the Dutch title was: *Omweg als methode* (*Detour as a Method*). It is this 'detour' that he describes in the article 'Clues and the Scientific Method'. In that article Ginzburg compares tracing things through history with following threads in a piece of weaving. This piece of weaving could be another description of a paper trail – see Ginzburg, 'Clues', 24.

[52] Waterbolk, *Omtrekkende bewegingen*.

[53] Ginzburg ultimately concludes that 'intuition' is the crucial skill to fully be able to deploy his method, see Ginzburg, 'Clues', 28-29. This 'intuition' was conceptualized by the archivists Elizabeth Yakel and Deborah Torres who branded this 'archival intelligence', see Yakel, 'Archival Intelligence', esp. 54.

1.2.6. Early Modern print

Next to this specific and strict approach to the available sources, there are several themes that reoccur throughout different parts of this book. One of the most prominent of these is a very inquiring stance toward Early Modern print. Almost all authors who published in the seventeenth century and who are discussed here seem to have been at least partially motivated by the desire for social or career advancement. When their printed works are discussed, I have tried to investigate those cultural patterns from which their books sprung. This is, however, not how mathematical texts are generally read. They are often seen as mere reflections of sums, calculations or observations, much like how today publications are seen as representations of research. Historical accounts need to look beyond those sums.

This is especially true for the Early Modern period, when print culture was still a very flexible practice. An author could start having a book printed, even when he had no clue yet on how the book would finish. It would take weeks before that part of the book would have to be ready for press and the author could still rework it. Practices like this show that books from the six- seven- and eighteenth centuries differ very much from later prints, yet this is not often recognized by historians. Today a book represents a form of knowledge, which Bruno Latour may define as an 'immutable mobile'. Questionable as that claim is for present-day print, for Early Modern publications this is even more problematic, as the historian Adrian Johns has shown in a brief exposé of Latour's (and Elizabeth Eisenstein's) paradigmatic discussion of the sixteenth century astronomer Tycho Brahe (1546-1601).[54] In this, Johns accentuates both the historical challenges of achieving textual mobility during the Early Modern period and the inherent instability of texts. Not only were authors – even those that can be ranked among the most authoritative ones of those days – hostage to the availability of a reliable press, distribution channels and patronage, texts themselves were and remain subject to the destabilizing impact of interpretation and use.[55] By tracing the production and subsequent travels of numerous prints from Franeker in the seventeenth century, I take up Johns' historiographical call to re-situate print culture in the concrete specifics of time and space as a corrective means of understanding how knowledge was historically constructed.

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[54] See their discussion in *American Historical Review* 107 (2002): Eisenstein, 'An Unacknowledged Revolution Revisited' and Johns, 'How to Acknowledge a Revolution'; see also Johns, *The Nature*; and Eisenstein, *The Printing Press*; see for a discussion on 'print culture' (which is one of their main striving points) Van Netten, *Koopman in kennis*, 14-19; Joseph Dane argued that there never was a thing like 'print culture', see Dane, *The Myth of Print Culture*, 10.

[55] Adrian Johns, *The Nature*, 6-20.

1.2.7. *Ramus and beyond*

A second point that is discussed throughout large parts of this book concerns one of the most important philosophical foundations of Early Modern education: Ramism. In the sixteenth century the French philosopher and humanist Petrus Ramus (or Pierre de la Ramée; 1515-1572) proposed a thorough modernization of the whole curriculum of education. In short his ideas boiled down to learning more, in less time.[56] He wanted to reform the entire schooling system, from the moment a boy first went to school, until he left university. With this Ramus also proposed a radical break with the classics and with the scholastic tradition, his main enemy being Aristotle (384 BC-322 BC) whose ideas formed the basis of all education and much of philosophy. To achieve these ambitious objectives, Ramus tried to organize knowledge according to new guidelines that were created for each discipline.[57] This called for a complete revolutionizing of how all knowledge was organized. Ultimately this formed a threat to the entire community of humanist scholars at the end of the sixteenth century who defended the old traditions that Ramus wanted to reform. Therefore, Ramism became an object of contempt and subject to attacks of some of the most prominent members of the late sixteenth century Republic of Letters.[58]

Ramus' ideas, however, found their way into most textbooks across Europe. Even peripatetic knowledge, with which Ramus had his greatest difficulties, could not avoid Ramus' influence.[59] This development made Ramism very difficult to detect. It had not become a school of thought; rather it was a broad tradition in which all sorts of educational trends were incorporated and which influenced numerous pedagogical activities across Europe over a long period of time.[60] Because of this adaptive nature, it is also very hard to define. As the Oxford based historian Howard Hotson says, 'defining the essence of Ramism at the outset is an impossible exercise'.[61] Both this character of the tradition, as well as the fact that the leading intellectual world felt threatened by it are some of the most notable reasons why Ramism ultimately became 'one of the most underestimated currents in the history of philosophy'.[62]

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[56] Hotson, *Commonplace*, 39.
[57] Hotson, *Commonplace*, 44-47.
[58] Hotson, *Commonplace*, 51.
[59] Hotson, *Commonplace*, 47.
[60] Hotson, *Commonplace*, 277-279.
[61] Hotson, *Commonplace*, 278.
[62] Van Berkel, *Isaac Beeckman*, 258. Likewise important is that in the 20th century, historians, especially Walter J. Ong who was very involved in writing the history of Ramism, were inclined to minimize its importance. This is discussed by Hotson, *Commonplace*, esp. 3-37. An example of how this was done can be found in a review written by Ong on a translation of one of Ramus' texts in which Ong suddenly lashes out at the

Still Ramism can be traced and studied. For instance, some noble, protestant families in the north-western parts of Europe took a strong interest in this economic refashioning of education. It promised a higher output for the investments they made in educational institutions. Not only would it become cheaper to educate all kinds of officials (ministers, lawyers, land surveyors), Ramism also held the promise that those officials would be better suited for their future jobs. Another important accomplishment was that it did not seem to collide with Calvinist ideals.[63] Over time, numerous historians have argued for the importance of Ramism to the University of Franeker, More recently, however, the Dutch historian Klaas van Berkel has contested this assessment. He sees Ramism primarily as an intellectual trend that was only important in the early stages of academic training at Franeker.[64] However, Hotson showed that Ramism was more than a philosophical system; it was a way to take a fresh look at philosophy and education. To understand what the influence of Ramus was, one thus needs to look beyond those sources and historical actors that refer to Ramus very openly.[65] I will therefore, when appropriate, show how and when Ramism played a part in the teaching of mathematics at the University of Franeker. Not because I am looking at the development of a philosophical system, but because the historical actors I discuss often tend to refer to Ramism.

In the historiography of 'science' in the Netherlands, whenever Ramism is discussed, much like with mathematics, historians want to know what its place in intellectual history is.[66] For this study that question is not very relevant; rather, the place it took at university and how this could help or frustrate Early Modern academics are questions that are of interest for this study. My approach will therefore not result in a whole new understanding of Ramism, but it is still very important

Dutch historian Verdonk (who is *not* the initial subject of the review). See Ong, 'Review: *The Logike*'.

[63] Hotson, *Johann Heinrich Alsted*, 15-24.

[64] Van Berkel, 'Franeker als centrum', argues that the influence of Ramism at Franeker should not be overrated. However, his approach to Ramism is precisely one that Hotson reveals as not the most fruitful one. For example Van Berkel sees the availability of works of 'post-Ramists' like Keckerman as movements against Ramus, where Hotson argues this should be seen as a result of Ramism. See Van Berkel, 'Franeker als centrum', 430-431, comp. Hotson, *Commonplace*, 6-7 and chapt.4.

[65] This is, of course, a very slippery path. What was a reference to Ramus and what not, if this is not clear? It is the historians' job to take such paths, examine what is known of the past and make an assessment of what is studied. I want to stress, however, that it is not my intention to assess the influence of Ramus. Rather, my goal is to understand mathematics.

[66] See for example the Galama, *Het wijsgerig onderwijs* and Verdonk, *Petrus Ramus*. A positive exception is Van Berkel, 'Franeker als centrum', who recognizes the value of Ramism as being important for the everyday education. However, this is precisely what he does not seem to want to investigate.

for this study in general.[67] Ramist ideas may have been as important a point of reference for the seventeenth century academic as Cartesianism. Nevertheless, while the first is overshadowed and hardly mentioned, the former is widely discussed in many histories that focus on the seventeenth century.[68]

The vague and hard to trace nature of Ramism is also a showcase for many other currents in the various stories I will discuss. Of some of them we know that they were discussed among students, accidentally referred to by professors, or that they were secretly read or covertly criticized. It is these processes that I have stumbled upon from time to time. Here it is important to note that Ramism did not stand on its own. There are numerous other 'lost' pedagogies and philosophies, which contributed to many implicit claims, also in mathematics. I will touch upon those from time to time, just as I will refer to Ramism. Not all of them are interlinked and not all of them are as important as Ramism, but they all remind the historian of the importance of persistence when conducting research.

1.3. Franeker in Friesland

1.3.1. Friesland as a province of the Dutch Republic

Franeker is a town in the Dutch province Friesland. It may seem like a marginal place, but it has proven to be an ideal site to analyze the cultural history of mathematics. It is my laboratory where I can conduct the experiment of a cultural history of mathematics.[69] I am not interested in knowing to what extent Franeker followed or influenced 17th century developments in math, science or culture. Such a question would presuppose something like a universal history, of which localities are a part. As recent work in the geography of knowledge has shown, the big narratives like 'Scientific Revolution' and 'Enlightenment' are of a local origin.[70] For Dutch history, Franeker is particularly enlightening, since Dutch history is usually presented as a history of Holland (which is

[67] Ramus is all the more appropriate to serve as an example here because of his love for mathematics. See the outstanding work the Dutch historian Verdonk has done in on Ramus and mathematics, Verdonk, *Petrus Ramus en de wiskunde*.
[68] Van Berkel, *Isaac Beeckman*, 258.
[69] This laboratory-metaphor is a reference to a recent article by Klaas van Berkel, 'The Dutch Republic. Laboratory of the Scientific Revolution'; the metaphor draws on the work of Bruno Latour, although Van Berkel does not refer to him in this article; see also: Van Berkel, *Academisch leven*; Van Berkel's discussion of what he phrases 'Academic life' has been a late, but strong inspiration for my study of Franeker in the seventeenth century.
[70] They should for example be called the *English Scientific Revolution* and the *French Enlightenment*. See Livingstone, *Putting Science in its Place*. Of course such developments became trans-local as soon as ideas 'started to travel', or when people were moving and taking with them those ideas, books, instruments and tacit knowledge.

Prospect of Franeker taken from Daniel Meisner, Sciographia Cosmica *(Neuremberg 1637-1638).*
Private collection.

a province in the west of the Netherlands), ignoring the heterogeneity of the Dutch Republic and the interactions between various (intellectual) centers.[71] The important point here is that my continuous focus on Friesland and Franeker, which will be my anchor throughout this study, shows that there were more places in the Dutch Republic that are important for our understanding of this period than just those in the province of Holland. In a similar fashion, others have pointed out that there was more to the Scientific Revolution than what happened in France and England.

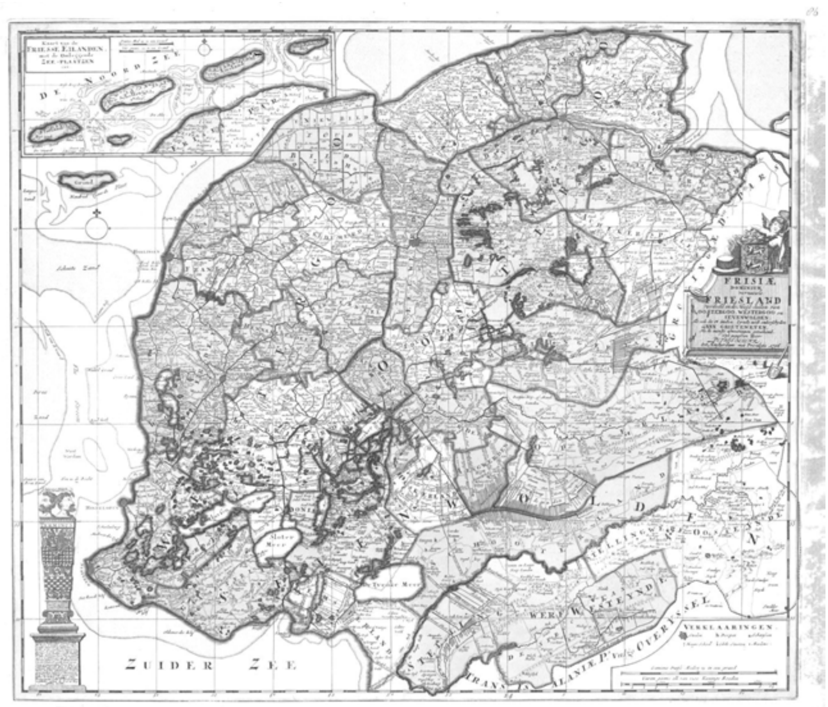
For the historian familiar with the Dutch Republic, it may be clear what is meant with the province of Friesland, but for those unfamiliar with this Republic, an introduction is needed. Friesland was one of the seven Dutch provinces, and with that one of the cornerstones of the Dutch commonwealth. However, when the success story of the Dutch Republic in the seventeenth century is told, the focus is often just on the province of Holland, with perhaps some attention to the provinces of Utrecht and Zeeland. There was, however, more to the Dutch Republic than those three provinces. In fact all provinces were at least formally equal. A focus solely on the centre of Holland blocks out what happened in the other regions, which remained competitive with Holland and were successful in contributing to the grand picture.

[71] Mijnhardt, 'Urbanization, Culture and the Dutch origins', 63-99.

The province of Friesland had a special position in the Republic. From 1584 onward, the year when William The Silent (1533-1584) was murdered, the province would always have a different Stadtholder than the one who represented (or at times did not even represent) the province of Holland. This second Stadtholder of the Netherlands built a second centre of power in the capital of Friesland, Leeuwarden. Next to The Hague, real political influence was distributed from there. A general cultural history, or a political history of the Dutch Republic will therefore at least have to incorporate Friesland. After all the two Stadtholders often worked closely together. In 1585, Friesland founded the Dutch Republic's second university (after Leiden) in Franeker.[72] This would remain the second most important center of learning of the Dutch Republic well into the eighteenth century. A general intellectual history of the Dutch will therefore also need to pay attention to Friesland. This book will contribute to such histories by focusing specifically on the Frisian university.

With the foundation of the University of Franeker, students wanting to study at a Calvinist institution from anywhere in Europe suddenly had another choice of where to go. It broadened the scope of the whole Reformed world, since university was the place where ministers were trained. For the Frisians it may have been a way to challenge Holland's dominance on yet another level. They not only had their own stadtholder and were sovereign in foreign affairs, they also had their own blossoming harbors, and they raised their own taxes, with which they (among other things) paid their own soldiers. All through the seventeenth and a large part of the eighteenth century, Frisian regents and noblemen tried to emphasize their position as a second center of power in the Dutch Republic. In internal affairs Friesland functioned even more strongly as an autonomous field, with its own currency, judicial system and even a language of its own that was spoken by a vast majority of its population.[73] In trying to establish a second centre, Friesland tried harder than the other provinces of the Republic, even though it was not always more successful. The founding of the University of Franeker must be seen in this light. It was the result of a policy of competition with a stronger brother, but also of the striving of local politicians who were trying to build a strong Reformed province.[74]

[72] On the founding of the University of Franeker, see Waterbolk, 'Heeft de hogeschool'; I cite general literature on Franeker below, in paragraph 1.3.3.
[73] This was Frisian, which is not the same vernacular the Franeker professors in mathematics used to address their students, which was an early version of Dutch.
[74] One of the aspects of this Frisian striving is explored in Groenveld, *Nassau uit de schaduw van Oranje.* For an analysis of the position of the Frisian province, see Breuker, *Negen eeuwen*.



Map of the province of Friesland from 1706, by Petrus Schenk, Amsterdam. Tresoar, Leeuwarden.

The Reformation had become an urgent matter in the late sixteenth century, when one by one the Dutch provinces, in opposition to Catholic Spain, chose to support Protestantism. Spanish king Philip II was the rightful ruler of the Low Countries. He was a staunch Catholic and a strict ruler, which incited the Dutch Revolt. From the late 1560s until 1648, the Dutch fought a war against the Spaniards. Especially in the sixteenth century this war affected Friesland directly, but from the turn of the century onwards the actual fighting was done in other parts of the Republic, with the Frisians giving financial and military support. Ultimately, this resulted in the Peace of Munster or Westphalia, which also concluded the Thirty years war.

By that time, the economic wonder of the Dutch Republic had already become visible to the whole world. The seventeenth century was one of prosperity and growth for the Dutch. It is generally regarded as the 'Golden Age' for the provinces,. with Dutch ships dominating the world seas and Dutch trade dominating the European markets. In general terms, Friesland profited from this welfare. Historians of the period have pointed out that this made for an uneasy alliance between enormous economic wealth on the one hand, and Calvinist sobriety on the other.[75] It is likewise important to note that not all inhabitants of Friesland were Calvinists. During the seventeenth century Friesland was a province with about 150.000 residents; there was no constant increase of this number and it fluctuated over time. From the end of the sixteenth, until the middle of the seventeenth century, the percentage of this total population that became either a "lover" (sympathizer) or a member of the protestant Calvinist church grew steadily, until it more or less stabilized at about two thirds of the adult population.[76]

Politically, the province has been characterized as a 'democracy' and a 'farmers republic'. Both assessments are false, but they reflect certain aspects of the actual situation. The power in the province was divided between eleven cities (or towns) and thirty 'grieternijen' (boroughs). In these communities there were about 10.000 'votes' that had a say in political decision-making. These votes were often bound to certain pieces of land. Hence the idea that 'farmers' had a sort of 'democratic' vote. Yet in practice most of this land, and thus most of these votes, ended up in the hands of only a few families. Over time, with more and more power going to these families, it became more and more difficult for outsiders to find a place in a system that was dominated by what I will refer to as Frisian gentry.[77]

The most powerful family in Friesland was beyond doubt the Nassau-family. They are the ancestors of the present day Dutch royal family and were cousins to the family Orange-Nassau, which ruled in Holland. Both branches of the Nassau families intermarried over the course of the seventeenth century, strengthening their mutual bounds, but also assuring that the political power would stay in the family. Like their more famous cousins, the Frisian Nassau's could claim the position of *Stadtholder*, which meant that they were the only ones eligible for the most influential position in the province. In Holland, this caused friction between the Oranges and the regents, which made for two long 'Stadtholderless Periods' (1651-1672 and 1702-1747). In Friesland, this mainly caused the different families to strive against each other for the favour of the Stadtholder. Although this sometimes presented strong challenges to the ruling Nassau family, their position was never under severe threat and there were no significant 'Stadtholderless' periods. However, the Stadtholder was not an absolute ruler, even though over

[75] This has been labelled an *embarrassment of riches* by Simon Schama, and more recently the Dutch historian A. Th. van Deursen called it 'the burden of too much happiness'; Schama, *The Embarrassment*; Van Deursen, *De last van veel geluk*.
[76] Bergsma, *Tussen Gideonsbende*, 96-150; the term 'lover' ('liefhebber') was introduced by Van Deursen, *Bavianen en Slijkgeuzen*, 128.
[77] Very important for my understanding of Friesland in this period is Bergsma's introduction (who also refers to older literature), see Bergsma, *Tussen Gideonsbende*, chapter I. esp. 69-81

time he became more and more successful in permanently linking certain facets of power to his position.[78] An exception to this was perhaps the first stadtholder of the Nassau family Willem Lodewijk (1560-1620), who was very successful at binding those two facets to his position from the start.

Important for this current study is that the families of Nassau and Orange played important roles in the foundation of several universities. The most famous one is beyond doubt that of Leiden (1575), where William the Silent's involvement was vital. Other examples can be found in Herborn (Germany; 1584), Franeker (1585), Harderwijk (Illustrious School; 1600) and numerous other towns in the Netherlands and the German lands. The Nassaus often seem to have had practical goals attached to their involvement. This could include using the universities to spread the protestant faith, to educate good lawyers, or to train fortification engineers, land surveyors and wine gaugers. Therefore, the whole Dutch university system of the seventeenth century was founded on the ideas, concerns and patronage of those two families, closely linking these universities to those in the German lands. In Friesland in particular, the Nassaus kept close ties with the University of Franeker, which resulted in the family having an official role in the university's *curatorium* (from 1653 onwards), and in all of the male heirs of the Nassau family being sent to Franeker for their education in the second half of the century. This meant that, to a certain extent, Franeker was a rival of Leiden, in the same way in which the province of Friesland was a rival of that of Holland.

Politically, the Frisian nobility scaled down to an oligarchy of just a few families over the course of the seventeenth century. Next to the Nassaus, the most influential was beyond doubt the originally German family Vegelin van Claerbergen, which obtained an important and crucial position in Friesland during the seventeenth century. Because of the relatively small size of the province, there were always other noblemen from outside (e.g. non-Frisians) eyeing positions in the provincial government. At times it seemed an easy way to start a political career in the Dutch Republic, but it obviously caused friction, which in turned proved fertile soil for factions to arise.[79] As always, such factions were not clear-cut; individuals could easily move from one camp to the next, crossing what may seem like important boundaries, but doing so without any explanation for their actions.

This was best visible in the body where all political power of the province accumulated: the "Staten van Friesland", or the Frisian States.

[78] Breuker, 'De vestiging'.
[79] See De Vries, *Het familiearchief Van Eysinga-Vegilin van Claerbergen*; new light on this will doubtlessly be shed by the forthcoming dissertation of Hotso Spanninga.

These assembled every spring in Leeuwarden under the guidance of the Stadtholder. The actual assembly met in two different chambers (the boroughs and the cities). Both had a single vote and if they disagreed the Stadtholder could break a tie. During the time this assembly was not in session, which was the largest part of the year, a special counsel of Deputy States looked after the daily affairs. In practice the positions in this counsel were divided among only a few influential families, often members of the Frisian gentry (which existed in absence of a true high aristocracy, with the Nassaus being the only family with an international "noble" reputation).

Since the Middle Ages the province of Friesland has had no less than eleven towns. In the seventeenth century the largest of these was Leeuwarden where some 14.000 people lived. The smallest was the city of Sloten, which held less than 500 citizens.[80] But even when these small towns are regarded as countryside, still about one third of the total Frisian population lived in city like agglomerations. This made Friesland one of the most urbanized areas (together with the province of Holland) of the western world. It resulted in what has been branded a "city culture", where painters, printers and patronage played a vital role.[81]

1.3.2. Franeker

The Frisian 'city culture' was reflected in Franeker, which was the intellectual centre of the province. The town had a community of roughly 3600 citizens during most of the seventeenth century.[82] Economically it had been booming around 1600, but over the course of the seventeenth century the vigor that came with that economic growth slowly faded. At the heart of Franeker's economy were farmers who lived in the surrounding lands and who were primarily specialized in diary products like cheese, butter, and buttermilk. Franeker functioned as a regional centre, the place from which these products were shipped to the nearby port of Harlingen, or other Frisian towns, like the capital Leeuwarden. The university attracted scholars from all over Europe, which gave the town a good number of inns and pubs. Book print and trade was rather new to Franeker at the end of the sixteenth century, as it was to the rest of Friesland, but this proved to become an important part of the town's economy and cultural life.[83]

The town was ruled by a counsel of burgomasters and magistrates, positions that rotated every three years, with several families dominating the available seats. These regents not only controlled the city, but they

[80] Faber, *Drie eeuwen*, II, 415.
[81] Bakker, *De Friese schilderkunst*.
[82] Faber, *Drie eeuwen*, II, 415 and 567.
[83] A century later, book printing had moved from Franeker to Leeuwarden.

Petrus Bast, Prospect of Franeker*, 1598.*
University Library, Leiden.

were also delegated to the Frisian States every spring. A place among them was highly desired, but not easy acquired. Despite the limited opportunities, the system was not completely closed; the Franeker community was too small for that. Nevertheless, it was considered hard to become a member of the regents-class. Over the course of the seventeenth century the university would become an ever more important part of the town, and although the 'citizens' of the university often caused friction and turmoil, Franeker did not want to part with its famous institution.[84] Yet to understand the University of Franeker, the broader perspective of Friesland is ultimately more important than that of the city of Franeker. Not only did the university act with relative autonomy in the city, as a 'state within a state', most university officials had an attitude that transcended the town of Franeker and was focused on the province. Likewise important was that the source of all funding, and the highest authority for the university, was of a Frisian, rather than of a Franeker, nature.

1.3.3. The University of Franeker

The University of Franeker provides the historical scaffolding for my entire story.[85] The university was officially established on July 29 1585,

[84] Jensma, 'Inleiding'.
[85] This entire paragraph resembles the Dutch entry I wrote for the *Nieuwe Encyclopedie van Fryslân* under 'Universiteit te Franeker' to a great extent.
For my understanding of the Early Modern university, I have drawn on many studies. In general terms the first two parts of Otterspeer's history of the University of Leiden have been inspirational, see Otterspeer, *Groepsportet met dame*; important was also Van Miert, *Humanism in an Age of Science*, on the history of the athenaeum in Amsterdam; a more general approach is taken by Frijhoff, *La société néerlandaise et ses gradués*; a European

about a year after the States of Friesland had decided to found a 'Seminary' with the purpose of educating Calvinist church ministers.[86] Friesland had just definitively turned protestant and the university was seen as a way to solve the genuine shortage of preachers. Even before the first lectures were given, the institution grew into a full university due to the ambitions of the Frisian politician E. Reinalda (†1610) and, more importantly, of the Frisian Stadtholder of the day, Willem Lodewijk of Nassau.

Classes would start in the spring of 1586. Housing was found in the empty medieval monastery of the Brothers of the Cross, and the accompanying Mary Chapel. After a short initiation period the financial and political responsibility was in the hands of a board of curators, which was superseded by the Deputy States of Friesland. Like at many Early Modern universities, the official governing body was the Senate, in which all full professors had a seat, one of which acted as *Rector Magnificus*. Every year a new *Rector* was chosen from the corps of professors. The university was a small state within the state of Friesland and the city Franeker. Of this 'state', all academics (students, scholars, professors and university staff) were citizens: the *cives academicus*. Judicially they resided under the *Senatus Judicialis*, which consisted of the *Rector* and one professor of every faculty – in every day practice this *Senatus Judicialis* was the governing body of the university.[87] The academics were exempted from all sorts of taxes and at times allowed to carry weapons in public.[88] Students arrived in Franeker at approximately 16 years of age, after which a full education would take about seven years. Upon graduation, or sometimes shortly afterwards, a *Peregrinatio academia* (an Academic Journey) was often made, if, of course, the financial situation of the individual student allowed for this. These tours would take a student along a range of Reformed centres of learning

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context is offered by Clark, *Academic Charisma*; and also the edited volume by Rüegg and De Ridder-Symoens, *A History of the University* II; see also Gascoigne, 'A Reappraisal of the Role of Universities'; a number of separate studies have been of importance for this study, many of which had the shape of a 'Festschrifte' that commemorated the foundations and anniversaries of institutions all throughout Europe.

86 On the University of Franeker a lot has been written. The most important text is still Boeles, *Frieslands hoogeschool*, a splendid but typical nineteenth century history of the institution. More recent is the edited volume Jensma (red.), *Universiteit te Franeker*; and a special issue of the Frisian journal *It Beaken* under the title 'Betinking 400 jier stifting universiteit yn Frjentsjer.' XLVII (1985), no. 4; still more recently is a special issue of *De Vrije Fries* on the closing of the university in 1811, which appeared in 2012. Much older, but with access to since lost sources are the eighteenth century account of Vriemoet, *Athenarum Frisiacarum*, and the seventeenth century account of Blancardus, *Panegyricus*. The archive of the university now resides at Tresoar in Leeuwarden; an inventory (with introductions) is published as Nienes, *De archieven*.

87 Comp. Nienes, *De archieven*, 11.

88 Although not according to Franeker university laws.

Pieter Feddes van Harlingen, the University of Franeker in 1621, taken from Winsemius, Chronique.
Tresoar, Leeuwarden.

across Europe where he either could take a degree, or celebrate his acquired degree.

The University of Franeker consisted of the four usual faculties: *Artes Liberales*, Divinity, Law and Medicine.[89] The *Artes*, or the faculty of arts, was also dubbed the philosophy faculty and was meant as a propaedeutic phase, which prepared the students for a study in one of the other three 'higher' faculties. It was primarily used as a continuation of the Latin or grammar schools, and the subjects that were taught all had an adjective character. The languages, like Latin, Greek, Hebrew and later French took an important role next to practical philosophy, like Logic and Rhetoric.[90] All education in mathematics also resided under this faculty,

[89] An introduction to the four faculties in their specific Franeker setting is provided by Jensma, 'Inleiding' I. The different faculties are separately discussed in Jensma (eds.), *Universiteit te Franeker*.

[90] Galama, *Het wijsgerig onderwijs*, offers a study that focuses on the 'philosophy' faculty. It is, however, limited strictly to those professors that were 'natural philosophers' and it, thus,

which meant, thus, that this faculty was responsible for educating the *idiotae*.

After two or three years, the academic students could pick a 'higher' faculty. This was not self-evident, but it happened quite frequently. Divinity was the most important faculty. Not just because it had been the primary reason to found the entire institution, but also because theology was seen as the queen of all academic studies. During the seventeenth century, many theologians of international fame read at Franeker. The first strong man at Franeker was, for example, the theologian Sibrandus Lubbertus (c.1555–1625), a staunch protestant and one of the spiritual leaders of the young Dutch Republic at the end of the sixteenth and beginning of the seventeenth centuries. He was succeeded by others who did not necessarily share his convictions. Of those Johannes Maccovius (1588-1644), William Ames (1576-1633), Johannes Coccejus (1603-1669) and Herman Alexander Roëll (1653-1718) stand out. All of these set the agenda of the entire Calvinistic world at a certain point in time.[91] The faculty attracted students from all over Europe, but a particularly strong connection with Hungary and Transylvania was built. The Hungarian students even had their own college in Franeker, the only one to have lasted over a significant period of time.[92]

Over time the faculty of Law would grow and attract more students to Franeker. It also employed some of the best-known legal experts of the Early Modern period. The most notable was Ulrik Huber (1636-1694), who started his Franeker teaching career as a professor in history and eloquence (part of the faculty of arts), but would grow to one of the best known jurists of his day and probably one of the greatest scholars to have taught at Franeker.[93]

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does not discuss the numerous other professors who were housed in this department over the ages.

[91] There is no comprehensive study of the theology department, although its history could warrant one. For the early period, the intellectual biography Van der Woude wrote of Lubbertus offers a good introduction, Van der Woude, *Sibrandus Lubbertus*; several other professors are separately discussed, see for instance Kuyper, *Johannes Maccovius*; Van Sluis, *Herman Alexander Roëll*; Van Asselt, *Johannes Coccejus*.

[92] These Hungarian students have found an important advocate in modern historiography in Ferenc Postma, who researches their case both in the Netherlands and in eastern Europe, see Postma, 'Peregrinatio librorum'; Postma, 'De Hongaren en het onderwijs' (with references to various other works published by Postma); see also Van de Graaf, 'Ontmoeteningen met Zevenburgse en Hongaarse studenten'.

[93] For the faculty of law the work of Feenstra is important, see Feenstra, *Bibliografie van hoogleraren in de rechten*; likewise important is the overview article of Ashmann, 'De juridische faculteit'; likewise important is the edited volume on the history of law and jurisdiction Vries (eds.), *Heeren van den Raede*; on Ulrik Huber in particular a lot has been written, most recently (with an overview of the available literature) Hewett-Hunter, *Ulric Huber*; likewise important is Veen, *Recht en nut*.

The last higher faculty in Franeker, that of medicine, was always the most vulnerable one. Although some scholars of international fame and even the very first *Rector Magnificus* of Franeker, Petreius Tiara (1514-1586), were employed by this faculty, it was always subordinate to the other three. Around 1650 this seemed to change for the better when Johannes Antonides vander Linden (1609-1664) was the strong man in Franeker. Yet, right about when he seemed to have pushed his faculty forward, receiving some generous stipends from the States of Friesland for different purposes, he accepted a post at the University of Leiden.[94] Nevertheless the medics were often important for the practice of mathematics, with two of the most important Franeker mathematicians claiming some form of academic laureate at that faculty.[95]

All teaching was, as a rule, done in Latin, although there were several classes where Dutch was the primary spoken language. Of course the *idiotae* were taught in Dutch, but also in certain practical lessons in preaching and reciting sermons was Dutch used. Outside the actual classes, Dutch seemed to have been the most spoken language, although the university had an outspoken international character. Thus the Senate notes, for example, were written in Dutch and Latin depending on who was present during the meetings and who made the actual notes.

One of the most important forms of academic education was the *lectio* (lecture), which every professor was supposed to give at a certain set moment. These fixed lectures were printed on a schedule, a so-called *Ordo Lectionum*, of which only very few have survived. On these the professors in mathematics were mentioned, as a rule, at the very bottom, which must be seen as an indication of their academic status. Another important form of education was the *disputation*, where students defended certain theses against opposition from their fellow students under the guidance of a professor. In practice these professors had often written the thesis and often even the defense. An important distinction can be made between disputations that were defended as a practice exercise (*excercitia gratii*) and those that were defended to obtain a degree (*pro gradu*). Next to this it was also possible to obtain a degree without any thesis (*remissa disputatione*), although the rules changed on this from time to time. From the start of the university it was possible to obtain a baccalaureate in arts, and from early in the seventeenth century onward, a *Liberalium Artium Magister* (L.A.M.) also became a possibility.

[94] The best introduction to the medical faculty is given by Napjus and Lindeboom, *De hoogleraren in de geneeskunde*.

[95] These two were Adriaan Metius and Johannes Phocylides Holwarda, see below for more details.

Ever since the 1650s the Franeker students could take a doctorate in philosophy.[96]

Right about the time the doctorate in philosophy was introduced, the high demand for new ministers had dried up, with supply and demand reaching an equilibrium. The university, however, entered it most impressive blossoming period from about 1650 until the end of the century; student numbers climbed rapidly and consequently some important professors were attracted to Franeker. In the course of the eighteenth century student numbers would move in the opposite direction and although there were several rebounds, Franeker would never reach the same height it had in the second half of the seventeenth century. During the peak years, more than 100 new students would matriculate every year and 14 or 15 professors were employed.[97]

The Franeker professor would earn a salary between 600 guilders at the end of the sixteenth century and 1.100 guilders at the end of the seventeenth century. This was about one and a half times the sum a church minister could earn, but less than what a highly paid judge or a well-known politician could make. It was also not the entire income for a professor, who could boost his salary with fees from classes he taught at his house, from *privatissima* (classes for which students had to be invited), from lodging students, sales of books and investing his money (which seems to have been a good practice among Franeker professors).

Franeker had a good library, where the emphasis was on collecting large folio volumes. The students and professors, on the other hand, likely bought cheaper (smaller) works for themselves. From the outset an academic printer, who would print most of the works published by the academics (although there was no strict rule about this), was housed in Franeker. The academics could turn to other publishers and other printers if they wished (initially, however, several different publishers used the same press in Franeker). The academic publishing house also printed work for non-academics and even acted as the formal publishing house for the States of Friesland from time to time.

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[96] Invaluable for the study of the University of Franeker is the *Auditorium*, which lists all publications related to the education practices of the university that can be found in hundreds of libraries across the world. The Herculean work was done by Jacob van Sluis and Ferenc Postma. They in turn could rely on work done by C. van der Woude and J.J. Kalma before them. In the near future, Postma hopes to publish a supplement with newly found prints, he has kindly granted me access to the preliminary results of his ongoing chase for *Franekeriana*.

[97] An *Album Studiosorum*, which lists all matriculations of the University of Franeker, has been published by Fockema Andreae and Meijer, see *ASF*. The latter also published an *Album Promotorum*, but this is very imprecise, see *APrF*. In addition to these works, Postma and Van Sluis published an updated version of the matriculations in the back of their *Auditorium*; that last book also contains a separate list with *disputationes pro gradu*, which is a welcome addition to the *APrF*.

Universitylibrary of Franeker in 1713. Taken from Catalogus Bibliothecae *(Franeker 1713).*
Royal Library, The Hague.

The teaching of mathematics holds a specific place at Franeker. On the one hand, after 1598 mathematics was taught almost without interruption, which could indicate the importance of the field. However, in academic society mathematics did not take the most prominent spot. Academics saw it as a prerequisite, or a necessary evil for the study of arts. This is possibly why it took fifteen years before a chair in mathematics was granted to Franeker. It is clear that Willem Lodewijk was personally involved in the establishment of this chair, in the same way in which his cousin, Maurits, was in Leiden and his father had been in Herborn with the respective chairs there. Practical mathematics was a sort of family project.[98] In Franeker, this led to the establishment of a permanent post that was initially taken by Adriaan Metius (1571-1635; professor from 1598-1635). Students were allowed to follow classes with the professor of mathematics, even if they did not master Latin. From 1632 on, official diplomas for land surveying were issued, with which the education of the *idiotae* was officially institutionalized. In the seventeenth century Metius was succeeded by Bernhardus Fullenius senior (1602-1657; professor from 1636-1657), Abraham de Grau (1632-1683; professor from 1659-1683) and Bernhardus Fullenius junior (1640-1707; professor from 1684-1707). Johannes Phocylides Holwarda (1618-161), who consecutively held a post as professor of Logic and of Philosophy, was also important for mathematics at the University of Franeker. In the second half of the century, mathematicians occasionally

[98] Wemheuer and Dijkstra, 'Mathematik'.

took other degrees, such as the L.A.M., for which they (even more sporadically) defended actual mathematical theses.

As part of a larger European process in which many smaller universities were closed, the University of Franeker was abolished in 1811. It would shortly reopen in 1816 as an Athenaeum, which in turn was closed in 1843 because it hardly ever attracted enough students.[99]

1.4. Mathematics at the University of Franeker

1.4.1. The practice of the history of mathematics in Friesland

This current study draws from many histories of mathematics in general, but also from several detailed studies, which focus more in particular on mathematics in Friesland. This is because there has been a long tradition of historians claiming to see an important tradition in this field, specifically in Friesland. The starting point for this claim was the very last professor in mathematics at the University of Franeker. This was Cornelis Ekama (1773-1824), who acquired his post in 1809, two years before the university would close its doors.[100] For his inaugural lecture he offered an overview of all known mathematicians in Friesland. Being a Frisian himself, he pointed at the traditions both in- and outside the university; he listed both academics and ordinary Frisians. The title of his *oratio* is telling in this respect: "Oration on the good predisposition of the Frisian for the practice of mathematics".[101] Ekama had good reason to do so: the university was under treath of closure and the ultimate way out seemed to be to modernise the sciences and emphasize the university's great tradition.[102] The possibilities of his field seemed a good thing to stress. With the Frisians being exceptionally capable of mathematics, as Ekama presented it, that field was once again the way forward.

While the lecture did not save Franeker from closure, it did start the tradition of discussing mathematics as something typically Frisian.[103] Today Ekama's rationale seems a typical nineteenth century explanation of the past, but it is too easy to dismiss his ideas solely because of this. His story touched some very old roots. An old saying, of unknown origin

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[99] On the closing of the university see the above mentioned special issue of *De Vrije Fries* (2012). Boeles discusses its successor, the Franeker Atheneaum (1816-1843), see Boeles, I; a recent master thesis sheds some new light on that institution, see Van Aken, 'De laatste jaren'.

[100] Professor from 1809-1811; see Boeles, II.2, 723-726; Zuidervaart, 'De omzwervingen'; and Zuidervaart, 'De Friese boerenprofessor'.

[101] Ekama, *Oratio de Frisia ingeniorum mathematicorum inprimis fertili*.

[102] Breuker, *Friese cultuur*.

[103] Ekama was the first to explicitly combine a sort of 'national character' with mathematics, but others before him already pointed at the remarkable amount and/or accomplishments of mathematicians in Friesland. See for example Van Swinden, *Beschrijving*, 46-47.

says 'Frisia non cantat, rationcinatur', 'Friesland does not sing, it reasons'. When Ekama wrote his *oratio*, he no doubt sought to make a connection with this old phrase.

Today, any historian would conclude that the Frisians did not necessarily produce the best mathematicians, nor that there are considerably more reasoning philosophers among them than there were among any other people in Western-Europe. What is important to take from this is that since Ekama, the Frisians have believed themselves to possess a gift for mathematics, and consequently they have dedicated themselves to the study of the history of mathematics. Mathematics became a Frisian tradition, one that often started with Gemma Frisius (1508-1555) and ended somewhere in the nineteenth century. That tradition not only produced several histories of mathematics, it also offers wonderful clues and has opened up many collections of sources. It is the results of that research that are the building stones for my own cultural history of mathematics. Ekama's *oratio* shaped the way in which mathematics in Friesland would be discussed. He started a trend that proved very fruitful and with that he influenced all future views on the sources he used and the subject he discussed.

For his *oratio*, Ekama drew on one important source concerning the history of mathematicians *at* the university: a mid eighteenth century history of the university by the Franeker professor Vriemoet.[104] That history would remain the most important source on the past of Franeker for most of the nineteenth century, and even today it offers details that can be found nowhere else.[105] For the history of mathematics *outside* the university, Ekama drew on published books and maps, most of which were published by people who were closely connected to the university. Ekama not only told the story of how interwoven the Frisian mathematicians were with the University of Franeker, his use of historical sources also showed this.

In the course of the nineteenth century several others tried to complement the list Ekama had published. Most notable was the addition the archivist and historian Wopke Eekhoff (1809-1880) made when the athenaeum (the institution that succeeded the university) was also closed in the 1840s.[106] Another three decades later, the chairman of the main provincial society Jacob Dirks (1811-1894) spoke about Frisian mathematics at the opening of the 'Great Historical Exhibition of Friesland', an exhibition that was to become a benchmark for Frisianness. Dirks described mathematics as such:

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[104] Vriemoet, *Athenarum Frisiacarum*.

[105] Vriemoet had access to sources lost today; I thank Martin Engels for pointing this out to me.

[106] See for example Eekhoff, *Beknopte geschiedenis*, 397-399; see also Eekhoff, 'Het leven van Eise Eisinga'; see also http://home.wanadoo.nl/mpaginae/ (retrieved 10-12-2011)

> 'The Frisians have always been famous for their love of practicing the so-called exact sciences, geometry, mathematics, arithmetic, astronomy and all related subjects, and for the making of a planetarium, sundials, spyglasses, telescopes, timepieces, watches etc. Able practitioners of these subjects were very productive, making pendulums, table works, watches, telescopes, geometrical manuscripts, almanacs etc. etc., a good number of which are present. And even though they are not exhibited in the best way, they still attract the attention of many, which shows that the interest in these subjects has not faded. May our Exhibition also have worked for the best in that respect! We do not doubt it does.' [107]

According to Dirks, the old Frisian preference for mathematics was fading (mathematics had not gotten a very prominent place at the exhibition, for example), and he was trying to revive it. This sums up how the history of mathematics in Friesland was regarded in the nineteenth century; everybody wanted it to be important, but there was not enough space to grant it an important place.

Despite the neglect of mathematics at that Exhibition, an important place was given to the remnants of the University of Franeker. Most of the professors' portraits were shown, and some books were on display, as were a few of the institution's instruments. W.B.S. Boeles, closely involved in organizing the exhibition, was writing his history of the University of Franeker at the time and he undoubtedly had a say in this. His effort to write a complete history of Franeker was a very successful one. In fact, it was so well done that even today his book is the standard beginning point for any study of the history of the University of Franeker. But Boeles, who was not a born Frisian, did not stress the Frisianness of the university, as his contemporaries may have wanted him to do. Instead he presented it as a Dutch institution.[108]

This set the scene for regarding the University of Franeker and its practices as something that was not quite Frisian, something that

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[107] 'De Friezen zijn immer bekend geweest door hunne liefde voor de beoefening der zoogenaamde exacte wetenschappen, meet- en wiskunde, reken- en sterrekunde en daarmede verwante vakken, en door het maken van een planetarium, zonnewijzers, verrekijkers, teleskopen, uurwerken, horloges enz. Talrijke voortbrengsels der kundige beoefenaars dier vakken, pendules, tafel werken, horloges, teleskopen, meetkunstige en daarmede verwante H.S.S., almanakken enz. enz. zijn aanwezig, en al had men voor deze voorwerpen geene gunstige gelegenheid ter expositie kunnen vinden, toch trekken zij de aandacht van velen en doen zien, dat de belangstelling in deze zaken niet verflauwd is. Moge onze Tentoonstelling ook daarin ten goede hebben gewerkt! Wij twijfelen er niet aan.' Dirks, *De historische tentoonstelling*.

[108] Boeles, I and II; See also Bergsma, 'Under professoaren'.

The 'Franeker Senate room' at the Great Historical Exhibition of Friesland (1877). *Tresoar Leeuwarden.*

irritated intellectual Friesland. One of the intellectual leaders exclaimed (1922): 'There was an academy for Friesland in Franeker, yet Friesland was not there!'[109] At the same time, mathematics was still seen as something typically Frisian, or as another historian put it (1926): 'Friesland has always been a land of teachers of arithmetic and mathematicians [...].'[110] From the 1930s onward this discrepancy was partly solved by H.K. Schippers (1893-1971), who published several articles on Franeker mathematicians and presented a well-listened to radio show between the 1930s and 1960s.[111] In these shows, his main argument was that the University of Franeker had produced some important mathematicians and that this was something the Frisians could take pride in. Schippers thus found a way to reconcile the two

[109] Kalma, *LC*, 11-02-1922, fol.4 c.1. 'Der wier in akadeemje for Fryslân to Frentsjer, en Fryslàn wier dèr net!'

[110] Wumkes, *Bodders*, 222. Wumkes is without a doubt one of the most important voices to propagate this special 'predisposition' of the Frisians for mathematics.

[111] Schippers, *Hofkesjonge by tûke tinkers*; Schippers, 'Fuotprinten'; and Schippers, 'Johannes Phocylides Holwarda'; the personal papers of Schippers today reside at Tresoar in Leeuwarden in the archives former FLMD (Frysk Letterkundich Museum en Dokumintaasjesintrum), I have consulted them frequently, also because they hold unpublished research of Schippers. See below, especially chapter 6.

traditions of [1] discussing the importance of the University of Franeker and [2] showing how capable the Frisians were at mathematics.

In the course of the 20th century, this way of looking at history was losing its appeal quickly. Sybrand Galama (1912-1975) published a very thorough study of the Franeker philosophy faculty, but he only had eye for 'natural philosophy'. Mathematics and astronomy were explicitly omitted by him, although he still stressed the down to earth nature of the Frisians.[112] The first to really overcome these Frisian nationalist tendencies in writing history after Boeles was Klaas van Berkel, who in the 1980s published an overview of mathematics at Franeker in the seventeenth century. Instead of contemplating the Frisian setting in which mathematics was practiced at Franeker, he compared the mathematics at Franeker with that of other Dutch academic institutions.[113] While historians had been attempting to establish the existence of Frisian mathematics, by the end of the 20th century it had become part of the ordinary academic world again.

Van Berkel's article has proven to be a point of reference for this entire dissertation. It was a valuable starting point, but it also needs some correction and clarification. This has to do with the fact that Van Berkel did not look beyond what was discussed by the professors of mathematics. He did not look at mathematics from a broad cultural perspective. Instead, he keeps a strict focus on what he considers to be part of mathematics.

This led for example to one of Van Berkel's main conclusions, which is that mathematics at Franeker and in the Republic in general did not slowly develop toward a practical application, as was perhaps suggested by the previous accounts, but instead was characterized by an *aristocratization*; mathematics became a thing for the aristocracy, practised outside university.[114] True as that may be, after all the most famous Dutch mathematician of the day Christiaan Huygens was not an academic, this conclusion omitted two important developments of the second half of the seventeenth century. On the one hand, the aristocrats came to university to study practical mathematics (in Dutch!), which could help their careers in the army. On the other hand, a group of laymen mathematicians materialized that tried to valorize mathematics and in the process caught the attention of the several Dutch governments. Such mathematicians had been around since the end of

[112] Galama, *Het wijsgerig onderwijs*, 16
[113] Van Berkel, 'Het onderwijs in de wiskunde'.
[114] Van Berkel, 'Het onderwijs in de wiskunde', 227-228; Other have pointed out that the education of mathematics (especially at universities) in the Dutch Republic declined dramatically during the second half of the seventeenth century. That is a claim I will contest, see for instance Van Bunge, *From Stevin*, 60-61 (who refers to Van Berkel, Vanpaemel and Van Maanen).

the sixteenth century, but in the course of the seventeenth their clashes with members of academia became more severe. This group also had a few well-known representatives in Friesland. Some of them had been closely connected to the university; others, however, reached academia only when they collided with its citizens. I will show that this group can be understood as forming a process of emancipation of the *idiotae*. During the seventeenth century some of them were growing independent of the university. At the same time they became competition for the professors in Franeker. The ultimate answer to this growing problem for the professors was an institutionalized spot for them in Franeker. That spot materialized when Willem Loré (1679-1744) was given a chair in mathematics that was strictly Dutch-language. With this two birds were killed with one stone: [1] the education of the *idiotae* was formalized, their emancipation broken off and [2] at the same time it made academia attractive to the aristocracy, who could send their less talented, Latin illiterate children to university.

This type of aristocratization is completely different from the one Van Berkel had referred to. He talked about modern mathematics developed by the likes of Descartes and later Leibniz (1646-1717), Huygens and Newton (1642-1727). This was a form that, according to Van Berkel, was pursued by the Dutch regents, and found no place at the more common universities. I will contest those claims to a certain extent, but it will also point to something even more important. I argue that to understand the development of mathematics at Franeker, it is important to actually look at what was going on there. The phenomenon cannot be understood by just looking at the professors in mathematics and what they talked about during their lectures. To really understand what mathematics at Franeker was, a very narrow scope (=Franeker) needs to be used with a very open mind. This approach will show that there is still much to learn about mathematics at the University of Franeker.

1.5. Mathematica peregrinans

The understanding of this broken off process of emancipation of the *idiotae* will ultimately provide an answer to the question of how mathematics was used in seventeenth century Friesland. There is, however, not just one answer, and likewise the process is not a simple journey from a to b. In fact, the journey of mathematics at Franeker is quite familiar and is filled with the bumps that are encountered during any period of unprecedented growth. It can be illustrated by a typical academic career in the Early Modern period. A young student would enter university. If his parents were rich they may pay for his studies; if they were not he needed to acquire some form of scholarship. He could find a stipend from his local government, or perhaps have a rich patron who looked after him. At university he would be responsible for his studies, but would also be involved in all sorts of academic traditions and possibly even in some mischief. He would defend a thesis, which would probably not have been very ground breaking, but more a sign of his capabilities. He would follow different classes and attend academic feasts. At the end of his student days, he would be able to conclude his education with a journey to centres of learning throughout Europe – a *peregrinatio academica*. After he took a degree of some sorts, a second phase would begin. Armed with his degree, the student could start out as a young academic, perhaps publishing a book or tutoring students. To be safe he would also try to obtain a position in society, as a minister if he majored in divinity, as a lawyer if that was his main pursuit or otherwise as a medical doctor. If he proved to be talented enough, he ultimately might have entered a third phase, which would bring him back to academia as a professor. This would have made him eligible for the academic senate, and would have given him prestige, but would have also meant that he would have to deal with the many problems a professor would face sooner or later. He would have to deal with attacks not only from people outside the university, but from his own colleagues as well. These struggles, however, would have proven that he had established himself as a scholar and as a teacher. It was just such a journey that mathematics would take at Franeker.

What is essential for this metaphor is that the student's education and his consecutive career were not simply forced on him. It was a process of negotiation and exchange. His teachers would have learned from him while they were teaching. His thesis would have perhaps influenced other academics, much like how he influenced his pupils as a tutor. Ultimately, as a professor he would have shaped academia. The student received, but also gave back.

With mathematics in Friesland much the same happened; it was shaped by its presence in Franeker, but it also shaped the university. In this book the first phase runs from the late sixteenth century until the 1630s, when mathematics literally came to the university. When Franeker was founded, there had not been a place reserved for a professor of mathematics, but by 1600 a full professor had been appointed. The main character in this part is Adriaan Metius, the person who took up that first full professoriate. He was an internationally acclaimed mathematician and he solidified mathematics' position at the University of Franeker. In chapter 2 I will discuss how his chair was established. In the chapters 3 and 4 I will focus both on his book production and on his involvement in the development of instruments. Both processes are reviewed in light of the circle surrounding Metius, consisting of his family, his students and his friends. Where did they play a part? How did they use his books? Were they involved in the production of his instruments? The main question for this part is, how did mathematics find its way at the university? The answer is that it did so by proving its usefulness time and time again.

The second part of this book starts shortly after Metius' death. It was immediately clear that a new professor of mathematics would be appointed (which was not self-evident at other universities), but no one knew who would take this role. In chapter 5 I will discuss how the field was further institutionalized by this new professor: Bernhardus Fullenius senior. But Fullenius' time as a professor also created a sort of void during which the most important mathematician at the University of Franeker was *not* the professor of mathematics but a natural philosopher: Johannes Phocylides Holwarda. He was a young and ambitious former Franeker student using different mathematical practices and aiming for a professor's robe. He would gain that robe, first as a professor of Logic after which an appointment as professor in philosophy followed. In chapter 6 I will show how this opened the eyes of several other mathematicians, some of whom were successful, who would also deploy various tactics in order to obtain a spot in Franeker. In chapter 7 I discuss how Holwarda as an academic was received outside the university. By focusing on several different aspects of his published work, I will give a *Wirkungsgeschichte* of his most important books and prints.

The last part revolves around the last two seventeenth century professors of mathematics in Franeker. In chapter 9 I show that how Abraham de Grau, the successor of Fullenius senior, modernized the teaching of the *idiotae*. At the same time he also tried to claim a part of the field of natural philosophy for his other teachings in mathematics. That was a 'Holwardarian' point, and it resulted in some remarkable contributions to an international debate on the nature of comets, not just by De Grau, but also by other mathematicians who were active in Franeker and Friesland at the same time. One of those was Bernhardus Fullenius junior. He is already discussed in chapter 9, and I will examine him more thoroughly in chapter 10. His father had occupied the chair in mathematics, but Bernhardus junior obtained a spot in the city magistrate. This was considered a splendid public career. Yet after De Grau died, Fullenius junior went back to the university to become a professor of mathematics. His move offers a great opportunity to understand what mathematics had turned into. From his time as professor, numerous sources have survived, which I will also review in chapter 10. This will give insight into how mathematics was practiced and valued at the very end of the seventeenth century. In chapter 11 I will discuss one case in more detail. This is the case in which this youngest Fullenius clashed with a layman mathematician. It resulted into the most vehement public attack by somebody from outside academia any

Franeker professor of mathematics had to endure. The professor defended his ground with vigor, and in doing so he showed how much his field had grown.

Matthias Gloskowski, Geometria Peregrinans*, (1648). Taken from http://www.fransvanschooten.nl.*

I

Mathematics Goes to University: Adriaan Metius (ca. 1590 - 1635)


ADRIANVS METIVS MATHES:PR

« *Unknown artist,* Adriaan Metius (1571-1635).
Museum Martena, Franeker.

PIBO GUALTHERI WAS one of the very first students in mathematics at Franeker (ca.1580 – ca.1639).[1] In 1613 he published a small treatise in which he presented, among many other things, an apology for mathematics. He dedicated this pamphlet to his old professor in Franeker, Adriaan Metius, and in it Gualtheri talked about how the Dutch government protected and promoted mathematics, much as ancient governments had wisely done. This was only logical, since the results of mathematics were widely applicable, he argued. Under explicit reference to Petrus Ramus, Gualtheri pointed out that the government had an important role in this. He went as far as to present arithmetic and geometry (which formed, he felt, the core of mathematics) as the two wet nurses of the entire Dutch Republic:

> 'Is the Government not obliged to protect these wonderful wet nurses [...] in universities and everywhere, against all envy and forgery? So that through these, to the common good and honour, smart minds are enlightened and able to practice, so they can increase from these, to everyman's gain.'[2]

This quote is telling in two respects. Firstly, Gualtheri makes connections between several of the early seventeenth century's developing ideas on mathematics. At this time many became aware of mathematics' great potential, but not everyone was easily won over.[3] In Franeker mathematics was therefore one of the last of the academic subjects to get its own professor. That such a professor was not present from the start is an indication of the academic contempt in which it was sometimes held. The fact that the chair was instituted after originally

[1] I could only find one source that unambiguously links Gualtheri with Metius. This is the pamphlet cited in the following footnotes. However, I know of no references to this pamphlet in the literature. Oddly enough several authors have already concluded that Gualtheri was a student of Metius, which is viable, but without substantive proof. Most, however, have made this connection with some caution. Recently Bakker concluded without reservations that Gualtheri studied with Metius, see Bakker, *Friese schilderkunst*, 132.

[2] Gualtheri, *Antwoort*, fol. A2 verso: 'Is d'Overheydt niet bevolen dese heerlijcke Voetsteren [...] in hoghe Scholen, ende alomme van alle nydicheyt ende verfalschinghe te hanthaven? op dat deur sulcx, tot welvaert ende eere van t'gemeene beste, deurluchtighe verstanden [...] tot meerdere lust onsteecken zijnde, hun tot voortplantinghe vandien, s'naestens profijt, hoe langer, so oeffenen mochten.'

[3] Dijksterhuis, 'Fit to Measure'.

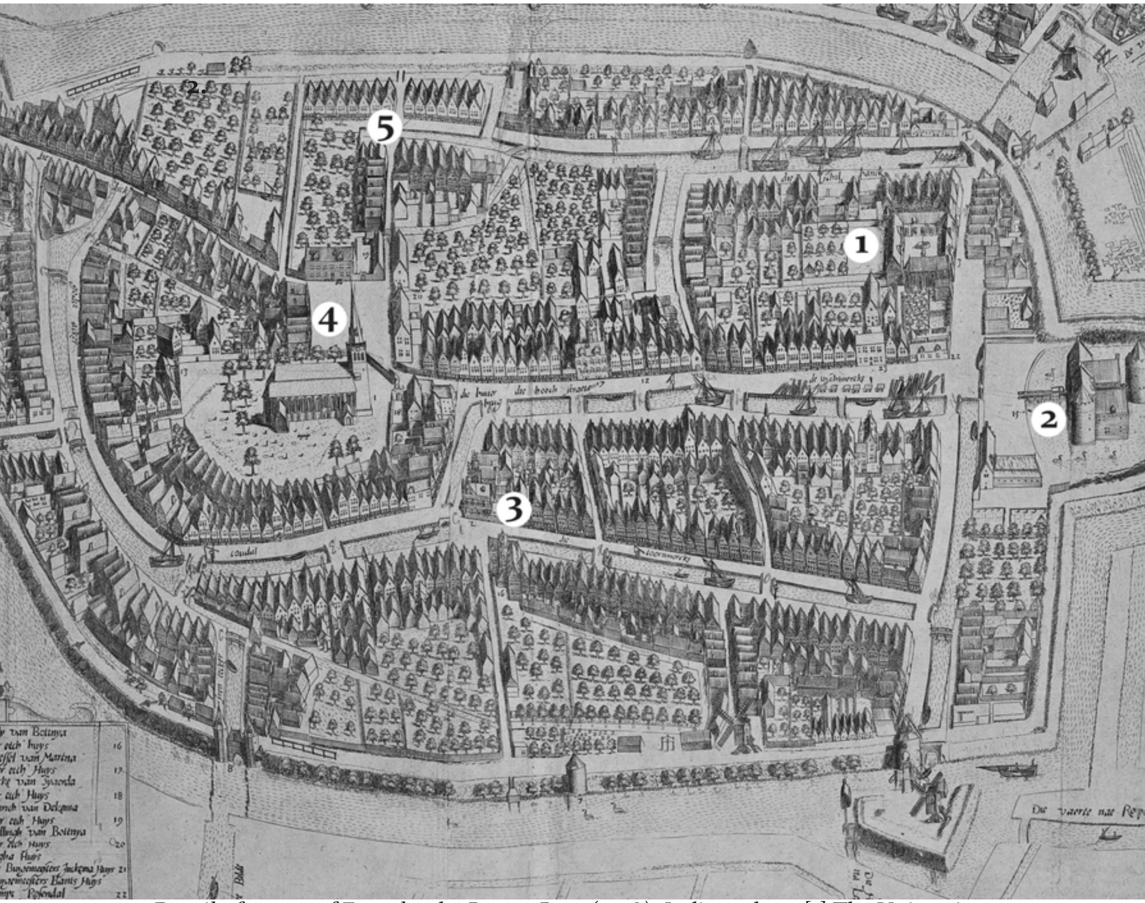
being excluded was a sign that mathematics was growing up at the young Frisian university. This is a process that Gualtheri seems to be referring to; by demonstrating mathematics' practicability, it would be possible for the subject to make advances.[4] The downside of this was that it made mathematicians vulnerable to 'envy' and that mathematicians should fear 'forgery'. The second point on which Gualtheri's quote is revealing is that he explicitly revealed the place where mathematics could flourish: under guidance of the government and at the university. The man to whom Gualtheri dedicated his pamphlet seems to have fit these two points perfectly. Metius was professor at a university where he acted under protection of the Frisian Stadtholder and where his writings were widely considered to be put to good use.

Gualtheri's line of argument was thus a reference to a practice already in place. Mathematics had gone to university because it was protected by the government. After it had been instituted there, the Frisian government occasionally lent its support to mathematics, but the field was also taking its first steps on the track of its academic career. The story behind this will be the starting point of this thesis: when did mathematics come to the University of Franeker and how did it settle there? This did not happen without a struggle, but the result was magnificent. Of all Dutch universities, the one in Franeker would develop one of the strongest traditions in teaching mathematics over the whole of the seventeenth century. How it developed during those first decades at Franeker is the focal point of this first part.

The following chapter centres on how a chair of a professor of mathematics was established in Franeker. While factionalism at the university initially seemed to threaten the chair, it ultimately helped the professor of mathematics, which was granted to Adriaan Metius, a former Franeker student. The third and fourth chapter of this book discuss how math could flourish in its early academic stages. For this Adriaan Metius takes a central spot in the story. In these chapters I will focus both on his books and on his instruments. Firstly I will show how Metius' name gained importance as a locally famous scholar. Then I will discuss how he used his books in his specific Franeker academic setting. It is the story of how Metius built a name for himself as an educator. The fourth chapter shows how Metius used instruments to valorise his rising

[4] Klaas van Berkel suggests that it was precisely this practicability that made Franeker interesting for the establishment of such a chair. He also suggests that it was Willem Lodewijk who pushed for the establishment of the chair, see Van Berkel, 'Het onderwijs', 221; see also Waterbolk, 'Met Willem Lodewijk', esp. 307-308; and Van de Heuvel, *De Huysbou*, 22 esp. footnote 52. I have given a more thorough analyses of the circumstances under which the Nassaus patronized several universities and illustre schools together with Wiebke Wemheuer in our article 'Mathematiek als Bindeglied'.

fame as an author. He invented, used and built these instruments for the benefit of his international reputation. A special place in this story is taken by the telescope, the invention of which was claimed by Metius' brother. The story of how that instrument was used and referred to by Adriaan Metius tells the story of both mathematics at the university and mathematics' practicality under government guidance.



Detail of a map of Franeker by Petrus Bast (1598). Indicated are [1] The University Buildings; [2] The Sternsee Castle; [3] City Hall; [4] The Martini Church; [5] The Nieue Hof, where many professor bought houses.
University Library, Groningen.

2. The Identity of a Mathematician, from Roggius to Metius

2.1. *Introduction*

AROUND THE TIME that the University of Franeker was founded in 1585, there were only a few dozen people in all of Europe who devoted a significant amount of their time to the pursuit and publication of mathematics, and perhaps only a handful in Friesland.[1] Yet the number of Europeans who came into contact with the field was much larger. Likewise several residents of Friesland were schooled in subjects like arithmetic, astronomy or fortification, even before the existence in Franeker of any academics who were officially considered *mathematicians*. Over the following decades this would rapidly change. By the end of the sixteenth century the chair of the professor of mathematics in Franeker was instituted, giving room for the first full time mathematician of the province. After this position was taken by Metius it would remain instituted and occupied for over two centuries. The Franeker students would prove to be entrepreneurial, finding several different ways to practice mathematics outside of the university. The handful of people that actively pursued mathematics continued to grow every year since the founding of the chair of mathematics, until eventually the Frisians took pride in the vast amount of mathematicians that came from their province. Far from being a rigid and static function, what was asked of the first professor in mathematics around 1600 differed very much from what was asked of his successor a century later, meaning that the professorship evolved as the program progressed. To fully understand what changed over the course of the seventeenth century it is necessary to trace precisely how and why the chair materialized. This did not happen over night and it did not happen without a whole set of problems.

This first chapter will focus on the question of why Adriaan Metius was a good candidate to become the first ordinary professor of mathematics in Franeker. This was partly because the appointment of

[1] Beside Metius, the names of Johannes Sems, Sybrandt Hansz Cardinael, Nicolaas Mulerius and Johannes Velsius are important. See for the first Westra, 'Johan Sems'; for the second Sitters, *Sybrandt Hansz Cardinael*; the third Van Netten, *Nicolaus Mulerius*; and for Velsius a good study is lacking, he is not even mentioned by H. Terpstra in *Friesche sterrekonst*.

his predecessor, the first professor of mathematics extraordinaire Johannes Roggius (†1618), was surrounded by problems and disaster. On the debris Roggius left behind, Metius emerged as the perfect candidate to fill his boots; he seemed a schooled mathematician and *not* a another scheming academic who saw the chair of mathematics as a stepping stone to an academic career. This was due to the fact that Metius had been able to acquire the identity of a useful teacher of functional knowledge, despite that teaching mathematics could be as problematic as teaching divinity, as the problems of his predecessor had shown. Metius exploited this reputation during his Franeker career and used it to give his Franeker professoriate a blistering start. In so doing, Metius had built a reputation that was quite the opposite from the one his predecessor had succumbed to.[2]

To show how this took place I will unearth the foundations on which the Franeker chair of mathematics was built. For this I will first examine the scarce evidence of the subject being taught before a professor was ever appointed. After this I will elaborate on why the appointment of the first professor was such a particular one and why it likewise failed miserably. Then I will get to the core of this chapter, which is the career of Adriaan Metius up to the moment he started lecturing in Franeker. I will take some small steps back in time, which reveal that Metius had carefully constructed the self-image of a mathematician, and a proper mathematician was precisely what Franeker was looking for after Roggius was forced out. At the beginning of the seventeenth century Metius seemed to be a careful academic who knew what it was to be walking on eggshells. While the first mathematician at Franeker was the centre of controversy, the second was building his future career in the German lands.

2.2. The university without a professor of mathematics

2.2.1. Petreius Tiara and Johannes Drusius

One of the appealing features of a university in the Early Modern period was the academic freedom it provided. Although this should not be confused with modern day ideas of total intellectual freedom, the concept was nevertheless crucial in Early Modern times. The citizens of a university were 'free' from all sorts of taxes and likewise had more freedom to argue over all sorts of intellectual differences. However,

[2] There has been a lot written on shelf fashioning over de past decades. I have drawn primarily from the work of Stephen Greenblatt as an example how to understand the concept, see Greenblatt, *Renaissance Self-Fashioning*. For the history of mathematics the seminal text is Biagioli, *Galileo Courtier*, likewise important has been the work of Steven Shapin, especially his 'A Scholar and a Gentleman'.

when the University of Franeker was founded these academic freedoms were not the only appealing feature. Together with the actual university a whole range of academic institutions was founded. For example, the States of Friesland financed a communal table ('de Burse'), an academic press. Money was also set aside for a university library, which soon started the acquisition of books.[3] Franeker was rapidly becoming a centre of academic activity, in a good Calvinist fashion, one that could rival its bigger sister in Leiden.

With its growing status, the University of Franeker was able to attract some of the better-known scholars of the day. For example in 1584 Sibrandus Lubbertus was appointed by the States of Friesland as a theologian, anticipating the foundation of a new educational institution. He would become one of the best-known university professors of his time.[4] In law, Henricus Schotanus (1548-1605) had left a position at the Plantijn publishing house to apply for an anticipated chair in that faculty.[5] After it became clear that the university would be founded, Martinus Lydius (1539-1601) was added to the roster. He was set to become the first senior member of the faculty of divinity. From impeccable antecedents Lydius would also become the first acting *Rector Magnificus* of the university.[6] The Deputy States found in Petreius Tiara a big shot willing to leave a position in Leiden for a chair in Greek in his native province.[7] A second signing in the *Artes* faculty was that of Johannes Drusius (1550-1616), who was not an established name like Tiara yet, but more a rising star. The two of them seemed to have been destined to become the leading members of their faculty.[8] In Drusius' case this promise would materialize, Tiara would die before he could make an impact as a teacher.

Still Tiara's appointment is of eminent importance, because it shows some of the possible motives of the founders of the university. Firstly, they were willing to spend money on important scholars. Secondly, they were keen on professors who had a personal link with Friesland. Tiara's appointment was important in other ways as well. Even though he died

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[3] Waterbolk, 'Heeft de hogeschool', 171.

[4] On the life of Lubbertus see Van der Woude, *Sibrandus Lubbertus*; on his time just before the University of Franeker opened its doors in particular see Ibidem, 48-55.

[5] Boeles, I, 8.

[6] Nijenhuis, 'Inleiding', 227.

[7] On Tiara recent publications are lacking, unfortunately he was not even discussed by Napjus and Lindeboom. This void is partly filled by Martin Engels on his website http://home.wanadoo.nl/mpaginae/ (retrieved 10-12-2011); the best introduction on his Franeker period is still given by Boeles, II.1, 44-46.

[8] A recent study offers a short introduction to the life of Drusius, as well as a discussion of older literature, see Korteweg, *De nieuwtestamentische*, 11-19; several unknown facts about Drusius as well as intriguing view points on his life can be found at the website of Martin Engels, see http://home.wanadoo.nl/mpaginae/ (retrieved 10-12-2011).

before any lectures were given, he brought his library with him to the university. After his death this collection was acquired by the university to become one of the core collections of the Franeker university library.[9] It was, for example, from Tiara's library that the university received a first print copy of Nicolaus Copernicus' (1473-1543) *De Revolutionibus* (1543), which included the marginal notes of Gemma Frisius.[10] The presence of that book is more than anecdotal, since it shows that Tiara had a strong interest in mathematical matters. And indeed there were more mathematical books that ended up in the university library from his collection.[11] This circulation of knowledge also shows that Tiara served as an intermediary between Frisius and Franeker. He had known the famous mathematician personally and he had been involved in the early moments of the university.

Tiara was born in 1514 in Workum, one of the eleven Frisian towns. He is said to have shown an interest in mathematics and medicine already at young age. He went to Latin or grammar school in the province of Holland after which he would study at the university of Louvain, where he successively acted as a professor in ancient languages (i.e. Hebrew). During this time he got personally acquainted with his fellow countryman Frisius. After some time Tiara moved to Delft and from there to Douai, where he was appointed professor in Greek.[12] This did not stop him pursuing his medical studies, which eventually led him to a position of official city physician in Franeker, decades before the university was established. But in Franeker financial sources dried up and when there was no more money to pay him, Tiara moved to the newly established University of Leiden in 1575. Over sixty years old he again became professor in Greek and also acted as first *Rector Magnificus* of that institution.[13]

Ultimately Tiara came back to Franeker in 1585 at the age of 71 to claim a professoriate. However, he died before the first academic year had passed and even before the first lectures were given.[14] It may have been his wide range of qualifications the Deputy States were after when

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[9] A lot of research on this matter has again been done by Martin Engels, which he published on http://home.wanadoo.nl/mpaginae/ (retrieved 10-12-2011), recently Jacob van Sluis published a complete study and introduction to the early years of the Franeker library, see Van Sluis, *De academiebibliotheek te Franeker*. It was astonishing to note that Van Sluis nowhere referred to the aforementioned website of Martin Engels.
[10] This book is still available at Tresoar in Leeuwarden, sign. 399 Wk kluis.
[11] http://mpaginae.atspace.com/lijstTiara.htm (retrieved 06-01-2012).
[12] Tiara was also one of the teachers of Suffridus Petrus, the historian, see Boeles, II.1, 44-46; see also Telting, 'Eenige levensbijzonderheden'.
[13] Leiden was not yet at the heights it would later reach, as rector Tiara was responsible for inscribing students in the *Album Studiosorum* of that university: he inscribed no more than two. On this period and Tiara as rector see Otterspeer, *Groepsportret* I, 106-107.
[14] Telting, 'Eenige levensbijzonderheden'.

they appointed him professor in Greek. He was known in Friesland as a man of medicine and he is said to have built astronomical instruments as well. It was for example the Frisian astronomer Sixtus ab Hemminga (1533-1586) who referred to him in his writings on, or rather against astrology, saying: 'Tiara mocks superstition in the same fashion as I do'.[15] It seems that the founders of Franeker did not just want a philologist, they wanted a fatherly figure who was well informed about Friesland and who could (temporarily) fill voids left open at the young university. Tiara may very well have been capable of lecturing on elementary principles of mathematics and perhaps even of filling the needs for a professor in medicine as well.

This interpretation would corroborate with the appointment of the successor of Tiara: Johannes Arcerius (1538-1604). He too was known as a fatherly figure with more than one talent. Together with Arcerius, a proper professor of medicine was appointed in the person of Alardus Auletius (1544-1606), again suggesting that Tiara left more than one gap to fill.

It is possible that mathematics from the outset was supposed to be taught by the professor in Hebrew. The ancient language was also something that Tiara had taught in the past. In Franeker this chair was taken up by Johannes Drusius. A telling clue in this respect can be found in the fact that when Drusius left Leiden, his teaching was substituted by Rudolf Snellius (1546-1613), the professor of mathematics at the university. In any case, in Franeker he started immediately lecturing on arithmetic, which can be learned from his surviving *dictata*.[16] These calculation lessons formed Drusius' introduction to ancient Hebrew and the oriental languages. Apparently Drusius felt that learning to calculate was an essential skill for learning to read and write Hebrew. It shows that parts of mathematics were at least implicitly part of the official curriculum of Franeker from the very start of the very first lectures.[17]

Likewise these lectures on arithmetic also point at the important combination between Hebrew and Greek on the one hand and mathematics in some form on the other.[18] Numerous practitioners of

[15] Terpstra, *Friesche sterrekonst*, 44.
[16] Drusius, 'Collectanea', Tresoar 725 Hs. A description of this manuscript can be found in Van Sluis, *Inventaris van de handschriften*, 103.
[17] The manuscript of these lecture notes is from before 1590. The stories cited below of Metius reading mathematics out loud to his fellow students in Franeker at that time is further evidence that mathematics at Franeker did not make its first start with the appointment of the first professor in Franeker. Of course Tiara's interests were already an indication that the field never was completely absent – he was a known enthusiast of mathematics.
[18] There are some intriguing examples of scholars who sought to connect the study of ancient languages and mathematics from the late sixteenth century. This could very well

mathematics at the end of the sixteenth and in the course of the seventeenth century would seek a combination of these fields.[19] Especially in an academic society, the professor teaching mathematics often had a philological, or humanistic background.[20] Drusius and Snellius are examples of this and so was Johannes Roggius, who would be appointed as the first professor of mathematics in Franeker.

2.2.2. *Growing pains*

When the student numbers in Franeker began to rise in the first decade, the pressure on the professors to stick to their assigned subjects was also rising. The tendency was to appoint more professors, but in different fields. In 1586 Franeker received a professor in history and eloquence, in 1589 professors in medicine and philosophy were added, in 1594 there was a new mathematics professor and in 1596 a second professor in law was appointed.[21] Three of the six newly created chairs were in the arts faculty. As a result in 1598 there were three professors in divinity, two professors in law, one in medicine and six in the faculty of arts. Of these last six, two were appointed as professor extraordinaire.[22] While these last six professors were paid less than the others, the faculty of arts was nonetheless the biggest spender among the four Franeker faculties. Exact numbers are lacking, but roughly speaking a full professor at that time would earn about 600 to 700 guilders a year, and an associate professor (*professor extraordinarius*, cf. full professor = *professor ordinarius*) would earn about half of that.[23]

That the university would have a strong focus on the arts department was clear from the start.[24] Like in other newly established academies a

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have been under influence of cabbalistic approaches to philology. A later example can be found in the person of Mattheus Wasmuth, who is discussed in chapter 11 below.

[19] Vermij has already pointed at the important connection between philology and the study of mathematics and in particular astronomy, see Vermij, *The Calvinist*, 17-25. Vermij argues that mathematics was an integral part of the humanist program, he speaks of a 'happy marriage between the world of mathematics and that of classical philology'.

[20] The term humanism has an ambiguous definition. I use it in the same way that Vermij defined his study of the Dutch Copernicanists: 'a cultural ideal of a search for the lost classical wisdom and knowledge, with the purpose of having them re-established'; see Vermij, *The Calvinist*, 18.

[21] A full list of Franeker professors is given in Postma and Van Sluis, *Auditorium*, XXXVII-XLIII; an analysis of the number of Franeker professors is given in Smit, 'Over honderdzevenenzeventig'. The exact date when the first professor in mathematics was appointed is unclear, see below par. 2.3.1.

[22] Roggius, Metius, and Adama during his first spell in Franeker were associate professors; On Adama see Zijlstra, *Het geleerde Friesland*.

[23] Nieuwland, 'Rekken'; see also Boeles, I, 43 and Van Berkel, 'Het onderwijs', 233.

[24] For two thorough analyses of the foundation of Franeker see Waterbolk, 'Vormende krachten' and idem, 'Heeft de hogeschool'. The tendency to have a strong focus on the arts department was the same in other universities. In Leiden, for example, this was influenced by the ideas of Petrus Ramus, see Hotson, *Commonplace*, 53-61.

lot was expected from that faculty. This was the case in Leiden, in several German universities and also in the later Dutch institutions that followed suit. For Franeker the founders even had this stronger position for arts woven into the statutes.[25] This corresponds with the wish to found a university that would deliver students that had something to offer to society. It is important to note that in the early sixteenth century mathematics was not necessarily considered a form of education that would contribute to that. Toward the end of the sixteenth century, however, this sentiment was about to change, as mathematics was coming to be regarded more and more as useful.[26]

2.3. Rebuilding the case of Roggius

2.3.1. The appointment of Roggius

The ever-increasing number of professors made the university more expensive, which inevitably added strength to those who had never been in favour of the entire institution. Thus the increasing financial strain on Frisian funds created the scene for the first cutbacks the university had to deal with. Meanwhile the students were causing numerous problems, which made the objections against the university even louder. Student fighting and drinking caused social turmoil and things went particularly out of control at the Burse. This institution was supposed to be the crown of the Franeker pedagogical system, making the university accessible to less fortunate students. Yet the students seemed to have been swearing during the prayers and arguing over who ranked highest during the meals. In spite of the cutbacks the appointment of an overseer of the Burse became an urgent matter.[27]

It was Johannes Roggius who landed the appointment in November 1592 of 'inspector der burse', the overseer of the communal table. A position as professor in mathematics followed sometime between 1593 and 1594.[28] The 'inspector' was on one hand an answer to problems that

[25] Galama, *Het wijsgerig onderwijs*, 28 especially footnote 4.
[26] Important in this development were the ideas of Philip Melanchthon in the German lands. The seminal article is Westman, 'The Melanchthon Circle'. The ideas discussed and pushed by that circle reached the Low Countries by the end of the sixteenth century. See for example the case of Leiden and how this may have influenced what happened in Franeker: Van Berkel, 'A note on', esp. 160-161; for the practicality as favored by Willem Lodewijk, see Waterbolk, 'Met Willem Lodewijk', 304-308.
[27] Roggius was not the first inspector, but the job seems to have been vacant from 1589 until his appointment. See Boeles, I, 387-388.
[28] Van Berkel states that the first education started with the appointment of Roggius as professor in 1594, see Van Berkel, 'Het onderwijs', 215, esp. footnote 4. Others state that he started teaching mathematics already in 1591 or 1592, see for example Waterbolk, 'Heeft de hogeschool', 177. Boeles does not address the question of when Roggius started lecturing on mathematics. What is clear, is that mathematics already had a place in Franeker, as can be

arose because Franeker was rapidly growing. On the other hand, Roggius' appointment was problematic because even before he arrived he was lured into a conflict between different factions at Franeker specifically and in Friesland more generally. Historians have always avoided the question why he was appointed and only mentioned that Roggius made mistakes. But precisely the answer to that question can provide insight in the entire conflict. At the same time it can offer an important example of how mathematics was used in academic conflicts. However, a caution is in order, because the sources on Roggius' past are scarce and those that are available need to be treated with care. In other words, his paper trail is highly problematic. The papers and accounts that have been studied by historians were all drafted with the explicit intention of portraying Roggius either positively or negatively. There are some scarce sources on his actual appointment and there are some on his life prior to his arrival in Franeker, which have gone unnoticed. There are also some obvious connections that put Roggius in a more comprehensible light, but that have not been made by historians.

Starting with his past, Roggius was born in Emden in what is now northern Germany. Emden was a Calvinist stronghold, right across the border from the Dutch Republic. The city had old (protestant) ties with the Low-Countries. For example one of the first Dutch translations of the Bible was printed there and for long periods of time a garrison paid by the Dutch Staten-Generaal was encamped there to protect the Calvinist city.[29] It was also the city where Lubbertus, the person responsible for running the show in Franeker before, during, and for many decades after the 1590s, was born.[30] Lubbertus was not an uncomplicated figure, but always in the middle of conflict. In a splendid study on early Calvinism in Friesland, Lubbertus is characterized as an 'armoured adversary of all non-Reformed views in Europe', and while fighting those views, he tried to keep the Franeker professor corps clear of all impurities.[31]

It is hard to imagine that this Lubbertus did not have anything to do with the appointment of Roggius and indeed, as events unfolded, it became clear that Roggius was actively supported by the Lubbertus faction. This suggestion can be based not merely on Roggius' birthplace,

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taken from Drusius' lecture notes. I deem it unlikely that he was appointed professor of mathematics prior to the moment he stepped down as inspector of the Burse in 1593, see below.

[29] In 1558 an edition of the Bible was printed here, which would be the source for the famous Biestkens Bible. This was followed by the famous Deux-Aes Bible in 1562, see Van den Berg and Thijs, *Uitgelezen*.

[30] Lubbertus certainly was not the only influential protestant coming from that city. The eighteenth century historian of the University of Franeker, Emo Lucius Vriemoet, also came from this town.

[31] 'geharnast bestrijder van alle niet-gereformeerde opvattingen in Europa', see Bergsma, *Tussen Gideonsbende*, 19.

but also on his academic career prior to his arrival in Franeker. Roggius studied at Heidelberg and Wittenberg and at this last university he got acquainted with Bernhardus Fullenius (1561-1637).[32] Fullenius, who originated from the same area in northern Germany as Roggius and Lubbertus, would shortly become minister in Leeuwarden. Fullenius would gain and keep close contact with several professors and students at Franeker, among whom the most prominent was Lubbertus.[33] After his time in Wittenberg, Roggius would return to Heidelberg. Here he was appointed in 1591 to a job teaching Hebrew.[34] Before long he was called to Franeker to become the inspector of the Burse. The appointment of two fellow students at important positions in Friesland was no coincidence. That they both stemmed from the same area as Lubbertus makes it likely that he was behind this – in fact they ended up actively supporting him. This suggests that both Roggius and Fullenius from the start were what they would turn out to be: staunch Calvinists and hardliners. For Fullenius this is well known, for Roggius this has largely been ignored.[35]

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[32] Both Roggius and Fullenius wrote *carmina* in a laudatory print to a Christopher Hodderso, with whom they apparently studied in Wittenberg, see *Christophoro Hodderseno*, passim. I located the only known copy of this booklet in the Herzog August Bibliothek in Wolfenbüttel and I thank Christian Hogrefe of that library for making digitized scans of the *carmina* available to me.

[33] For more on this Fullenius – whose son and grandson would play important roles in the development of mathematics in Friesland in the seventeenth century, see Boeijinga, 'Fullenius', 11-21.

[34] Willem Baudart talks about Roggius being a teacher in Heidelberg. His account was published by the Dutch historian P.C. Molhuysen, see *Kroniek van het historisch gezelschap*, 225-249. This account was known to Boeles, who briefly refers to it, see Boeles, II.1., 62. However, Boeles did not believe Baudart when he referred to Roggius as being a teacher of Hebrew in Heidelberg, where there were good reasons to do the opposite. First of all, Boeles turns Roggius into a proper professor and looked for him in the official university sources. It is, however, much more likely that a young graduate had a function that resembled that of a *Privatdozent*, which would make him indeed virtually untraceable in the university archives. This is corroborated by the fact that Baudart recalls that he could succeed Roggius in Heidelberg, even before Baudart himself had taken any university degree. Secondly, if Roggius was indeed a teacher of sorts in Heidelberg, that would immediately explain why he was allowed to matriculate there 'gratis', see for this *Die matrikel der Universitat Heidelberg*, II, 152 and 469. All in all this seems to point to Roggius having had a similar position at the German university, as he would fulfill in Franeker. The definitive proof that he was indeed a teacher in Heidelberg is given in a disputation defended under Lubbertus in 1604, where Roggius is referred to as 'Quandam in Academia Heydelbergensi Hebraea linguae professori', see Postma, *Disputationes*, 30. That it was Hebrew he was schooled in, made him a likely candidate to switch to mathematics at a certain point, since Hebrew and mathematics went hand in hand, as Drusius has made clear.

[35] Although Boeijinga has unearthed almost every piece of material that can be found on Fullenius' life, one of the few letters that he did not know testifies to this feature of Fullenius' view on the world. That letter is kept at the Germanisches Nationalmuseum in Nürnberg (GNN). I thank Dr Birgit Jooss for her help in making this letter available to me.

Unkown artist, Sibrandus Lubbertus (c.1555–1625). Museum Martena, Franeker.

Boeles gives the exact date on which the decision to appoint an inspector of the Burse was taken by the States of Friesland: April 21 1591.[36] He does not mention that the States in fact decided two things concerning the university that day. Firstly, they wanted one of the professors or another learned person to take up the position of inspector, presumably one of the sitting professors. If this failed before the 1st of May the Burse should be abandoned. Secondly, they wanted to decrease the number of professors back to seven, and they named all seven explicitly: two in divinity among whom the professor in Hebrew, two in law, one in medicine, one in Greek and one professor in dialectic and rhetoric.[37] This list is odd because Hebrew was not considered part of

The letter is filed with the recipient unknown, but this is clearly Piscator of the Hohe Schule in Herborn, with whom Fullenius exchanged letters more often. See GNN, 'Letter by Fullenius to [Piscator]', Historisches Archiv, Autographen K.33.
[36] See Boeles II.1, 62. The decision on appointing an inspector was taken by the States of Friesland in April 1591. Boeles paraphrases the decision to appoint such a staff member quite incorrectly and he neglects to cite the decision that was taken directly following this. Most later accounts of these events cite Boeles: see for example, Van Berkel, 'Het onderwijs', 226.
[37] If alumni whished to stop attending the Burse they would receive an allowance of 10 gold guilders a year. See Tresoar, 'Nadere toegang', 5.26, 90-91.

the divinity faculty, but part of the arts faculty.[38] The decision to decrease the number of professors was in fact an attempt by the States to perform a budget cut with either the chair in Hebrew or a professor in divinity under threat.

The result of both of the decisions taken on the 21st of April was, of course, the opposite. The number of professors was never decreased. Drusius, the professor in Hebrew (who had gone on to teach mathematics), was an internationally acclaimed philologist. Due to his publications, Franeker had become the first centre of Hebrew printing in the Northern Netherlands, even before Leiden. And due to his other writings, Hebrew was printed in Franeker even before it was in Amsterdam.[39] Although his chair may have been under threat, his personal position was not in question. The ruling suggests that his post would be up for grabs as soon as he left Franeker. With all of the different universities trying to sign him, Leiden leading the way, that was a vivid possibility. While the chair Drusius held may have been in danger, the Hebrew language still had to be taught at the Calvinist institution. This is why the ruling is of importance for the position of the Burse inspector; the inspector was in fact the replacement of the professor that was removed.

By the first of May none of the sitting professors had stepped up to take charge of the Burse, but the decision to abandon the 'table' was consequently revoked. Ultimately a new member of staff who was going to be the new supervisor was brought in a year later. This was Johannes Roggius. It is likely that Roggius was not just a new ally for the orthodox faction at Franeker. He was also groomed to be the new teacher in Hebrew as soon as Drusius left. After all Roggius had been teaching that same subject in Heidelberg.[40]

On November 14 1592, Roggius arrived in Franeker and signed the *album studiosorum* as M[agister] et Inspector [Bursae].[41] His travel expenses were immediately covered by the States of Friesland.[42] When he arrived things seemed to go his way, however within half a year the

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[38] It is also remarkable that no professor in dialectic and rhetoric was yet present in Franeker at the time. The States had ordered only two years earlier that one should be appointed, but none was.
[39] Fuks and Fuks-Mansfeld, *Hebrew typography*, 65-93, esp. 68-70; see also Sybrandy, *Libben en wurk*.
[40] That Lubbertus wanted Roggius on that position became clear when Drusius died in 1616 and Lubbertus immediately pushed for his appointment. Again he did not succeed in this, Roggius was passed for Amama, Drusius' favorite student, see Boeles, II.1, 99.
[41] AS, 201; see also Tresoar, AUF, inv.no. 104.
[42] Bokkinga, *Extraordinaris*, see also http://home.wanadoo.nl/mpaginae/ (retrieved 10-12-2011) and Tresoar, ABF, inv.no. 2654, fol. 86v
I want to stress that I have found absolutely no evidence whatsoever that he arrived as early as 1591 as is sometimes claimed.

States changed their mind once again. They passed a resolution in May 1593 to abandon the Burse after all (a resolution that never went into effect). What is more, despite all sorts of lucrative offers Drusius never left. Early in 1593 it seemed as if Roggius might have to settle for the position as inspector.

In the four years Roggius was present in Franeker, he always received a firm backing by the States. Although they tried to abandon the Burse, they never seemed to have any intention of getting rid of the inspector. This is a strong indication that Roggius had more to do than merely watching students eat their supper. Roggius matriculated in Franeker (which staff and students both did at the time) explicitly as *M[agister]*, underlining that he was brought in as a 'learned man', as had been required by the States. Furthermore, his previous function in Heidelberg had been a teaching post and he once again was assigned teaching duties when his position at the Burse became impossible. All of this points to the idea that he was a sort of tutor.[43]

Roggius' appointment then was two faced. On the one hand he was a solution to the rising student numbers and a pedagogical tool to improve the teaching results. On the other hand he was an ally for the strict Calvinistic professors.

2.3.2. Roggius, from inspector to professor

If Roggius indeed was a tutor, he may well have been one the students hoped they did not get. Nevertheless, there were more important reasons for Roggius' degrading situation than just his personality.

The story leading up to the conflicts has often been told.[44] What has been neglected by historians is the observation that the accounts of this story come from people who had a clear stake in the dealings. It is therefore necessary to give a short summary of the events leading up to the moment when Roggius stepped down as inspector, after which he officially became professor of mathematics, a position from which he was later honourably discharged. All actors in this saga can be loosely grouped into two factions, which were loosely organised and whose members may very well have had close ties and worked together with those of the other.

The members of the first faction were often of Frisian decent or with strong Frisian family connections. This is important, because certain offices were only open to Frisians, while other positions strongly

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[43] In fact Roggius' predecessor, Henricus Schotanus, did indeed act as a sort of tutor, teaching and lecturing during the meals. See Boeles, I, 387.

[44] The most detailed account is given by Boeles, I, 31-40 and Idem, II.1., 62-66. Boeles also gives references to most sources. Some of the details he skipped can be found on http://home.wanadoo.nl/mpaginae/ (retrieved 10-12-2011).

favoured Frisians (like that of *Rector Magnificus*). That in turn was important, because this way Frisian regents felt that they could keep a grip on academic affairs.[45] This group was less staunch on religious matters – some of them were even accused of heterodoxy. And although they were of Frisian decent, their connections in high Frisian politics (which was not dominated by native Frisians at the time) were relatively weak. Important members were Schotanus, Auletius, Arcerius and Drusius.[46] This group seems to have had a majority at the university, but that was not always mirrored in the governing bodies (like the States and the Deputy States). The *Rectores* in Franeker of the 1590s are mostly members of this group.[47]

The second faction was grouped behind the newly appointed Roggius. They were headed by Lubbertus and Lydius, the strong men in Franeker who both held a professoriate in divinity. Their main common dominator seems to have been that they wanted to keep the university a beacon of orthodoxy and order. They were in a minority at university, but were always strongly backed by the Stadtholder and his circle and they also had good connections in the Franeker city government. This had to do with the fact that the more orthodox faction voiced the concerns of the regents in Friesland. Those regents were often still threatened by old Roman Catholic forces and all sorts of new reformed currents as well. Calvinistic Orthodoxy seemed to be an answer to this.[48]

Roggius tried to put affairs in order at the Burse immediately upon his arrival in Franeker. This was his job as inspector, but he also put a strong Calvinistic edge to it.[49] This caused friction with the students who took their meals there. Problems ran high for example after he expelled a student and was consequently accused of being arbitrary in his decisions. That his case had become, or had been from the start, one of rivalling factions became imminently apparent when the Senate of the university refused to back him. Next the Deputy States, the official authority ruling over the university, reversed his decisions and the student in question was allowed back into the burse. This may very well

[45] This became a problem again in the 1620s, see Martin Engels' publication of the 'Saeckma letters' on http://home.wanadoo.nl/mpaginae/BrvnSaeckma/brstekst.htm (retrieved 10-12-2011). See also Tresoar, Codex Saeckma no. 223, 226 and 227.
[46] This list is compiled of references to these events from the respective short biographies of these professors given by Boeles and his account of the whole saga surrounding Roggius. See Boeles, I and Idem, II.1, passim.
[47] Nienes, *De archieven*, 305.
[48] Bergsma, *Tussen Gideonsbende*, 383 and esp. 415-421. Bergsma concludes that the protestant church soon after it had seized power in the province took the characteristics of 'the mentality of a minority'. This is the most important possible explanation for the way Lubbertus c.s. acted: they felt threatened.
[49] Both parties seemed not even to agree on the fact that this was necessary, see for instance the letter written by Auletius, which is cited by Boeles, I, 36-37.

have undermined Roggius' authority, but it would have also served to ease the growing discontentment among the students.[50] After all, most were not obliged to study in Franeker and could opt to leave for Leiden.

Ultimately, the States of Friesland (who ruled over the Deputy States) intervened and their ruling was telling in more than one way. They ruled on four points, which had risen after complaints about Roggius. However, all four points remarkably only touched upon the problems with Roggius and instead concentrated on a completely different matter. On April 12 1594 the States ruled that: [1] All professors would from then onward have the same 'power and authority'. [2] The Burse would be continued for one final year, during which all professors would attend it in rotation, visiting every few days. After this year the inspector would be recommended to another 'good position'. [3] All differences between university staff would be forgiven and forgotten. Would any of them rouse partisanship again, they would be deducted 100 guilders of their annual salary. [4] To avoid differences in the future, a curator who had the authority to deal in all matters concerning the university would be named.

It has been concluded from this list that, while some stated that Roggius was 'stubborn and hard set',[51] he apparently was not such a bad person at all.[52] In the opinion of most historians the apparent conclusions to draw from this whole affair concern assessments of Roggius' character. However, the list provides evidence for other conclusions, for example that university was deeply divided at that time. Why else would the States rule on these general matters if the only thing at issue were personal problems? It seems that the principal division that was at the core of this dispute threatened the very existence of the university. Roggius thus was no less than a red herring. He was let go from his position at the burse, but in return he was promised compensation in the form of a 'good position' in April 1594.

Despite these rulings, the Roggius affair was not yet settled. According to a much quoted letter by Schotanus, Roggius' case made clear that no one was in charge at the university.[53] From Lydius similar sounds were heard.[54] Roggius' case showed that the university was divided and at the same time it showed that there was a power issue;

[50] I disagree with the accounts given by Boeles and Van Berkel, which both seem superficial in their assessment of the complicated state of Franeker at the time, see Boeles, II.1, 65; see also: Van Berkel, 'Het onderwijs', 215; especially the reference 'Toen ook bleek dat de Senaat en de Staten niet altijd geheel achter hem stonden, werd zijn positie onhoudbaar.'

[51] 'koppig en onbuigzaam', see Van Berkel, 'Het onderwijs', 215 and 230.

[52] 'Duidelijk blijkt hieruit, dat de Staten niet tegen Roggius waren ingenomen, maar veeleer verstoord over klagten, die zij als ongegrond of overdreven beschouwden.', see Boeles, I, 32.

[53] See for the full letter http://home.wanadoo.nl/mpaginae/ (retrieved 10-12-2011).

[54] See Boeles, II.1, 63.

there were questions as to who was in control of the curriculum and who was not. To solve this the States offered to name a curator in the near future. It was either this, or the Deputy States would have to spend a lot more time on their prestigious new educational institution. Both solutions were not welcome to the majority of Franeker professors who saw their own authority curbed by these developments.[55] But the two most important allies of Roggius may have welcomed those developments, confident as they were over their protectors. These two were Lubbertus and Lydius, the two professors in divinity.[56]

The promised 'good position' for Roggius was the chair in mathematics. There were at least three attempts to install him as such. The first two failed for reasons that remain unknown. The third attempt, in September 1596, caused great disruption. At the end of the summer Roggius had been advertising his *privatissima*, his private lectures. Among those attending were the students he had the greatest difficulties with.[57] This gave rise to new irritations and conflicts, resulting in outright riots when Roggius was supposed to give his inaugural lecture, which would officially install him as the mathematics professor a few days later. Students refused to attend the official meeting and some of the professors openly vented their disapproval of Roggius. Riots followed in the small town of Franeker. These revolts in turn forced the city government to intervene, in an attempt to restore order by force. Not only was this a flagrant assault on the academic institution itself, the students refused to back down. When gunfire was exchanged a student, Johannes Laquart (†1596), was shot dead.[58] Before everything would spin even further out of control the city council deployed even more policemen who ultimately seemed to have restored order.[59] Thus, the

[55] There are several occasions on which such partisanship became clear. Perhaps the most telling instance is when Auletius as the acting *Rector Magnificus* had to temporarily flee Franeker a few years later.

[56] See for example the letter by Lydius in: Boeles II.1, 64-65; on them helping him afterward see below.

[57] One of the very few students that I have been able to identify as having studied mathematics with Roggius is Festus Hommius. He would later play an important part during the Synod of Dort. See Wijminga, *Festus Hommius*, esp. 6-8. Hommius and Roggius were reacquainted in 1608, when both visited the same synod of the South-Holland church, see Ibidem, 64.

[58] H. Schotanus to J. Saeckma, September 6 1596. http://home.wanadoo.nl/mpaginae/BrvnSaeckma/brstekst.htm (retrieved 10-12-2011). This letter was also the most important source to Boeles account of these events, see Boeles, I, 32. Laquart was a son of a secretary of a Frisian borough (grieternij), which gives him the perfect antecedents to fit the camp opposing Lubbertus. This will also have made it probable that he was at least an acquaintance to Henricus de Veno – who came from similar circles.

[59] Winsemius talks about three battalions, which seems a exaggeration, see *OFAM*, 36. Both Boeles and I have found no traces of these in the archives.

official start of mathematics at Franeker had a shocking result: one student shot dead and a civilian force restoring order at the academy.

The most important divide between the two Franeker factions involved theological matters. The Lubbertus-Roggius faction was in favour of a strong grip on the student population, in order to safeguard their spiritual orthodoxy. Their opposing group took a more relaxed stance on this. Over the coming decades this divide kept coming up both in Leiden and in Franeker and similar matters would ultimately bring the Dutch Republic to the verge of a civil war around 1618.[60] Of course things were not yet that far developed in the 1590s, but the contours of what would follow were already quite visible. One of the students opposing the Lubbertus faction for instance was Henricus de Veno, who would later become professor in Franeker and again get himself into trouble with the more orthodox groups.[61]

How far the arms of the Lubbertus faction reached became most obvious in their struggle with Drusius, whom Roggius was probably supposed to replace at Franeker. Lubbertus and Lydius waged a slander war against the eminent Hebrew scholar, accusing him of all sorts of things. This ranged from complaints on his alleged theological impurity to virtually stating that he encouraged loose sexual morals under his students.[62] At the same time Drusius' theological liberalism led to him being purged from the committee that was established to prepare the official Dutch translation of the Bible in 1598. That seat, for which an annuity was awarded, was immediately filled by none other than Johannes Roggius. This suggested another involvement of Lubbertus

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[60] The quarrels that lay ground to that conflict are dubbed 'the bestandstwisten' in Dutch historiography. The best introduction is without a doubt offered in Van Deursen, *Bavianen en Slijkgeuzen*.

[61] See Telting, *Register*, 94-95; Around 1602 De Veno was considered to succeed Lydius as professor in divinity, but he had to settle for a post as professor of Logic, see Galama, *Het wijsgerig onderwijs*, 77; Sepp, *Het godgeleerd*, 135; De Veno had fabricated(!) splendid references from all over Europe which made him apparently impossible to snub for a post at Franeker – that he was very well connected in Friesland would have worked in his favor as well. His partisanship would ultimately cost him his job at Franeker. The best introduction to his life is given by Lüthy, *David Gorlaeus*, see also Lüthy and Spruit, 'The doctrine, life'; see also Boeles, II.1, 75-77.

[62] Sepp, *Het godgeleerd*, 134; Sepp quotes a letter I have not been able to trace in which Lydius states that Drusius had allowed one of his students to seduce a Frisian woman (or possibly a daughter of Drusius?). In the process Lydius warns the Utrecht States that if they wanted to avoid the Utrecht students bringing home women next to scholarship from Friesland, they had to act against Drusius. Sepp himself seems to pity the fact that Drusius had loose morals (as he sees it). He connects it to remarks made by Joseph Justus Scaliger, who referred to Drusius house as 'un bordel'. Those remarks however should be taken for what they are: insults made by Scaliger, who was never shy of using very harsh words especially not when someone challenged his authority, which Drusius did. To illustrate this, in the same breath he made this insult Scaliger also wrote about Drusius: 'Il écrit encore plus mal que Ramus, qui écrivoit fort mal.' See Scaliger, *Scaligerana*, II, 67.

cum suis and almost underscores the intentions they had with Roggius from the start.[63] Even after Roggius left the university, they never let him out of their sight and tried to bring him back to Franeker as a professor on several occasions.[64]

Two years after Johannes Laquart was shot and Roggius was consequently forced to leave Franeker, everything seemed to spin out of control again and this time the professors themselves were under threat. The Frisian faction had been trying to obtain a chair in Law for one of their protégés, but failed.[65] The post was given to Johan van den Sande (1568-1638), a confidant of the Stadtholder. When, during Van den Sande's inaugural lecture two professors were forced to flee town and another two came under severe pressure to give up their positions, things seemed as bad as in 1596.[66] The four 'dissidents' were Drusius, Auletius, Arcerius and Lollius Adama (1544-1609), a complete recapitulation of the faction opposing Roggius. Ultimately their jobs were saved and order was restored in Franeker. But as late as 1608 these four professors were still writing *insult poetry* to commemorate that Van den Sande had snatched the job from under their noses.[67]

2.3.3. Mathematics learned from Roggius

The traumatic affair of Roggius taught the Franeker academics several lessons. The most prominent of these was how explosive a situation could get if students were enticed by factionalism. All of the sources seem to be at least clear on one thing: everything had gotten so dire because the professors, acting in their own interests, had manipulated the students' feelings.[68] In an attempt to avoid disrupting the university to such a degree in the future, from 1596 onward it was explicitly forbidden for any professors to engage in partisan behavior.[69] Of course the Franeker academics kept on arguing and fighting, but when proof surfaced around 1610 that the students were once again rallied behind professors, the Frisian government did not hesitate to intervene firmly

[63] Fuks, 'Hebreeuwse', 410-411.
[64] Postma, *Disputationes*, 30 and Boeles, II.1, 99.
[65] This was Johannes Saeckma, see http://home.wanadoo.nl/mpaginae/ (retrieved 10-12-2011).
[66] Boeles, I, 38.
[67] http://home.wanadoo.nl/mpaginae/ (retrieved 10-12-2011). Ultimately Van den Sande would be accepted by those who made up the Frisian judicial system.
[68] One of the main sources on these matters, the letter written by H. Schotanus to J. Saeckma, sums up several of such cases. It seems as if Schotanus (who had a great stake in these matters) was exercising being penitent and reminding himself how things had gotten as far as they had.
[69] Words like 'partye', 'factien', 'partyeschappen' are used by those involved. See Boeles, I, 36-37; comp. Schwartzenberg, *Groot placaat*, IV, 943.

and briskly.[70] The events of 1596 were obviously still fresh in their minds.[71]

It was the 'Roggius affair' that had given an explosive ring to the chair of mathematics in Franeker, but this happened because Roggius had a second agenda. He had not come to Franeker to preside over the meals of the students as an inspector of the *Burse*, he came with the goal of becoming the new professor in Hebrew. That he was brought in for that purpose had to do with the objections certain academics had against the sitting professor Drusius. Of course a conflict arose – especially when Drusius did not leave. Students were mobilized in support of *pro* and *contra* Drusius factions, which in turn put pressure on Roggius' position. As a solution to those tensions he was offered the chair in mathematics, a subject that was primarily taught by Drusius until then. This was perhaps a partial success, but it also ensured that the machinations did not stop. The conflict still lingered and ultimately it came to an outburst when Roggius tried to deliver his *oratio* for the third time.

There are few sources on what Roggius actually did during his math classes. He did not publish anything on mathematics, there are no lecture lists available from this time, no notes from his lectures survive, nor do any real comments on his teachings. All there is to go on are a few remnants from which the following is safe to conclude. Roggius started at least in 1594 with *privatissima* on mathematics, which he continued until at least September 1596. He had written an inaugural lecture on mathematics, which he unsuccessfully tried to deliver twice but at least partially delivered in the auditorium of Franeker. That is about all there is known about how mathematics had officially set out at Franeker as an individual academic chair. This may seem like a 'false start', but it in fact outlined the future of the field: If anyone wanted mathematics to secure a spot at the Franeker university curriculum the field could no longer be used as a battlefield for other conflicts.[72] And this is precisely the lesson Roggius' successor seems to have taken from this. In 1598 Adriaan Metius was appointed, a former Franeker student, who could apparently carry the consent of all involved parties.

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[70] Lüthy and Spruit, 'The Doctrine, Life', 1129; not surprisingly this case centered around one of the ringleaders of the students who had opposed Roggius (and a friend to Laquart): Henricus de Veno.

[71] Metius was involved in those matters and was fined 100 guilders for litigiousness because he had denounced De Veno to the Frisian States. However, he also received no less than 300 guilders in incidental payments by those same States around that very same time – almost as if he was compensated for opening his mouth and denouncing one of his colleagues. See Bokkinga, *Extraordinaris*, I, 163 and 168.

[72] Van Berkel, 'Het onderwijs', 215 ; comp. Jensma, 'Inleiding', 408 footnote 27.

2.4. *Adrianus Adriani Metius*

2.4.1. *Student in Franeker*

To understand why Adriaan Metius was an agreeable candidate to all parties involved to succeed Roggius, it is vital to discuss his personal history in some detail. Before Roggius arrived in Franeker, Adriaan Metius had been a student there. He enrolled in Franeker on July 24 1589 as Adrianus Adriani, student in law.[73] He was one of the first one hundred students to matriculate in Franeker.[74] Metius would soon become a member of a select group of students who would have splendid careers in universities and administrations all over Europe.[75]

Born on December 9 1571 in Alkmaar, Adriaan Metius was a native of the province of Holland. Little is known about his mother other than that her name was Swij Dircksdochter and that she died on January 29 1612.[76] Shortly before Adriaan was born his father, Adriaan Anthonisz (1541-1620), had become the fortification master of Alkmaar. Over his lifetime, his father would come to be the most important military engineer for the Dutch Republic.[77] Accounts of Anthonisz' work relate him to almost every important fortification in the Republic in the 1590s. For this he stood in close contact with Maurice of Nassau (1567-1625), Willem Lodewijk and the States General.[78] Soon after Adriaan was born his father would be elected burgomaster of his hometown, a function (and honour) he would carry more than once in the years to follow. Anthonisz was, in other words, a practical mathematician with a lot of social standing, who knew exactly how to materialize this fame.

It is important to note that Anthonisz never used the name Metius like his sons would. This name is most likely a Latin pun of the word '*metiri*', which means 'to measure'. It could very well be that his sons took the name to refer to the family business.[79] Like a man from a family of blacksmiths could carry the name *Faber* or *Fabricius* or a member of a family of sailors might be called *Nauta*, Anthonisz' sons used Metius in this way. This is all the more probable since at least four of his sons took up a job of which *measuring* was an important part. To gain insight in the rise of mathematics and mathematicians, the development of such a

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[73] *ASF*, no. 94.
[74] Dijkstra and Jensma, 'Wiskunde', 117ftn76.
[75] Jensma, 'Het huis', see also http://home.wanadoo.nl/mpaginae/ (retrieved 17-11-2011). Martin Engels points to the specific combination that can be established between the lodgers of Arcerius and the group around the jurist Johannes Saeckma.
[76] Belonje, 'Biografische notities', 42.
[77] Westra, *Nederlandse ingenieurs*, 36; see also Wortel, 'Adriaen Anthonisz.', 176-178.
[78] Wortel, 'Adriaen Anthonisz.', 179-215.
[79] From the verbum 'metior', comp. Wortel, 'Adriaen Anthonisz', 175; see also Belonje, 'Biografische notities', 42.

surname serves as a point of reference, for it was at that time that it became appropriate to carry a name that referred to the practice of measuring. The use of such a name meant that *measuring* had become something that represented social value. For Metius' brothers, being a 'measurer' was something to be proud of. Of the seven sons of Anthonisz, no less than three definitely used the name Metius, but only after Adriaan Metius' had built an international name as a mathematician under that name.[80] He was in any case the first to do so and he probably started it during his time as a student in Franeker.[81] Thus when Metius matriculated at Franeker, he was still known as Adriaan Adriaansz, but by the time he left he proudly wore the epithet Metius.[82]

It is probable that Metius received or picked this (nick)name himself in a very collegiate or academic setting. Several other students who were closely associated with Metius similarly came to Franeker without a surname and left with one. It is revealing to have a look at this circle of friends in order to understand what may have driven him to adopt a new name. They all lodged with the professor of Greek, Johannes Arcerius (who had taken his 'academic' name from his birthplace Nordhorn). The reasoning behind it was that the Greek word *Arkos* was derived from *Arktos* meaning bear, which in turn was a reference to the star sign *Ursa Major*, which is set in the north. The name is thus a reference to his birthplace.[83] But the other students who lodged with Arcerius also took epithets in a similar fashion. The most striking example is that of Johannes Isacius Pontanus (1571-1639), who was said to have been born on a ship when his parents made a journey to Denmark.[84] His name was

[80] Both his brothers Jacob and Anthony are referred to with this name, but at different moments. Jacob is for example mentioned as Metius by Marcellus Vranckheim (see below chapter 3) and Anthonie is referred to as Metius in the eulogy on Adriaan, see *OFAM*, 19.
[81] The very first reference to the name Metius, of which the date that it was noted is beyond doubt, is his matriculation in Leiden in 1594, which was made probably directly after he left Franeker.
[82] The editors of the Franeker *Album Studiosorum* make it seem that he matriculated under the name 'Metius', however even a quick glimpse at the actual source reveals this was not the case. See *ASF*, no. 94; comp. AUF, inv.no. 104.
[83] http://home.wanadoo.nl/mpaginae/ (retrieved 10-12-2011), Ursa meaning Bear, in English this star sign has the name Big Dipper, in Dutch however it is again named Grote Beer.
[84] A good biography on Pontanus is lacking, the best introductions to date have appeared as parts of other projects. See for example the introduction to the facsimile edition of Pontanus his own history of Amsterdam, H. Zwager, 'Johannes Isacius', see also Doorninck, *Brieven*; more recently he was briefly discussed in works devoted on his brother: Noldus, *Pieter Isaacz*; and Roding, *Pieter Isaacz*; the best English introduction is possibly given by Christianson in his *On Tycho's Island*, 337-339. For his historical work see Esser, *The politics of memory*.

a reference to the Latin word for sea, *pontus*.[85] Metius choice of a name that referenced both his interests as well as his father's work fits this perfectly.[86]

But the students who lived and lodged at Arcerius' house shared more than enthusiasm for humanist surnames.[87] They all studied and lived in a true humanist fashion with a proper humanist education, and all of them went on to build an academic or public career. Of the two sons of Arcerius one would become professor and the other a minister. The aforementioned Pontanus would become a professor in mathematics in Harderwijk. Other lodgers included Raphaël Clingbijl (1569-1608), who would become a professor in Franeker, Thomas Herbajus (ca.1570-1613), who would become chief prosecutor in Friesland, Sibrandus Siccama (1571-1622), who obtained the post of secretary in Bolsward and Godefridus Sopingius (1573-1615), who became a minister in Bolsward. During their time in Franeker these students had shown that they were serious about their pursuits. They studied together and adhered to self-imposed laws that carried penalties for offences against them. Every week one of them would act as president over their 'school within the university'.[88] All of this is important because no less than three of the eight students would at a certain point pick up the study of mathematics. They were the first to have studied at Franeker and to pursue a career of sorts in mathematics.

It was Pontanus who had a career that is best comparable with that of Metius. He studied with Tycho Brahe in Denmark and ultimately became a professor of mathematics at the illustrious school in

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[85] Another was Sopingius, who grew up near a swamp. His name came from the Latin word *spongia* for sponge. They chose their names with respect to their heritage, see http://home.wanadoo.nl/mpaginae/ (retrieved 10-12-2011).

[86] I strongly reject the nineteenth century notion that Metius' family may have come from the city of Metz. There is no evidence, not even circumstantial, to support these claims; see for instance De Waard, *De uitvinding*, 208; comp. 'Biografische notities'.

[87] This paragraph is indebted to Jensma, 'Uit het huis'.

[88] Especially telling is the letter by Siccama to Aysma published on http://home.wanadoo.nl/mpaginae/ (retrieved 10-12-2011). Comp. Jensma, 'Uit het huis', 455-456. The description given by Siccama is of great import [translation by Martin Engels; http://home.wanadoo.nl/mpaginae/]: 'Daarbij kwamen dagelijks de vermaarde jurist Thomas Herbajus, tijdens zijn leven advocaat fiscaal, en de kundigste der medici R. Klingbijl, nadien Hippocratisch hoogleraar en andere studenten, die nu mijn geheugen ontgaan. - Indertijd ging ik het burgerlijk recht met vurige ijver en onvermoeibare inspanning na, zij vormden een college en genootschap met bepaalde straffen en wetten, waarbij er één enkele weken voorzitter was, de overige dagen in de middaguren, wanneer ze de gewoonlijke studie achter de rug hadden, een of andere spreuk van een wijsgeer, dichter of geschiedschrijver, bezig waren voor de vuist weg te verklaren, niet zelden ook aan de deurpost van de (zitslaap)kamer, waarin ze bijeenkwamen, een of ander Romeins spotschrift aanbrachten, dat de overigen met grote ijver om strijd beoordeelden of opnieuw formuleerden. Zo was het huis van Arcerius een thuis van de Muzen, vonden er meer private oefeningen plaats dan openbare lessen van sommigen.'

Harderwijk. However his main accomplishments lay on the field of philology and history. Already in Franeker he showed some brilliance in these fields; when it was his turn to read to his fellow students in the house of Arcerius he did this so splendidly that these lectures 'were good enough to be read in the academy'.[89] He may well have done so, since this happened more frequently in the early years of that university. The best students would be invited to present lectures in the central auditorium, not just in front of their fellow students, but in front of the professors and responsible politicians as well. A system of rewards for these forms of 'self education' was in place.[90] This was the setting where Metius for the first time showed his competence as a mathematician. When it was his turn to read in the study group he chose texts by ancient mathematicians and commented on them. Metius was already practicing as a lecturer.

Metius enrolled as a student in law, but he never took a degree in this field.[91] In fact, there is no evidence that he obtained any degree until very late in his career (1626). Precisely when he left Franeker is not clear. What is clear is that he enrolled in Leiden on May 12 1594, almost five years after he had enrolled in Franeker. Most of his fellow students had also left the house of Arcerius by then. If Metius enrolled in Leiden directly after he came from Franeker, he left Friesland around the time when tensions were starting to build up around Roggius.

2.4.2. Student in Leiden

Sources on Adriaan Metius' time as a student in Leiden are scarce. It is however more than fruitful to have a look at the circumstances he found there and combine these with what is known and what has been suggested about this time. By the time Metius arrived in Leiden his father had climbed up to the rank of official *engineer* of the province of Holland.[92] It seems fair to assume that his contemporaries would have associated him with practical mathematics even before he did anything there. In Leiden Rudolf Snellius was responsible for teaching mathematics at the university and Ludolf van Ceulen (1540-1610) had an important role outside the university. It is certain that Metius had contact with both. Not just because they were mathematicians, but also because his father had worked in close cooperation with both Snellius and Van Ceulen. Anthonisz had published several treatises for which he had consulted Van Ceulen and he personally knew Snellius. A third

[89] Jensma, 'Uit het huis', 455.
[90] This can be taken from the description given by Baudart, see *Kronijk van het historisch*, 237.
[91] Comp. *OFAM* 27, where Winsemius states that Metius had set out to study 'philosophy'.
[92] Wortel, 'Adriaen Anthonisz.', 175.

Jacques de Gheyn II, Portrait of a young man*, possibly Metius (1594), proof print. ©British Museum.*

mathematician who was at the time active in the same circles as the other Leiden mathematicians was the Maurice court mathematician Simon Stevin (1548/49 – 1620). All three may have been instrumental in Metius' education, although a more specific division – who taught what – is impossible.

The contacts between Van Ceulen and Anthonisz originated from the time when the latter had written treatises against fellow mathematician Simon vander Eycke (before 1584-† after 1640) in the 1580s. These were pamphlets on squaring a circle. Van Ceulen had mastered calculating the ratio between the circumference and the diameter of a circle to such an extent that even today this number (π) sometimes goes by his name as 'Ludolfs number'. In Leiden from 1593 onward he taught fencing and mathematics at his home, where he had some illustrious students.[93] For example Rudolf Snellius' son Willibrord attended these classes on mathematics.[94] But Maurice of Nassau, the Stadtholder of Holland and son of William of Orange, also had contact with Van Ceulen.

Snellius too taught math at home, where he tutored his lodgers in addition to his public lectures on the subject. He even held a small school at home, like Van Ceulen had done, where he also employed other teachers.[95] It is tempting to think that Van Ceulen was one of these teachers, but unfortunately there is no precise information available. That Snellius had this school at his house is particularly interesting in light of the fact that at university he was not allowed to teach everything he wanted. For example, his lectures on Petrus Ramus evoked fierce opposition from his fellow professors.[96] It even threatened his position at university. His house was thus a place where he could speak about these ideas more freely, although not even this is certain.[97] What is also uncertain is which lessons Metius may have attended. It seems plausible, however, that he was taught some maths by Snellius.[98]

Had Metius lodged with Snellius, the dots would have been easily connected. He did not, however. Instead he lived with the painter and engraver Carel Liefrinck (1559-1624), a refugee from the southern Netherlands.[99] Liefrinck was also a known mapmaker, which was considered a mathematical practice at the time.[100] Liefrinck was born in Antwerp, but after taking refuge in the Republic he built his career in Leiden, where he probably kept contact with fellow refugees such as the globe maker Jodocus Hondius (1563-1611) and the artist Jacques de Gheyn

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93 Westra, *Nederlandse Ingenieurs*, 82-89.
94 De Wreede, *Willebrord Snellius*, 19-21.
95 Witkam, *De dagelijkse gang*, V, 82-89
96 Hotson, *Commonplace*, 53-61.
97 See, for example, Van Berkel, *Isaac Beeckman*, 279; see also De Wreede, *Willebrord Snellius*, 38-39.
98 *OFAM*, 30.
99 On Liefrinck little has been published to date. My information mostly comes from: Ekkart, *Geschildert*, 90.
100 Witkamp, *De dagelijkse gang*, II, 17; and Ibidem, IV, 51 and 179.

II (ca. 1565–1629).[101] In the early seventeenth century, Metius would calculate several celestial globes for the Hondius family and he quite possibly had his portrait etched by De Gheyn in 1594. This etching depicts a young, wealthy man in an oval, decorated with a cryptogram. Based on the cryptogram, the portrait was identified in the 1970s as Metius by the art historian I.Q. van Regteren Altena (1899-1980).[102] In the oval a comet is depicted, which could be a reference to Metius' practice as an astronomer.[103]

The identification of Metius' portrait is exciting, especially because of the text given in the margin of the portrait and because of the next step Metius would take in his career. The text in the margin of this portrait is *Aeque inermis ac armatus* and could be translated as 'the same whether armed or unarmed'.[104] This could of course be a strong reference to the practice from which Metius' mathematical interest sprung: his family circle. His father was a developer of instruments and there are suggestions that already in 1593 Metius himself had applied for his first patent on an astronomical instrument.[105] His *arma* could, of course, refer to these physical instruments, but they could also be a reference to the intellectual instruments he was equipped with after finishing his education in Dutch universities. That the engraving was made by the famous artist Jacques de Gheyn provides another look into Metius' future, as does the link with Hondius. De Gheyn had also engraved Maurice of Nassau, would later make several star maps for the Danish astronomer Tycho Brahe, and he had engraved the portrait of the Dane in the 1580's.[106] After Metius had finished in Leiden he set out on his *Peregrinatio academia* and his first stop was that very same astronomer.[107] At the end of that journey he would publish a book that he would dedicate to Maurice.[108]

[101] There were numerous artists who came from the southern Netherlands, but who functioned in the same network in the Dutch Republic. Of course Petrus Bast was also one of these and Petrus Plancius as well. Most can also be connected to the University of Franeker at a certain point in time and some more specifically with Metius. Bast etched prospects of the town of Franeker (see the introduction to this book), Plancius sent his sons to study with Metius and Hondius dedicated a globe to (among others) the professors of Franeker.

[102] Van Regteren Altena, *The Drawings*, I, 37-38.

[103] Some caution is in place, since the comet originally gave Regteren Altena the idea that it may have been a portrait of Metius, but later it was from the cryptogram that he took his proof, see Regteren Altena, *The Drawings*, II, 115.

[104] Christoph Lüthy's translation. Regteren Altena translated it as 'provided with innocuous instruments', see Regteren Altena, *The Drawings*, II, 115.

[105] *Navorscher's bijblad*, 1855, 38.

[106] Christianson, *On Tycho's Island*, 286-287.

[107] I oppose the idea that he got his astronomical or mathematical education solely in Leiden, or that only there he switched from law to mathematics. I do so because I could

2.4.3. *Tycho Brahe*

On the evening of July 19 1594 a party arrived on the Danish isle of Hven, paying a visit to Tycho Brahe, the foremost astronomer of the day.[109] The most important member of this group was without a doubt the Dutch envoy Isaac Pietersz († after 1615). He was one of the first diplomats the young Dutch Republic had sent to the Baltic and he was well connected in that region of Europe. It was not the first contact between Pietersz' family and Brahe. In fact Metius' friend and co-lodger in Franeker, Johannes Isacius Pontanus, was Pietersz' son and had served as a *famulus* (student/assistant) to Brahe just one year earlier. As famulus Pontanus showed his humanistic skills, precisely what he had done in Franeker. Brahe appreciated this so much that he made Pontanus in charge of answering his Latin correspondence. Later Pontanus would be tutor to Brahe's nephews and he would keep close contact with Brahe over a long period of time.[110]

But Pontanus was not the only link between the Dutch mathematical scene and Brahe. Many mathematicians, astronomers and even artists visited the Dane. And here they picked up knowledge, skills and mathematics, which would influence their careers over a long period. With these visits they upped the level of mathematics in the Low Countries.

One of the members of Pietersz' company was Metius, who would stay with Brahe for several months.[111] Before his visit, Metius had already been acquainted with many of the Dutchmen who would visit Brahe. The very first to go to Hven was probably Rudolf Wicheringe (or Rudolphus Groningensis; 1560-1646), serving Brahe 1585-1588. Afterwards, he would be among the first students in Franeker, where he got acquainted with both Metius and Pontanus.[112] Another Franeker student of those days to visit Brahe was Frans Gansneb a Tengnagel (1576–1622), who would go on to marry Brahe's daughter. Very influential

find no evidence for this, see (for instance) Lodewijk Palm's short biography of Metius in: Van Berkel, *A History of Science*, 525-526.

[108] Metius, *Doctrinae* (1598).

[109] Christianson, *On Tycho's Island*, 322.

[110] Christianson, *On Tycho's Island*, 336 and 331. Christianson shows that Pietersz was trusted very much by Brahe.

[111] Christianson suggests that Metius was part of the company. If this was in fact the case, it is more than probable that Metius was one of the highly placed members of this party, since that had been his social status in the Republic as well.

[112] Christianson, *On Tycho's Island*, 286. Christianson misses that Wicheringe and Rudolphus Groningensis were the same person. It was this Wicheringe who was also one of the very first students to get a (bachelor's) degree at Franeker. See Boeles, I, pp 368; see also Groninger Archieven, Archief Familie Gockinga 518, inv. no. 2.

was Willem Jansz Blaeu (1571-1638), who had his roots in Alkmaar and was a close personal friend of Metius. Blaeu stayed with Brahe only months after Metius left. Jacques de Gheyn, of course more an artist than a mathematician (and the same artist who may have portrayed Metius so skilfully) also worked in close collaboration with Brahe.[113] Snellius' son was also soon to join this group of *famuli* when he assisted Brahe in 1600.[114] Back in the Netherlands, this group kept close ties and showed strong admiration for the Dane's astronomical skills. Hven became a point of reference for them.

Metius and Pontanus may serve as excellent examples for this. To both of them the visit was a decisive moment in their career. For the rest of their lives they would keep referring to this period in their letters and publications. Tycho's name was soon so emblematic for the practice of astronomy that everybody tried to be associated with him. Even Metius' gravestone had a clear allusion to the Danish Astronomer. About Pontanus' time at Hven some precise details are known and it is likely that Metius did similar things there. This is even more likely since Pontanus' programme would fit Metius' career like a glove.[115] The Danish historian John Robert Christianson characterized Pontanus' education at Hven as follows:

> 'He learned Tycho's methods of observation and data analysis, took part in observations, and also studied Platonic philosophy and Paracelsian medicine on Hven.'[116]

In 1598, shortly after he had visited Brahe, Metius was very clear about what he had picked up in Denmark. He learned to use Tycho's instruments and his methods.[117] And Metius would use that knowledge in the years to come.

2.4.4. Tutor in mathematics

After Metius left Hven he more or less followed in Tycho Brahe's footsteps visiting the Dane's Alma Mater in Rostock. Details are again almost absent, but some intriguing historical connections can be made.

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[113] Christianson, *On Tycho's Island*, 286.
[114] Willebrord Snellius visited Brahe in Prague. All others met him for the first time in Denmark. See De Wreede, *Willebrord Snellius*, 20 and 47-48.
[115] According to Christianson, Metius arrived in the second half of 1594. Pontanus had arrived in 1593 and would leave in 1595
[116] Christianson, *On Tycho's Island*, 336.
[117] 'Deinde ad nobilem & magnificum virum Tychonem a Brahe in Daniam profectus, qui pro sua humanitate accessum mihi liberum permisit ad spectanda sua instrumenta, spectatu sane dignissima & admiranda, meq; ea benignitate excepit, ut singularem eius erga me benevolentiam ac beneficetiam nunquam satis digne possim prae dicare.', see Metius, *Doctrinae* (1598), 10.

In many sources Prince Uldrik of Denmark is mentioned as one of Metius' students.[118] Historians have always assumed that this prince visited Metius when the latter was at the top of his fame as professor in Franeker. This is a story that is liked by historians of Franeker, because it adds to the fame of the institution. However, all accounts of this visit lead back to one source that lacks a reference to time and geographic location for Metius and the Danish Prince's meeting.[119] As it happens, right about when Metius arrived in Rostock, Ulrik Johannes of Denmark (1578-1624) was studying there, and not just as a student. Due to his noble ancestry he was made an honouree *Rector Magnificus* of that university around this time.[120] Since there are no actual sources of him (or his namesake) visiting Franeker it may be that this *prince* was among the very first of Metius' students in 1595.[121]

To take up a role as a tutor in mathematics would fit the status of a young mathematician at the time. Several other examples are known from the circle around Metius, who followed or would follow a similar path. It is therefore rewarding to trace them, since their stories give a cross section of what probably was one of Metius' activities. At the same time, this reveals the interest in math by the Nassau family; since they were very influential in Franeker, it is a story of specific interest. The Nassaus ran a similar project in Herborn in Germany, where their stake in a local academy was even bigger. And there were some strong connections between Franeker and Herborn, especially when it came to the education of mathematics. In the years to come Metius would find himself at the centre of this attention.

Closely associated with the Nassaus around this time was Georg Pasor (1570-1637). He would later become professor in Greek, first at the academy in Herborn, followed by an appointment in Franeker. However, he had started his career as a tutor to the younger sons of John VI of Nassau (1536-1606) and thus the younger brothers of the Frisian Stadtholder Willem Lodewijk and cousins to Maurice of Orange, Stadtholder of Holland.[122] Directly following Pasor's tutorship to the

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[118] These reports originate from Winsemius' eulogy on Metius. A Dutch translation of this work is in print, see *OFAM*. See also Boeles, II.1, 72. Boeles refers to Nicolaas Blancardus, *Panegyricus*, 24; Blancardus in turn seems to have derived his knowledge from Winsemius.
[119] *OFAM*, 56.
[120] Fridericia, 'Ulrik'. This prince is said to have had a strong inclination with mathematics and mathematical instruments. Even if he did not meet up with Metius at Rostock, he is a more than likely candidate to have been this enigmatic figure from Franeker historiography.
[121] If a Prince Ulrik would have visited Franeker it is more than likely that other sources would have mentioned it, such as the *Album Studiosorum*, Alba Amicora or even other Franeker scholars or visitors. In absence of all of this, I feel that this is one of the stories that has created its own paper trail, however in without substantial evidence.
[122] Boeles, II.1, 128-131.

Nassau children, in 1597 he was appointed a teacher at the grammar school of Herborn, which was preliminary to the academy. As such he published his very first book in 1602, an introduction to arithmetic.[123] While he may have ended up as something other than a mathematician, he started out as one. When Pasor left the Herborn grammar school, he was succeeded by none other than Johann Heinrich Alsted (1588-1638), who would become one of the most productive and most read scholars of his age.[124] The very first books Alsted published were also introductions to mathematics.[125]

As tutor to the Nassau boys, Pasor was succeeded by Sixtus Arcerius (1570-1633), son of the Franeker professor Johannes Arcerius. As such he had been Metius' housemate and he would keep close ties with Metius all through his life.[126] His first published work was a Latin-Greek edition of Aelianus, a classical work on military tactics.[127] These tracts were considered practical mathematics and were explicitly used by both Maurice and Willem Lodewijk in their campaigns against the Spanish.[128] Simon Stevin, the court mathematician to Prince Maurice, made translations of precisely these same tracts into Dutch. Later, Arcerius would publish conversations between John VI and Marnix of St. Allegonde (1540-1598) on the topic of education.[129]

Pontanus would also secure a position as a tutor to the nephews of Tycho Brahe, who were also young noblemen. He travelled through Germany, Italy and England with them. Pasor wrote a textbook on arithmetic, Arcerius on fortification and warfare, Pontanus included astronomy into his tutoring and Metius' oldest writings are on geometry and astronomy. All this points to an important development, which was that the European nobility was starting to show a strong interest in mathematics in all its different facets. That Metius, although still in his early twenties, was a teacher of a Danish prince fits this picture nicely.

Lessons in mathematics given to young noblemen would have focussed on the many different facets of the field. It is probable that a tutor would have started at the very basis, thus making it likely that arithmetic and geometry would have been the first focus. Since these fundamentals were hardly taught at grammar schools this is only likely.

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[123] Unfortunately no known copy of this particular book has survived, but the fact that it is mentioned in his eulogy, delivered by Bernhardus Fullenius senior, is convincing enough to assume that it once did exist; See Fullenius, *Pasor*, fol. 3B recto. A second important link can be established through Pasor's brother Mathias Pasor: he would become the second professor of mathematics at Groningen, still during Metius' life.

[124] On Alsted see Hotson, *Johann Heinrich Alsted*.

[125] Hotson, *Paradise Postponed*, 105.

[126] Van den Heuvel, *De Huysbou*, 22.

[127] Aelianus, *Tactica* (1613).

[128] Waterbolk, 'Met Willem Lodewijk', 307-308.

[129] Waterbolk, 'Heeft de hogeschool', 158 and Menk, *Hohe Schule*, 28.

If there was time, or if the well-educated nobles did have some knowledge of mathematics, a tutor may have scaled up a bit. Astronomy, fortification and surveying will likely have been part of such follow up lessons. These were the fields in which Metius would specialize in the years following his visit to Rostock, as can be taken from a manuscript that has survived from that period.

2.4.5. Privatdozent *in Jena*

This manuscript was made at the next university where Metius would pursue his didactic skills: the university of Jena.[130] He enrolled there as a student in the course of 1595, but would take up private teaching soon after. At least from the fall of 1596 onward, but possibly before that, he gave a series of *privatissima* on geometry and astronomy. The unknown and unstudied notes of these lectures are preserved in the University Library of Tübingen. These lecture notes offer a blueprint of the practice of mathematics at any European university in the Early Modern period, but mostly they tell a lot about the practice of Metius' classes.[131]

The classes started in on November 15, with official lectures by the professor of mathematics, Georg Limnaeus (1544-1611).[132] The notes seem to be meticulous transcriptions of his lectures and they warrant the conclusion that these lectures did not reach a very high standard. Limnaeus did not go beyond reading out loud a version of Euclid's (ca. 300 BC) *Elements*, without giving the proofs to his students. The whole series of lectures comprised of the reading of propositions, starting with 'Mathematics is a science that deals with quantity, continuity and divisions', and continuing with no less than 432 different theorems.

Following these lectures, which provided a framework, Metius instructed the students on mathematics more in depth. He started his course with a thorough discussion of what he called geometry. In a true humanist tradition, the title page of the lecture notes has a quote from Cicero (106 BC-43 BC): 'If now he will not have faith in geometrical proofs, he will truly be far off from having faith in the proof of

[130] Steiger, *Die Matrikel,* I, 205.

[131] Universitätsbibliothek Tübingen, manuscript Mc 25. This entire paragraph is based on the manuscript of Metius' lecture notes. A short description of the manuscript can be found in: Röckelein, *Die lateinischen Handschriften*, I, 106-107; see also Ibidem, II, 330 and 337; I am very much indebted to Frau Anna-Elisabeth Bruckhaus of that library, who not only helped me acquire a scan of a microfilm of this manuscript, but also sent some details on it.

[132] This Limnaeus claims some fame, because he was at one point very enthusiastic about Platonic ideas voiced by Johannes Kepler. See Martens, *Kepler's philosophy*, 38. His son would become a famous expert on constitutional law in the German lands.

philosophers.'[133] Metius' classes were a thorough instruction on geometry in twenty-two different sessions. In these he dealt with some basic arithmetic and divisions, but also with trisections and geometrical figures. Different instruments were introduced like the Jacob's staff and ultimately an astrolabe for land surveying purposes. During several weeks, Metius gave classes on five consecutive days. It was a programme of great intensity, in which the students were taught to master all of the basics of geometry.

About a week after the classes on geometry had started, Metius began teaching classes on astronomy as well. This was three days before Limnaeus would start lecturing on astronomy, but Metius was on a tight schedule.[134] His weeks were already full with his classes on geometry; he would take until January 5 1597 before he had finished these new lessons. It would take a total of twenty-six lessons to teach the students all the basics of astronomy, including cosmology, observations and astrological calculations, as well as the use of several astronomical instruments like the astronomical astrolabe. Metius even talked about observations he had made in Jena, just prior to the start of his course.[135] Like the geometrical course this was a serious introduction to astronomy and Metius seems to have been an able instructor.[136]

By early 1597 Metius left Jena for Marburg. He gives some references about teaching there in later publications, dating as early as 1598. Still it is impossible to date his time there more precisely. What is clear is that he had his first book published in 1598, which is an elaborate version of his lectures in Jena. It would also be the basis for all his later work on astronomy, although those works were neither static nor simple copies of these firstlings. By this point, Metius had modelled himself after a German professor in mathematics. He was lecturing, publishing and would soon be inventing instruments. For example, his successor as *Privatdozent* in Jena, Heinrich Hoffmann (1576-1652), also fits this description.[137] Metius would successfully merge this German tradition with his own social status and with his education in Franeker. He arrived

[133] Universitätsbibliothek Tübingen, manuscript Mc 25, title page: 'quod si geometricis rationibus non est crediturus nae ille longe aberit, ut rationibus credat philosophorum'
[134] Universitätsbibliothek Tübingen, manuscript Mc 25,, 72; That he took a week off at the beginning of December did not help.
[135] Universitätsbibliothek Tübingen, manuscript Mc 25, 82.
[136] The classes on mathematics were succeeded by lectures on Ethics and Logic by professor Wolfgang Heder. After Limnaeus and Metius were finished Heder picked up the teaching again with lectures on Plutarch. All this suggests that mathematics clearly was a part of the propaedeutic education of university students.
[137] Kratochwil, 'Der Jenaer Mathematikprofessor Heinrich Hofmann'. There are numerous other mathematics teachers in Germany around this time that fit this description, for example Adam Ries, Abidas Trew and the Hambrug mathematician Johann Adolph Tassius. See the various contributions to Gebhardt, *Arithmetische und algebraische*, passim.

back in Friesland early in 1598 as a proper teacher. When he had left the Republic a few years earlier he possibly had his portrait made, depicting him as an astronomer. Upon returning there was no more doubt about this image. He had assisted Tycho Brahe, the most famous astronomer/mathematician of his day, he had been a lecturer on mathematics at several universities and he had published a comprehensive textbook on astronomy. Metius had fashioned for himself the image of a mathematician.

2.4.6. Professor in Franeker

Around the same time that Metius returned, the Frisian Stadtholder, Willem Lodewijk, welcomed an unnamed mathematician, who pressed him to reestablish the Franeker chair, which had been unoccupied since Roggius had departed.[138] It is unclear if Metius was this mathematician, but the sequence of events seem to imply that Willem Lodewijk was persuaded and that Metius was that mathematician.[139] At the end of February, Willem Lodewijk's secretary reported the visit of the unnamed mathematician. At the end of March, Metius was back in Franeker to take up a position as associate professor in mathematics.[140] Of course it was not solely Metius' doing to have the chair re-instituted. In fact Willem Lodewijk, as a fond amateur of mathematics, hardly needed an incentive to act. And at Franeker the professors probably welcomed an able mathematician who would concentrate on that field.

His new colleagues, who had sharpened their knives over the appointment of Roggius, did not loudly object to Metius. This was likely because Metius was virtually the opposite of Roggius. There are no signs that he took active part in any partisanship, while at the same time his social background would have been pleasing to the two rivaling camps at Franeker. On the one hand, Metius' family kept good relations with both Dutch Stadtholders, his father Anthonisz being an important official working for both Willem Lodewijk in Friesland and Maurits in Holland. This worked in Metius' favour for the Lubbertus camp, whose main allies were Willem Lodewijk and people from his circle. On the other hand he was himself a Franeker student who had lodged with Arcerius and was close friends with some of the 'Frisians', which made him a more than acceptable candidate for other camp.

[138] Waterbolk 'Terug naar Everhard', 41 and Van Berkel, 'Het onderwijs', 216.
[139] Or was it possibly his father Adriaan Anthonisz?
[140] There were at least two other strong candidates to take the role of this mathematician. First of all, Metius' father who traveled all through the united provinces to reinforce the bulwarks of many cities. Second of all, Simon Schotio, the first to take a masters degree in mathematics at the University of Leiden (and one of the very few in the first centuries of that university). A date for the defense of his *disputatio pro gradu* had been fixed on February 21, he would defend it on March 9 that year, see Molhuysen, *Bronnen*, I, 106.

Most importantly Metius showed an approach toward mathematics that was typical for the late sixteenth and early seventeenth century. He organized old knowledge and referred back to classical authors, without aiming high or being innovative with his own ideas.[141] Contrary to Roggius, who clearly had an orthodox and strict Calvinistic agenda, from the outset Metius focused on mathematics. Still the people in charge had learned an expensive lesson with Roggius and were not set to have their fingers burnt again; Metius got a probation period. He was expected to show his skills as a teacher, before he could receive a full appointment in Franeker.[142]

There is at least one account of Metius' first lessons in Franeker. In 1597 Pibo Gualtheri, a Franeker boy, had enrolled at university and wrote about Metius' first classes. In a pamphlet published in 1613, which will be discussed in a following chapter, he reminisces on his time as one of Metius' students:

> 'I recall, when I began to lay the mathematical foundations in the University under Your Honor's liberal profession, and gradually opened the books of Your Honor and other scholars, which kindled great hope, alertness, joy and friendship towards Your Honor in me, as [in] others, and [this] is truly preserved today.'[143]

One of the books Gualtheri refers to is Metius' first textbook in astronomy, which was published in 1598 and which Metius used for his lessons. Apparently teaching mathematics from books was an important novelty for Gualtheri, novel enough for him to ponder enthusiastically on it decades later. Likewise he reminisces that Metius read the fundamentals of mathematics to his students. Not only does this fit the general picture of the education of mathematics at the time, but it also goes perfectly well with Metius' lectures in Jena. Indeed he started out

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[141] It was what could be labeled a 'humanistic approach' to ancient knowledge. This was humanistic in the sense that most of Metius' contemporaries organized other forms of knowledge in a similar way and referred to themselves and to each other as humanists. See also Rienk Vermij's comparison between Metius and Snellius in Vermij, *The Calvinist*, 21-22.

[142] *OFAM*, 39 and 57. Winsemius points to Ramus as the instigator of such 'trial' periods.

[143] 'My ghedenckt, wanner Ick d'Mathematische beginselen inde *Vniversiteyt* onder V.E. liberale professie begonste te leggen, en allenxkens V.E. als andere Geleerder Boecken opsloech, dat ick met overgroote hope, wackerheyt, vreuchde ende vrientschap neffens V.E. als andere onsteken ware, ende eernstelijck tegenwoordich beholde.' Gualtheri, *Antwoort*, 5.

with simple geometry and arithmetic. His textbook on astronomy thus came later in the course, and 'gradually' started to play a role.[144]

In 1600 Metius' appointment was officially confirmed when he was awarded a full position as professor in mathematics. With this he became eligible to serve as an official academic member, like a member of the Senate. The fact that he represented so little controversy was immediately rewarded the following year when he was appointed *Rector Magnificus* of Franeker by his colleagues. The most logical explanation for this very swift career advancement is that he was no threat to the sitting professors and that he was an acceptable candidate for all parties. Apparently Metius stayed ideologically under the radar in his early years as a professor.

2.5. Conclusion

Mathematics in Franeker did not make a false start, it made a disastrous start. The very first professor was an example to all his successors of what not to do with the chair of mathematics in Franeker.[145] Or perhaps, he was a general example of what not to do with an academic chair. The disaster had, after all, little to do with his teachings of mathematics. Roggius used the academic position of professor of mathematics to play a part in university politics. He had come to Franeker to help the cause of the Reformation. He was offered the position of inspector of the Burse but his position soon became untenable. The solution for the problematic situation consisted in appointing him as professor of mathematics. Roggius had no track in mathematics that we know of, but he was a Hebraist. What is more important is that he was academically qualified as a literate man. At the Early Modern university, a qualification in mathematics was of subordinate importance.[146] This indicates that mathematics as an academic discipline did not exist, as did other 'academic disciplines in general'.

Like Roggius' appointment, his failure as a professor of mathematics cannot be understood in terms of 'mathematics'. He failed neither as a mathematician nor as a mathematics teacher. What his case does show, is that Roggius' appointment and the troubles he got embroiled in can only be understood by looking at the dynamics of academic life; Roggius was a victim of larger forces at work. These forces were the political and

[144] This is corroborated with the description Winsemius gives of Metius' first classes, see *OFAM*, 39.

[145] *OFAM*, 35-39.

[146] Possibly the most famous example is that of Petrus Ramus, who was appointed professor of mathematics after he was forced out of his chair as professor of philosophy, see Goulding, *Defending Hypatia*, esp. chapt.2. There are, however, numerous other examples of Early Modern professors in mathematics who excelled in other fields than those that were considered to be part of mathematics.

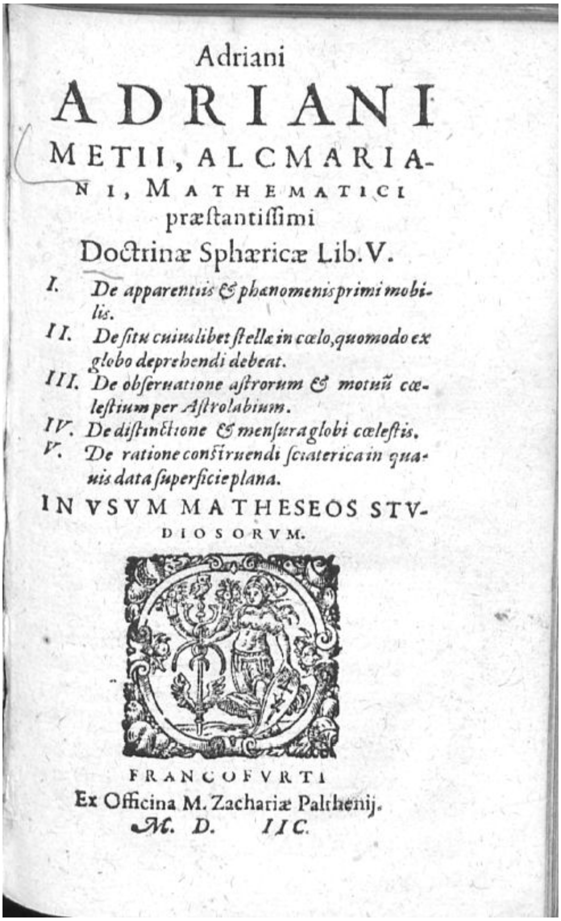
theological issues that were fought over in the Dutch Republic at the time and that partly originated in *academia*. Over the decades to come, these matters would find their way into a number of different areas of cultural life, bringing the young Republic to the verge of civil war in the year 1610. The extensive study of Roggius' term as a professor reveals that math was already part of these particular disputes. This highlights that Roggius' chair was foremost an academic chair that must be understood in terms of academic society, scholarship and university politics. This is corroborated by the fact that the chair of mathematics was often offered to young academics at the start of their careers.

In contrast to the failure of Roggius stands the success of Metius. He secured a place for the teaching of mathematics at Franeker. One of the reasons for his success may be that he advocated keeping the content of his teaching modest, namely measuring and calculating. Maybe more important is that through his education in fortification and surveying, he linked the chair of mathematics to the societal interests of state formation. This is once again proof of the fact that mathematics could not be understood on its own; it had to be given a place in academic life as well as in society at large. Metius managed to do both.

Meanwhile, Metius also needed to build an academic career. Given his background and his own education he successfully adopted the image of a new breed of professors in mathematics. He took an interest in the field he lectured in, and as such he was able to offer his pedagogical modernization. Metius' story shows that mathematics was something more than a field where theological disputes and academic quarrels could be settled.

Metius would find a home in Franeker. This is best illustrated by the fact that in his early years his colleagues elected him *Rector Magnificus* only two years after he became eligible for the post. He was a professor that was agreeable to all the various factions at Franeker. He was well connected, had studied in Franeker and there were no known controversies surrounding him. All of this made him a likely candidate for both the liberal and the more orthodox parties. The fact that he seemed capable of avoiding controversy eased the pain of the disastrous start of mathematics. For Roggius the chair of professor of mathematics was merely the first stage of a dreamed academic career, for Metius it was his final destination.

The establishment of the chair of mathematics in Franeker shows how a place for mathematics at the university had to be won and how subsequently mathematics was given shape within the context of academic life and societal dynamics. The specific shape the chair got under Metius – a practical and pedagogical approach – was not inherent to something like 'mathematics', but it was the product of the interaction of Metius' particular background and aspirations, the time-specific situation at the university and the provincial interests with the university as such. Metius managed to strike a fruitful balance. How he practiced math and further developed the chair is the subject of the next two chapters.



Adriani
ADRIANI
METII, ALCMARIA-
NI, MATHEMATICI
præstantissimi
Doctrinæ Sphæricæ Lib.V.

I. De apparentiis & phænomenis primi mobilis.
II. De situ cuiuslibet stellæ in cœlo, quomodo ex globo deprehendi debeat.
III. De obseruatione astrorum & motuũ cœlestium per Astrolabium.
IV. De distinctione & mensura globi cœlestis.
V. De ratione construendi sciaterica in quauis data superficie plana.

IN VSVM MATHESEOS STVDIOSORVM.

FRANCOFVRTI
Ex Officina M. Zachariæ Palthenij.
M. D. IIC.

Titelpage of Metius, Doctrinae *(1598). This was Metius' first book.*
Universitäts- und Landesbibliothek Sachsen-Anhalt.

3. Building a Reputation: Metius' Books

3.1. *Introduction*

OVER THE 37 years he was a professor in Franeker, Metius of course met with opposition and controversy. Most notable are his suspensions for public drunkenness.[1] And although he also clashed hard with his colleagues from time to time over typical academic affairs (appointment of professors, students who got into trouble), he kept himself out of structural problems in the long run.[2] He did so by keeping a rather strict focus on mathematics, without voicing strong opinions on theological and philosophical matters. Over time his name became more or less synonymous with that of mathematical practicality.[3]

There are roughly two different groups of 'products' through which this practicality has become visible. These products are also symbolic for Metius' long career as a professor. The first are his books and the second are his instruments. Together, these two help understand how Metius gave shape to the mathematics chair at Franeker, how he instructed his students and how he advanced his career. The study of these products will provide insight into how mathematics was used in Franeker at the time. Of course these two groups did not simply represent Metius' knowledge and skills. His students helped him refine his knowledge, his books were reworked and republished and his instruments were used to make observations and collect data, all of which in turn was used for his books, to make new instruments and to educate those students. It was a circle in which Metius as well as his students took various roles. They could be authors, readers, users, producers or consumers of both the books and the instruments. The whole concept of a textbook therefore

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* Parts of this chapter have previously been published as Dijkstra, 'Translating Astronomy'. I kindly thank LIT-Verlag for letting me use it again.

[1] Boeles, II.1, 72.

[2] He clashed with Henricus de Veno in 1609-1611, see Lüthy and Spruit, 'The Doctrine, Life', 1129, comp. above par. 2.3.2.; In the 1620s he got into troubles over the appointment of several professors and the *Rector Magnificus*. See http://home.wanadoo.nl/mpaginae/BrvnSaeckma/brstekst.htm (retrieved 10-12-2011), especially in the correspondence of J. Saeckma with Amama are some revealing passages.

[3] See Van Berkel, 'Het onderwijs', 216; I agree with this interpretation and have published on it, together with Goffe Jensma in our article 'Wiskunde als familiebedrijf'.

needs to be examined: what remains of the 'textbook' when both author and user are scrutinized?[4]

The aim of this chapter is to gain insight in how Metius used various different publications to build a reputation and how he was helped with this. The case of Metius' books is intriguing because his reputation was not only built by himself but also by his students and their publications. It is therefore necessary to investigate what his position was in the Frisian world of print.[5] His case is all the more interesting since he was the most productive mathematician of his day; no other European author published more editions on mathematics than him.[6] The core of this chapter deals with a more general point, namely the relation between a professor and his students. The books published by a professor are not simple representations of what he intended to do in his classroom, students influenced how those books were shaped and professors modeled these books along the demands of students.[7] All this is presumed often enough in the literature. Here, however, the study of this process is used as a way to reveal how mathematics was being used as a means to gain academic recognition.

I will first present a comprehensive introduction of Metius' oeuvre and a first selection of the works that are essential to understand the different characteristics of this large corpus of printed books. I will then offer five different examples of books and other print, in which Metius played a crucial factor. These five specimens can best be understood as parts of a group of people that was centered around Metius. The first case is a book Metius published himself. The second is a play that was printed in Franeker by a writer that can be identified as belonging to Metius' circle. The third case is the booklet published by Metius' student Gualtheri in which several difficult games and riddles give important indications to how the practicality of Metius' classes was perceived by his students. The fourth and fifth cases focus on two different translators of Metius' work. All of these publications came from within the sphere of

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[4] I take from Howard Hotson that textbooks could roughly take two different forms up to the seventeenth century. On the one hand it could be an abridgement 'of ancient works' or an 'introduction' to a discipline. On the other hand it could be a means to spread a new view on how the philosophical system should be designed. See Hotson, *Commonplace*, 50-51. The two main textbook authors of the sixteenth century were Melanchthon and Ramus. I propose to have another look at this concept and investigate how those textbooks were compiled.

[5] An interpretative study on how print functioned in Friesland is lacking, but a lot of research has been done by the likes of J.J. Kalma, Philippus Breuker and recently by Dick Eisma. My understanding of this world is very much indebted to their research.

[6] Van Netten, *Koopman in kennis*, 75.

[7] Metius was already a known 'textbook author' in his own time, Johannes Kepler, for example, hailed him as the last of the modernizers of astronomical education in 1618. See Westman, *The Copernican Question*, 434-435, who cites Kepler on this.

influence of the university and each helps to understand how the professor of mathematics functioned, which in turn helps to the understand how math was practiced.

3.2. Metius' oeuvre

There is one important name virtually absent in most of Metius' books: Petrus Ramus.[8] One of the most important philosophers and mathematicians of the sixteenth century, he is only mentioned a few times in all of Metius' books. At the same time all of Metius' work seems to have a smell of *Ramism* – that is, taking after the ideas of Ramus in one way or another. This means that Metius, much like the French philosopher, proposed to facilitate the curriculum. In Metius' case this was strictly limited to the curriculum of mathematical education, while in Ramus' case it involved the whole of academic schooling.[9] Also, contemporaries often explicitly compared Metius to Ramus.[10] Besides the distinction between the two, there is an important similarity between the works of these authors; both were part of a tradition of constant reinvention in terms of publication strategy. The production of Ramist works was one of the largest trends in print in the early seventeenth century, and the production of Metius' works was one of the largest in mathematics around that exact same time. Both trends seem to share some distinctive features.

During his life Metius oversaw no less than 27 editions, of original works, reprints and translations. Most of these are comprised of several parts, volumes and tomes, which are sometimes bound in separate bindings. He published in both Latin and Dutch, but he was (without his involvement) translated into German and Spanish during his life, and commonly referred to in English literature shortly after his death.[11] Several of his books were pirated in other provinces of the Dutch Republic. If a strict, present-day bibliographic method is not employed, a complete list of his publications would reach well over 50. This poses problems for historical research, but it also offers great opportunities. When Metius' oeuvre is scrutinized this gives a brilliant overview of his

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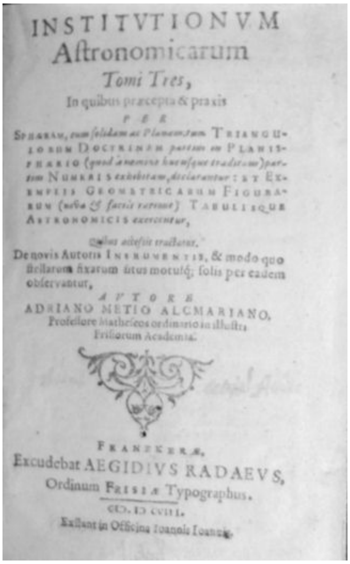
[8] Metius, *Doctrinae* (1598), 4 and Metius, *Arithmeticae* (1611), II, 2 and 81; That he was influenced by the ideas of the French humanist can be taken from his usage of the word 'Radius', as is discussed by Kokomoor, 'The Distinctive Features', 382.

[9] The most notable Dutch *Ramist* was Rudolf Snellius. Snellius, one of Metius' teachers, did copy the whole program of Ramus, see De Wreede, *Willebrord Snellius*, 36-39.

[10] Metius was explicitly compared to Ramus by the historian Furmerius, see Metius, *Arithmeticae* (1611), fol. *4 recto; and in his Eulogy Menelaus Winsemius also explicitly compared Metius to Ramus, see *OFAM*, 39 and 57. Johannes Kepler, for example, compared Metius' works with those of Ramus in a letter to Benjamin Ursinus, see *Johannes Keplers Gesammelte Werke*, XVII, 101.

[11] The best discussion of how this was done with Ramus' works is again Hotson, *Commonplace*.



Titlepage of Metius, Institutionum *(1608). Museum Boerhaave, Leiden.*

Franeker academic career. Of course to do so, the first thing that is required is a modern bibliography, which will provide a backbone to the story. Such a bibliography has been desired and called for by several historians. In fact, many have tried to do so; the most recent and by far most successful effort was done by Djoeke van Netten. It is her work that mapped my path through this bibliographical minefield.[12]

Metius and his different publishers and printers were masters in reinventing his work.[13] Basically, his entire oeuvre comprised no more than three different works: 1. A textbook on geometry and arithmetic; 2. A textbook on astronomy; 3. An ever-lasting calendar.[14] To complicate things, this last book was hardly his own; it was comprised more or less of work that Metius himself had found among the papers of his deceased father. So the mathematician who published more editions than any other contemporary mathematician, at the same time, only wrote two original works. But the re-editing, re-publishing and re-organizing of his

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[12] Van Netten, *Koopman in kennis*, 75-103 (chapter 3) and 209-213 (appendix). I want to stress that I could not have written this chapter without her granting me access to this bibliography, long before it was published.

[13] It seems that Metius himself was responsible for a number of his editions; he even owned some of the printing blocks used to print the images in his work. This makes him stand out again from his contemporaries. See also: Dijkstra en Jensma, 'Wiskunde als familiebedrijf'. Van Netten does not distinguish the third category of the ever-lasting calendars, see Van Netten, *Koopman in kennis*, 86.

[14] Breugelmans and Dekker, 'Adriaen Anthonisz'. The authors of this article try to diminish the role Anthonisz played in the fortification of Dutch towns, but it is very unclear why they do so.

work was done in such a clever manner, that almost every edition can be seen as a new starting point. Every new edition had something desirable, and even if a contemporary user of the books had old editions, a purchase of the latest print would have still seemed like a good idea. Yet the old edition was published in such a way, that it still had value and could well be sold to a new owner. If anything, this resembles the way first year students at modern universities deal with textbooks from modern publishing houses. Every new print has new features, but last year's edition can still easily be sold on the internet.[15]

All of Metius' books are easily read and understood. Even today his examples are clear, well written and accessible. This is also the main explanation for his success. A second reason can be found in the fact that he was published so often. Metius was a success because his works were readily available over a longer period of time. In the Early Modern period, books on mathematics were perhaps the most expensive enterprises for a printer to venture on.[16] It seems that Metius' publishers took that risk happily, a fact that made him stand out from his contemporaries.[17] But these general observations do not provide insight into the production of individual books. With Van Netten's bibliography, things have cleared up quite a bit. Nevertheless, important additions that reveal the secret to the success of Metius' oeuvre are still to be made.[18]

For this to be a comprehensible story, it is necessary to focus on certain key publications in Metius' oeuvre. These will provide a short route through the minefield. Starting with one of the first of Metius' books to be printed in Franeker, I will introduce only a few other works, focusing on some of the most intriguing instances where Metius and his students clearly exchanged influences on each other's work. This will at the same time help to understand how Metius functioned in Friesland, which of course is still the main focus here. My discussion of Metius' oeuvre can be used to understand similar processes in the history of mathematics and of science more generally. Most importantly, the production of Ramist texts in Germany shows strong similarities with what happened in Franeker. Numerous editions, translations and reprints appeared there, all of them varying slightly, or claiming to be a translation of a previous edition.[19] At the academy of Herborn that

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[15] In this sense Metius' books were ordinary textbooks, to a certain extent.

[16] Johns, *The Nature*, 90.

[17] During the whole of the second half of the seventeenth century, the English author Moxon (a former apprentice to Metius' friend Blaeu) used Metius' name as a commonplace for mathematical books on the title pages of his own work, see Dijkstra, 'A Wonderful', 79.

[18] Van Netten has not only provided an overview of Metius' work, she also explains how he functioned as an outpost to Willem Blaeu, see Van Netten, *Koopman in kennis*, 98-100.

[19] On Ramism in Germany, see Hotson, *Commonplace*, passim.

tradition culminated in what has been labeled the 'most important baroque encyclopeadia', written by Johann Heinrich Alsted and published in 1630.[20] This work was the result of a 'gradual accumulation of material' and provides a mirror that helps to understand Metius' work.[21] Alsted's work has in fact been recognized as Ramist based on both its content and on the way it was printed and published.[22]

This republishing and reinventing of the content of the books reverberates in Metius' oeuvre. Metius' publications did not have as large an epistemological impact as those more illustrious examples from Paris and Herborn, but his books offer cases that show quite well the production process. They show that those large movements of reinvention and republication clearly resounded in seventeenth century Friesland.[23]

To get a good grip on the five cases I discuss here and also to present a good overview of Metius' complete oeuvre, the following editions of his work will take a central role in the remainder of this chapter. As will become clear these books offer the opportunity to discuss some of the most distinctive features of Metius' oeuvre:

1608 *Institutionum astronomicarum* – a Latin textbook on astronomy;
1611 *Arithmeticae et geometriae practica* – a Latin textbook on arithmetic and geometry;
1614 *Institutiones astronomicae & geographicae* – a Dutch textbook on astronomy and geography, a translation of 1608, republished in 1621;
1623 *Praxis nova geometrica per usum circini et regulae proportionalis* – a Latin treatise on Galileo's proportional ruler;
1624 *De genuino usu utriusque globi tractatus* – a Latin translation of the 1614(!) textbook on astronomy, republished in 1626;
1626 *Maet-constigh liniael, ofte proportionalen ry ende platten passer* - a Dutch book on geometry and fortification, in which parts of the books from 1611 and 1623 were published in translation;
1627 *Eeuwige handt-calendier* – a manual how to calculate calendars and almanacs. [24]

[20] The quote on Alsted is taken from Hotson, *Commonplace*, 7.
[21] Hotson, *Commonplace*, 198.
[22] Hotson, *Commonplace*, 186 and 292-293.
[23] On the early editions of Euclid, a massive amount of literature is available. A particularly telling example in view of this article is that of how Euclid was reinvented time and time again by none other than Petrus Ramus himself, see Goulding, *Defending Hypatia*.
[24] For full details see the bibliography in: Van Netten, *Koopman in kennis*, 75-103 (chapter 3) and 209-213 (appendix).

I will only discuss other prints in their relation to those listed here, but first some general remarks about the entire oeuvre can be made. Most of Metius' publications are characterized by their practical application; they describe instruments, globes or practical methods for applying mathematics. His method for gauging wine barrels was particularly clear and was used by numerous other writers. More than 90% of his work was printed in Franeker.[25] He used a variety of publishers, none of whom stands out by quantity, but they differ in quality. Willem Blaeu's editions of Metius' works, which were printed in both Franeker and at Blaeu's own presses in Amsterdam, attract attention for their neatness.[26] One of the most desirable features of Metius' books, which was also one of the most expensive parts to have made, are the numerous tables and charts that his books contain.[27] In those Blaeu editions, the charts and tables are printed particularly clearly, which makes those books presumably even more desirable. Even here Metius' works resemble those of Ramus and even more so those of Alsted. Concerning the works of the latter two, the historian Howard Hotson says: 'This clear correspondence of pedagogical and typographical form is one of the most immediately appealing features, even today [...]'.[28] This can also be claimed for Metius' oeuvre.

3.3. *Metius' books in a cultural setting*

3.3.1. Institutionum astronomicarum

One of the best and most captivating examples of Metius' works is a textbook on astronomy that he had re-issued in 1608: the *Institutionum astronomicarum* (Education in astronomy). Not every professor in the Early Modern period wrote or published his own work. For Metius, however, this was business as usual.[29] This *Institutionum* was for a large part composed of the lectures Metius had given in Jena and showed a

[25] On wine gauging around 1600 a good introduction can be found in Meskens, 'Wine gauging'; although Meskens only mentions Metius once, the practice in Antwerp was remarkably similar to that of the Franeker professor.
[26] On Blaeu and Metius see Van Netten, *Koopman in kennis*, 75-103.
[27] These pages were often completely engraved – making them as expensive as illustrations. The upside of this was that they were easily reproduced. When the pages were set by the printer from loose type, which also happened with Metius' works, this was hardly cheaper since it involved a good deal of (complicated) work to have the tables neatly aligned, comp. Johns, *The Nature*, 90.
[28] Hotson, *Commonplace*, 292-293.
[29] Even the Jesuits used Metius' books at their colleges. Tresoar in Leeuwarden owns a copy that was clearly used at such an institution, see Tresoar, Metius, *Primum mobile* (1631), shelf mark B 38329 kluis. Another indication how important his work became to these colleges can be found in the fact that he was placed on the Spanish *Index librorum prohibitorum* – if purged of certain passages, Metius' work was allowed to be used by Roman Catholics on the Iberian peninsula.

Titlepage of Metius, De Novis. *With Metius' sextant 'in action' depicted on the right side.*
Tresoar, Leeuwarden.

strong resemblance to his first book from 1598. More importantly he had published the same book in 1606. To complicate things, that book's title page had given 1605 as the year of publication.[30] The book also consisted of three tomes and on the title page (where it showed 1605 as the publication date) a fourth tome was 'announced', but not yet included in the book.[31] In 1608 Metius had finished this last tome and added it to the book, replacing the original title page of the book with a new one that gave 1608 as the year of publication.

He had good reasons to re-date the book. In 1606 the first issuing had been on sale in Frankfurt.[32] But since he wanted this new issue to be included in the catalogue of 1608, it had to be on first sale there again. Because books were normally sold as loose stacks of paper, that reissuing

[30] Other parts of the book are dated 1606, I have found no copies without those parts and therefore conclude that the book was not on sale prior to 1606.
[31] Metius, *Universae* (1605), III, 292; see also Ibidem, I, [16].
[32] Moretus bought several copies, see Meeus, 'Jan Moretus', 367; I also draw on a friendly communication of Djoeke van Netten, who pointed out that Moretus bought Metius' works in Frankfurt in 1606 and in 1611, which she had found in the Plantijn-Moretus archives in Antwerp. The first purchase was the *Institutionum astronomicarum*.

was easily done; all it took was a new title page for the copies that were still in stock. A second reason for renewing the first page of his book was that the fourth part had taken a slightly different form than Metius had anticipated. It was now preceded by a short treatise in which Metius introduced a new instrument. The new issue gave him the possibility to announce this on the new title page: *De Novis ab autore inventis Instrumentis* (On a new instrument invented by the author).[33] The fourth tome was thus made up of two different and distinctive parts: a treatise and the actual work that was already announced in the previous issue.

The treatise is remarkable in more than one way. First of all its contents are stunning. Directly noticeable are the woodcuts. On the thirteen pages, no less than three page-filling woodcuts of the new instrument were used.[34] The first is a depiction of the instrument 'in action', and the other two are greater detail images of the two important parts of the instrument. These pictures should be regarded as examples for how to build such an instrument. With the use of letters and symbols the reader is referred to the text. The woodcuts thus have both a realistic and a theoretical function. Or, to be more precise, the second and third woodcut have a pedagogical function, in contrast with the first, which was more or less an illumination to make the book more attractive.[35]

Secondly, this treatise is all the more remarkable because it is oddly placed between the third and the fourth part of Metius' book. It was printed with little attention to the amount of paper that was needed, and precisely in the first decades of the seventeenth century there was a shortage of that in the Dutch Republic.[36] The treatise comprises one octavo section, but including the title page, only thirteen of the sixteen pages are used in a sensible way. The copy that is kept at Tresoar in Leeuwarden today includes no less than three white pages; several other copies have a woodcut reprinted just to fill empty pages.[37] Also the

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[33] The complete title is: *De Novis ab autore inventis Instrumentis et Modo quo per eadam stellarum fixarum situs solisque motus annuus observantur, Tractatus brevis & utilis.*

[34] In his treatise, Metius' presented a newly designed sextant, which will be discussed in the following chapter.

[35] For the use of images in Early Modern books on mathematics see Kusukawa, *Transmitting knowledge*. The articles of Dupré and Mosley in particular offer clues on how to analyse such images: Dupré, 'Visualization', 38-39 and especially Mosley, 'Objects of Knowledge', there specifically 216.

[36] Especially at the beginning of the seventeenth century, paper was scarce in the Dutch Republic. Only when a truce with Spain was agreed in 1609 did more paper became available. See Van Delft, *Bibliopolis*, 62.

[37] This 'reprint' can be found in numerous libraries, for example the University libraries of Nijmegen (Radboud), Amsterdam (UvA), San Fransisco. Both copies in the British Library are of this edition. The one in the University library of Aberdeen is a compound copy with a title page from 1605/1606 but the tract on the sextant, as well as the whole fourth part from 1608, are added.

overall sloppiness of the treatise attracts attention. Page numbers are missing and references are wrong. All in all this indicates that the treatise was made in a hurry and that it was probably added to the fourth tome only at the very last moment.

The *Institutionum astronomicarum* proved a benchmark for the rest of Metius' oeuvre. He would continue to keep a flexible approach toward printed works. His editions could be reworked, or sold to another publishing house. He would deploy translators, or at times translate material himself. At a last moment something could be added or removed. A book could be published, but just as easy be taken from the shops or be reissued.[38] At the same time, however, Metius published his books with special attention to the pedagogical value of his works.

3.3.2. *Van Zonhoven*

How did these publication strategies reflect upon Metius as a public and cultural figure? It is clear that by the 1610s and 1620s he was turning from a teacher of mathematics into a well-known and admired author. That Metius was actively engaged in cultural life is a conclusion that can be drawn, for example, from the many *carmina gratulatorum* or *dedicatorum* that were published with his books. *Carmina* were laudatory poems, traditionally poems that sung praise for authors or books and were often published in the works of the praised authors. Sometimes they were separately printed and published, but if so, they seem to have been much less likely to survive. In Franeker, it was often (though not exclusively) academics that wrote such poems. It was thus a typical activity within the sphere of the university.

A telling collection of such *carmina* was printed in 1614, together with Metius' first book in Dutch. To understand the setting in which this book was written, edited and published it is necessary to take a close look at two other works that were in print in that same period. The first one is a pamphlet written by Pibo Gualtheri, which was published a year before Metius had his book printed. The second is a *Happy ending tragedy* published in Franeker in 1616 by Reinier Olivier van Zonhoven († after 1630).[39] That play will be the start of this interpretation because it best shows in which cultural background Metius' mathematical works were received and what the local setting was in which they were produced.

[38] As late as 1626 the 1605 book was reissued, with new title pages, but largely with pages from that first print run. See below footnote 74.
[39] Van Zonhoven, *Blyeindig treurspel*.

The author of the play, Van Zonhoven, can be directly associated with Metius through a *carmen* he wrote for Metius in 1614.[40] Van Zonhoven did not matriculate in Franeker, yet this poem shows how close he was to the academy. In fact his is the only *carmen* in all Metius' works that is written by someone who is not directly identifiable as an academic himself. Numerous of the better-known citizens of the University of Franeker also wrote and published such verses to Metius' work and they often give clues to how academia worked. For example, in the 1605-1608 editions of the *Institutionum astronomicarum*, Metius' colleague Henricus de Veno had a *carmen* printed. After he and Metius clashed hard in 1610, all reprints (and re-editions) of that book lacked De Veno's poems, whereas the other *carmina* of that 1605-1608 edition were reprinted in those new editions.[41] Pier Winsemius (1586-1644), Metius' lifetime friend, was the most productive *carmina* poet in Metius' works. He had poems printed in almost all editions printed after 1614.

Van Zonhoven's case is important because he discusses a certain Metius at length in his *Happy ending tragedy*. That play was partly a translation and partly an adaptation of a classic piece by Livy (Titus Livius 59 BC-AD 17). It centers on a war between the Romans and the Albans. This confrontation is won by the former due to their heroic performance and brotherhood, as well the fact that the second party overestimates their own ability. Interestingly, the Albans are under command of the classical figure Metius. Although Van Zonhoven gives no direct references to the state of affairs in Franeker at the time, it is beyond doubt that Reinier Oliver van Zonhoven, would have thought about his friend, the local professor of mathematics, who bore the same particular name when he published his version.[42]

The role Van Zonhoven gave his Alban Metius differs from the one this fief normally takes. In the more common executions of this story the Alban is overly arrogant, for which he is severely punished (normally he is quartered). Here the Metius character is modestly confident and the focus is more on the side of the Romans. Metius the commander escapes his traditional penalty of being killed after he submits himself to the Roman king. This is not the only alteration Van Zonhoven had made; he also slightly changed the name of this character. In other versions this Metius is often referred to as Metius Suffitus, and Van Zonhoven leaves

[40] Metius' 1614 book had a poem printed that was signed with just 'Olivier', followed by the phrase 'search for peace' ('zoeckt vrede'). Neither the name Olivier, nor that epitaph mean anything to historians of science or mathematics, but historians of literature talk about a poet who used that phrase often. This was in fact Reinier Olivier van Zonhoven who wrote and published several other poems in numerous prints, all of which he signed with his call to 'search for peace'.
[41] See Metius, *Institutionum* (1608), fol. *6 verso; Metius, *Astronomiae* (1626).
[42] Breuker, 'Harns 1623'.

Rembrandt van Rijn, Historical Scene *(1626). The man on the right is possibly a 'Metius'.*
Museum De Lakenhal, Leiden.

that second name aside completely. These are clues that he moderated his Metius character so as to avoid insulting outright his namesake in Franeker. [43]

[43] On a side note there is an intriguing possibility that cannot go unmentioned here: the very first painting by Rembrandt van Rijn that is known today, may well depict a scene from this classical story, based on the version written by Van Zonhoven. It is therefore more than remarkable that the Metius depicted in that painting clearly has a strong resemblance to Adriaan Metius. Although this is of course no proof that Rembrandt painted Adriaan Metius, the possibility hints at the surprising areas where Metius' name may have turned up. That this possibility has to date gone completely unnoticed is because no one has made the connection between Van Zonhoven and Metius. It was the art historian Stumpel who pointed at Van Zonhoven's text as the likely source for Rembrandt's painting, see Stumpel, 'A twelfth attempt'. He also points out how difficult it has been for historians to explain what is depicted on the painting (hence the 'twelfth attempt'), but he oddly enough refers to the Metius in the painting using the spelling 'Mettus', which is *not* how Van Zonhoven spelled the name, see Ibidem, 46. If Stumpel's assessment, that the painting was influenced by Van Zonhoven, is correct, Adriaan Metius becomes a likely candidate to be depicted as the 'Metius' on it.

3.3.3. *Pibo Gualtheri*

Right about the same time another pamphlet reveals how Metius' position in Frisian cultural life actually influenced the practice of mathematics by other mathematicians.[44] In 1613 Pibo Gualtheri, one of Metius' very first students, published a largely unnoticed pamphlet that bears the peculiar title *An answer to a clever and not self made introduction*.[45] The pamphlet is dedicated to Metius, which makes the connection hard to miss. More interesting, however, is that like the title, the whole pamphlet is packed with seventeenth century riddles and rhymes. This not only makes it difficult to understand, it also offers a case of how these mathematicians communicated on several different levels. To unravel these levels, which would help to understand how Metius' fame and name was spread throughout Friesland, it is necessary to take a very close look at this pamphlet.

The central theme of *An answer* is a defense by Gualtheri against the attacks of a certain Jan Beerentsz († after 1630), who had responded to a geometrical question posed by Gualtheri himself.[46] Gualtheri had nailed this question to his house in the city of Leeuwarden and challenged anyone capable to a mathematical duel. Perhaps – but he gives no hints on this – he had presented this public question to celebrate the completion of the construction of his house, which occurred around the same time. According to Gualtheri, this Beerentsz had answered him, but not with his own writings; the title of Gualtheri's pamphlet refers to the 'not self made introduction' of this answer. Beerentsz' reply was printed and annotated by Gualtheri in his *Answer*.[47]

The geometrical questions and their presented solutions are typical displays of mathematical ability. Either the one who poses the question, or the one who poses the solution is the best mathematician. To Gualtheri this would have been important; he worked as a land surveyor

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[44] That Metius was an important member of Frisian cultural life is more than once suggested, but hardly ever backed with historical evidence. See for example Terpstra, *Friesche sterrekonst*, 59-64.

[45] On Gualtheri's life see Dolk, 'Pibo Gualtheri', 18.

[46] On Beerentsz little is known, he may have been born in the city of Dokkum and became a citizen of Leeuwarden in 1605, and he may have been a shipper by profession, see Historisch Centrum Leeuwarden (HCL), Oud archief, inventory no. M226, p. 195. In the 1630's Beerentsz would be a land surveyor in the Frisian harbor town of Harlingen, where he published riddles much like Gualtheri had done in Leeuwarden, see Hoen, *Natuerlycke*, 216-217

[47] Gualtheri's library has attracted the attention of several historians, although the lists that recorded his books have not been published in full. I used a transcript and consulted copies of one of the (two) originals at the Fryske Akademy in Leeuwarden, see Fryske Akademy, 'Apparaat Breuker', 161809. The originals can be found at the Historisch Centrum Leeuwarden; Among Gualtheri's possessions in 1618 was a sign board which depicted a 'scene at the land surveyor' ('Een taffereeltie ofte bord bij den Landtmeter') and which was valued at 3 guilders, see Dolk, 'Pibo Gualtheri', 18; see also Dolk, 'Muzikanten'.

and his ability had to be beyond doubt. Beerentsz claimed to have solved Gualtheri's problem, but he was most likely not the person Gualtheri had hoped to come up with that solution. Therefore he tried to shred Beerentsz to pieces in his pamphlet. His main critique focused on the accusation that Beerentsz' solution was unoriginal and without solid proof. Or as Gualtheri phrased it: '[E]ven a child would notice it and it will show here from his stupid answers, not the least bit of proof for his work is given, other than like a parrot would say: I will tell you later.'[48] Beerentsz was parroting others and he did so in an unworthy fashion by not revealing the actual proof to his solution; he had learned it from others.

The mathematical content is highly intriguing as well. The main problem Gualtheri presents is a geometrical question on calculating the length of line-segments. That was the question that had enticed Beerentsz' reply. But in the rest of his pamphlet Gualtheri also gives a few other difficult problems, all of which have a clear cultural setting. He presents, for example, a question on a lute, a specific model that was invented by another Frisian citizen.[49] What is important here is Gualtheri's reply to Beerentsz' answer. In this Gualtheri discusses the question on authorship. He states that he was looking for an answer that somebody thought up on their own, not an answer that was taken from a published source. That Gualtheri himself had not completely made up his own geometrical question, as he admits in the course of his pamphlet, was no problem.[50]

This fact, that the given solution was not the solution he was looking for, forces Gualtheri to give a justification for his involvement in mathematics. Mathematics is useful, he claims, because it is practical. He goes on to provide numerous possible applications, from typography to politics and 'Bombardica'. He even claims that all free arts would be 'crippled without mathematica'. Gualtheri argues that, in his opinion, mathematics should be protected by the government because of this utility. Almost literally echoing the words of Metius, Gualtheri argues that arithmetic and geometry form the basis of all science. To this he appends a quotation from Petrus Ramus: '[...]that Argus, by the poets equipped and portrayed with 100.000 eyes, can never look as sharp, far, wide and deep as with these two lights *arithmetic and geometry*'.[51]

In building his case that mathematical solutions should be original and layered with proof, Gualtheri cites the story of the doubling of the

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[48] Gualtheri, *Antwoort*, 10: '[E]en kindt zoude t' mercken, ut syne sotte hiernae ghesettede antwoorden ghebleecke, niet het alderminste bewijs sijns wercx gegeven, dan seggende metten *Papegay. Dat heb ick u noch te seggen.*'

[49] Rasch, 'De familie Vredeman'.

[50] Gualtheri, *Antwoort*, 10.

[51] Gualtheri, *Antwoort*, 2-3.

cube. This was a famous historical narrative about one of Apollo's altars. When mayhem struck ancient Athens, the Oracle advised a doubling of that altar, which was shaped like a cube. The desperate citizens did so, but this did not stop disaster. Only after a philosopher had pointed out that a cube is not doubled when the sides are doubled, advice was sought from a mathematician (in Gualtheri's version a role taken by Euclid). The mathematician solved the problem and thus saved the city. Gualtheri cites this story with the following rather particular sentence:

> 'Gelooft ghy wel dat Euclides t'schone *Problema van t'Orakel Appollinis* voorgestelt de *Cubo duplando* oft t'verdubbelen des Altaers overgeslagen soude hebben, so t'selfde met bewijsreden hadde bekledet gheweest?'[52]

Which translates as

> 'Do you think that Euclid would have skipped the beautiful problem proposed by the Oracle of Apollo, the *Cubo duplando*, or the replication of the altar, if it was furnished with proof?'

His point here is that Euclid, although he had known about the problem of the doubling of the cube, did not include this in his *Elements* because Euclid did not have a proof for a solution. Thus, Gualtheri continues, even if his own problem (which he had nailed to his house) may perhaps not have been brand new, at least his proof was his own.[53] Gualtheri's reasoning seems crystal clear, especially since he finishes this paragraph with the Latin phrase 'Nil est jam dictum quod non dictum sit prius', 'Nothing has been said that has not been said before'. There is, however, a catch. His whole argument was in fact a *translation* of something that had been previously put into print. It was the sixteenth century French mathematician Jacques Peletier (1517–1582) who was quoted by Gualtheri, without any reference. He had taken no less than twenty lines from a letter that Peletier had written to Jean Fernel (1497-1558) and published as sort of defense to his edition of Euclid's *Elements* of 1557.[54] For example, the sentence Gualtheri had used to defend himself against claims of plagiarism, read in the original:

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[52] Gualtheri, *Antwoort*, 6.
[53] Gualtheri, *Antwoort*, 6.
[54] Gualtheri defends him printing of someone else's problems with: 'In the end, what can any writer claim to be by himself, or be his own, than the smart way in which it is phrased' ('In summa wat isser dat eenich scribent sich selfs eygentlijck toekennen, ofte voir t'sijne houden kan, behalven d'verstandige stellinge?'), see Gualtheri, *Antwoort*, 6. The Latin quote is on the same page.

> '[A]n denique Euclidem Problema illud ab Oraculo propositum de Cubo duplicando, praetermissurum fuisse credemus, si constitisset demonstratio?'[55]

Which was translated by Robert Goulding in 2010 as:

> 'And finally, do we believe that Euclid would have left out that problem of duplicating the cube, proposed to him by the oracle, if there had been a demonstration?[56]

Gualtheri does not try very hard to hide the fact that he is masquerading behind someone else's words; he just does not mention it. He even left the Latin phrase *de Cubo duplando* unaltered in the text, as if he wanted to point the readers in the right direction.[57] And he gives more hints, like a direct and open quotation from Peletier in his address to the reader, which preceded the dedication to Metius.[58] His problem was not using somebody else's words and phrases but using somebody else's proof. And he gives an example or proof of this precisely when he is building his defense to the contrary!

Gualtheri thus pointed at the importance of original proofs and the practicability of mathematics. Both approaches can be found in the work of Metius as well. At the same time Gualtheri was far from original and he even plays with this. This is not only a reminder of how hard it is to understand seventeenth century books, it is also an example of what was done in a lot of works from that era. It is often very hard to see how they are interlinked.

3.3.4. Fundamental education

In Metius' 1614 edition of his astronomy textbook, a loose reference to Gualtheri's pamphlet seems to be made. A careful reading of the introduction shows how it ties in with Pibo Gualtheri's pamphlet. This reveals how the links between Metius and Gualtheri ran and shows that they had a shared agenda next to common interests. Metius' book was a revised edition in two parts of his Latin work on astronomy and geography. It was also the first of his books published by his friend Willem Jansz Blaeu, the famed cartographer and publisher, who had it printed by a local Franeker printer. According to Metius' introduction to

[55] See Euclid, *Elementa* (1557), fol. p4verso; comp. Goulding, *Defending Hypatia*, 155-156.
[56] Goulding, *Defending Hypatia*, 155.
[57] Of course it was not uncommon to leave certain phrases in the original Latin words. I found out that Gualtheri in fact 'cites' Peletier by pure coincidence when I read Goulding's book on Ramus and Saville.
[58] Peletier's edition of Euclid had just been reprinted in 1611, which would have been available at the time. Gualtheri owned several different editions of Euclid.

one of the books, he had translated the books himself, only after other people had insisted he should. Comments like these should be treated with caution, since they were commonplaces among Early Modern writers, and Metius especially always seemed to come up with such an excuse for publishing a translation.[59]

The first part of the book was dedicated to the Dutch Estates-General, the stadtholder Maurits and the governing body of the admiralty of the Dutch Republic. Metius argued that they were the rightful addressees, because it was the commonwealth that would benefit most from his writings. After addressing them, he continued his dedication with the classical story of the doubling of the cube. He did not cite this story arbitrarily. On the one hand he was referring to a larger discussion on this matter, citing the German educator and reformer Philip Melanchthon as his source.[60] On the other hand, Metius seems also to have been referring to Gualtheri's pamphlet, although he did so much more implicitly. As noted above, Gualtheri had not only studied with Metius, he also dedicated his pamphlet to him.

In his dedication Gualtheri said that the use of arithmetic and geometry was the basis for all good mathematics – in fact for all sciences. Gualtheri explicitly stated that he had taken this point from Metius.[61] Gualtheri was thus echoing the words of his master. But in 1614, only a year later, Metius suddenly deviated from this path, and he did so precisely in reference to the same story of the doubling of the cube.

That Metius took a different approach than his student was already clear from the very account of the story on the doubling of the cube. Whereas Gualtheri had presented Euclid as the hero who saves the day, in Metius' version this role is taken by Plato (ca. 427 BC – 347 BC). After this Plato warns the Greeks telling them that in times of war they should 'exercise themselves rigorously in *geometry* and other very important arts'. Metius continues that teaching geometry precisely is what he had done. However, since peace was upon the Dutch now, who were in the middle of a twelve year armistice with Spain, it was time to move on and 'leave geometry at rest'. With this he did not mean that geometry should not be practiced anymore, but that the general focus should be on something else: astronomy. Astronomy could help shippers and seamen, Metius argued. He was in fact swapping warfare for trade.[62]

Metius' account thus shows two things. First of all it seems a reference to Gualtheri's pamphlet. Not only did they both cite the story

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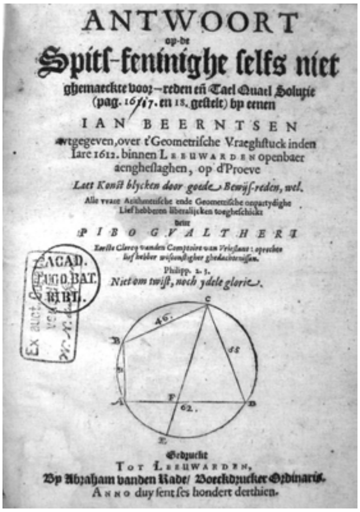
[59] Metius, *Institutiones* (1614), introduction; Terpstra claims this translation was done by Schotanus. This is incorrect, see Terpstra, *Friesche*, 144.

[60] See Metius, *Institutiones* (1614), introduction; Metius' refers to a preface by Philip Melanchthon in George von Peuerbach's *Theoriae Novae Planetarum* on this matter.

[61] This is so despite the fact that Metius in turn had not been very original by stating it.

[62] Metius, *Institutiones* (1614), introduction.


ANTWOORT
op de
Spits-feninighe selfs niet
ghemaeckte voor-reden en Tael Quael Solutie
(pag. 16/17. en 18. gestelt) by eenen
IAN BEERNTSEN
wtgegeven, over t'Geometrische Vraeghstuck inden
Iare 1612. binnen LEEUWARDEN openbaer
aenghestaghen, op d'Proeve
Laet Konst blycken door goede Bewijs-reden, wel.
Alle ware Arithmetische ende Geometrische onpartydighe
Lief hebbers liberalijcken toegheschickt
door
PIBO GVALTHERI
Philipp. 2. 3.
Niet om twist, noch ydele glorie.
Gedruckt
TOT LEEUWARDEN,
By Abraham vanden Rade/ Boeckdrucker Ordinaris.
ANNO duysent ses hondert derthien.

Title page of Gualtheri, Antwoort. *University Library Amsterdam.*

on the doubling of the cube, they also both referred to the usefulness of mathematics with the story. It would be too much coincidence if the two references were not connected. The second thing that it makes clear is again the flexibility of Metius. When the circumstances asked for an apology of geometry and arithmetic, he was able to provide one. When they asked for an apology of astronomy he could give that as well.

Still the two did not seem to exclude each other; Metius was no opponent of Gualtheri and Gualtheri did not seem to oppose Metius. In fact Gualtheri owned several books written by Metius and even owned a set of lecture notes.[63] And his pamphlet may have very well fitted the classes of Metius, as is shown by an inventory of 1623 from a bookshop in Franeker. A decade after the pamphlet was printed, it was still for sale in the university town. In the inventory a stack of copies of the pamphlet is listed between disputations and textbooks. This could be an indication that it may have functioned as a Dutch introduction to geometry or a playful way to tackle difficult mathematics. At the end of the seventeenth century, using pamphlets for such purposes was certainly common in Franeker, and it may well have been so already in the 1620's.[64]

While Van Zonhoven's case shows how 'Metius' could function in an edited classical text and Gualtheri's case shows how a shared agenda could be pushed forward, both cases reveal how flexibly mathematical names and mathematical questions could be deployed. The name of the

[63] Fryske Akademy, 'Apparaat Breuker', 161809.
[64] The inventory can be found at the Fryske Akademy, 'Apparaat Breuker', 162301; For another example in Franeker where, stemming from the end of the seventeenth century, common pamphlets were used in the mathematics classes, see Dijkstra, 'De erfgenamen'.

professor of mathematics in Franeker could find a place in a play; his teachings found their way into a pamphlet that was explicitly written to denounce a local adversary. The following two cases reveal how the problematic matter of authorship was dealt with.

3.4. The translation of Metius' texts

3.4.1. A new Practical Geometry

As Metius' fame began to rise, his books were more and more sought after. This offered the possibility for completely new strategies to build a reputation through printed texts. By 1621 the first straightforward reprint of one of Metius' books was made, a reissue of the 1614 Dutch astronomy text. While the text is almost unaltered, the woodcuts were largely renewed. Soon afterwards Metius would turn to the presses again. In 1623 he published his *De praxis nova geometrica*, printed in Franeker by Uldricus Balck († 1648) but published by the Amsterdam publisher Johannes Janssonius (1588-1664).[65] The book centered on a proportional ruler, an instrument to use as a sort of calculating tool. This tool, as Metius is happy to state, was not of his invention but Galileo's, who was then 'a professor in Padua'.[66] Metius offers no explanation for returning to geometry after he had set it aside so blatantly in 1614. Since the war with Spain had started again in 1621 there was perhaps no need to make excuses. The book again had two dedications, the first directed to the Deputy States of Friesland and the Curators of the university. In this Metius made the status of the Dutch Republic as a seafaring state to be the reason for the publication of the book. There were competitors, Metius argues, and in order to stay ahead, his book could prove to be a welcome guide.

The second dedication, which is more oriented toward the content of the book, is presented to Laurens Reael (1583-1637), a former governor of the Dutch East India Company in the Far East. This second name may have added to the international status of the book and appealed to a

[65] Janssonius' father had worked in Franeker at the beginning of the 17th century. Janssonius himself had married the daughter of Hondius, with whom Metius published several globes, see Sybrandy, 'Academiedrukkers', 128-129; comp. Boeles, I, 308; it seems that Fuks and Fuks-Mansfeld miss this connection, in their noteworthy book on Hebrew typography, see Fuks and Fuks Mansfeld, *Hebrew typography*, 140-141.

[66] Metius, *De praxis* (1623), sign. *2 verso; Galileo was in fact court mathematician and philosopher to the Tuscan Grand Duke at the time.

more interprovincial and international reader audience. Since the book was written in Latin, its proposed audience was international.[67]

Metius also offers a glimpse of how his work had grown into the book that was presented. He talks to the deputy states about how he had given lectures on geometry and how he had published on these matters, in both Dutch and Latin. Some of these lectures had been on Galileo's proportional ruler, others on more common geometrical subjects. The Dutch texts were translated with advice from Bernhardus Schotanus (1590-1652), the son of his deceased colleague professor Henricus Schotanus. Metius called this Bernardus an 'expert in mathematical matters'.[68]

Apparently this cooperation was a success. Only a year later, in 1624, Metius published his astronomy textbook of 1614 again, this time in a translation back to Latin made by Schotanus. Here the book is presented as an extensive guide to accompany a set of terrestrial and celestial globes. The book was again published by Janssonius in Amsterdam and printed by Balck in Franeker. Metius had presented his 1614 edition as a translation of a previous Latin book into Dutch. In the dedication to this 1624 edition Metius seems to have forgotten about that. The new edition differs a great deal from those that had formed the basis for the 1614 book, but it is still framed by them. Bernardus Schotanus gets full credit for the translation, moving up from an advisor. But this credit is only presented in the dedication and a few places in the text. He is not mentioned on the title page, or in a colophon, where one might expect the name of a translator.

There are some indications about what Schotanus did and what he did not do. For example, the Dutch textbook of 1614 was supposed to be a book for seamen and one of Metius' major feats was presenting his material in an orderly and comprehensible fashion. He was making expert knowledge available for a broader audience. A nice example was a so called 'star song' he quoted that was written by the navigation master Robert Robbertsz and initially intended to help illiterate and poorly educated sailors to remember the position of the stars. Of course a song, clever as it may be, will not be completely effective in this task. Hence, its utility has been questioned.[69] The song did not appear in any edition before 1614, but in Schotanus' translation of 1624 it did show up. To remind the reader who had made this translation, Schotanus' initials are explicitly quoted, '[...]per D[r] B[ernardus] H[enrici] S[chotanus] parum

[67] Metius, *De praxis* (1623), sign. *2-A; the dedication to Reael is a problematic one, since he was just disposed of as governor general of the V.O.C. in Batavia (Jakarta), see Van Netten, *Koopman in kennis*, 90, and Jensma, 'Uit het huis van Arcerius', 460.
[68] Metius, *De praxis* (1623), sign. *2-A; Metius refers to Schotanus with the words 'rerum Mathematicarum perito'.
[69] On the star song, see Van Gent, 'Het sterrenlied'.

mutate, & Latinitate donati'.[70] He had not only translated the song, but also reworked it. When the translator took such an active role, he was made more visible.

3.4.2. Metius' wonderful year 1626

From 1626 onwards it is particularly hard to keep track of Metius' publications. That year no less than five new editions were published in which Metius' personal involvement can be assumed; it was his most productive year ever.[71] Of these five books, there was only one that really was 'new', a translation made by Petrus Baardt (1580-1645), a former student of medicine in Franeker.[72] The other books were all published before, in the same language and in more or less the same form. Four were printed in Franeker by the printer Balck and one in Amsterdam by Willem Jansz Blaeu. The book printed by Blaeu was also published by him. Of the four books printed by Balck, one was published by him, two were published by the Amsterdam publisher Henrdrick Laurensz († ca. 1648) and one by the Elzevier publishing house in Leiden. In fact, the Elzevier book was neither a reprint nor a new edition of a previous book. The first few pages of that edition had been swapped for new ones, making it look like a newly printed book whereas in fact it was printed and published by Balck the previous year. This form of 'title editing' or 'title issuing' was not uncommon, especially with Metius' works.[73]

Three books had Metius presented as a M[edical] D[octor]. He had acquired this doctorate only in the fall of 1625. It was awarded to him honorably by the Senate of the University of Franeker. It may be that these books were published because of this doctorate; two of them were in fact just reissued editions. The other two books were the last that were ever published under Metius' name without mentioning that doctorate. One of them, the one published by Blaeu, was a new edition of the book translated by Schotanus, which had been published in 1624 by Blaeu's competitor Janssonius. In the dedication to that book Metius

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[70] Metius quotes it in full in Metius, *Institutiones astronomicae*, 74-7[6]; and in Latin in Metius, *De genuino* (1624), 72-73.

[71] Over the following years several pirated prints appeared. Metius' involvement in the production of these editions is very unlikely. Those of 1626 were all published in Franeker and printed across the street from the university, a two-minute walk from Metius' home. Some copies of these books hold his signature, for more details on that see below.

[72] Baardt matriculated in Franeker in 1611 and took his degree probably in 1617, see *ASF*, no.1294 and Breuker, 'Literatuer'. Since Baardt presents himself as 'Matheseos Studiosum' on the title page of the *Maet-constigh* (1626), the suggestion that he was a mathematics student in Franeker in the 1620s is easily made. However, this should be read as 'a lover of mathematics', which is the same phrase he would use on the title pages of his almanacs. Comp. Ibidem.

[73] On Metius' publicizing strategies and his relationships with different publishing houses see Van Netten, *Koopman in kennis*, 75-102.

had explicitly thanked that printer for publishing his *Praxis nova geometrica*, the book to which Schotanus had been instrumental, calling it a *Geography*.[74] In the same sentence Metius also mentioned his publications in the vernacular, which had appeared with Blaeu. Of course, he did so without explicitly naming this second publisher. In the 1626 edition Blaeu copied the whole dedication almost *verbatim*, not even changing the dating. He did, however, change Janssonius' name into his own.[75] The original sentence had read:

> 'Nostram autem Geographiam cum recudisset Ioannes Iansonius Bibliopola Amstelodamensis, & ea quae de usu utriusque Globi scripseram lingua Belgica & nostrate, Doctiss. D. Bernardus Schotanus, auctum opus secunda mea cura, latinitate donavit.'[76]

Which can be translated as:

> 'However, when our Geography [=geometry] was reprinted by Johannes Janssonius [in 1623], a bookseller in Amsterdam, and including what I had written on the uses of both Globes in our own Dutch language [in 1614 and 1621], the most learned D. Bernardus Schotanus translated the work, revised and expanded by me, into Latin [in 1624].'[77]

Blaeu replaced 'Ioannes Iansonius' with 'G. Jansonius', giving himself credit for his previous work of Metius – piling up his own edition of the

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[74] On Metius' strong interests in medicine little has been published to date. As a student he was already involved in a network of medicine students and later in his life he would keep on pursuing several medical and alchemical projects. Telling in this respect is that some of his closest friends were well known professors of medicine, like M. Winsemius, J.I. Pontanus and N. Mulerius. See for a more in depth analyses of these networks: Cook, *Matters of Exchange*, esp. 147-148 and 233; I thank Torsten Schlichtkrull of the Royal Library in Copenhagen, who provided some crucial photos of a very rare edition of one of Metius' 1626 books. These photos helped me (among other things) to find out what institution had presented Metius his medical doctor; Concerning Janssonius' publication of Metius' Geometry, but not a Geography, several explanations can offered as to why it ended up on the title page. (I am sorry, I do not follow this sentence very well, consider re-wording it) Two stand out: the first is that it was a typographical mistake of some kind; the second is that (military) geometry and (military) geography did not have such different meanings in this context.

[75] Van Netten analyses the competition between Janssonius and Blaeu, see Van Netten, *Koopman in Kennis*, 163-195.

[76] Metius, *De genuino* (1624), introduction.

[77] See also Van der Krogt, *Globi Neerlandici*, 189-190. Van der Krogt translates the sentence in such a way that Janssonius claims to have published both the *Geography* and the Dutch works. This was not just false; it would have been an open insult to Blaeu as well. Janssonius may not have hesitated doing so, but Metius would have. He kept a good relationship with Blaeu, which makes the explanation by Van der Krogt improbable.

Geographiam and the *De usu [...] Globi* and delicately pointing out the typographical mistake of his competitor. In this one sentence the whole bibliographical mess that Metius' works seemed to have created was summed up. After Blaeu's alteration the sentence should be read more or less like this:

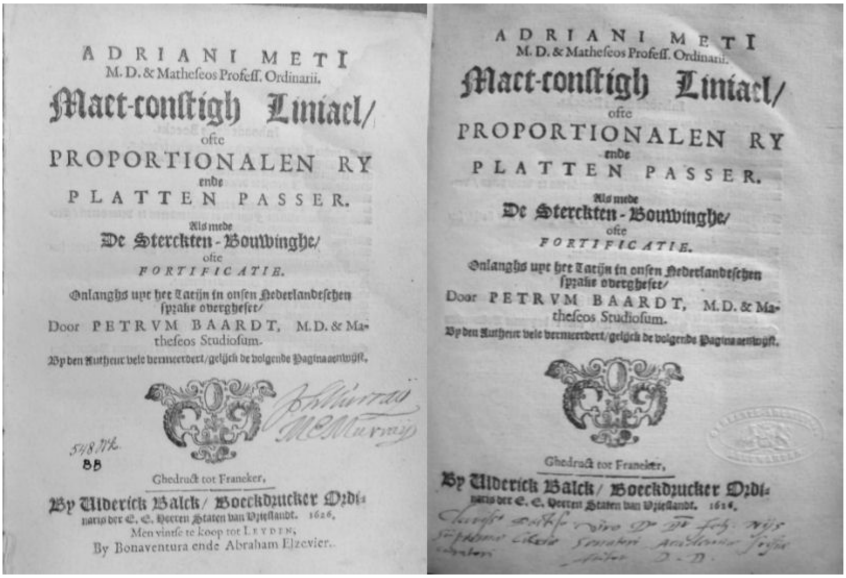
> 'However, when our Geography [in 1614 and 1621] was reprinted by W. Jansz [Blaeu], a bookseller in Amsterdam, and including what I had written on the uses of both Globes in our own Dutch language [in 1614 and 1621], the most learned D. Bernardus Schotanus, translated the work, revised and expanded by me, into Latin [in 1626].'[78]

This reveals Metius' particular involvement with printers and publishers and how difficult it is to unravel all of the connections.

In 1626 Metius also published a Dutch translation of his 1623 geometry and arithmetic and added a translation of a tract on *Fortification* to it. This last tract was composed of work he had found among his father's papers and thus constituted a sort of commemoration.[79] The translation was not made by himself, but by Petrus Baardt, as stated on the title page of that book. This was a big difference from the previous translation, where Schotanus was mentioned in one of the introductions, but not on the front page of the book. This suggests that Baardt's involvement may have been larger. It could also point towards a different publication strategy. The Latin books were meant for an international market, in which Metius had a reputation. Adding Schotanus' name would probably not have improved sale figures, whereas Baardt was building a local reputation and his name would have meant something locally. This theory is corroborated by the fact that the dedication of the book is written and signed by Baardt and not by Metius. From reading the book, thus, one gets the idea that Baardt had created the book. Of all of the books by Metius published during his life, this is the only one that had a dedication written by someone other than him.[80]

At the bottom of the title page of Baardt's translation, the Elzeviers explicitly take credit, stating: 'Men vintse te koop tot Leyden, by Bonaventura ende Abraham Elzevier' ('These are found on sale in Leiden, with Bonaventura and Abraham Elzevier'). Such information may have been practical in the seventeenth century, but today it must be treated with care. The 'title issuing' already showed some

[78] Metius, *De genuine* (1626), introduction.
[79] Metius, *Maet-constigh* (1626), IV, 12 and 30; see also Jensma, 'Adriaan Metius', 16-17
[80] Metius, *Maet-constigh* (1626).



Two title pages of Metius, Maet-constigh liniael*. The one on the left is title issued by the Elzevier publishing house, the one on the right is dedicated by Metius to Johannes Nijs.*
Tresoar, Leeuwarden and Historisch Centrum Leeuwarden.

entrepreneurship by the Elzeviers and this edition does as well. These lines were clearly added later and were not printed by the original printer. The exact distance between these lines to the lines above differ from copy to copy, varying from a millimeter to half a centimeter. Some copies lack these lines all together, like the one in the City Library of Leeuwarden. In this 'Leeuwarden' copy the blank is filled with a handwritten note by Metius, dedicating the copy to Johannes Nijs. The occasion on which Metius gave the book could be the moment Nijs was appointed as curator of the university, an office he would take in 1626 and keep till his death in 1649. Possibly Metius gave him a copy to congratulate him on the appointment. The copy in the City Archives in Alkmaar also lacks the Elzevier imprint and also has an autograph by Metius. This book is dedicated to his colleague Sixtinus ab Amama (1593-1629), professor in Hebrew. Because someone has crossed out Metius' address, it is impossible to track the specific occasion for which Amama was presented this copy.[81]

[81] I have consulted several copies of this book or have seen a photo or scan of the title page. The copies standing out are the one in the City Library, now kept at the Historisch Centrum Leeuwarden, shelf mark B 1313 (signed title page by Metius); Regionaal archief Alkmaar, shelf mark 22 A 5/2 (also a title page signed by Metius, but blacked out at a later date); the other copies I have consulted are kept at the University Library of Amsterdam, the Royal Library in The Hague, Tresoar in Leeuwarden, the Royal Library in Stockholm,

These personal dedications show that although the book appears on the one hand to be a construction of Baardt, it was also a book used by Metius. In the game of acquiring patrons and keeping good relations with colleagues Metius used his own copies of this book as gifts. Such a use of books as a form of 'social capital' also fit the content of the book. It was a good introduction to the use and possibilities of Galileo's ruler, of which a paper model was supplied with the book. The book was not a thorough discussion of everything there is to know about war and mathematics. It was more an introduction to the art of fortification for gentlemen and for enthusiasts alike. As Metius and Baardt put it, they presented the 'pith and the marrow' of fortification, so everyone could pursue it.[82] On the whole, the book was aimed at people like Nijs and Amama, people with high status who could help protect the mathematical arts. On the other hand it was oriented toward people who could not afford large, expensive volumes (or training in Latin, for that matter). Thus, the book was a perfect combination of the professor Metius and the local mathematician Baardt.

3.4.3. Metius' translators, Baardt and Schotanus, as mathematical practitioners

With his translation Baardt established his name as a writer in Dutch. He would go on to publish numerous almanacs, poems and other ephemeral prints, which are considered of high quality still today.[83] At the same time it is precisely Baardt's activities as an author and publisher of this sort of work that would frame his translation of Metius' work. Baardt's most important publication was a yearly almanac, not only because this form of publication had a huge distribution, but also because it allowed him a certain amount of freedom of expression. This freedom was shown in the introductions to these small calendar-like prints. There, Baardt showed his writing talents, while through his calculations he showed his skills as a mathematician. His medical degree, furthermore, gave him authority for prognosticating the year to come. Oddly enough these prognostications did not keep him from

the University Library of Leiden and the library of Museum Boerhaave in Leiden. I own a complete photocopy of the one kept in Tresoar in Leeuwarden, which was made in the 1980s and was generously given to me by Gerard van der Heide from Franeker.

[82] See Metius, *Maet-constigh* (1626), II, 39, where the following is stated: 'Wij hebben alleen in't corte het pit ende merch der fortificatien den genen willen voorstellen die metter herten de konst beminnen nochtans door de wreedtheyt van't geluck de middel niet overich zijn omme eensdeels de langhduyrighe studie te achtervolghen: Anderdeels vermidts het een Const-liever die den oorloch vervolghen moet seer beswaerlijcken valt groote Boecken na te slepen'.

[83] See for example Salman, *Een handdruk*, 31; see also Spies, 'Satire'.

Unknown artist, Bernardus Schotanus *(1590-1652). Museum Martena, Franeker.*

mocking predictions altogether, since, like Gualtheri, he showed a talent in using irony.[84]

With the publication of his almanacs, Baardt took the training he had from Metius to the presses.[85] This sort of practical enterprise by a mathematician found fertile soil with the Frisian regents. Not only had Baardt's university studies been paid for by the province, every year from 1628 to his death in 1644 Baardt received payments from the province. He was awarded several stipends and rewards for his almanacs and other books – some of which had an explicit mathematical character. The government of the province thus became one of his most loyal customers. The States had good reason to grant Baardt this position. Besides all sorts of different mathematical content, the almanac was also

[84] 1627 traditionally is staged as starting year for the Frisian almanac. On the oldest Frisian almanacs see Breuker, 'De betekenis', 160; see also Idem, 'Fryske almenakken', 36-37; comp. Salman, *Populair drukwerk*, 49, 69 and 244. Of course Nicolaas Mulerius had published several almanacs prior to 1627, but even though he lived in Friesland for a long period of time, these little books were printed outside the province. Therefore, they are not included in the 'Frisian production' of almanacs.

[85] Baardt probably published his first almanac in 1627 and he possibly used one of Metius' guides that showed how to calculate almanacs. In the same year, Metius had published a guide on how to calculate almanacs, again from papers he had found among his father's inheritance. (make sure this is the intention of your original sentence) See Metius, *Maet-constigh* (1626), II, 12; and also Idem, *Fundamentale* (1627), 103, 116; see also Breugelmans and Dekker, 'Adriaan Anthonisz'.

Title page of Petrus Baardt, Almanach *(1639). Tresoar, Leeuwarden.*

the one place where annual markets were advertised. To have a specific Frisian almanac was thus in the interest of the Frisian community.[86]

Until his death in 1645 Baardt would publish almost anything he could. In addition to the almanacs, he printed instructions for sailors, translations of classics and prognostications. From 1630 onwards he was an established name in Friesland, even becoming one of the first to publish in the Frisian tongue. Frisian as a language was mainly used in books of law, but these dated almost exclusively from before the printing press had become common. What made him really special was that he published in Frisian outside the field of law, for a broad audience. Until his very last publication he presented himself as a medical doctor and a 'student' of mathematics. He used the name he had built as a translator of Metius' work throughout his career.[87]

Likewise, to Schotanus the translation activities also formed an important facet of his career. In 1635, directly following the death of Metius, he accepted a position in Utrecht at the predecessor of the University of Utrecht, the Illustrious School. This school acquired the rights of a proper university the following year and Schotanus was

[86] Baardt, *Friesche boere-practica*; see also the homepage by Martin Engels, http://home.wanadoo.nl/mpaginae/ (08-2011).
[87] Baardt depicted himself as a mathematician on almost all the work he published under his own name; for an overview of the surviving almanacs published by Baardt, see the digital bibliography with Salman, *Populair drukwerk*.

appointed its first Rector. He came to Utrecht to do more than just teach Law, the subject in which he had held a position in Franeker. He would also teach mathematics, making him the first professor of mathematics at Utrecht University. He was awarded an additional 300 guilders for this, on top of his ordinary salary of 1200 guilders as professor in Law. These 300 guilders were precisely what made Schotanus' Utrecht position more desirable than the one he had held in Franeker. Mathematics, thus, had a practical (financial) profit for him.[88]

Although he would not publish anything on mathematics himself, he supervised several disputations on astronomical and mathematical matters. One of them was defended by a student who went on to a position in mathematics at the university of Harderwijk before becoming Schotanus' successor in Utrecht. Schotanus' lessons in mathematics must have been solid if they were to produce such alumni. It also shows that his appointment was not just an excuse to grant him a higher salary. This does not mean, however, that in Utrecht mathematics enjoyed an academic status similar to the one Schotanus had known from his time in Franeker. Several sources seem to point to a much more theological approach to mathematics. For example Schotanus' colleague (and actual leader of Utrecht University), the theologian Gisbertus Voetius (1589-1676), found arithmetic useful because it could help students understand the parts of the Bible in which numbers are mentioned. He even defended the idea that counting (arithmetic) was invented by God himself.[89] The professor in mathematics was not just any odd teacher; he contributed a fundamental element to the education of future church ministers.

Both Baardt and Schotanus were not typical mathematical practitioners, and neither were they typical translators, but those two descriptions could apply to them. In the Early Modern period they found a way to use their skills that best suited them. They both had command of several languages and they both knew how to apply mathematics. They both had started their respective careers in these fields as translators of Metius' texts. Baardt found a way to continue a part of Metius' stream of publications: practical mathematics aimed at a particular Frisian market. Schotanus found a way to continue the

[88] On Schotanus' later career see Hengstmengel, 'Een Friese familie'; on him earning extra as a professor in mathematics see Boeles, II.1, 124; see also Van Berkel, 'Het onderwijs in de wiskunde'; The next chapter will deal with Johannes Phocylides Holwarda, another one of Metius' students who benefited greatly from his mathematics education and built an academic career around the same time Schotanus did.

[89] See Voetius, *Van de nuttigheyt*, 35; esp.: '[A]ls hy[=God] sich selven het tellen toeschrijft', which translates as '[W]hen he[=God] attributes counting to himself'; the student who would ultimately succeed Schotanus was Jacob Ravensberg, he would publish an *Encyclopedia Mathematica* in 1642 and he would clash with Voetius on Copernicanism. In the years to come that debate would gain momentum; see Vermij, *The Calvinist*, 123-126.

academic tradition of Metius: climbing the ranks with mathematics as a starting point. If anything, Baardt and Schotanus were typical products of the professor of mathematics at the University of Franeker.

3.5. Conclusion

Pibo Gualtheri called his adversary a parrot to brush him off. That same word, but perhaps with a little more dignity, can be used to characterize Metius' works. A good deal of Metius' publishing strategy showed what could be described as parroting. With this I refer in the first place to him parroting his own work, which he recycled and reprinted in all sorts of ways. This does not mean that he stood by passively. With every reprint, edition and translation things were changed. A parrot may say something at a time when it is completely inappropriate to say such a thing, giving new meaning to the phrase he is parroting; the context in which something is said is vital to knowing how it is understood. This holds true with Metius' works as well. They had different meanings in different settings, and every republication was made in a different setting, with only minor changes.

Metius' oeuvre makes clear that the main goal of Early Modern publications on mathematics was not to present 'original research'; the parroting was not considered a bad thing to do. While this may suggest that Metius' research was not original, or even that he was a second-rate mathematician, such conclusions would completely miss the point of Early Modern mathematics publications, and of the age's scholarly publications in general. Metius' books present his vision of how mathematics should be practiced. They also demonstrate what his chair had to offer.

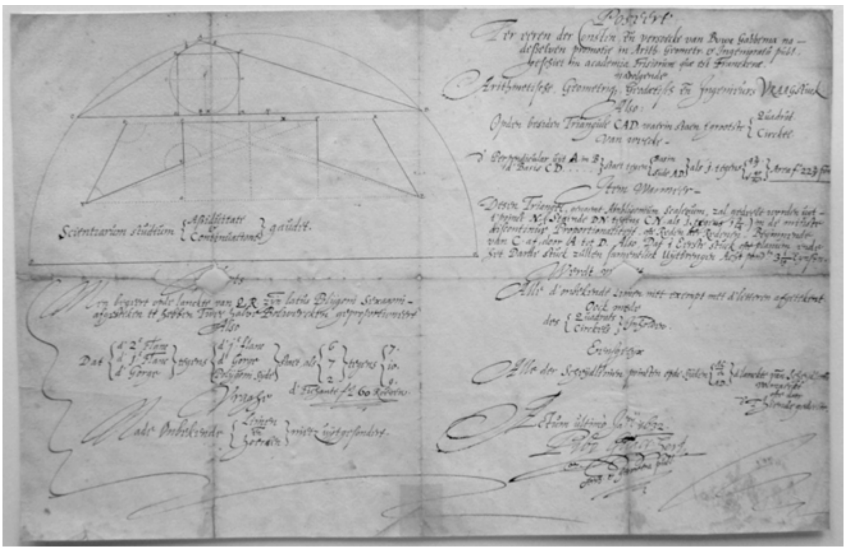
In this sense, Metius' books can be considered textbooks, but that is also a term that needs revaluation. Textbooks are mostly (implicitly) considered to be vehicles for knowledge transfer, reflecting the educational practice of a professor teaching students. Of course there is a didactical aspect to textbooks, but not only in this simple, direct sense. It is how they were used and why they were bought which deserves further study.

If a textbook is said to represent an educational practice, one first has to find out how such practices looked in Early Modern academic life. The case of Metius shows that the relationship and interaction between professor and student was not unidirectional and not solely a matter of a teacher transferring knowledge to a pupil. During his years of teaching, Metius offered his students the opportunity to profile themselves by contributing to his publishing activities. This served at the same time to profile himself as an able tutor. This reciprocity was the core of Metius' strategy for creating a strong reputation in the world of mathematics and in local cultural in general.

This reputation was possibly most visible in a number of different prints that appeared during Metius' long career as a professor at the University of Franeker. Van Zonhoven drew on this reputation when he published a play in which a character with the name Metius played an important role. Similarly, Gualtheri talked about the ancient story of the doubling of the cube. He furthermore added several layers to this account, which he dedicated to Metius. Over time Metius' name became almost iconic for mathematical education. His numerous editions helped spread the 'Metius' brand all over Europe, time and time again. It is important to note that those publication strategies never seemed to stop with the appearance of a print run, and never seemed to consist of casual references: mentioning Metius' name was almost always intended. In Metius' vicinity there was always a new possibility to re-edit or re-publish a book.

In this chapter one specific group stands out: the translators of Metius' works. They had great opportunities; their careers were built with a single translation serving as a stepping stone. Yet this also unearths the problem translators in general had: while translation may have been a worthy practice at the beginning of a profession, later in their career, once established as a scholar, the specific job of translating would become something of a distraction. The best example in this context is Metius himself. In the beginning of his career he still did his own translations, but after a while he had other people do this for him, even when a text passed through different languages into the original one. This created a distance between himself, as the author, and the text that was presented to the audience. Apparently reworking, editing and republishing, or parroting, was a business a university professor could pursue in Friesland in the first half of the seventeenth century. Translating, however, was done by others. Once his name and fame were established, Metius used young and promising authors to do so. For these translators it proved a great opportunity en route to building a reputation for themselves.

The parroting, the use of students for his work and the fact that Metius actively engaged in other printing practices, all show how the Franeker production of mathematical books functioned and it reveals to what degree Metius was involved with the production of these books. At the same time, education and the publication of textbooks never is a simple task; it is never about publishing facts and objective accounts of learning. Metius' books on mathematics are is no exception to this. His case shows very clearly how incredibly important the circumstances informing any publication process are. The students reading Metius' work were confronted with the results of those processes and they immediately contributed to that same development. Building a reputation, in this case a mathematician's reputation, through printed works was not a linear, straightforward thing, it was very circular, interconnected and reciprocal. The question now is: how did Metius try to materialize this growing fame?



Mathematical question which Gualtheri publicly posed at the occasion of the promotion of Buwe Gabbema. See introduction to Part II, below. Gemeentearchief, Leeuwarden.


ADRIANUS METIUS ALCM. MATHESEOS PROFESSOR ÆTAT. XXXXVI ANNO CIↃ IↃ CVIII
Tabella in hac sculptoris artifex manus
Ex parte Metium exhibet. sed integrum
Videre qui volt, indices erunt libri,
Quos edidit. nosci inde quantus sit potest.
S.A

4. Claiming Fame: Metius' Instruments

« *Adriaan Metius in 1608.*
Scheepvaartmuseum, Amsterdam.

4.1. Introduction

AT THE FRANKFURT *Buchmesse* in the autumn of 1608 Adriaan Metius presented his *Institutionum astronomicarum*.[1] At the same gathering, a telescope was shown to the world, possibly a specimen of the same instrument that would make its grand debut a few weeks later in The Hague.[2] That book fair marks one of the first recorded sightings of the instrument that would swiftly take Europe by storm in the years to come.[3] There have been numerous suggestions concerning who could have been the person bringing this specific specimen to Frankfurt, but remarkably, the obvious link with Metius has not been discussed. A few weeks after the Buchmesse, Adriaan's brother, Jacob Metius (ca. 1580-1628), claimed to have invented the telescope.

This chapter will discuss the entirety of the telescope's early reception, but this time from the Franeker perspective. Was Adriaan Metius' brother indeed the first inventor of the instrument? That question will be discussed, although the answer remains inconclusive. This is because the goal here is not to identify the *true inventor* of the telescope, but rather to gain more insight in how the Franeker mathematical world functioned. For this chapter, the question of how the circle surrounding Adriaan Metius viewed the claim of first invention is more relevant and is the chapter's driving principle. This will offer some essential details that help to understand how Metius valorized his growing fame, which he was constructing through the help of the printing press.

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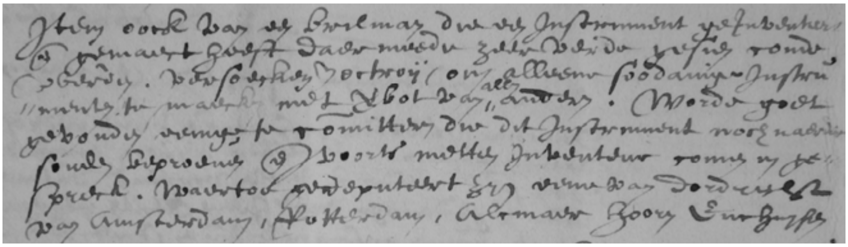
[1] See for example Schwetschke, *Codex nundinarius*, 49-50. I thank both Djoeke van Netten and Michiel van Groesen who shared their notes on the Frankfurter *Buchmesse* with me.
[2] Traditionally the oldest known recording of the telescope, known as the 'first serviceable telescope', is only weeks later on October 2, 1608. See for example: Willach, 'The Long Road', 93. On the telescope a lot of research has been done recently. This whole chapter is influenced by the congress that was held in Middelburg in 2008, as well as by the volume in which most of the lectures were published afterwards: Van Helden e.a., *The Origins*.
[3] There are numerous different telescopic devices that were used and which were discussed in Europe prior to 1608. However, that year still marks the 'birth of the instrument', since it was only after September 1608 that the telescope swiftly became a commodity in Europe. This is possibly due to the fact that the inventor[s] of 1608 made an important technological improvement by applying a diaphragm to the instrument: Willach, 'The Long Road'.



A note indicating that Jacob Metius requested a patent for the invention of the telescope. Westfries Archief, Hoorn.

Three different stories are central in this chapter. The first focuses on Adriaan Metius' own instruments and involves a leap back in time to Adriaan's own days as a student at the end of the sixteenth century. The story continues until the day he died in Franeker in 1635. Throughout his entire career, Metius used and designed instruments. These instruments will provide insight into how Metius used them as vehicles of his own name and ideas, and it is important to note that his use of his books for those same purposes was distinctly different. In short, the instruments often complemented the books.

The second story starts at 1608 when Jacob Metius stepped forward as the possible inventor of the telescope. The invention of the telescope is a notoriously complicated story, but it is also one of the best-studied episodes in the history of Dutch instrument making and therefore offers an opportunity to tap into that vast field of study.[4] There are numerous possible inventors, and almost as many countries claim to have nourished that inventor.[5] Many of these inventors had an advocate of sorts, who defended their case. Jacob Metius found advocates in his brother Adriaan, as well as in René Descartes. To date, no one has actively defended his case since the first half of the seventeenth century. Dutch attention has been on the proclaimed Middelburg-inventors Sacharias Janssen (1580-1638) and Hans Lipperhey (1570-1619), and Jacob Metius' story is only briefly mentioned.[6] This has to do with the paper trail of Jacob's story; all sources on Jacob's life seem to have been snowed under, and his trail, although existent, has slowly faded away. For sake of the argument, I will review what can be argued in favour of Jacob being the inventor of the telescope. I will do so not because I can definitively

[4] There has been a lot written on instrument making in the Early Modern period. My approach is much indebted to the way Huib Zuidervaart has tackled this field and asked some intriguing questions, see for example Zuidervaart, 'The 'Invisible Technician' Made Visible'; comp. Shapin, 'The Invisible Technician'. My approach is not just to show the technicians who made the usage of instruments possible, but I also want to show how they were used.

[5] Zuidervaart, 'The 'True Inventor'', 9.

[6] Zuidervaart, 'Uit vaderlands liefde'; see also Van Helden, 'The Invention', 6.

prove that he was the inventor, not because it is such an interesting question and not even because there was such a person, but because that is how the circle of people around Metius portrayed Jacob. Therefore, this story gives insight into how Jacob was perceived in Friesland in the seventeenth century, which, again, is the main focus of this chapter.

The third and last story once more leaps back to 1608. In this final part I will present some new material on the earliest history of the telescope. Central in this is Marcellus Vranckheim, one of Metius' students. Studying Vranckheim reveals not only how the invention of the telescope was in fact an international story, it also shows how people rallied around the already famous Adriaan Metius. The first two stories will then function as the frame within which this last is told; Adriaan Metius was a known developer of instruments and Jacob was the inventor of *a single* instrument. In light of these two stories, Vranckheim's story shows that the Metius family's claim to the invention the telescope was a deliberate strategy.

These three stories on the telescope and the Franeker setting in which it had known a reception are crucial to understand how mathematics was practiced there in the first decades of the seventeenth century. The stories show how an academic setting adapted to the instrument. If anything, the early history of the telescope in Franeker gives an example of how complicated and ill defined the mathematical world still was. It shows how the Franeker mathematical scene functioned under Metius; he took after his teacher Tycho Brahe. Metius was trying to build a little Hven.[7]

4.2. Adriaan Metius' instruments

4.2.1. 'Hfraneker'

At the end of the sixteenth century, before his career as a professor began, Metius had lived in several small communities, in Franeker, Leiden and at Hven. In Arcerius' house in Franeker he had met other students with whom he would stay in contact for the rest of his life. In Leiden he had entered the Holland scene of scholars and artists, with which he would often be associated.[8] And at Hven, with Tycho Brahe, he

[7] Metius too housed lodgers, which shows once again how these practices were done very close to his own household. See for example Joachimus Molinarius, who lived with him in 1616; http://home.wanadoo.nl/mpaginae/ (retrieved 05-22-2012). Both Metius' *Eulogy* and the fact that his instruments were stored in his home also testify to the construction of a household in which mathematics was practiced. See for example *OFAM*, 31-32 and chapter 6 below. For a discussion of private spheres where the practice of 'natural inquiry' took place, see Cooper, 'Homes and Households'; see also Biagioli, *Galileo's Instruments*, 8-10, where the 'Hotel Galileo' is discussed.
[8] For Metius time as a student, see chapter 2.

lived in what was a decisive environment, in which the *famuli* interacted with each other and with the knowledge, skills and instruments of Tycho. It was an environment that would color Metius' entire career.[9]

All the astronomical work Metius would do went back to the period he spent in Denmark. He never seemed to get tired of referring to Brahe. He even tried to model his environment after that of the illustrious Danish nobleman. There are several poems in which Metius is lauded and where Franeker is compared to Uranienborg, the place where he had lived and worked with Brahe on Hven.[10] These references functioned as a mirror to Metius; by describing Hven he was trying to present an ideal picture of his own world.

In the Dutch Republic, Metius functioned as a miniature Tycho of sorts, surrounded by other *famuli* of the actual Tycho.[11] Of course Metius stayed in contact with his old study friend Johannes Pontanus, who had also spent time with Brahe.[12] But Metius can also be linked to Rudolf Wicheringe who studied in Franeker together with Pontanus and Metius.[13] This Wicheringe had possibly helped build Tycho's large quadrant and made observations for the Dane during the 1580s.[14] The next of the Danish students who functioned in Metius' circle was Willem Jansz Blaeu. He too was an instrument maker and a keen observer.[15] The Leiden professor of mathematics Willibrord Snellius was another of these former *famuli* to act in this network. Both Metius and Snellius had instruments built by Blaeu.[16] Both Pontanus and Metius had some of their most important work published by Blaeu. In these publications Pontanus and Metius would refer to each other, or to Snellius.[17] This

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[9] When his colleague Limnaeus in Jena referred to Metius, he did so by referring to him as a student of Brahe: see Kepler, *Johannes Keplers Gesammelte*, XIII, 208; see also Rosen, *Three Imperial*, 104.
[10] For example the poem Baardt would publish in 1626, see Metius, *Maet-constigh* (1626), fol. ***4 verso and recto.
[11] Waterbolk, 'Van scherp zien', 192-193; see also Dijksterhuis e.a., 'Werktuigen', 137.
[12] There seem to have been occasional visits. In March 1617 for example, Metius was in Harderwijk where Pontanus was a mathematics professor and served as a hatch to the Baltic – obviously Metius was not the only one trying to be a little Tycho. See the Album Amicorum of Ernst Brinck in the Dutch Royal Library, shelf mark 133 M 86, fol. 219 recto for Metius' visit.
[13] Christianson, *On Tycho's Island*, 287. How close these ties were kept, became clear when in 1617 Wicheringe's son Barthold, who also had studied in Franeker, was examined in mathematics by Adriaan Metius' friend Nicolaus Mulerius: See Jonckbloet, *Gedenkboek*, 324.
[14] Christianson, *On Tycho's Island*, 270; see also Dreyer, *Tycho Brahe*, 332.
[15] On Blaeu see Van Netten, *Koopman in kennis*, passim; on Blaeu's time at Hven see Christianson, *On Tycho's Island*, 254-256; on a map of Hven that he made as a result of that visit see Richter, 'Willem Jansz Blaeu'.
[16] De Wreede, *Willebrord Snellius*, 101.
[17] Pontanus quotes Metius' work in several places. See, for example, Pontanus' edition of Robert Hues' tract on globes: Hues, *Tractatus de globis*, 81. Ioan Blaeu, the son of the

group of *famuli* was tight and Metius took a central role in it. Meanwhile he also started building a circle of students in which he even more strongly functioned as the Dutch-image of Tycho Brahe. [18] In, or at least very close to, Metius' own household this role became very imminent.

4.2.2. A poor man's sextant

In Franeker, Metius designed several instruments for which he found inspiration during his time with Brahe. Sometimes he used these for his own activities, but he also influenced others around him. For example in 1606 Pibo Gualtheri had a beautiful astrolabe made, which today is the oldest known surviving astronomical instrument of the northern Low Countries.[19] This instrument was 'calibrated' after data collected by the 'famous and outstanding innovator of astronomy Tycho Brahe, and it was made in the same year that Metius published a book on how to use and construct these instruments.[20] It is one of the very few instruments from Metius' circle to have survived, yet a clear example of how Metius brought the Tychonian practices to Franeker.

A year later, in 1607, Metius took this to another level, when he designed a large sextant that Willem Blaeu constructed for him. Another year later Metius published a short treatise on this instrument, which I discussed in the previous chapter. This treatise was not only a bibliographical anomaly, it was also a manual on how to build and use Metius' sextant. The instrument itself is best described as a combination of a very large sailor's astrolabe and a simple astronomical sextant. Both parts of the instrument can be used to measure the distance between two far away points, for example the distance between two stars or the height of a celestial body to the horizon. In fact such instruments are

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publisher Willem, in turn also listed Metius' publications together with those by Pontanus and by his father; see Blaeu, *Institution astronomique*, fol. B2 verso (I refer to the French edition because this was available through http://books.google.com, retrieved 11-2012).

[18] There are even more of these famuli that can be strongly linked to Metius. For example Gansneb van Tengnagel, who would become Brahe's son in law, was a student in Franeker at the same time Wicheringe, Metius and Pontanus were also studying there, see *ASF*, no. 226 and Christianson, *On Tycho's Island*, 366-373. David Fabricius, who will be discussed below, also came to Franeker, possibly to visit Metius: See Bunte, 'Über David Fabricius' III, 12-13. In 1596, when most of these later Tycho students had left Franeker, one of Brahe's famuli came to study there. See *ASF*, no. 353 and Christianson, *On Tycho's Island*, 357, where he is referred to as Finn Sigurdsson.

[19] Only a few Jacob's staffs predate this instrument. However, it seems highly unlikely that it was Gualtheri who made it. This leaves the possibility that it was made somewhere else than in the Dutch Republic, or it could also mean that it was made by Willem Jansz Blaeu. It would then be the only handheld instrument that has survived of his hand.

[20] For the full inscription on the instrument see Ottema, *Geschiedenis*, 9 and 18; I thank Piter van Tuinen for sharing a translation of that inscription with me; On Metius' publication on the astrolabe see Metius, *Doctrinae* (1606).

crucial for any astronomical observation. This specific instrument was an invention by Metius. The novelty of it was that it could be simply constructed and easily duplicated. Metius was, thus, not the first to invent a sextant; his contribution was rather one of popularization and simplification.

In his treatise Metius presented ‘a poor man’s sextant’, a cheap version of the highly specialized large sextant. His model was cheap because Metius found a way to build it from modest materials that were easily joined together. The basic construction consisted of three iron bars, with a few eye-pieces and a ruling rod, all of which was mounted on a tripod. Suddenly, with the publication of Metius’ manual, every European astronomer had access to an instrument that had been mainly available in the large centers of astronomy. Until then they were present in observatories like the Imperial Court in Prague and the University of Oxford, the observatories of Brahe and in that of William IV (1532–1592) at Hesse-Kassel.[21] These were institutions that presumably invested a great deal of money to acquire these instruments.

Around the same time that manual was written, Metius had this instrument built by his fellow Brahe-famulus, Willem Blaeu.[22] The source of Metius’ invention was clearly a sextant used by Tycho Brahe. Metius had learned to operate that when he spent time with Brahe in 1594. It once again underlines the impact of Tycho on the practice of astronomy in the Netherlands. But it also shows how Tycho’s influence was put into practice. The *famuli* did not just reproduce what Brahe had taught them, they were instead entrepreneurial and innovative with his legacy.

Remarkably, there is some clear evidence that Metius used this instrument for his classes in Franeker. He gave a lecture once a week and filled the rest of his time with privatissima, writing his books and making observations.[23] He used his own textbooks for his classes and he took examples from his own life, to explain how certain calculations were made. Unfortunately, this is virtually all that has been written concerning the precise details of his lessons, but a close look reveals how he used his own instruments for instruction.[24]

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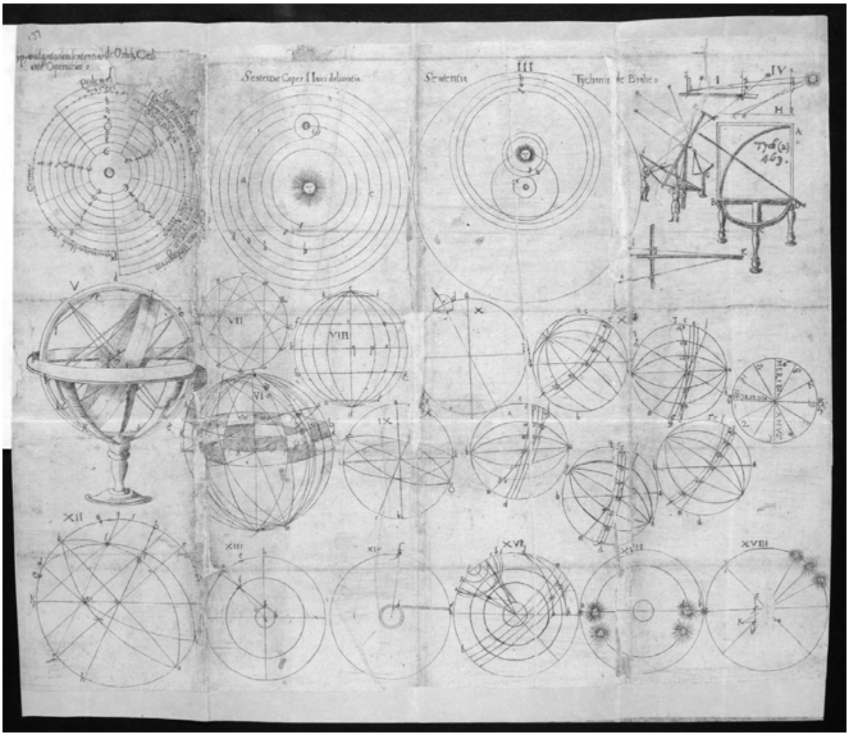
[21] On the Oxford sextant see Gunther, ‘The First Observatory Instruments’; on the Prague sextant see Šíma, ‘Prague Sextants’.

[22] Dijkstra, ‘[De] sextant’; Metius, *Institutionum* (1608), [‘De novis instrumentis’] fol.):(2 -):(3.

[23] On the observations (which have been questioned) see for example: Metius, *Institutionum* (1608), IV, 130.

[24] It has often been repeated that Metius received a stipend from the Frisian States in 1611 to acquire instruments and that he started using those instruments around that time. However, from his books it is clear that he had been making observations long before that. Consequently it has also been assumed that he did not start developing instruments prior



Folded leaflet which is bound with the copy of Metius, Institutionum, in the British Library. At the top right are two men operating an instrument that closely resembles Metius' sextant.
© British Library.

In the collection of Sloane manuscripts, now in the British Library, a copy of just the fourth part of the 1608-edition of the *Institutionum astronomicarum* is kept. This is the new part that was added to the earlier print in 1608.[25] This Sloane copy comprises the entire fourth part including the manual on the sextant. But there is also a manuscript drawing bound to this specific book, a drawing that illuminates the different topics discussed by Metius in that part. Several world systems (i.e. Ptolemy, Copernicus) are presented, as well as an armillary sphere, parts of an astrolabe and some calculations. In the top right corner of the drawing, Metius' version of the back staff is drawn (E), as well as a large quadrant (A) and a small ordinary sextant (G).[26] The *pièce de résistance* is a picture of Metius' large sextant 'in action'.

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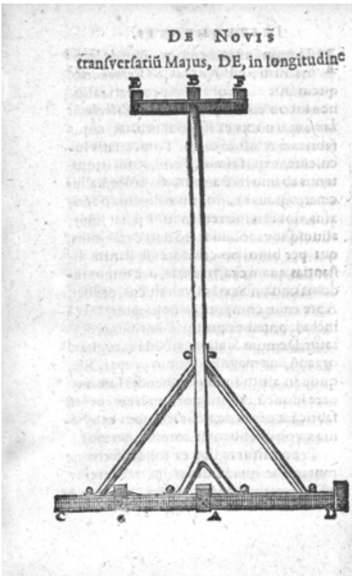
to 1611. This is likewise not true. These views are find a strong advocate in a recent (and well read) biographical entry: Palm, 'Adriaen Metius'.

[25] Scott, *Index to the Sloane Manuscripts*.

[26] Metius, *Institutionum* (1608), II, 167-174.



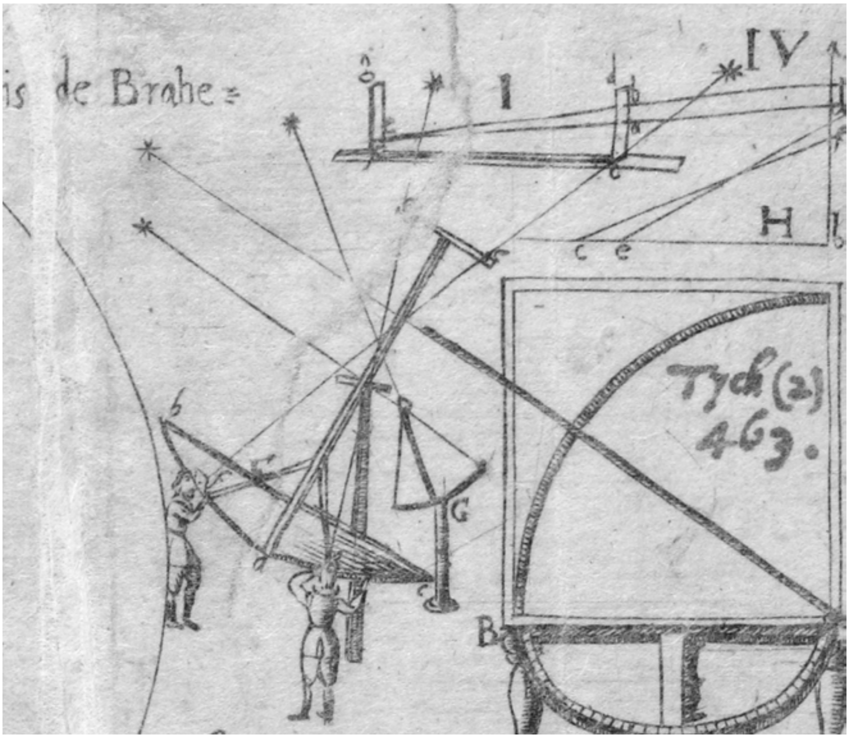
Metius' sextant as depicted in his De Novis. *Tresoar, Leeuwarden.*

Two men operate the instrument; they are clearly measuring the distance between two stars. They are doing is basic astronomical work, precisely what the instrument was meant for. From the drawing it is also clear that Metius' instrument was very large, which corroborates with other sources. It was over two meters in length.[27] In the manual two depictions of the instrument were printed, but they show a sextant smaller than the version Blaeu had built for Metius (see also par.4.3.1. above). The drawing that is bound shows the large version. It therefore seems plausible that whoever made the drawing saw a real sextant made according to Metius' directives, possibly even the one that was used and owned by Metius in Franeker.

The entire leaf presents calculations from the book, as well as several instruments and the world systems that are described in it. The conclusion must be that one of the book's students drew the whole sheet. Since whoever made the drawing also saw the sextant, it may have been a student who had visited Metius' classes.

One of the important details of the drawing is the two men. This corroborates with one of the descriptions Metius himself gave of his sextant: 'This radius can only be used by two persons, as happens in the

[27] Metius refers to it being '7 foot' ('septem pedem'), see Metius, *De genuine* (1624), 112-113; he refers to the instrument as a 'large sextant' ('groote sextant'), see Metius, *Astronomische* (1632), 109. This more or less corroborates with the picture. Since a Frisian foot would have been approximately 0,32 meters, the seven foot sextant would be 2,24 meters (www.meertens.knaw.nl/mgw, retrieved 09-01-2011). The people operating the instrument would on average have been about 1,6 meters in height.



Detail of a folded leaflet which is bound with the copy of Metius, Institutionum, *in the British Library.*
©British Library.

case of the sex[t]ant of Tycho Brahe'.[28] This description gave him the opportunity to once again stress the instrument's origins: Tycho. It also points to another important practice in Metius' classes, namely that he used his students as his assistants.

To use his students to assist him, he first needed to teach them how to use instruments. They could learn how to do this, for example, with paper astrolabes Metius added to his books.[29] The astrolabe was not in the first place an instrument to use for observations. Rather, it was designed and constructed to make calculations; when the several disks of an astrolabe are turned in the right direction, the position of the stars on any given date can be predicted. The instrument projects the heavens in a plane. For educational purposes, astrolabes were very important, but at

[28] The original phrase reads: 'Dese Radius en kan niet gebruyckt werden, dan alleene door twee personen, ghelijck gebeurt met de sex[t]anten van Ticho Brahe'. See Metius, *Institutiones* (1614), 101.
[29] I discuss the idea that he actually had his students buy and use those instruments elsewhere. See Dijkstra, 'De erfgenamen'.

the same time copies made of paper and cardboard functioned well enough.[30]

By publishing these paper instruments Metius could mesh with traditions that were already in place in Franeker. The instruments were printed by the publisher Metius had used since the 1590s.[31] Metius did not just use his own textbooks in his classes he also used these specific astrolabes in his classes. There is, for example, an auction list from 1611 where several students of his bought both his textbooks and these instruments.[32] His classes thus offered a full set of skills and knowledge for a future astronomer. The books provided the basic knowledge, the paper astrolabes functioned as calculating tools to practice with and the presence of high quality instruments like the sextant all created the perfect teaching environment.

In January 1609 Metius turned his students into proper assistants, when he collected data that he would later publish. That winter he made some important observations with the help of his students.[33] On January 10 he, along with 'four or five' of his students, observed a highly anticipated moon eclipse. Metius also believed that their presence attributed credibility and exactness to his observations.[34] This was more or less the standard way in which credibility was attributed to Early Modern observations.[35] As a teacher Metius even had his students check his data by re-measuring what he had done.[36] A well-executed

[30] Museum Boerhaave in Leiden recently acquired a copy of Metius' 1608 *Institutionum astronomicarum* with an almost complete paper astrolabe. These instruments are very rare. I have been able to locate only a handful of them in libraries all over the world. Thus far, the only complete copy can be found at the University Library of München. parts of these instruments are to be found in the Bodleian Library in Oxford, the library of Brown University (Rhode Island) and the University Library of Nijmegen.
[31] They were printed and added to the works of Mulerius, see Mulerius, *Cort onderwijs*. Unfortunately, although the numbers in which they were printed must have been extremely high, only very few survive today.
[32] Fryske Akademy, 'Apparaat Breuker', 16110; I elaborate on this in my article 'De erfgenamen van Gemma'.
[33] 1 Metius, *Astronomische* (1632), 109
[34] See for example: Metius, *De guino* (1624), 9 and Metius *Astronomische ende geographische* (1632), 46-48.
[35] On the credibility of Early Modern astronomical observations it can generally be stated that when such observations were repeated they gained such credibility, see for example Westman, *The Copernican Question*, who discusses 'credibility' throughout his book.
[36] Metius *Astronomische ende geographische* (1632), 47. This will of course have been a strategy by Metius to enhance the credibility of his text. The book historian Adrian Johns claims that the credibility of published texts was often linked to the credibility of the author of that specific text, see Johns, *The Nature*, 32; Volkert Remmert explicitly added the frontispieces of books as a means to persuade readers to trust a text, and used one of Metius' scarce frontispieces as an example, see Remmert, 'Frontispieces', 259-262 and Remmert, *Widmung*, chapter 6. If it really had been that important to Metius to build credibility through the use of frontispieces he would have resorted to using those images more often. Most of his books completely lack these elaborate first pages; in fact the only

observation of a moon eclipse could reveal, for instance, the exact position of the place where the observation was done. And Metius indeed measured the exact position of Franeker, establishing coordinates that would be used for any Franeker observation for decades to come.[37]

These observations give glimpses of how Metius' classes worked. The results then circulated among Metius' correspondents. This can be concluded from the fact that one of the students who was probably participating, used data acquired during the above moon observation as late as the 1630s. This student was Petrus Landsbergius (1587-1644), the son of the astronomer Philipus Lansbergen (1561-1632).[38] He matriculated in Franeker only weeks after the eclipse, but since there was no strict regime in place concerning matriculation, he may have been around a few weeks before.[39] The father, Philipus, is seen as one of the most illustrious Dutch astronomers of the time. He was one of the first and loudest adherents of Copernicus and he also published several books on astronomy, manuals on astronomical instruments, biblical chronology and on squaring the circle. Some of his sermons were published in both Latin and Dutch.[40] Not content with the astronomical tables of Ptolemy and Copernicus, he set out on a project to restore astronomy, as so many of his fellow astronomers were doing at precisely the same time (Mulerius, Snellius). His interest in mathematics and astronomy dated back well into the sixteenth century. His publications and his correspondences show that he had access to the Republic of Letters and knew how to use that.

That this astronomer would send his son to Franeker to observe the lunar eclipse was on the one hand a smart thing to do. It is always difficult to predict how well these celestial phenomena will be viewed,

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two editions that do have such images were printed in the 1630s. This was long after Metius' name as a trustworthy astronomer had been established. The example of Metius having his students recalculate his work shows that he established such a name with the tactics that are discussed by Johns. He wanted to convince his readers with textual strategies and trustworthy print.

[37] Metius gave the coordinate 53°11' N as the latitude of Franeker. One of his successors, Holwarda, tried to improve those calculations, and came up with 53°13' N. Today Franeker is put at the same distance Metius gave. See for a discussion of these attempts by Holwarda a manuscript written by H.K. Schippers, which is kept at Tresoar, FLMD, persoanlik argyf H.K. Schippers, box 967: typoscript of a translation of Holwarda's *Dissertatio*, page 32. This manuscript will be discussed in some detail in chapter 5. See also Holwarda, *Dissertatio*, 280-281; Holwarda, *Friesche*, 170. 173 and 176; comp. Metius, *Tafelen* (1627), fol. A7 verso-A8 recto. Nicolaus Mulerius praised Metius and his instruments for measuring precision, see Mulerius, *Tabulae*, 36.

[38] AFS, 1098.

[39] He matriculated on 28 February 1609.

[40] Vermij, *The Calvinist*, 73-76.

and to distribute possible observation points seems like a good idea.[41] On the other hand it is also a sign of Metius' fame. By 1609 he had clearly built a name as an observer. Petrus would later return to Franeker, together with his younger brother. By that time Petrus already had become a minister in Zeeland, but his still obtained his medical degree in Friesland. Both Lansbergens took their doctorate in June 1613; several of their descendents would later return to the Frisian University.[42]

It certainly was not the only time Metius operated his sextant with the help of his students. Months before he died, in the spring of 1635, he again observed a moon eclipse. This time Johannes Phocylides Holwarda was present; he would go on to publish the data collected during those observations.[43] According to Metius' eulogy he was also making observations on the day he fell fatally ill in September 1635, again with students present.[44] Those observations were possible because Metius had fulfilled some basic necessities: instruments, tools, books, knowledge and access to the Republic of Letters. His sextant was an example of an object where these necessities were combined; it was something that was ground breaking in its reach, but not necessarily in its design. This was the setting where in 1608 the telescope of Metius' brother was received. That instrument would be much more revolutionary than Metius' sextant and it would immediately hit the world of European astronomy with vigor.

4.3. Jacob Metius' telescope

4.3.1. Jacob Metius

The circle around Adriaan Metius, this Frisian Hven, was one of the first circles of astronomers to have direct access to an inventor of the telescope when Adriaan's brother stepped forward as being precisely that. Adriaan was a keen observer, working on new instruments and trying to develop ideas on astronomy. It is all the more remarkable that Adriaan never succeeded at making an impact with the telescope, even though that would become the most successful astronomical instrument of the era. A possible explanation for this is that the telescopes at Adriaan's disposal were of lower quality than those available to other

[41] Philippus Lansbergen published extensively on Metius' observations, he even gave details that lack in Metius' own account of the eclipse. See Lansbergen, *Tabulae*, III, 76.
[42] Petrus Lansbergen would later utter some criticism toward Metius precisely on following Tycho all too eagerly, see Lansbergen, *Tabulae*, III, 78, where he wrote: 'Decepit igitur Metium vitiosus Tychonis calculus'.
[43] See below, chapter 6.
[44] *OFAM*, 60.

astronomers.[45] Another explanation is that the telescope of 1610 was no measuring tool. It was an instrument to make cosmological observations. Measuring with telescopes would only begin in the second half of the century. But that is still not the entire answer to the question of why Adriaan Metius failed to make an impact with the instrument, and it is certainly not an explanation that provides insight into the world of Adriaan Metius. To understand how this very particular instrument functioned in Adriaan's environment, a leap back in time, to the summer of 1608, is necessary. This is right about the moment when the re-issue of the *Institutionum astronomicarum* was to appear.

Jacob Metius, Adriaan's brother, had the possession of a telescope in that summer of 1608. He took this to The Hague to claim a patent in October of that year, only to arrive there weeks after Hans Lipperhey had filed for a patent with a remarkably similar instrument.[46] Both Metius and Lipperhey were ordered to build new instruments. Both seem to have done so, but the question of who was first to invent the first instrument has never been resolved.[47] Generally historians attribute that to Lipperhey, because he arrived in The Hague with a telescopic instrument first. A third claimant to be the inventor the telescope, who is often mentioned in literature on the early telescope, is Sacharias Janssen who, like Hans Lipperhey, came from Middelburg.[48] A fourth claimant is only known as 'a certain young man', who also came from the province of Zeeland.[49]

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[45] The research of recent years shows that it is probable that Jacob Metius' instruments had a magnifying power that did not come close to the one Galileo's telescope would have. See Willach, 'The Long Road' and Van Helden's introduction to Galileï, *Sidereus Nuncius*, 9. It is Descartes' report that indicates that Jacob's telescope had a concave ocular and a convex objective. See Moll, 'Geschiedkundig onderzoek', 138.

[46] Both Albert van Helden and Rienk Vermij suppose that news of Lipperhey arriving in The Hague with a telescope reached Jacob through the network of his father. Vermij quotes Van Helden as a source for this assumption. Van Helden offers a note by a burgomaster of Medemblik as proof for this thesis, a note which he brands 'a routine report', which was sent home by the representative of Medemblik and he continues: 'And if the delegate from Medemblik sent routine reports home, we may assume that the delegate of Alkmaar did the same. As Jacob Metius was a member of a prominent family in Alkmaar, this piece of news must have been brought to his attention very quickly upon its arrival there.' However, it is Vermij who has shown that this note was of a personal nature rather than a report, a personal note that did not travel but stayed in the possession of the author. Oddly enough Vermij did take over the reasoning of Van Helden, while he corrected the proof. See Van Helden, 'The Invention', 22 and Vermij, 'The Telescope', 85.

[47] Lipperhey offered newly built telescopes to the States-General in December 1608 and February 1609; Metius was rumoured to have built a much better telescope on numerous occasions. See Van Helden, *The Invention*, 42-43.

[48] Huib Zuidervaart has convincingly shown that Janssen's involvement did not exist, see Zuidervaart, 'The 'True Inventor''; see also Zuidervaart, 'Uit vaderlandsliefde'.

[49] On the 'young man', see Van Helden, *The Invention*, 39.

On Jacob Metius, remarkably little research has been done. Although several stories circulate, only recently historians have started to look into his claims.[50] Jacob, like his brother, grew up in the city of Alkmaar, where his father Adriaan Anthonisz home educated him. As I have shown, around the same time several other prominent Dutch 'mathematicians' were born and raised there. Most notable for Jacob's story is perhaps the inventor-philosopher Cornelis Drebbel (1572-1633), but also the seaman-astronomer Frederik de Houtman (1571-1627) and the publisher-instrument maker Willem Jansz Blaeu. All came from Alkmaar in the 1570s and all played a role in the early history of the telescope. [51]

Stories of Jacob being uneducated have been debunked by Goffe Jensma, who argues that these are common places for inventors.[52] Jensma also points out that it is probable that Jacob had some education, since he served as an assistant to his father for a while.[53] Over time it has been questioned whether he even possessed a telescope, but recently discovered archival sources establish beyond doubt that he did.[54]

Most early printed sources on the telescope point out Jacob as the inventor. This was so until 1655 when Borel printed his *De vero inventore telescopii* (*On the true inventor of the telescope*). Only very recently, Huib Zuidervaart revealed how, from that point in time onward, the Middelburg citizen Sacharias Janssen was given credit for the invention even without there being much evidence to substantiate such claims.[55] In the 1670s Christiaan Huygens, who was working on the improvement of the telescope, made the archival discovery that it was Hans Lipperhey who was the first to claim a patent for the telescope. This tipped the

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[50] The one article that does so most thoroughly, written by Huib Zuidervaart, has unfortunately remained unpublished until today. Zuidervaart kindly communicated this article to me. He elaborated on some of the facts dealt with in those articles in Zuidervaart, 'The 'Invisible Technician''.

[51] Snelders, *Alkmaarse natuurwetenschappers*, 119; see also: Tierie, *Cornelis Drebbel*, 21-35

[52] See Jensma, 'Adriaan Metius'; see also Jensma and Dijkstra, 'Wiskunde als familiebedrijf'; comp. Westra, *Nederlandse ingenieurs*, 37.

[53] See Waterbolk, 'Van scherp zien', 197.

[54] These sources were found by Huib Zuidervaart and were published by Rienk Vermij, 'The telescope', esp. 90-92; that Jacob never actually owned a telescope is implied by De Waard. He claims that it is definitive that Metius did not yet have a spyglass in the summer of 1608, from which he concludes that he could not be the inventor. He then continues to say that Jacob Metius never added a thing to spreading knowledge of the invention. Thus De Waard argues that Jacob's role is virtually negligible; see De Waard, *De uitvinding*, 165, 189 and 218. Moll was also very critical on Metius' (and Lipperhey's) claims: see Moll, 'Geschiedkundig onderzoek', 173. From the marginalia in Moll's personal copy of Borel's *De vero inventore* he is a bit more cautious and even openly questions Janssen's claims. See the copy of *De vero inventore* kept at the Utrecht University Library, shelf mark ex. P qu 838 (Rariora). I thank Hans Mulder of that library for making digital photos of that specific book available to me.

[55] Zuidervaart, 'Uit vaderlands liefde', passim.

balance definitely in favour of an inventor, living in Middelburg around 1608 and it left only Janssen and Lipperhey as likely candidates.

In the eighteenth and nineteenth centuries, the question of who had invented the telescope largely centred on just Janssen and Lipperhey. Metius was also often referred to, but without taking a close look at his claims.[56] The fact that Metius filed for a patent later than Lipperhey could be learned from Huygens' papers, which were available in the Leiden university library, and in the early nineteenth century they were put into print and made available all over the world.[57] Metius' story meanwhile was more and more becoming one of enthusiasts and not of professional historians.[58] His paper trail was getting weaker over time – not because it had a bad start, but because it slowly faded.

Jacob Metius' case may not have been argued, but several historians have found new data on his life.[59] All those new facts give enough cause to rebuild that case, not to claim priority for a Dutch inventor, however, but to learn something about the circle surrounding his brother. It was in that circle that Jacob was discussed as the inventor. The attempt to see if Jacob invented the telescope, therefore, gives insight in the world of Adriaan, which will contribute to the main point of this chapter.

The events surrounding the revealing of the telescope by Hans Lipperhey in the autumn of 1608 in The Hague have been labelled the birth of the telescope as a 'scientific instrument'.[60] It is branded 'scientific' to distinguish it from telescopic toys that had been available before September 1608. Yet, before a 'scientific program' could be carried out with the instrument, improvements would have to be made. Galileo achieved success as early as the summer of 1609, yet numerous other astronomers and the like had started working on the instrument at the

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[56] Both Descartes and Adriaan Metius, who were the strongest advocates of Jacob's claim, were well read still in the nineteenth century, and their works were readily available in libraries all over the world.

[57] Moll, 'Geschiedkundig onderzoek', 129-134; the transcription is published on 129-131, but it contains many errors. For a good transcription see OC, XIII, 591-593; comp. Van Helden, *The Invention*, 6 and 39.

[58] He is, for example, broadly discussed in numerous issues of the Dutch periodical the *Navorscher*.

[59] See Vermij, 'The Telescope'; Waterbolk, 'Van scherp zien'. A very telling episode is that of Adriaan Metius' Eulogy. An important source on Jacob Metius' life, it was often cited but by the 1980s no known copy of that source had survived. It was Goffe Jensma who ultimately discovered one in the University Library of Groningen. By now a few more copies have been located in different libraries, see Jensma and Dijkstra, 'Wiskunde als familiebedrijf', 10-11.

[60] See Zuidervaart, 'The 'True inventor', 11; comp. Van Helden, 'The birth', esp. 50-53. The Dutch historian Rob van Gent used a similar phrase in a series of lectures he gave in the autumn of 2008 on the invention of the telescope.

same time. The events in The Hague, however, would prove a decisive moment in the process of the telescope's coming into the world.[61]

Just two weeks after Lipperhey, Jacob Metius would show up in the same city, claiming he had been working on the telescope since 1606.[62] He only received recognition as having invented a similar instrument. Irony has it that both Lipperhey and Metius were denied the patent they applied for because the instrument would be too easy to duplicate. If anything, the fact that two instruments showed up proved that this line of reasoning was accurate.[63] These patent applications are often seen as the moment the instrument became public knowledge.[64] But those meetings were not the first time someone showed a telescope. The first (cameo) appearance of a Dutch telescope was in fact in Frankfurt am Main, Germany where in August 1608 the first telescope was shown.[65] A 'Dutchman' would have been the one showing such an instrument to Johann Philipp Fuchs von Bimbach (1567-1626). The source for this is the German astronomer Simon Marius (1573-1624), who would a few years later write that Fuchs von Bimbach heard,

> 'that there was then present in Frankfurt at the fair a Dutchman, who had invented an instrument by means of which the most distant objects might be seen as though quite near. Our nobleman [Fuchs] had a long discussion with the Dutch first inventor, and felt doubts as to the reality of the new invention. At last the Dutchman produced the instrument, which he had brought with him, and one glass of which was cracked, and told him to make a trial of the truth of his statements. So he took the instrument into his hands, and saw that objects on which it was pointed were magnified several times. Satisfied of the reality of the instrument, he asked the man for what sum he would produce one like it. The Dutchman demanded a large price, and when he understood that he could not get what he first asked, they parted without coming to terms.'[66]

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[61] Van Helden phrases it as follows: 'If everything leading up to the invention of the telescope might be called its prehistory, its history begins when Hans Lipperhey set out from Middelburg, on 25 September 1608, to go to The Hague with his new spyglass.', see Van Helden, 'Galileo and the Telescope', 183.
[62] Van Helden, *The Invention*, 21 and 39.
[63] By December several other telescopic instruments had surfaced, see for example the remarks made by Jeannin, a French diplomat: Van Helden, *The Invention*, 43.
[64] On Early Modern Dutch patent applications, see Davids, *The Rise and Decline*, passim.
[65] Van Helden *The Invention*, 21; the fair was held between August 15 and September 8 every year. Presumably the telescope was offered sometime in those weeks.
[66] Cited and translated by Van Helden, *The Invention*, 21 and 47-48.

There are at best three likely candidates to have been in Frankfurt. These are the ‘certain young man’, Jacob Metius and Hans Lipperhey. That it may have been Jacob Metius is first of all suggested by the description of the state of his instrument. When he presented it in The Hague in early October he excused himself for the fact that his instrument was made of ‘poor materials’. From the most extensive source available, it is clear that Jacob was clearly rushed to The Hague to apply for a patent.[67] The Frankfurt specimen had a ‘cracked’ lens, a possible similarity that is not spotted in the literature on the telescope.

More importantly, Jacob is the only one of the three who may have had a good reason to be at the Frankfurt fair. The 1608-edition of his brother’s *Institutionum astronomicarum* had just been published and was sold internationally there for the very first time. Adriaan Metius seems to have supervised his own book production and sales and he used the services of his brothers for these practices. For example, in 1611 his brother Abraham worked for him as a bookbinder.[68] The German market was a very important outlet for Metius’ publications and it is clear that he had a lot riding on this specific book; it was printed in very high numbers.[69] He thus may have sent someone to accompany the introduction of it, someone from his closest circle; Jacob seems a likely candidate.

Meanwhile, Fuchs von Bimbach had tried everything to create his own telescope. Together with Simon Marius, whom Fuchs patronized, he had ordered many lenses and struggled, but eventually failed to assemble a telescope. But while their own efforts were unsuccessful, the instrument was rapidly becoming a commodity in the Netherlands. In the summer of 1609 Marius and Von Bimbach received their first working specimen from the Netherlands, which enabled Marius to construct new telescopes.[70] This specimen was possibly sent to Germany

[67] ‘seer slechte stoffe’, OC, XIII, 591-593; comp. Van Helden, *The Invention*, 6 and 39-40; That Jacob seems to have only had one instrument at the time seems a fair suggestion because he brought a poor instrument to apply for a patent. The source states ‘And he, the petitioner [=Jacob Metius], does not doubt that with improvement of the materials the instrument would also improve much in use [...]’, see Ibidem, 40.

[68] See also Djoeke van Netten, *Koopman in kennis;* comp. Dijkstra and Jensma, ‘Wiskunde als familiebedrijf’, 42.

[69] Until the late 1620s parts of this print run were repacked and republished as a new book: Metius, *Astronomiae brevis* (1626). I thank Torsten Schlichtkrull of Det Kongelige Bibliotek (Royal Library) in Copenhagen who sent me numerous photos of this, and other, books by Metius. Without his help it would have been impossible to determine that this 1626 copy was for large parts the same as the 1605 and 1608 copies discussed in the previous chapter.

[70] Around that same time Rudolf Snellius was already demonstrating these instruments in his classes at the University of Leiden. It is clear that the telescope was becoming very common, very fast. See, De Waard, *Journal*, I, 11 footnote. It would take the highly interested David Fabricius another half a year before he had acquired his own specimen. See Bunte, ‘Über David Fabricius’, I, 122 and III, 16.

by Von Bimbach's relative, Adamus Valentinus Fuchs von Bimbach, who studied in the Netherlands during this time. Interestingly he went to Leiden first in 1609, but continued his studies in Franeker, still in 1609. He would stay there, close to Metius, at least until 1610.[71]

Jacob is said to have kept working on the instrument for the remainder of his life. He also claimed to have invented a new, improved version of the telescope.[72] Whether or not he did so remains unclear. Even if it is true, the actual invention had no impact on the numerous astronomers who started using the telescope after 1608. This does not mean Jacob's inventions had no impact whatsoever; they were in fact very important for him and his family. Under the leadership of Adriaan, the Metius family tried to claim the invention as theirs.

4.3.2. The uses of the telescope

Adriaan Metius started using the telescope as soon as he got his hands on a copy. He was showing the skies through this instrument to enthusiasts in the same setting in which he was deploying his sextant. In other words, he was encountering great success with the instrument. One of the nicest descriptions of how the early telescope was used in Friesland was written by the astronomer Nicolaas Mulerius, who lived in Friesland at the time. In 1613, he wrote to the former Tycho-famulus and fellow Metius student, Rudolphus Wicheringhe, about observations made with the telescope:

> 'I cannot hide from You, noble sir, that we observe the sun daily with the use of a telescope. With the rising and setting of the sun there appear bright and black discs, sometimes many, then less. I have seen often four, often three and once a few. These revolve around the sun. These are not spots; they would have to have a thin shape and not be moving. They all have a round shape, like discs. The gentleman Metius was the first to show them to me. We suspect that they are stars or planets, until now unknown to mankind, that do not part from the sun. It is not an optical

[71] Fuchs von Bimbach matriculated in Leiden on Jun 20, 1609; see ASL, col. 95. He matriculated in Franeker on November 2 of that same year; see *ASF*, no. 1157. He stayed in Franeker at least until 1610 when he defended a disputation under Joachim Andreae, see *Auditorium*, 27/1610.3, for which Metius' friend Lycklema à Nyholt wrote a carmen. It is unclear how and to what extent Adamus Valentinus was related to Johann Philipp Fuchs von Bimbach. One explanation as to why no-one ever pointed to this possible connection can be found in the fact that his name was given as 'Pinbach' and that he was wrongfully presented as 'Franequerensis' in the *ASF*. Fuchs von Bimbach's hometown was, in fact, Frankfurt. See also the improvements on the *ASF* given in *Auditorium*.

[72] On Jacob's claims see Dijkstra and Jensma, 'Wiskunde als familiebedrijf'.

illusion. Because many others have gazed upon them together with us, and their movement is irrefutable.'[73]

This eyewitness report gives a remarkable insight into how Metius' circle was functioning in the early 1610s. The telescope was an attraction and it was used to make astronomical observations, drawing astronomers with an international reputation to Metius. Mulerius, for example, had already published his famous *Tabulae Frisicae*, a large volume that contained tables with the positions of the stars.[74] He would shortly thereafter also publish a well-read 3rd edition of Copernicus's *De Revolutionibus*.[75] In the following years several internationally acclaimed astronomers tried to get to know more about Jacob Metius in one way or another.

Apart from Nicolaus Mulerius, several astronomers, mathematicians and philosophers inquired after Metius' telescope. At one point or another, most of them ended up with Adriaan, the best-known Metius internationally, although they also pursued different paths.[76] How news of the telescope travelled and how Metius' family was closely linked to that becomes clear from a letter that was sent from London right around this time. The inventor and alchemist Cornelis Drebbel wrote it,

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[73] Waterbolk, 'Van scherp zien', 200. The Latin text is given by Waterbolk as follows: 'Celare te non possum, vir nobilissime, quod in sole quotidie conspicimus, adhibito telescopio. In sole oriente vel occidente clare apparent quasi disci nigri, nonnumquam multi, aliquando pauciores. Vidi quaternos, ternos et semel unicum. Et hi quidem moventur circa solem. Maculae non sunt, essent enim forma vana, nec moverentur; omnibus est forma rotunda disci instar. D. Metius mihi primus ostendit. Suspicamur esse stellas seu planetas antehac humani generi incognitos, qui a sole non digrediuntur. Non est hallucinatio oculorum. Nam multj alij nobiscum conspexere et manifestus est illorum motus.'

[74] Van Netten, *Nicolaus Mulerius*, 53-56.

[75] Mulerius explicitly refers to Metius several times in his works, see for instance Mulerius, *Astronomia instaurata*, 36. One of the (presumably) Roman-Catholic, original readers the copy of this book kept at the 'Universidad Complutense de Madrid', which can be read online via http://books.google.com (retrieved 08-2011), did not agree with Mulerius' assessment that Metius was an excellent professor and stroke the adjective 'praestantissime' out.
In his edition of Copernicus' *De revolutionibus*, Mulerius discussed an instrument that could be used to explain the movement of the earth and which was developed by Metius' father. Mulerius recalls how it was Metius who had explained to him how to use and make such an instrument. See the excellent website of Ad Davidse, http://adcs.home.xs4all.nl/beeckman/Iv/adr.anth-tell.html (retrieved 11-17-2011); on Mulerius' edition of Copernicus, see Van Netten, 'Herstelde astronomie'; see also: Copernicus, *Astronomia instaurata*, 28.

[76] An impressive list of men who wanted to learn about Metius' telescope will include Galileo, Kepler, Peiresc, Descartes, Drebbel, Simon Marius and David Fabricius, see Zuidervaart, 'The 'true inventor', passim. To Pereisc's famous inquiries after Jacob Metius, see a recent article by Feola, 'Botanical', 21; On Kepler, Galileo see below; On Fabricius, Marius and Descartes see above.

probably between October 1608 and January 1609.[77] His letter was addressed to the Alkmaar burgomaster Ysbrand van Rietwijck († after 1619) and in it Drebbel explicitly asked about Jacob Metius' telescope: 'Your lordship has kept silent until now on the far sights [=telescope], found by the son [=Jacob Metius] of Mr. Adriaen Thonissen. I ask you to let me know what he has done in this. I have also found many excellent things in this, some seem unbelievable and are valued as sorcery [...]'.[78] After writing this, Drebbel continues to describe several optical findings he made.

The purpose of his letter was thus twofold. On the one hand Drebbel wanted information on the telescope. On the other he wanted to claim or present some optical findings he had made himself. Drebbel was not the only one to show this somewhat twofaced reaction to Jacob's invention. The letter was addressed to someone who can be linked directly to the Metius family. Not only was Van Rietwijck a fellow burgomaster to Anthonisz, the Metius brothers' father, he had also written a *carmen* to Adriaan Metius' very first book.[79] Rietwijck was thus the right person to direct such inquiries to.

Descartes showed a similar strategy when he came to study in Franeker. Historians have concluded that he must have discussed the telescope with Adriaan Metius.[80] Consequently, he started writing his *Dioptrique*, in which he presented his own ideas on the telescope. Nevertheless, he started with a reference to Jacob Metius.[81] This seems a likely scenario, and although there is little evidence to support it, it is precisely why the invention of the telescope is such an important event.

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[77] It is unfortunate that only an undated copy survived. Many have tried to date it more precisely, but until now this has been unfruitful. The letter has been published numerous times. The best context is perhaps given by Jaeger, *Drebbel*, 110-111, who points out that a large part of the letter was published for the first time in 1630.

[78] 'UE. heeft mij voor desen geswegen 't verre sien gevonden bij den zoon van Mr. Adriaen Thonissen. Ick bidde laat mij weten wat daerin gedaen heeft. Ick hebbe oock vele excellente dingen daerin gevonden, soo ongelooflijke schijnen ende als tooyerij geestimeert werden [...]. waervan UE. hier een weinich wil gedencken.', see Jaeger, *Drebbel*, 110-111

[79] Metius, *Doctrinae* (1598), 16.

[80] Traditionally it is said that Descartes came to Franeker to study with Metius. There is, however, little evidence to corroborate such claims. There are two pieces that have led historians to this conclusion. The first is that Descartes was interested in mathematics. The second is that he studied with Metius, because he is generally seen as the strongest advocate of Jacob's claims. The third bit of evidence is the fact that he was working on lenses when he was living in Franeker. See for instance, Waterbolk, 'Van scherp zien', 195; recently Hal Cook argued that Descartes came to study with Maccovius, one of the most notorious professors in divinity that Franeker had, see Cook, *Matters of exchange*, 229-230; whatever the case, historians seem to have overlooked that Descartes' inscription in the Franeker Album Studiosorum is a rather remarkable one: he is the only person in 250 years of the University of Franeker to have enrolled as a 'Philosophus'. This arouses the suspicion that Descartes was perhaps seen as a sort of visiting fellow. See *ASF*, no. 2538.

[81] On Descartes pointing out Jacob Metius see Zuidervaart, 'The 'True inventor', 21.

Whether or not it was indeed Jacob Metius who first lined up the lenses and used a diaphragm, he was the brother of a Franeker professor who could provide the social setting where such an instrument made sense. Whatever the historical distortions between the early seventeenth century and today are, it is clear that the telescope revolutionized astronomy. Adriaan Metius knew this, and so did Descartes. That is why this story is such an important example of how instruments were received and introduced in Franeker at the time.

4.4. Claiming the invention of the telescope

4.4.1. Marcellus Vranckheim

The most important contribution to the telescope in the period shortly after 1608 was without a doubt made by Galileo Galilei. After he first heard about the instrument, he immediately started reworking and, literally, reconstructing it.[82] This resulted in an almost entirely new instrument, which he used to make some stunning observations. It was Galileo who turned the Dutch invention into an actual research instrument.[83] He published the results of his observations in the famous *Sidereus Nuncius*, or *Sidereal Messenger*, a pamphlet that shocked the European Republic of Letters like hardly any other work would.[84] What has gone virtually unnoticed in the massive amount of literature published on this booklet, is the existence of a letter by one of Metius' students. The letter is dated on November 20/30 1609, the day on which Galileo started the observations for this pamphlet, and addressed from Padua, where Galileo was working at the time.[85] In this letter the student openly links Jacob Metius' telescope with Galileo's. That student was a Marcellus Vranckheim (1587-1644), and in the 1610s his letter did not go unnoticed.

Before a closer look at that particular letter is warranted, the questions of who this Vranckheim was and what he was doing in Padua need to be solved. Marcellus Vranckheim was born and raised in

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[82] Biagioli, 'Did Galileo Copy'.
[83] Zuidervaart sees the presentation in The Hague as the decisive moment for this transition from a toy to a 'scientific instrument', see Zuidervaart, 'The 'True Inventor', 11. Van Helden discusses how Galileo turned the invention into 'an instrument of discovery' and immediately exhausted its possibilities, see Van Helden, 'Galileo and the Telescope'.
[84] Johns, *The Nature*, 19-30.
[85] Vranckheim dates his letter on XII Kal. Dec. MDCIX Patavij anten, which is 30 November 1609, Julian Style. On one of the rare occasions that this letter is discussed in recent literature, this has been translated as '20 November 1609', see Drake-Brockman, 'The *Perpetuum Mobile*', 131. On the dating of Galileo's observations, see Righini, 'New light on Galileo's Lunar Observations', see also Whitaker, 'Galileo's Lunar Observations' and Van Helden, *Sidereus Nuncius*, 9-10.

Zutphen, in the Dutch province of Gelre.[86] In 1601, at the young age of 14 he was employed as a tutor to the sons of a rich merchant, Anthoine l'Empereur (1552-1612) in Utrecht.[87] He would take his tutees to the university of Leiden in 1607. At the end of 1608 he left the service of his patron family to set out on his own *peregrinatio academia*, during which he would keep the (financial) support of l'Empereur and in return he would update him of his studies abroad from time to time. Thus, letters in which Vranckheim talks about his spell at the university of Marburg beginning in January 1609, where he would defend a long disputation in law in June, have survived.[88] In that same letter he also talks about hearing Landgrave Maurice the Learned (1572-1632) – a distant cousin, but good acquaintance to the Dutch stadtholder[89] - defend some theses on philosophy and theology.[90] Vranckheim found the Landgrave 'un grand amateur de bonnes lestres et lettres comme aussy de la Religion reformée'.[91]

Sometime at the end of spring Vranckheim moved on, continuing his journey to the University of Basel. He arrived there before June. Only a month later he would take a degree in Law, right after he had defended another long disputation.[92] The announcement of the actual promotion is even preserved, on which it states that he took this honour together

[86] On the very curious Vranckheim, see Doornink-Hoogenraad, 'Een Zutphense rector'. All personal details on Vranckheim come from this article, unless indicated otherwise. After his studies Vranckheim became a rector of the grammar school in Zuthpen, where he seemed to have been far from orthodox in his personal life, in his personal faith and in the way he expressed his faith publicly. He was consequently accused of Arminian sympathies, which cost him his job. He ended up in the Southern Netherlands, where he adhered to the Roman Catholic faith. He spelled his name in various different ways during his life. I have come across the following: Vranckheim, Vrancheim, Franckheim, Francheim, Frankheim and Euletarius.

[87] These l'Empereurs became a famous professor-family in Leiden. Most would spend time in Franeker as well: *ASF*, no. 1463; 1472; 1634; 1656 and 2757. They are related to the family Thysius, of which Johannes Thysius (who lodged with the his uncle Constantin l'Empereur, to whom Vranckheim had been a tutor) would found the Leiden Bibliotheca Thysiana. That library still exists today and most of its seventeenth century papers and books are preserved. It is in this collection that some of the letters by Vranckheim sent to his patron are preserved today. See also introduction to the inventory of that archive, available in typescript at the University Library Leiden, and see also: Van Rooden, *Theology, Biblical Scholarship*, 20-21.

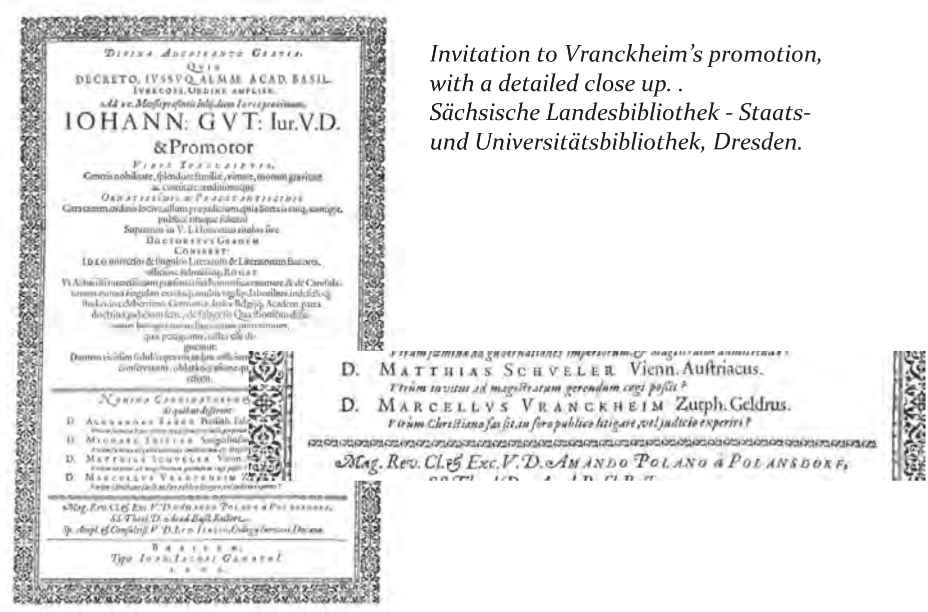
[88] Vranckheim, *Meletemata*; see also: Doornink-Hoogenraad, 'Een Zutphense rector', 76-77.

[89] De Wreede, *Willebrord Snellius*, 137-138.

[90] Doornink-Hoogenraad, 'Een Zutphense rector', 76

[91] These letters are kept in the Thysius archives in the University Library of Leiden and are quoted in Doornink-Hoogenraad, 'Een Zutphense rector', 76-77. I have checked all letters and could not find a reference to Metius, the telescope or Galileo in them. See University Library Leiden, Thysius Archive, tweede afdeeling, inv. no. 238: Brieven van Marcellus (Eleutherus) Vranckheim, 1605-1611.

[92] Vranckheim, *Zhthmata quadam*. I thank Dominik Hunger of the Universitätsbibliothek of Basle in Switzerland for making a scan of this disputation available to me.



Invitation to Vranckheim's promotion, with a detailed close up. .
Sächsische Landesbibliothek - Staats- und Universitätsbibliothek, Dresden.

with Alexander Faber, Michael Triller and Matthias Schueler. Possibly one of these three may have been his companion, about whom he talks in a letter sent to l'Empereur from Basel.[93] Vranckheim took his degree on July 20th, after which he was off to Venice, Italy. It is uncertain when he arrived there precisely, but because chronology plays a crucial role in this reconstruction it is important to note that this was around the same the time as when the first telescope was recorded there.In a recent article the historian Mario Biagioli makes a strong case that the telescope arrived in Venice shortly before the 20 July 1609.[94] This was, probably, ten days before Vranckheim took his degree in Basel, where the dating was still done in the old, Julian style.

Therefore, Vranckheim arrived in Venice just a few weeks after the telescope was first spotted there. He was, however, still in time to arrive months before Galileo had finished his improvements on the instrument and started his observations. Galileo finished his first advancements at the end of August, when he offered a specimen to the counsel of Venice.

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[93] Mommsen, *Auf dem Wege*, 28; see also illustration of the invitation to his promotion in par. 5.4.1. of this book.

[94] Biagioli builds a case to re-date Galileo's first acquaintance with the telescope on a 'forgotten' letter by Sarpi. Unfortunately he does not mention if the letter could be 'Julian'-dated; the letter was, after all, sent to a protestant heretic, and thus, to a member of a group that tended to take to the old fashion way of dating. If Sarpi's letter was indeed 'Julian'-dated, Galileo would have seen a specimen of the telescope 10 days later. This, however, was still too early for Vranckheim to have been able to bring him the telescope.

From September to November he improved the telescope a second time. The initial Dutch telescopes had a magnifying power of approximately three times; Galileo's August telescope magnified about ten times, the November telescope would have a magnifying power of about twenty times.[95]

Exactly on November 20/30 Galileo turned this last telescope to the sky in nearby Padua, where he held a chair as professor in mathematics. With that, he started what has been labelled as his 'scientific programme', which resulted in the *Sidereus Nuncius*. On precisely that same day, Marcellus Vranckheim sent a letter from Padua to Johannes Ernst Burggrav († 1629). In this letter Vranckheim indicated Jacob Metius as the inventor of the telescope and mocked Galileo as a fraud.[96]

4.4.2. Epistola

No manuscript of Vranckheim's *Epistola* is known to have been handed down.[97] The only known edition was published in 1611, only about one and a half years after it was written. It was published as a sort of preface to an alchemical book, which was written by the addressee of the letter, the Paracelsist Johannes Ernst Burggrav.[98] Normally this swift publication may be good for the credibility of a letter; when letters are published shortly after being sent – and in this specific case Vranckheim even overlooked the publication process – there is little reason to doubt the trustworthiness. Vranckheim, however, discussed events that took place long after the date on the letter; this means that he 'edited' his letter before publication, adding things that were not in the original.

The first intriguing question is: who was the addressee Johannes Burggrav? A second is: how did he know Vranckheim? Burggrav and Vranckheim made their acquaintances in Marburg in 1609, when the latter was a student and the former was lodged with the professor of mathematics.[99] While Vranckheim was in Marburg, Maurice the Learned established a chair in chimiatria (Alchemy), the very first in the history of universities in the German lands. On April 4, the chair was officially established with an inaugural lecture by Johannes Hartmann (1568-1631), who until his death would combine his chair in mathematics with that of

[95] Van Helden, *Sidereus Nuncius*, 9-10. Galileo would construct an even stronger telescope over the months to follow, see also: Van Helden, 'Galileo and the Telescope', 190.
[96] Drake-Brockman, 'The *Perpetuum Mobile*', 131; Drake-Brockman erroneously assumes the letter was published in a book that was printed in Frankfurt, whereas it was actually printed in Franeker.
[97] My interpretation of this letter leans heavily of translations made by Henk Nellen of the Huygens Institute, The Hague, as well as that of Piter van Tuinen, Harlingen. I am very grateful for their unselfish help in these matters.
[98] Burggrav, *Biolychnium*, 49.
[99] Keller, *Cornelis Drebbel*, 388.

chimiatria.[100] It is reasonable to assume that Vranckheim met with Hartmann and that he even participated to some extent in the alchemic practices of that professor. This is reasonable because directly upon coming to Franeker, he cooperated with Burggrav on the publication of a treatise on alchemy. The letter that discusses the telescope was published precisely in that book.

Vranckheim seems to have had time enough to edit the letter, which did little good to its style. It is written in a very impenetrable Latin, larded with even more ambiguous Greek quotes. This was probably done as a way to demonstrate Vranckheim's education, but in this case it led to overkill, making the letter difficult to understand.[101] Vranckheim introduces both Adriaan and Jacob Metius, right after he discussed Drebbel's *perpetuum mobile*. That all three were from the same town was remarkable enough to discuss them in relation with each other. He hails Jacob as the true inventor of the telescope, an instrument that had enabled him to make all sorts of discoveries:

> [...] Jacob Metius (the brother of Adriaan Metius, a celebrity because of his remarkable achievements in the mathematical sciences), the inventor of the spyglass, with which he can measure a tower or any other object from a distance of three Dutch miles, as if he stands right before and eye to eye with it, and with which he can observe England from the coast near [Alkmaar]. He also gives other observations of the surface of the moon, the Milky Way, stars that astronomers have thus far referred to as nebula, and about other stars that are wandering around Jupiter, an unprecedented novelty with regard to earlier generations [...].[102]

[100] On Hartmann and the establishment of the chair in Chymitria, see Moran, *Distilling knowledge*, 107-111; see also Vera Keller, *Cornelis Drebbel*, chapter 5. The same Hartmann already held the post in mathematics at the time Metius had visited the university of Marburg in the 1590s.

[101] Doornink-Hoogenraad, 'Een Zutphense rector', 79.

[102] Burggrav, *Biolychnium*, 53-54. The full quote reads: 'Sed ecce tibi alterum huic concivem! Iacobus Metius est (frater Adriani Metij, Viri ob singularem in Scientijs Mathematicis praestantiam Clarissimi) qui Perspicillum invenit, quo turrim vel corpus aliud quodlibet tribus milliaribus Hollandicis dissitum, velut pede collato, & ad oculum dimetitur exactis simè, & Angliam è littore suo clarè prospicit, & alia de Lunae globo; de Galaxia; de Stellis, quas Nebulosas hactenus dixerunt Astronomi; de alijs circa Iovem erraticis prodit inaudita veterum aevo novitate. 'Quam penè, τάς μηχανάς μετά τον πόλεμον mi Galilee, [Galileus Galileus Matheseos in illustri Patavina Professor] & perspicillum illud tuum cum Observationibus? Et Sidereus Nuncius tuus Callipides erat, nisi inter caesa & porrecta, quod aiunt, nescio quid additum fuisset operae homini Batavo, & adhuc imberbi, qui citiùs Instrumentum tale invenerit, quàm ejus à se reperti famam sparserit, adeo ut rumore de hoc divulgato, ad consimilis Organi inventionem te devenisse confitearis ipsemet, cujus beneficio Observationes εκ τών υπερβερεταίον illas prodidisti in Lunae facie; fixis

With this Vranckheim accredited almost all of the discoveries Galileo had announced (or would announce) in his *Sidereus Nuncius* to Jacob. He continues to affront 'my dear Galileo' explicitly by calling the *Sidereus Nuncius* an imitation and warning the Italian mathematician that the 'prize' for the first inventor of the telescope will not be handed to him. In fact, Vranckheim claims, the True Inventor will rename the moons around Jupiter to either 'Mauritiana or Nassovia', referring to the Dutch Stadtholder. Galileo, of course, had named them Medician stars to honour the De Medici family of Florence. After this scolding, Vranckheim talks about a new invention by Jacob that was about to be revealed. With that 'similar' instrument it would be possible to look well beyond the known hemisphere. The inventor would proudly be able to wear the name Metius, because he will measure or know with this instrument the unknown secrets of the gods.[103]

The letter was clearly edited after Galileo had published his pamphlet in March 1611, and thus also after the claimed date of the letter. From his biography it is even uncertain if Vranckheim had met either of the Metii prior to his *peregrinatio*. Of course that remains a possibility, and it is certain that he met Adriaan after he had written his letter. He travelled from Padua to Paris sometime in the Spring of 1610, and after a short period in the French capital he moved on to the Dutch Republic where he immediately set out to Franeker. There he matriculated at the Frisian university on September 15 1610.[104] He met up with both the addressee of his letter, the alchemist Burggrav and with Adriaan Metius.[105]

Somewhere in 1611 Vranckheim wrote a *carmen* for Metius' *Arithmetic*, which was about to be published.[106] It was probably printed around the same time Burggrav's book on alchemy was printed on the same press. When Vranckheim had set out on his journey in the winter of 1608/09, he had traveled almost at the same speed as the news of the telescope. His return journey was characterized by a similar news wave, that of the *Sidereus Nuncius*.[107] The response of Metius' circle was Vranckheim's letter, which was published in an alchemical booklet by Burggrav. In it, Burggrav presented the design for an everlasting lamp,

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innumeris; lacteo circulo; stellis nebulosis; & quatuor Planetis, eorundemque circa Iovem periodis. Age verò, dum alteram tibi muralem cedimùs, ne Isthmum Sinapi bibas.'

[103] Burggrav, *Biolychnium*, 53-54.

[104] *ASF*, no. 1230.

[105] Burggrav, *Biolychnium*, 36; see also Metius, *Arithmeticae* (1611), fol. *3.

[106] The dedication in the book is dated October 1611, however Metius was already awarded a reward for his dedication in October 1610. See Metius, *Arithmeticae* (1611), dedication and Bokkinga, *Extraordinaris*, 163. I have checked this against the original, and there the date of October 1610 can be found.

[107] On the specific Dutch reception of the *Sidereus Nuncius* see Palmerino, 'La fortuna'.

which was fueled by human blood and which would give an indication of the wellbeing of the donor of that blood.[108]

The treatise, and Vranckheim's defense of Jacob Metius' claim to first invention of the telescope, did not hit Europe with the same vigor that the telescope and its discoveries had. Nevertheless, the book did have an important audience. The main conclusion that can be drawn from all this is that Adriaan Metius' circle claimed the invention of the telescope for Jacob as early as 1611. This claiming of the invention thus happened at least three years earlier than has been recognized in the literature on the telescope.[109] It also shows that the circle around Metius was aggressive in its tactics, much more aggressive than has been recognized. It finally gives an example of the opportunities that were available to academics in Europe and idea of how many young scholars traveled all over Europe, carrying ideas in their heads and letters and objects in their luggage. The conclusion seems to be warranted that Metius, who had many different students, knew how to make use of the possibilities these students had to offer. How successful the Metii were can be shown by assessing the publications of the time; whenever someone referred to the Dutch inventor of the telescope with a name in the 1620s and 30s, they used Jacob Metius' name.[110]

4.4.3. *The reception of the* Eternal Light

It is very hard to tell exactly how widely read Burggrav's book was. It was reprinted several times, but all of those new editions lacked Vranckheim's letter. A better indication can perhaps be found in the fact that several authors at the time mentioned or referred to that first edition.[111] Two of those stand out for discussing Vranckheim's view on the brothers Metius. One is an indisputable reference to Vranckheim by the English alchemist Robert Burton (1577-1640), who briefly mentioned

[108] Doornink-Hoogenraad, 'Een Zutphense rector', 79.
[109] On this circle claiming the invention, see Waterbolk, 'Van scherp zien'; Waterbolk describes what I refer to with circle as 'a group of friends' ('een groep vrienden'), see Ibidem, 194.
[110] Zuidervaart, 'The 'True Inventor', 20-21; Important additions to Zuidervaart can be found in a Johannes Phocylides Holwarda, who referred to Jacob Metius as the inventor in the 1640s in a specific Franeker context; see Holwarda, *Dissertatio*, 237 and Matthias Gloskowski, a Polish nobleman who possibly had studied in Franeker, but certainly had traveled through the Netherlands, and explicitly referred to Metius as the inventor around the same tame. See Gloskowski, *Geometria*, fol. [32 recto]; see also the introduction to this book. I thank Henk Rietbrink for attending me to Gloskowski, see also his website which is a true Fundgrube: http://www.fransvanschooten.nl/ (retrieved 12-12-2011).
[111] This letter by Vranckheim was only published in the Franeker edition of 1611.

Vranckheim's letter in his *Anatomy of melancholy* (1618).[112] The second is more ambiguous, but also a little more substantial. It was also written by one of the most notable early users of the telescope, the East-Frisian pastor David Fabricius (1564-1617).[113] Together with his son, Johannes Fabricius (1587–1615), he was among the very first to observe sunspots with the use of the telescope. In the spring of 1610 they aimed their telescopes (which they had acquired in Leiden) at the sun. They published on these spots before either Christoph Scheiner (1573-1650) or Galileo, making them the very first in Western Europe.[114]

Like Metius, David Fabricius had assisted Tycho Brahe for a while and discussed the construction of instruments with the Dane. Also much like Metius, he was a keen observer of the skies. Fabricius went as far as to sell his own lands to finance the purchase of new astronomical instruments.[115] His strategies for communicating the results of his observations also resembled Metius'. Fabricius was a keen publicist who published a yearly almanac in which he discussed the results of those observations. This also resembles Metius' strategies to a certain extent; the Franeker professor also discussed his astronomical practices in his books and prints.

Fabricius also corresponded with both Tycho Brahe, and later with Johannes Kepler, on his observations. His correspondence with Kepler offers an especially important view into the astronomical world of the early seventeenth century. It is believed that Fabricius' expertise and his tenacious commitment to calculations forced Kepler to rethink his ideas on the universe over and over again. This ultimately resulted in a strong enhancement of Kepler's ideas on the elliptical orbits of the planets.[116]

In 1615, 1616 and 1617, Fabricius discussed several remarkable inventions in the prefaces to his almanacs. He referred, for example, to Drebbel's perpetuum mobile.[117] He also talked about the telescope and

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[112] Burton, *The Anatomy*, II, 93. Burton does not just mention Vranckheim, he also gives his assessment of the claim and a summary of Burggrav's book: 'Marcellus Vrencken an Hollander in his Epistle to Burgravius, makes mention of a friend of his that is about an instrument, quo videbit quae in altero Horizonte sint. But our Alcumists meethinks and Rosie-Cross men afford most rarieties, and are fuller of experiments: they can make gold, separate and alter mettals, extract oyles, saltes, lees and doe more strange works then Geber, Lullius, Bacon or any of those Ancients. [...]Ernestus Burgravius a disciple of Paracelsus hath published a discourse in which he specifies a lampe to be made of mans blood, Lucerna vitae & mortis Index, so he termes it, which Chimically prepared 40 daies, and afterward kept in a glasse, shall shew all the accidents of his life [...] and which is most wonderfull, it dies with the party [...] the lamp and the man whence the blood was taken, are extinghuished together.'

[113] On Fabricius the best introduction is Folkerts, 'Der Astronom'.

[114] See Folkerts, 'Der Astronom', 132; comp. Reeves and Reeves, *On Sunspots*, 30-34.

[115] See the publication of his Diarium in Bunte, 'David Fabricius', I.

[116] Cohen, *How Modern Science*, 214.

[117] Vera Keller, *Cornelis Drebbel*, 490.

about the good it had brought to the study of astronomy. He said that it had brought to light all kinds of things that 'the ancients had not known'.[118] On one of the title pages of these almanacs, one of the oldest images of the telescope is printed.[119] For his 1615 almanac Fabricius seems to have used Vranckheim's letter as an inspiration.[120] In the preface of that booklet he refers to Jacob as the true inventor of the telescope and how many remarkable things had come to light because of Metius' telescope. Fabricius mentions Galileo's find of the satellites orbiting Jupiter, the surface of the moon, the strange threefold-like appearance of Saturn and the phases of Venus. Interestingly, he refers to Jacob's ability to read letters at a distance of three miles, which was only a small alteration from the claims Vranckheim had made. Fabricius states it as following:

> 'Just as these glasses' first and true inventor Jacob Metius, a citizen of Alkmaar in Holland who right now is working with his invention on higher pursuits, is, through his wonder glasses, able to read a letter over three Dutch miles away'. [121]

Although Fabricius does not make a direct reference to Vranckheim, the fact that most of the details show strong similarities seems proof that he

[118] Fabricius, *Prognosticon [...] 1618*, [7]. Van Helden and Reeves refer to this prognostication as being lost, but it is available in the National Library of Austria, see Reeves and Van Helden, *On Sunspots*, 34. From this almanac it can also be learned that the date of death of Johannes Fabricius is wrongly presented in almost all literature. Instead of March 19 1616, Johannes died on January 10, 1617, and not in Marienhafe (as is suggested on numerous places on the internet), but in Dresden, on a journey to Basel. This may also contradict the assessment Van Helden and Reeves give of Fabricius. A journey to what may be considered one of the centres of Calvinist scholarship could very well indicate that the young Fabricius was actively pursuing his own interests.
Folkerts also considers the prognostication lost and says that no copies of Fabricius' calendars have survived. Both assessments are wrong, since together with this copy, one of those is also preserved; see Folkerts, 'Der Astronom', 131. They are kept in the Österreichische Nationalbibliothek – Tresoar in Leeuwarden will acquire my microfilms of these prints.

[119] Information kindly communicated by Huib Zuidervaart.

[120] Keller, *Cornelis Drebbel*, 490.

[121] '[W]ie dann desselben perspicilli primus unnd verus Inventor, Iacob Metius Burger zu Alckmar in Holland (den ich auch wegen dieser erßen Invention selbst für drey Jahren besucht(=1609/1610) und mit ihm davon communciert habe) an jetzt? damit im Werck seyn solle unnd diese Speculation unnd Invention nun mehr so hoch getrieben/ daß er durch seine verbeserte WunderBrill auch ein Brieff über drey Holländische Meilen lesen cönne/ daß auch ein jeder gemeine Buchstab in quantitate pollicis erscheine/ unnd der Mond in die 45 und 50 Grad nach dem anschen begreiffe/ wie dann davon der hochgelehrte Doctor Nicolaus Mülerius, Medicus und Astronomus zu Lewarden/ nich allein Schrifftlich mir zuekennen? geben/ sondern auch dessen theils in offnen Trucken Spargirt/ als der auß deß Inventoris Mund solches selbst gehört hat.' See Fabricius, *Prognosticon 1618*, [7]

used Vranckheim's letter. He even repeats some phrases from that letter word for word.[122] But next to these parallels with Vranckheim, Fabricius did have other sources; the German pastor mentions a visit to Jacob Metius sometime in 1610-11 in letters he had received from Nicolaus Mulerius.[123] Unfortunately, nothing more can be said, neither about these visits, nor about the letters by Mulerius. This is because this is the only place where they are mentioned.

On the almanac, however, a little more information is available. Interestingly Kepler replied to it in a publication of 1618 and he also had a few specific words for Jacob Metius.[124] Since Fabricius seems to have restated Vranckheim's words, Kepler actually replied to the claims made by the latter. Whatever the case, he rejected the idea that it was possible to read a letter at a 'three mile distance'. Kepler argued that this is 'good to want, but impossible to achieve'. He does, however, concede that it is possible to read characters at such a distance, but only when they are written on the face of a clock tower, when the weather is good and only with the help of Juno and Apollo.[125]

Whereas Vranckheim's story already showed how knowledge and claims on inventions travelled through Europe, Burton, Fabricius and Kepler once again showed that after a claim was made its interpretation was still subject to debate. Every time a claim was repeated, it was often altered a little. These claims are also examples of the success of the Metii agenda. The fact that Jacob Metius invented the telescope was not contested; this was more or less taken for granted. Scholarly Europe wanted to know what more to expect, what Jacob's possible future inventions could be. For Metius *cum suis* the attempts to claim the telescope were very successful.

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[122] In the same almanac Fabricius also refers to Drebbel's *pertpetuum mobile* machine – it is that reference that almost word for word resembles Vranckheim's letter. See Keller, *Cornelis Drebbel*, 490.

[123] Fabricius, *Prognosticon [...] 1618*, [7]

[124] See on the relation between Kepler and Fabricius Voelkel, *The Composition*, esp. chapter 8.

[125] The full quote is: '4. Quod Metius inventor Telescopij pollicetur *instrumentum, quo literas ex intervallo trium milliarium legere possis*; id pulchrum ausu, impossibile factu puto: non vidit homo, aut non percepit demonstrationes a me proditas. Unicales literas repraesento facile, quae sunt scriptae communi magnitudine; sed illas, quae non distant multo plus a vitro, quam vitrum ab oculo. Datur appositio ad speciem in infinitum, at divisione infinita incrementi primi, non repetitione incrementi ejusdem. Quanto majus apparet, quod vides, tanto minor est incrementi auctio. Quid quod et, quanto seipso majus apparet quod vides, tanto pars de toto, quae in uno perspicilli situ videtur, minor est? Lego tamen et ipse literas ex intervallo trium milliarium, sed inscriptas Horologij circulo, pedales et cubitales existentes, nec nisi dijs faventibus, Junone et Phoebo.' I thank Ron Gruijters for his help with translating this text. Kepler published it as part of Kepler, *Ephemirides*, 17; see also De Waard, *De uitvinding*, 228.

4.5. *The practicality of the telescope: Alchemy and the search for longitude*

The booklet in which Vranckheim's letter to Burggrav was printed was dedicated to the local Franeker nobleman Carolus Sternsee (1551-1615).[126] This dedication connects the letter to a specific Franeker setting. Some glimpses of that setting are revealed by the *carmen* Vranckheim wrote at precisely the same time for Metius' *Arithmetica*,[127] and by another *carmen* Vranckheim wrote to a published sermon of the Franeker professor of law Lycklema à Nyholt (1573-1625).[128] There, Vranckheim's poem appeared in a book that was published by Butenpost (who was organizing a large book auction together with Adriaan Metius)[129], next to a poem by Jacob Rodrigius († after 1621), who would also write a *carmen* to Metius' *Arithmetica*.[130] Lycklema himself happened to write a *carmen* to Adamus Valentinus Fuchs von Bimbach's disputation, which was defended around that same time.[131] These back and forth dedications reveal the contours of a group of people within the academic community of Franeker.

One of the focuses of this group was alchemy, and this was also the main subject of Vranckheim's letter. It was Sternsee who housed the most important alchemical laboratory of Franeker and together with Adriaan Metius he was one of the leading figures of a circle of Franeker alchemists.[132] In this circle, Vranckheim and Burggrav were participating in 1610-11, when the book, the letter and Vranckheim's *carmen* were all printed in Franeker. Although sources are scarce once again, this Franeker circle seems to have had some clear goals with their pursuits; they would ultimately use alchemy to look for medicines that could cure diseases. This is a rather surprising setting when looking at the reception of the telescope. Members of the circle not only discussed the instrument, as Vranckheim's case shows, they also actively advocated Jacob Metius as the inventor. In both the history of the telescope, as well as the history of Franeker this has gone largely unnoticed.

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[126] Burggrav dedicates the book to Sternsee, as well as to Taco van Burmania who was another Frisian nobleman and to D.S.B.M.M.S.P. Behind those letters Vranckheim is hiding once again; he uses a similar expression to sign his own carmen to Metius' *Arithmetica*. See Metius, *Arithmeticae* (1611), fol. *3.

[127] Metius, *Arithmeticae* (1611), fol. *3.

[128] *Auditorium*, 18/1610.1.

[129] See Jensma and Dijkstra, 'Wiskunde als familiebedrijf'.

[130] Metius, *Arithmeticae* (1611), fol. *4, verso. This Rodrigius would later write a carmen to Pier Winsemius' history of Friesland, see Winsemius, *Chronicque*, fol. [9]. In that same book, Lycklama would write another carmen. Winsemius' brother (who would write Metius' *Eulogy*) also wrote one, and Metius himself made maps that accompanied that book. See also Dijkstra, 'Het wiskundeonderwijs'.

[131] *Auditorium*, 27/1610.3

[132] Another probable member was Sixtus Arcerius.

For a period of time Adriaan Metius was more than passionate for alchemy. As the author of his *Eulogy* puts it: 'Especially alchemy [...] gave him a lot of pleasure. For a number of years he was completely obsessed by it. [...] But due to damage to his family's wealth and due to the shame he received from the artisans, he grew wise and learned that alchemy is but a servant to the medical sciences'.[133] Nevertheless, his activities did not go completely unrewarded; his search for alchemical recipes that could cure illnesses eventually earned him his honorary doctorate in 1625. He would also donate several alchemical works to the university library.[134]

However, this was not before he had spent years trying to find the Philosopher's Stone (Lapis Philosophicus). A bill from 1617 testifies that Metius undertook these enterprises together with Carolus Sternsee.[135] From this it is clear that the two men were working on an alchemical project, buying on several occasions several hundred pounds of 'stone coal' for 'distilling purposes'.[136] Just a few months after the bill was issued, Sternsee would die after a long disease. Metius was one of the witnesses to his last will and testament.[137] One can imagine the two men franticly trying to find a cure for Sternsee, an attempt in which they eventually failed.[138] They undertook their research at Sternsee's house, the only castle in Franeker, which was right across the street from the university buildings. When his belongings were auctioned shortly after his death, numerous distilling apparatus and utensils were up for sale. Unfortunately there were no telescopes up for bidding at that specific auction.[139]

What is clear is that Metius was an active practitioner of alchemy.[140] What is also clear is that Vranckheim's letter in Burggrav's book shows that the telescope was discussed in this circle. Combining those two details shows that the invention of the telescope was not only claimed by the Franeker circle, it was also linked to alchemical practices there. It seems that the Franeker circle tried to valorize the instrument in that

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[133] *OFAM*, 53-54.

[134] Wierda, *Armamentarium*, 374; see also Van Berkel, 'Wiskundige boeken', 84; Winsemius utters explicit criticism on Metius' alchemical practices, see *OFAM*, 53.

[135] Burggrav, *Biolychnium*, 36. Burggrav wrote in this dedication that he had written that 'e Musaeo Meo' in Franeker. Apparently he had stayed in Friesland for a certain period.

[136] See Gemeentearchief Franeker, inv.no. 3023,

[137] http://mpaginae.atspace.com/Sternsee.htm (retrieved 10-12-2011).

[138] This is corroborated by a story of an unpaid doctors bill, which the heirs of Sternsee refused to pay to Metius' friend Arcerius (as a student Metius had lodged with his father). See Boeles, II.1, 81; comp. the letter of Sixtus Arcerius to Saeckma of October 27, 1617, published by Martin Engels on http://home.wanadoo.nl/mpaginae/ (retrieved 10-12-2011).

[139] An auctionlist is kept at the archives in Franeker, see Gemeentearchief Franeker, inv.no. 3023. Sternsee's house would be rented next by Pierus Winsemius, who did own and used a telescope.

[140] In this he resembled Tycho Brahe too. The Dane was a known alchemist.

way. Yet, an alchemical application was not the only valorization Adriaan Metius sought. From 1614 onward, he outlined in his own books the use of the instrument as well as the promise of progress it held. Adriaan Metius expressed the expectation that the telescope would solve practical problems. He boasted about the applicability of Jacob's second, secret telescope and he suggested using it to find longitude, one of the biggest problems navigation and astronomy were struggling with at the time. This new telescope would be so strong that it would make all sorts of height differences in the moon visible. Those observations could lead to a perfect system to calculate the exact coordinates of any position on the globe, Metius believed.[141]

> 'So, when it pleases my brother to reveal the glasses he has discovered (which he keeps to himself), then people will be able to measure the longitude of all the countries perfectly, because through these glasses they will be able to see certain heights and depths in the Moon (which always keep their position). With help of these glasses, they will also be able to accurately measure the distance to the stars to within one second.'[142]

He continues, saying:

> 'there is no practice yet revealed for finding longitude certainly, which can be of use to navigation. But, [...] that can be expected by the glasses invented by my Brother.'[143]

With this assessment, Metius brought the telescope right back to his own observations of the moon eclipse of January 1609. At that time Metius was also trying to find these coordinates, which he could

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[141] Metius referred to his brother's invention on the following places in his oeuvre: *Institutiones astronomicae* (1614), 3-4; *Nieuwe geographische onderwysinghe* (1614), 12-13 en 95; *Institutiones astronomicae* (1621), 3; *Nieuwe geographische onderwysinghe* (1621), 15 en 86; *De genuino usu utriusque globi tractatus* (1624), I, 11 en II, 11 en 74; *De genuino usu utriusque globi tractatus* (1626), I, 9-10 en II, 12 en 67; *Primum mobile* (1631), I, 4-5 en 149; *Primum mobile* (1633), 3 en 88; see also: Dijkstra and Jensma, 'Wiskunde als familiebedrijf, 47.

[142] Metius, *Nieuwe* (1614), 12-13: 'Soo wanneer mijn Broeder ghelieven sal zijne ghevondene perspicillen (die op hem alsnoch rusten) aen den dach te brenghen, soo salmen op dese manier de longitudines der landen perfectelicker conen afmeten, want men door die selve perspicillen inde Mane zekere hoochten en dalen can aenschouwen (die onbeweechlijck altijt hare plaetse houden) van welcke men de distantie der sterren, tot op een secunde door behulp der selver perspicillen connen afmeten.'

[143] Metius, *Nieuwe* (1614), 95: 'Dit is in de Zeylage onbequaem, want daer geen pracktijcken alsnoch aen den dach ghebracht zijn, om den Longitudinem seeckerlijck te vinden die in de navigatie ghedienstich can wesen, dan hebben sulcx te verwachten uyt de perspicillen van mijnen Broeder gheinventeert'.

calculate with data collected during the eclipse. Unfortunately, it is impossible to know if he was using a telescope during those observations with his students. The only instrument we can be certain was used was his sextant. But cunning as it may have been – revolutionary perhaps for the astronomer with a small purse – the sextant did not have the same alchemical connotation, which the telescope did have. The sextant had been just an instrument to measure, not one with an almost magical nature. The professor Adriaan Metius had known to combine these to facets of astronomy. Metius' suggestions to deploy the new, improved telescope in an attempt to find longitude at open sea are in fact the perfect illustration of his career. They are practical solutions, without too much philosophical connotations. This was the local setting in which the telescope was first deployed.

4.6. Conclusion

When Metius observed a moon eclipse again in the Spring of 1635, just months before he died, he measured the position of Franeker using his sextant. This literally gave Franeker a 'Tychonic' place on the globe. At the same time he used the astronomical event to instruct his students, as he may have done numerous times before. By that time, the names of Vranckheim, Burggrav and Sternsee were already in the distant past. Metius himself had been busy in the previous decade thoroughly reworking his books on geometry and arithmetic, and reprinting his textbooks on astronomy. Ultimately, his brother being the inventor of the telescope was not much more than a brief side note in his entire oeuvre. It hardly made a lasting impression within the alchemical scene in which it initially was received.

The long and winding narrative about Metius' instruments has raised questions over the nature of the telescope. In the circles where its invention was claimed the telescope was embedded in alchemical practices and cultures. In Metius' case it was not part of his astronomical work in the way his sextant and his paper astrolabes were. This is not an accident; in the first half of the seventeenth century the telescope was not used as a measuring instrument. It was not an instrument that could measure positions, but was rather used for observations of the make-up of celestial objects; it was a physical and philosophical instrument. Only with Huygens, Cassini and Flamsteed at the other end of the century did the telescope become an astronomical instrument.[144] Others have pointed at numerous different circles where the instrument was used (i.e. the court and the army), the Franeker case reveals that it was also academically and locally embedded and that it was used in an alchemical setting.

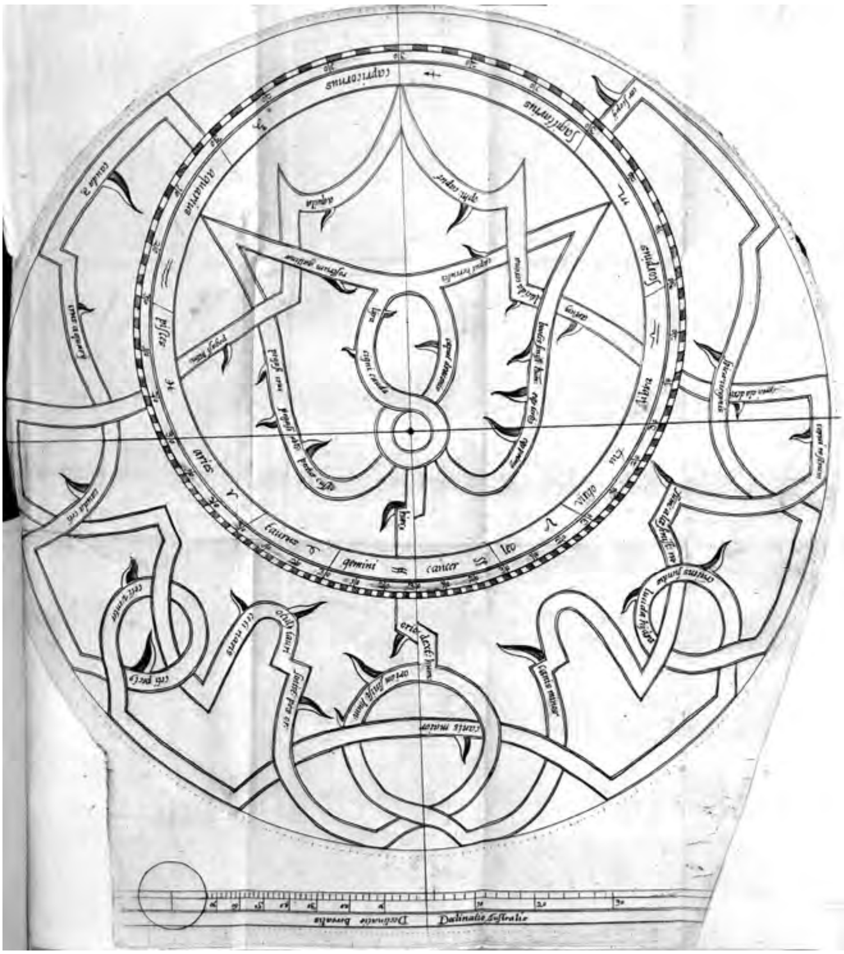
[144] Dijksterhuis, *Lenses and Waves*, chapter 2.

Furthermore, the use of the instruments needs reevaluation. These were not just tools to 'do science' with, but also, and maybe primarily, tools used by those in the Republic of Letters to make connections and build fame. Metius used them to build a 'Hfraneker' and to construct the image of 'mathematics as a family corporation'. For example, after the telescope had been presented in The Hague in September 1608, the Metius family had been actively busy trying to claim its invention. It is my understanding that these claims were for a large part orchestrated from Franeker. In the 1610s and 1620s, Jacob Metius was not seen as making one of the many dubious claims towards having invented the telescope. Instead he was regarded as *the* inventor of the instrument. That he was regarded as such demonstrates how successful the Metius family was in their desire for this recognition and how successful they were in building a reputation for the Metius kinship. This approach toward society is indicative of the Early Modern period, in which family was the foremost important distinguisher.

Over the course of his life Metius had turned Roggius' legacy into his own specific enterprise. As a professor he had started to build a name, publishing on mathematics in numerous editions. But he was also talked about in publications. Through his books, Metius became a well-known mathematician. Through his instruments he cunningly built an even bigger reputation, not just for himself, but for his entire family. By the 1630s Metius had become one of the most famous mathematicians of his day. He had turned the debris of Roggius into a workshop of mathematics; mathematics had come to Franeker to stay.

This was especially important because Metius would die soon after those observations in the Spring of 1635. The question of what his legacy would be thus became all the more eminent. It may have looked like a solid foundation, one which his successors could work on and cultivate for many more years. It seemed that Franeker had become a centre where mathematics was practiced. Yet in any Early Modern setting, such centers were only sustainable as long as the person who created them was alive. With Metius' death the reputation of Franeker as a place where the mathematical arts could flourish immediately came under threat.

It is frustrating that one of Metius' most novel approaches toward university education, the education of *idiotae*, is very hard to study due to the lack of available sources. Yet it leaves little doubt that he was the very first university professor in the whole of the Netherlands who was officially allowed to teach mathematics in the vernacular. Of course, Metius' work was translated into Dutch numerous times, and his measuring and paper instruments reached an audience far beyond academia, yet before 1630 there is not a single identifiable student who did not master Latin. Fortunately some things are known. Just a few years prior to Metius' death, the university senate granted those *idiotae* the right to obtain a university degree. It was one of the final things Metius would leave his institution, which was his *alma mater* and his employer for over three decades. He had given mathematics a solid basis at Franeker, there were numerous opportunities for those who wanted to advance the field, which was firmly entrenched into the scholarly world of that university. Metius left his successors a lot to work with, which they did. They would all work in the tradition of Metius, trying to build reputations for themselves and publishing on astronomy and mathematics. Their stories show what the value of their field was.



Rete of a paper Astrolabe from Metius, Institutionum. *Clearly distinguishable is the so-called tulip shape.*
Museum Boerhaave, Leiden.

II

Institutionalizing Mathematics: Johannes Phocylides Holwarda and Bernhardus Fullenius(ca. 1635 – ca. 1660)


BERNH. FVLLENIVS MATHES. PR

« *Unknown artist,* Bermhardus Fullenius senior (1602-1656).
Museum Martena, Franeker.

IN 1632, THE Franeker *idiotae* officially became a part of the university when the university Senate recognized their degrees.[1] Before that only those who knew Latin were allowed to get an official diploma.[2] It is impossible to tell how many had taken a degree in mathematics before 1632 or what status the graduates had. What is clear is that they were around.[3] One of the very few *diplomas* from all of the seventeenth century mathematics students in Franeker to still be in existence was awarded around that time and is thus one of the first under these new rules. The degree was obtained by Buwe Gabbema (1607-1643/44), a friend of Pibo Gualtheri. What makes this specific degree even more interesting is that Gualtheri composed one of his publicly presented mathematical problems to celebrate the graduation.[4]

The decision by the Senate to recognize the *idiotae* marks one of the most important moments in the emancipation of that specific group. Unfortunately, it is also a very poorly documented moment, which makes the event itself hard to study. The effects of this decision, however, can be discussed from within a broader view on the University of Franeker in de decades following 1632. The decision to award diplomas to the *idiotae* assured a certain continuity when Adriaan Metius died only three years later, although it was uncertain what this precisely meant at the time. Ultimately the decision of 1632 was the foundation on which mathematics at Franeker would further flourish.

Immediately after Metius' death, the search for a successor began.[5] Within a month a former student of Metius, Christian Otterus (1598-1660), arrived in Franeker. He would be giving *privatissima* on mathematics in the following year, but he did not become the official successor to Metius.[6] That post was taken a year later by the professor of Hebrew, Bernhardus Fullenius. After Johannes Roggius, Fullenius was

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[1] AUF, inv.no. 15, 'Acta et decreta', 29; 24-1-1632.

[2] Van Winter, *Hoger beroepsonderwijs*, 50 esp. ftn.89; Van Winter incorrectly states that Metius was Rector Magnificus in 1626, a fact that adds credit to his assessment.

[3] *OFAM*, 38, see also Van Winter, *Hoger beroepsonderwijs*, 50 esp. ftn.89; comp. Van Berkel, 'Het onderwijs in de wiskunde', 230, nt.10 and Van Winter, 'Twee eeuwen landmeters', 33-51.

[4] Van Winter, *Hoger beroepsonderwijs*, 51 esp. ftn. 93; A week later Gabbema was officially sworn in as a land surveyor.

[5] *OFAM*, 64.

[6] On Otterus, see below.

the second professor of mathematics with a strong Hebrew connection. Very much unlike Roggius, Fullenius would be a success.

During the first 15 years of his professoriate Fullenius found a young and ambitious philosopher by his side: Johannes Phocylides Holwarda. This young academic had a decisive impact on how the field of mathematics was further defined, how mathematics was practiced and what sort of mathematics was practiced at Franeker. It was Holwarda's publications and his students that attracted the attention of the Franeker academic society and the Frisian administration. Although Fullenius fashioned the continuity from Metius onwards, it was Holwarda who cunningly exploited several other possibilities that mathematics held.

One of the main questions on which the second part of the thesis is founded, is what happened to mathematics in Franeker? Between Holwarda and Fullenius, the field was split up in two. Fullenius fit the mold of the Frisian university quite well. Holwarda, on the other hand, clearly was more ambitious, a sentiment he shared with his students. Therefore, Holwarda and his students shall be the main focus of this part. The rationale behind this is that it is this ambition on the part of Holwarda that reveals best what happened to the field of math. It is, after all, the whole of mathematics in its broadest sense that is subject of this study.

The following part of this book is again divided in three chapters. The first of these three, chapter 5, picks up with Metius' successor Fullenius and then zooms in on the start of Holwarda's academic career. Holwarda and Fullenius are the two academics that would divide the legacy of Metius between them. Chapter 5 discusses some of the key elements in this process. Chapter 6 studies how Holwarda continued working on mathematical ideas, but it also shows that neither he nor Fullenius were the only 'mathematicians' in Franeker. To answer the question how mathematics was practiced in the middle of the seventeenth century I will elaborate on two of the most colourful academics that lived in Franeker around this time. The final chapter of this second part, chapter 7, traces the publication and reception of two of Holwarda's books, those that can be regarded as his most mathematical works, but also two of his books that were not directly aimed at a Franeker audience. The study of the reception of those works shows what was appealing about Holwarda's mathematics beyond the borders of the University of Franeker.

5. Metius' Successors: Fullenius and Holwarda

5.1. Introduction

WHILE LOOKING AT the moon in the early winter of 1638, a Franeker student, Johannes Phocylides Holwarda, 'by chance' saw a 'disturbing light'. The young Phocylides was observing the skies to collect data for a book on the motion of the moon. He was ambitious and hoped to further his career at the University of Franeker by attacking some of the best-known Dutch astronomers of the day. For this he needed his own lunar observations to be precise and extensive. But the disturbing light offered him new opportunities; it would seem that he had accidentally discovered a whole new star. Holwarda completed his studies on the moon and had these printed in a nice little book. While this book was still in print, however, he decided to add a second part in which he claimed his discovery and explained at length what it was he had discovered. [1]

Phocylides sought the help of his professor of mathematics, Bernhardus Fullenius senior. This professor was the direct successor of Adriaan Metius and had to manage the vast legacy that was left to him. Metius had had the skills to cleverly market his ideas, his books and his instruments, and he used all of this to exploit his position. Fullenius would have known this better than most; not only had he himself been a student of Metius, he had also been his direct colleague at Franeker. As a student and a colleague, Fullenius was well schooled in the different facets that characterized mathematics. So when the student Phocylides asked Fullenius for help with his observations, Fullenius knew what to do. Meanwhile, Fullenius went to work on what seemed a much more important task, institutionalizing mathematics at Franeker.

Both the ambitious student and the hard working professor are important elements for understanding how the events surrounding the

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* Parts of this chapter have previously been published as Dijkstra, 'A Wonderful Little'. I kindly thank LIT-Verlag for letting me use it again.

[1] For my use of the treatise by Holwarda I lean heavily on an unpublished translation that I found in the personal archives of H.K. Schippers (1893-1971), which are kept at Tresoar in Leeuwarden, The Netherlands. The translation is from the hand of Jacob Cohen (1911-1972). Lysbert Bonnema and Jelle Krol of the former Frisian Literary Museum and Centre for Documentation (Frysk Letterkundich Museum en Dokumintaasjesintrum, which is now a part of Tresoar) made these documents accessible to me. For the sighting see Holwarda, *Dissertatio*, 189.

sighting by Phocylides Holwarda unfolded. Firstly it is important to trace what happened to the chair of mathematics once Metius was no longer there. Ordinarily a newly discovered star would be claimed by the professor who held that position. But astronomical research was not the road Fullenius had in mind for the chair of mathematics. He instead continued to pursue the more earthly mathematics; he firmly rooted the training of land surveyors in the university structure, thereby ensuring a special place for the mathematical students who had not mastered Latin – the *idiotae*.

Holwarda, on the other hand, developed possibilities that were in some ways opposed to those of Fullenius. Ever since he reported on what he saw that winter night, he became viewed as one of Franeker's brightest lights. The booklet in which he claimed his discovery is one of the most discussed treatises in the history of astronomy to come from the university. In this chapter I will also trace the conditions that made Holwarda's sighting possible and enabled him to successfully claim a discovery.

Rather than celebrating Holwarda's work as a heroically individual achievement, this chapter shows how the accumulated resources at the University of Franeker, as well as the community of mathematicians surrounding Holwarda, provided both a context for his successes and the means to achieve them. Likewise this chapter does not aim to rebuke Fullenius' work as uninteresting, but it tries to understand how he shaped mathematics in the long run.[2]

By giving a thorough historical analysis of the events taking place after Metius died, as well as those that led up to Holwarda writing and publishing his book, I will give insight into what happened to the chair of mathematics in Franeker.

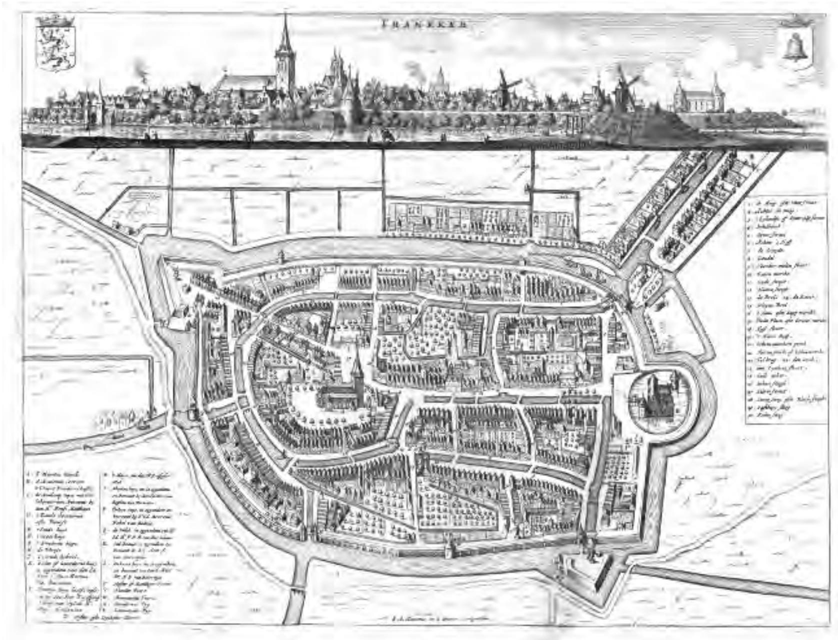
5.2. Bernhardus Fullenius senior

5.2.1. The family Fullenius

Bernhardus Fullenius senior was born in Leeuwarden. He was of a German father and a Frisian mother, which made him Frisian to his contemporaries.[3] He was married to Ebel Hinckena van Hinckenborgh (ca. 1605-1670), a daughter of Frisian gentry. Together they had three

[2] The oldest reference I know to Holwarda being the 'Frisiae Lumen', is made by the editor of Holwarda's *Philosophia naturalis*, a posthumously published book. The reference is made in this book, see Holwarda, *Philosophia naturalis*, 400. The complete title to the second part of the *Dissertatio astronomica* is: *Pars secunda de novis phaenomenis, sive stellis*, Holwarda, *Dissertatio*, 185.

[3] For all of the details on the Fullenius family, I refer to the splendid genealogical article of Gerrit Boeijinga. See Boeijinga, 'Fullenius', passim. Only when referencing data that was unknown to Boeijinga will I give separate footnotes.

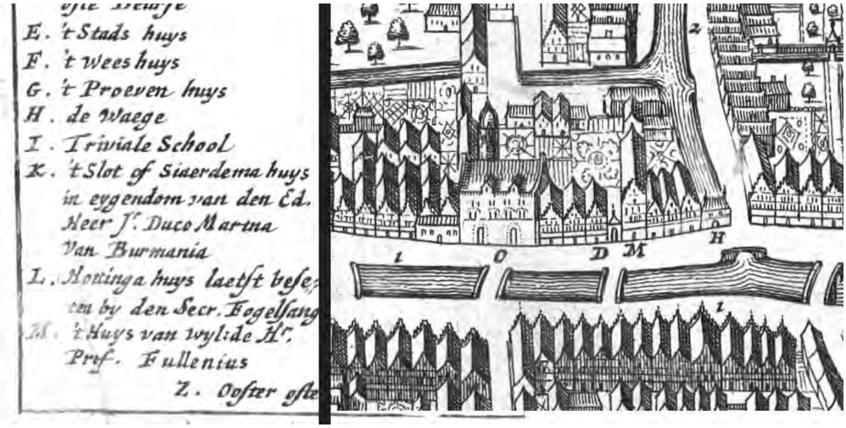


Map of Franeker by Schotanus and Haacma (1664). With a prospect on the town of Franeker.
Tresoar Leeuwarden.

sons and one daughter. The family lived in one of the nicest 'professor houses' in Franeker. It was set next door to the *Burse* and the Hungarian College and just down the street from the university; a map of Franeker of the 1660s even listed it specifically. Fullenius' academic career had no real lows and no apparent highs, apart from the two times he was installed as rector.[4] If anything Fullenius was an able professor who explicitly did not attract attention for his publications or attempts at modernizing the academic system. He was in that sense a typical example of an Early Modern professor.[5]

[4] On Fullenius' inauguration as rector in 1651, see the broadsheets now kept in the Franeker city archives. See *Auditorium*, M/1651.3 and M/1651.4

[5] See for example the description Harold Cook gives, somewhat implicitly, on the flexibility of the Early Modern university professor, Cook, *Matters of Exchange*, 6. Kristine Haugen's essay review of Clark's *Academic Charisma* lists several Early Modern professors that can be branded a 'rock star'. Haugen discusses some of the greatest minds of the Early Modern period that worked as a university professor. However, her entire list consists of exceptions, see Haugen, 'Academic Charisma', 204-209. Bernhardus Fullenius was not one of the exceptions; he was quite the opposite of those. This modesty is more or less reflected in the inscription he gave visiting students in their alba studiosorum: 'ne facias aliis, fieri quod tu tibi nolis'. See Sminia, 'Overzigt van twee alba', 73.



Two details of the Map of Franeker by Schotanus and Haacma. On the left the table listing the House of the late Professor Fullenius. On the right the depiction of that house (M).
Tresoar Leeuwarden.

This Bernhardus Fullenius senior was in fact the second person by that name to play a role in Frisian history, with his son Fullenius junior being the third. The first was grandfather Fullenius, who had been a fellow student of Johannes Roggius.[6] From this grandfather, some connections can be drawn to other episodes in European as well as Franeker history. He had, for instance, been partly trained in the centre of Ramistic education, the *Hohe Schule* in Herborn.[7] This, as well as his Wittenberg schooling, had made him into a typical and staunch product of the early Reformation. His personal training in Herborn may also account for some of the strong Ramistic influence that was clearly visible in the family library.[8] It cannot be determined without too much speculation exactly to what extent Ramism influenced both his son and grandson as a result, but it can be assumed that there was likely some influence.

Grandfather Fullenius arrived in Friesland to take up a ministry in Leeuwarden in 1593, and as his education suggested, he indeed proved to be a theologian with strong Calvinistic leanings. As a member of the *cercle* around Lubbertus, he would write several pamphlets and publish several letters while taking part in the pamphlet war against Conradus Vorstius (1569-1622).[9] This polemic was one of the first quarrels that

[6] See above, chapter 2.
[7] Boeijinga, 'Fullenius', 11-12.
[8] This influence was observed by Van Berkel, 'Wiskundige boeken', 90.
[9] See Van der Woude, *Sibrandus Lubbertus*, 198-258, esp.230; but also for example: Van der Tuuk, *Johannes Bogerman*, 323; Diest Lorgion, *De Nederduitsche Hervormde Kerk*, 47-49. Fullenius lead one of the various attacks on Vorstius, for Vorstius see Lüthy, *David Gorlaeus*, esp. chapter 3.

would characterize the theological and political situation in the Dutch Republic during the Twelve Year Peace (1609-1621).[10] In Leeuwarden he had a long spell as pastor in the protestant church. He would also be involved in the Dutch 'Statenvertaling' of the Bible in the 1620s and 30s.[11] This career paved the road for his descendants to rise through the social ranks of Friesland.

On May 27 1621 his son, Bernhardus Fullenius 'senior', made the official confession of his faith in the church in Leeuwarden at the age of 18. This confession granted him access to the Eucharist celebration of the Reformed church; it also marked a moment of transition. From the moment of confession a young person was more or less seen as an adult.[12] The following day Fullenius matriculated at the University of Franeker as a student 'linguarum ac philosophiae'.[13] In Franeker, Fullenius lodged with the local minister, Focco Johannes (1587-1650), another influential Frisian vicar and the father of Johannes Phocylides Holwarda![14] The young Johannes at the time was only four years of age, but he would stay acquainted with Fullenius for the rest of his life. Little is known of Fullenius' time in Franeker. There are, for example, no known disputations to which he contributed in any way. All we really do know is that during his time as a Franeker student, he bought books consistent with language studies, such as a Greek-Latin edition of Pindar (ca. 522 BC–443 BC) and an edition of Homer (ca. 850 BC?).[15] He would later refer to Metius as his teacher, which makes it plausible that he also received a training in mathematics in Franeker.[16] After his time in Franeker, Fullenius moved to Leiden, where he matriculated as student in divinity in 1627.

5.2.2. The first 'professor Fullenius'

Two years later Fullenius would succeed one of his old masters, Sixtinus ab Amama, as professor in Hebrew in Franeker. That he was allowed to succeed one of the most eminent professors in Franeker may say something about the high expectations the Frisian establishment had of him.[17] This gets even more weight when it is taken into account that his

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[10] Boeijinga, 'Fullenius', 12-14.
[11] This Bible translation is comparable to the English King James translation.
[12] On the practice of confession, see for instance Bergsma, *Tussen Gideonsbende*, 99-101, 302-304.
[13] Boeijinga, 'Fullenius', 21.
[14] Boeijinga, 'Fullenius', 22.
[15] Unfortunately the Eulogy on father Fullenius, written by Verhel, is lost. It is said to have been printed, although there is hardly any evidence that this was actually done. The account that this was done probably comes from the academic archive, see Boeles his questions in *De navorscher* (1874; no.2), 661, comp. Vriemoet, *Athenarum Frisicarum*, 255.
[16] Metius, *Manuele* (1646), fol.(*)2-(?)2verso.
[17] The fact that his father was a known philologist may also have something to do with this.

contemporaries did not believe him to possess a good voice or appearance.[18] From his time as professor in Hebrew there are hardly more sources than from his time as a student in Franeker. What is apparent is that Fullenius worked in the tradition of Drusius and Amama. He continued the work of the second, which consisted for a large part of editing and publishing the work of the first.[19]

With Metius' death in September 1635, the chair in mathematics became available. It seems to have initially been substituted by Christian Otterus, a German mathematician who had been a student of Metius in Franeker.[20] In the 1630s Otterus spent some time in Leiden tutoring mathematics and fortification. He returned to Franeker to attend the funeral of Metius, together with a Johannes Jacobus Locke, probably one of his students.[21] Since Metius' students were left without a professor, he filled the void for a short period.[22] It seems that Otterus even had good papers to definitively claim the position in Franeker and it even seems he had the support of both father and grandfather Fullenius, as well as that of Arnoldus Verhel (1583 - 1664), who also had been his teacher for some time.[23]

But Otterus was of German origin and Germans were slowly outnumbering the Frisian professors in Franeker, which was not a

[18] See Meinardus Schotanus to Johannes Saeckma, 11 February 1630, 'Schotanus 11', http://home.wanadoo.nl/mpaginae/BrvnSaeckma/brsframe.htm (retrieved 01-04-2011); comp. Boeijinga, 'Fullenius', 24.

[19] Because Fullenius played such a vital role in this process, it is odd that he is not even mentioned (he is just listed as an editor) in a recent study on Drusius' editions on the New Testament, see Korteweg, *De nieuwtestamentische commentaren*, 135.

[20] *ASF*, no 1771 and 3186. On Otterus, see Buck, *Lebens-Beschreibungen*. Otterus was a well-known mathematician in his day. He corresponded with numerous others and traveled all over Europe. This ultimately brought him to Nijmegen, where he became professor of mathematics shortly before his death in 1660. He left some intriguing manuscripts, which were kept in the German city Königsburg (among which an autograph by Descartes). Unfortunately, they seem to have been lost as the result of Second World War bombings. Some of them have possibly been preserved in Russia (St. Petersburg?). Unfortunately I have been unable to trace those, see Kowalewski, 'Eine Descartes-reliquie'. Some of the lessons were put into print, see Otterus, *Specimen problematum*, which was published under the 'geonym' Ragnetanum (Otterus was born in Ragnit, today Neman in Russia. Because Ragnetanum was used, the book is wrongly catalogued in the Leiden University Library catalogue).

[21] Johannes Locke (who does not seem to be related to his famous namesake) matriculated on the same day as Otterus, see *ASF*, no. 3187; Otterus and Locke had known each together from their shared time in Leiden but their acquaintance may predate that, see ASL, col. 264.

[22] Johannes Masius was one of the students who was educated by Otterus. He appeared in Franeker shortly before Metius died. See *ASF*, no. 3159; see Buck, *Lebens-Beschreibungen*, 249. Shortly after Metius died a Franeker boy matriculated to study mathematics at Franeker. See *ASF*, no. 3197, Gerardus Johannis.

[23] Buck, *Lebens-Beschreibungen*, 259.

situation that was considered favourably.[24] Fullenius, being born in Leeuwarden, passed for a Frisian, which is possibly the reason why the curators ultimately favoured him over Otterus. He moved from Hebrew to the chair in mathematics.[25] Together with Fullenius, there were no less than five new professors appointed in one sweep in 1636. It was in fact the last big achievement of Johannes Saeckma, the highly influential curator of the university.[26] Fullenius continued as professor in mathematics in the same way he had done as a professor of Hebrew: he published and edited the work of his predecessor, in this case of Adriaan Metius. In 1640 this would lead to a very nice edition of Metius' Latin geometry and arithmetic, published with the Elzevier publishing house. In 1646 a last edition of Metius' Dutch arithmetic, which included a Dutch version of Napier's bones, was published under the supervision of Fullenius.[27]

The content of both books seems to tell a large part the story of what Fullenius taught in Franeker because both contain references to his lectures. The first, Latin book, of 1640 is most explicit. Although Fullenius himself did not write an introduction or a preface, the brothers Elzevier as publishers did print an introduction letter. They write that they asked Fullenius, who used Metius' works in his lectures, to check and revise the books. And because he had access to the personal lecture notes of Metius, which he had used for both his public lectures and his privatissima, Fullenius was able to critically edit the new book.[28] These corrections are very minimal, and apart from the typesetting errors and a change of some of the 'paratext' (which was most likely done by the printer), Fullenius corrected only when absolutely necessary.[29]

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[24] There are numerous examples of this favoritism of Frisians for academic positions. This is particularly clear in the correspondence of Johannes Saeckma. See http://home.wanadoo.nl/mpaginae/BrvnSaeckma/brsframe.htm (retrieved 12-07-2011). See especially the letters written by Henricus Schotanus, of Sixtinus Amama (esp. the letter of 3 May 1627) and of Meinardus Schotanus (esp. the letter of 9 June 1631).

[25] Fullenius moved to mathematics and his place in Hebrew was filled by Johannes Coccejus, a young and ambitious scholar. Coccejus would become one of the most influential theologians of the century. Coccejus had been mentioned as a possible candidate for Hebrew when Fullenius was appointed. Meinardus Schotanus, for example, had been disappointed that the chair had gone to Fullenius. In 1631, two years later, Schotanus would again push for Coccejus as a possible professor. Only in 1636 was this lobbying successful, when Fullenius was made professor of mathematics. See the letters written by Schotanus to curator Saeckma, especially letter 24 of 28 June 1631, http://home.wanadoo.nl/mpaginae/BrvnSaeckma/brsframe.htm (retrieved 12-07-2011).

[26] http://home.wanadoo.nl/mpaginae/BioSaeckma/vanstotc.htm(retrieved 12-07-2011).

[27] Metius, *Arithmeticae* (1640); and idem, *Manuale arithmeticae* (1646).

[28] Metius, *Arithmeticae* (1640), fol.*4verso. This 1640 edition is actually a new book, with a new typesetting; as I have shown in chapter 3 this was not always the case with Metius' books. See also Van Netten, *Koopman in kennis*, chapter 3.

[29] Paratext is a concept to refer to the specific way text is presented in print, see Van Netten, *Koopman in Kennis*, 18-19; One of the very few differences I noted is, for example,

The second book he published and edited was the Dutch version of this book. Here Fullenius did write the preface himself. He refers to his position at Franeker, to the fact that the printer-publisher had no copies available anymore and claims that the books were useful to all lovers of the mathematical arts. Although Fullenius does not explicitly say that he uses the book for his own classes, this is implied, both because he published this edition and because he also refers to Metius as his own teacher ('praeceptor'). Both books show how Fullenius approached his profession; he continued the work of the professor that had preceded him. It was not mathematical novelties that would bring him status and recognition, but rather the continuation of the work already in place. Fullenius happened to be lucky on both occasions; Drusius and Amama, the latter of whom preceded him in Hebrew, as well as Metius, were seen as very important authors in their respective fields. It was rewarding to publish their manuscripts.

Under Fullenius, the practice of mathematics at the university developed in a similar direction, as had been the case under Metius. It was characterized by practical applicability and it may have appealed to an audience to which the university was normally closed, namely those who did not have Latin. This becomes especially apparent when the promotion of land surveyors under Fullenius' rule is studied. Under Metius, a start was made with the official promotion of these surveyors, which was more or less institutionalized from 1632 onwards. Under Fullenius, the first two promotions in 'math' took place in 1637, shortly after he was appointed.[30] And from 1641 on, their promotions took place with great continuity.[31] A land surveyor with a Franeker diploma only needed to take an oath in Leeuwarden, where surveyors without such a qualification needed to pass an exam as well before they were admitted.[32] It was therefore greatly beneficial to study in Franeker, since the professor who examined the students was also the professor who

the last line of the proper text. Fullenius added just a minor clarification. See Metius, *Arithmetica* (1625), book VI, 102 and Metius, *Arithmeticae* (1640), book VI 426.

[30] *APrF*, 26 April and 9 May 1637.

[31] Van Winter suggested that the first promotions under Fullenius were not of land surveyors but promotions in mathematics proper. I do want to point out that there are no precedents or other examples of promotions in 'pure maths'. These first two promotions therefore, seem to me to be the first land surveyor promotions that were done under Fullenius. See Van Winter, *Hoger beroepsonderwijs*, 53 and 60, see also: Idem, 'Twee eeuwen landmeters', 33; and see the remark made by Van Berkel, 'Het onderwijs in de wiskunde', 230ftn10.

[32] The same is true for the measurers of barrels. See for example, Dijksterhuis, 'Fit to Measure'; see also Teeling, *Repertorium*; See also Engels' list at http://home.wanadoo.nl/m.bourgonjen/Frl/landmeters.htm (retrieved 12-07-2011); and see a manuscript by H.K. Schippers in his personal archives, Tresoar, FLMD, box 968.

gave the classes.[33] During his spell as professor Fullenius would guide almost 30 candidates to such a diploma.[34] That land surveying was an important part of his regular lectures corroborates with the known Franeker lecture schedules. The *Ordo Lectionum* for both 1647 and 1649, the only two surviving of Fullenius' period, have him listed as teaching 'Geodaesiam', which is land surveying.[35] He probably also had numerous other students that did not matriculate and who are therefore impossible to individually trace.

It is remarkable how much Fullenius seemed to be a student of Metius while actually being something completely different.[36] Although, much like his predecessor, Fullenius focussed on the practical use of mathematics, he at the same time shared almost none of his 'preaceptor's' characteristics. Fullenius never actually wrote a book of any kind, he only published the work of others. Unlike Metius, today his name holds no fame in history of astronomy, nor in history of mathematics, although he was, of course, an active citizen of the Republic of Letters.[37] But under Fullenius senior mathematics claimed an important spot in Franeker. The numerous promoted land surveyors show that the Franeker chair had become an integral part of a provincial framework. From Fullenius onward it was clear that mathematics in the hands of someone other than Metius could also be useful and important in Franeker. The admission of land surveyors made the Senate room an annex to the High Court of Friesland, taking over one of the tasks of that court. Land surveyors were important, semi-government officials, and Fullenius' time in Franeker showed that their education was something the regents wanted done by a loyal Dutch citizen. While Fullenius may have a low-key historical identity, with a poor paper trail, he managed to influence mathematics in Friesland to a great extent.

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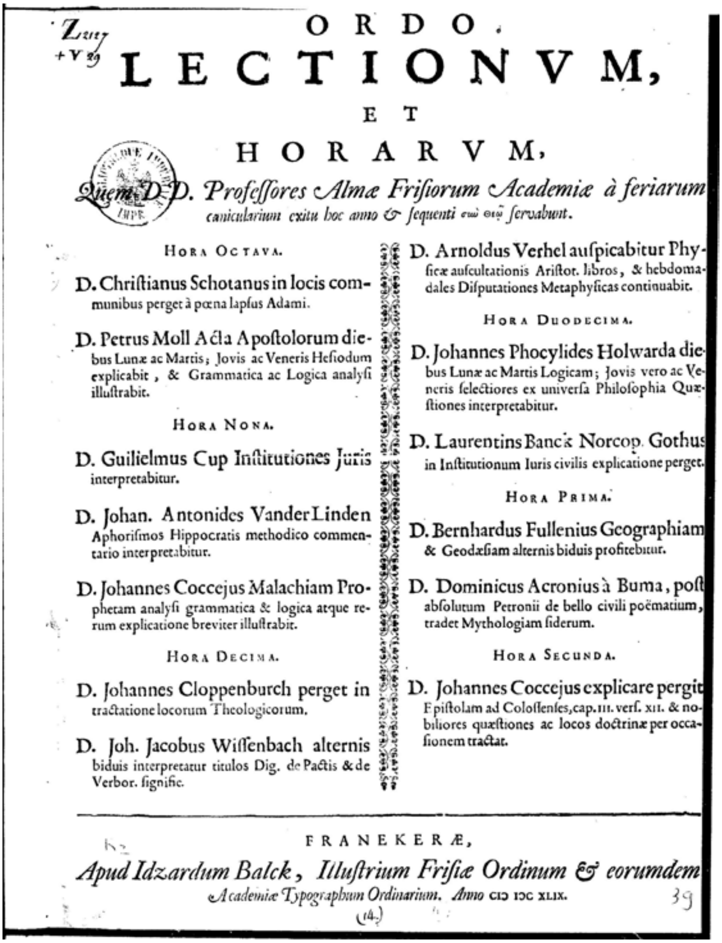
[33] In Holland this was done at the Court of Holland in The Hague. In Groningen all sorts of smaller sized courts took the oath, since no central institution was present. See for an overview: Van Winter, *Hoger beroepsonderwijs*.

[34] This is based off of my own count. Van Winter talks about 19 promotions. It is unclear why, but it seems he does so because of the way the students matriculated. To Van Winter, a student in 'math' was something other than a student in 'geom.' All evidence points to the idea that this was not(!) the case, but that depending on who the rector magnificus was, and thus on who wrote the students into the album, there would be differences in the matriculations. See *ASF* and *APrF*.

[35] I rediscovered one *Ordo Lectionum* myself in the National Library of France. The other was discussed in the Vrije Fries, after the first edition of *Auditorium* was published. See Elsmann, 'Ein unbekannter Ordo lectionum'.

[36] Whereas Metius was already focussing on mathematics during his studies, Fullenius' interests are only traceable after he accepted the chair of mathematics.

[37] He is, for instance mentioned several times in the correspondence of the German astronomer Jungius, as well as in the correspondence of Johannes Hevelius, see Elsner, *Der Briefwechsel des Joachim Junguis*, 679-681; Eichstaedt to Jungius, 3/13 November 1647.



ORDO.
LECTIONVM,
ET
HORARVM,
Quem D.D. Professores Almæ Frisiorum Academiæ à feriarum caniculariu exitu hoc anno & sequenti servabunt.

HORA OCTAVA.

D. Christianus Schotanus in locis communibus perget à pœna lapsus Adami.

D. Petrus Moll Acta Apostolorum diebus Lunæ ac Martis; Jovis ac Veneris Hesiodum explicabit, & Grammatica ac Logica analysi illustrabit.

HORA NONA.

D. Guilielmus Cup Institutiones Juris interpretabitur.

D. Johan. Antonides VanderLinden Aphorismos Hippocratis methodico commentario interpretabitur.

D. Johannes Coccejus Malachiam Prophetam analysi grammatica & logica atque rerum explicatione breviter illustrabit.

HORA DECIMA.

D. Johannes Cloppenburch perget in tractatione locorum Theologicorum.

D. Joh. Jacobus Wissenbach alternis biduis interpretatur titulos Dig. de Pactis & de Verbor. signific.

D. Arnoldus Verhel auspicabitur Physicæ auscultationis Aristot. libros, & hebdomadales Disputationes Metaphysicas continuabit.

HORA DUODECIMA.

D. Johannes Phocylides Holwarda diebus Lunæ ac Martis Logicam; Jovis vero ac Veneris selectiores ex universa Philosophia Quæstiones interpretabitur.

D. Laurentins Banck Norcop. Gothus in Institutionum Iuris civilis explicatione perget.

HORA PRIMA.

D. Bernhardus Fullenius Geographiam & Geodæsiam alternis biduis profitebitur.

D. Dominicus Acronius à Buma, post absolutum Petronii de bello civili poëmatium, tradet Mythologiam siderum.

HORA SECUNDA.

D. Johannes Coccejus explicare pergit Epistolam ad Colossenses, cap. III. vers. XII. & nobiliores quæstiones ac locos doctrinæ per occasionem tractat.

FRANEKERÆ,
Apud Idzardum Balck, Illustrium Frisiæ Ordinum & eorumdem Academiæ Typographum Ordinarium. Anno CIↃ IↃC XLIX.

Ordo Lectionum et Horarum (Franeker 1649).
Bibliothèque nationale de France, Paris.

5.3. Johannes Phocylides Holwarda

5.3.1. Holwarda's New Star

Early in his career as a math professor, Fullenius witnessed and took part in the events surrounding Johannes Phocylides Holwarda's discovery of a new star. Many histories of astronomy hail Holwarda for being one of the first to note a variable star. In the neck of the star sign Cetus (the Whale) he observed the 'wonderful' star that astronomers call Mira Ceti. Every eleven months, the star appears in the sky for five months, after which it disappears from sight for about six months, before reappearing for another five months etc., thus continuing the cycle. Mira reaches a different maximum strength in each cycle; sometimes it is as bright as a second class star (clearly visible with the naked eye), but more often it does not pass a fourth class rating (barely visible with the naked eye). Precisely because of its whimsical nature, the star has been the subject of many astronomers' study. As recently as 2007 NASA proudly presented news that research had shown the star has a tail, much like a comet.[38]

The divergent and, to a certain extent, unpredictable nature of Mira Ceti led to it being 'discovered' more than once, and Holwarda was certainly not the first. The oldest well-documented 'discovery' of Holwarda's star is closely connected to Tycho Brahe. As I have shown in chapter 3 and 4, many Franeker students had visited Tycho there.[39] The first discoverer of Mira Ceti was none other than one of these, David Fabricius in 1596.[40] Fabricius had visited the University of Franeker afterwards, but I have been unable to find a concrete reference that links Tycho, Fabricius and the Franeker mathematicians together. Nevertheless, Fabricius wrote about his new star to Tycho Brahe, and at the beginning of the seventeenth century he shared his observations with Tycho's successor, Johannes Kepler. Subsequently, Kepler mentioned these observations in his own work. In the footnotes to his *Ad Vitellionem Paralipomena* (1604) he gave an account of Fabricius' findings, but without including the coordinates. Around that same time Johannes Bayer (1572-1625) added the star to his star atlas. Yet he did so with very vague information on the star's exact position, and it never became part of the mainstream discussion among astronomers. In 1609 Fabricius noted to his amazement that the star he observed in 1596, which had vanished afterwards, had come back![41]

Fabricius had observed the star with good instruments and noted down its correct coordinates. He shared these observations with the one person who was a central node in the correspondence network of astronomy of that moment. Yet, Fabricius never succeeded in making his discovery public in a way that attracted the attention of the international

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[38] A recent study of Mira Ceti was completed by Nasa, see http://www.nasa.gov/mission_pages/galex/galex-20070815.html (retrieved 03-12-2008).

[39] On Hven as a centre of calculation, see Latour, *Science in Action*, 132-144. On how the network of Tycho functioned, see Mosley, *Bearing the Heavens*, 50-90.

[40] On Fabricius, see chapter 4; see also Folkerts, 'Der Astronom'; on Fabricius and his time with Tycho, see Christiansen, *On Tycho's Island*, 264-266. Fabricius is often characterized as an 'amateur' astronomer. This is not a good description of his practices, since it suggests unprofessional aspects to his observations, while he was probably one of the most advanced astronomers of his day.

[41] On the first sighting by Fabricius, the best starting point is Wattenberg, 'David Fabricius'. On Kepler mentioning Fabricius' sighting, see Kepler *Ad Vitellionem*, 464. For Bayer's listing of the star see Bayer, *Unranometria*, Cetus. On Fabricius publishing on the star and trying to get Kepler's attention, see the work done by Edward Rosen and published in Kepler, *Kepler's Somnium*, 230. A plausible reason explaining why astronomers had no interest in variable stars has recently been given by Rienk Vermij of University of Oklahoma in a paper that will be published later this year.

world of astronomy. Interested colleagues, for their part, never pressed his case hard enough nor gave all the relevant details on the new star. Only thirty years later, from the small town of Franeker in the Dutch province of Friesland, would Johannes Phocylides Holwarda attract the attention of the international world of astronomy.

5.3.2. Holwarda from student to professor

Johannes Phocylides Holwarda was born as the son of the minister Focco Johannes and his wife Magdalena Willems in the small village of Holwert, one of the most northern villages of the Dutch Republic. Soon after his son was born, Focco Johannes was appointed as the minister in Franeker. In the 1630s he acquired the position of senior minister in the city of Franeker and as such he was responsible for teaching the catechism to the students of the university. He also published many of his sermons as a sort of instruction book for young ministers. All of this places Focco Johannes within the sphere of influence of the University of Franeker, but other proof of his involvement in matters concerning the university can be found in his sermons and a few of his Latin works. That he was the minister to whom most of the professors and students had to listen every Sunday must be seen as another indication of this involvement. To understand Johannes Phocylides it is important to note that he grew up as a member of the Franeker elite.[42]

After attending the Latin school in Franeker, Holwarda enrolled at the university at the age of 14. He signed the *album studiosorum* as Joannes Fockonides on the 26th of May 1632. Probably one of the first major academic events he witnessed as an official student was the inaugural speech of Metius as *Rector Magnificus* of the University of Franeker, just ten days later. Holwarda had matriculated as a student of philosophy and languages, which was an ordinary enrolment for a first year student.[43]

As a student Holwarda was a fond writer of the poems, or *carmina*, which were printed with the disputations of his fellow students. In these *carmina* Holwarda showed his knowledge of the classics and his understanding of theological matters. In 1637, he finished the first phase of his academic education with a *Magistrum* (L.A.M.) in philosophy. For Holwarda this marked a milestone in his academic education. Especially for this occasion his father, who had graduated at Franeker as well, re-matriculated into the University of Franeker, probably because this gave

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[42] For Holwarda's biographical details, the best start is offered by Van Ruler, 'Holwarda'; on the instruction book for ministers, see Johannes, *Proef-praedicatien*. On other publications by Focco Johannes (one of which is edited posthumously by Holwarda), see Johannes, *Conciones miscellaneae*.

[43] *ASF*, no.2856.

him certain rights during the ceremonies that he would not have as an ordinary citizen of Franeker. This underlines how interwoven the family of Johannes Phocylides was with the local academic institution.[44]

In 1639, soon after he had graduated, Holwarda was appointed associate professor in logic by the States of Friesland. Meanwhile he kept on studying. It is important to note that logic, or philosophy, was not his sole focus. In 1640 he took a doctorate in medicine 'privatim', and he is said to have had a busy practice in Franeker.[45] He would marry Maijcke Wijbes Piebinga (1618-1690), a daughter of the Franeker burgomaster in 1643.[46]

Johannes Phocylides got his first professoriate at the young age of 21. The Deputy States of Friesland, who appointed him, justified their choice for such a young professor saying that they 'had heard of his good qualities and [...] hoped that this position would make him to live up to them'.[47] In all his work, Holwarda shows a great drive to advance at the university. He was a young scholar with great aspirations, who apparently convinced the magistrates of the University of Franeker to grant him an important position. The first book he published, his *Dissertatio astronomica*, contributed a great deal to this professional success. It is in this book that Holwarda claimed the discovery of a new star.

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[44] On Holwarda's laudatory poems, see *Auditorium*, no. 28/1639.2, 47/1635.7, 47/1635.8, 49/1646.1, 51/1640.3. These are probably not all of the *carmina* and poems written by Holwarda in *Franekeriana*. Still today, new prints are found in libraries all over the world. For example, Ferenc Postma recently discovered a disputation sub Holwarda in the Royal Library of Denmark (Friendly communication by Dr. Ferenc Postma). On Holwarda's promotion to L.A.M., see Boeles, II, 136-137; this promotion is (as many other) excluded from the 20th century *Album Promotorum*, see *APrF*. On Focco Johannes' re-matriculations see, *ASF*, no. 3202 and 3398. Focco Johannes had done so previously when a friend of the family took up a professorate at the university.

[45] In Franeker, as in other universities in the Netherlands, a doctoral degree could be obtained without a dissertation, although this was the exception than the rule. The candidate would have to undergo a severe oral exam for this. These promotions were sometimes (as is the case with Holwarda) done behind closed doors, for example to save the *promovendus* the possibility of being criticized in public. Only members of the university community were allowed to attend, whereas a 'normal' promotion included a public defense by the candidate. See Boeles, I, 364-365. On Holwarda's promotion, see Meijer, *APrF*, 26 and Boeles, II.1, 171 and 176. The recently appointed professor Johannes Antonides van der Linden granted Holwarda his doctorate.

[46] They married on May 19, 1643. The marriage surprisingly took place in Nijlân, a small village between the Frisian cities Sneek and Bolsward. Why the couple decided to marry there is unclear. See Tresoar, Verzameling handschriften, toegang 347, inv.no. 1136.

[47] 'om de goede qualiteiten, die van deselvde gehoort werden, [oock tot sijne meerdere opweckinge], ten einde hij, voldoende de hope van hem verwacht, nader mach werden geleth', cited in Boeles, II.1., 175.

5.3.3. *The* Dissertatio Astronomica*, a book in two parts*

In late 1638 Holwarda had been collecting data for a book in which he wanted to do two things: attack moon charts that the renowned astronomer Philippus Lansbergen had published, and start a polemic with Martinus Hortensius, professor of mathematics at the Athenaeum Illustre in Amsterdam. This may seem a bit overambitious for a young student of astronomy, but he felt it was the best way to bring his own ideas to the attention of his readers. By fiercely criticizing Hortensius and Lansbergen, he wanted to lure Hortensius into a polemic. This would, in Holwarda's view, not only add to his own 'fame', but in the end it would help bring attention to the work of the astronomers he criticized.[48]

It seemed that luck was not on Holwarda's side. In November 1638, the skies were often cloudy, rain poured down and he was thus forced to wait and wait before he could collect any kind of data. When December came and a lunar eclipse took place, however, his fortunes changed: '[...] finally things came right, that exactly on the day and the time of the eclipse in the evening the clouds slowly tore open, on several occasions, but not without end, giving me time to observe the heaven at ease.' While he was observing the darkened moon, a strange light drew his attention. At first Holwarda did not realize what he was looking at. Only later did he understand that it was an unnamed light, a New Star (as he named it) in the firmament. He decided to add a whole second part to his study, which effectively doubled the size of the book he was working on.[49]

Holwarda had seen a new light. After consulting his books and asking around, he concluded that what he had seen had not been in the sky before December 1638. Realizing this he told his professor Bernhardus Fullenius about the new star. Fullenius replied that he had spotted the star as well.[50] Together they made more observations and concluded that it was indeed a whole new phenomenon.[51] Holwarda looked for an explanation for this newly emerged light and while he was writing this explanation and processing the data he had collected on it, the phenomenon disappeared. His actual proof had suddenly vanished. It is because of this disappearance that he wanted to call it a 'New Star' rather than a star (although he is not very strict in this self-imposed rule).[52] A 'New Star' would, as Holwarda argued, refer not to an actual

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[48] On his attacks on Lansbergen see Holwarda, *Dissertatio*, IX and 279.

[49] Holwarda described his first sighting in Holwarda, *Dissertatio*, 186 (my translation into English); on him adding a second part to his *Dissertatio* see Ibidem, preface.

[50] Fullenius was a skilled and known astronomer, see above and comp. Hevelius, *Mercurius in sole*, 148 and Van Berkel, 'Het onderwijs', 219.

[51] See also Hatch, 'Discovering Mira Ceti', 157.

[52] For Holwarda's account of the events, see Holwarda, *Dissertatio*, 272-286.

star, but to an emanation of the Sun, or as Holwarda put it, this was a phenomenon rather than an actual star.[53] In his small booklet, Holwarda spent a great deal of space on this explanation. It was only after most of his elaborate account was printed (he was still writing the end of the book while the first parts were already in print) and his book was almost completed that the star reappeared. Amazed by this fact Holwarda wrote an 'Appendix necessary for the reader' in which he mentioned this reappearance. Here he explained to his readers that this reappearance only strengthened his account. In this he had, after all, mentioned that his phenomenon could disappear and reappear. So this return fit his explanation perfectly.

The book thus was completed and consisted of two important parts. The first contained charts on the moon in which Holwarda attacked Lansbergen and Hortensius. The second held his account of the discovery and explanation of a star in the star sign Cetus. This booklet has attracted the attention of astronomers and historians of science alike. Before I explain how other astronomers responded to his *Dissertatio*, it is time to clear up some misunderstandings that surround this little book.

5.3.4. A variable star in the sign of Cetus

In literature on sightings of Mira Ceti, several things are attributed to its sighting by Holwarda, none of which seem to be true. Firstly he is said to have been the first to write and to publish on the star. However, the first to write about the star was the above-mentioned astronomer David Fabricius in a private letter to Tycho Brahe in 1596. These observations were later published by Johannes Kepler at the beginning of the seventeenth century, decades before Holwarda's book went to press. Secondly Holwarda is said to be the first to have discovered the variability of the star, meaning that when it is observed from earth, the star seems to get 'switched on and off'. However, in 1609 it was Fabricius again who first noted a reappearance of Mira Ceti. He wrote about this to Kepler and published on it in a local almanac.[54] Thirdly Holwarda is said to have named the star Cetus. However, it was again David Fabricius who coined this name in his letter to Kepler in 1609. It was a copy of this letter that another astronomer, Johannes Hevelius (1611-1687), read and from which that astronomer took the name for the star.[55]

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[53] Holwarda, *Dissertatio,* 275. When I write 'New Star', I refer to Holwarda's philosophical explanation of the phenomenon.
[54] Wattenberg, *David Fabricius*, 5 and 12.
[55] Others attribute this to the German astronomer Jungius, see Hoskin, *Stellar Astronomy*, 24. On Fabricius, Kepler and Hevelius' role in this naming process, see Wattenberg, *David Fabricius*, 5.

The fourth and most persistent of claims about Holwarda is that he was the first to have calculated the cycle, or periodicity, of Mira Ceti. In his *Dissertatio astronomica* Holwarda does mention two periods of sightings, one starting in December 1638 and one starting in November 1639. On the basis of these two dates he is acknowledged as the calculator of the periodicity of Mira Ceti and to have set it at eleven months. But Holwarda never drew this conclusion himself. Therefore, it cannot be attributed to him. Because he did not think of the whole phenomenon as a variable star (a concept alien to him), it would be odd if he had evaluated it as such. From the account of his sightings, a more plausible conclusion would be that Holwarda never actively looked for a periodicity, and that he spotted the star by accident. The attribution of the discovery of its periodicity completely ignores the explanation Holwarda gave of Mira as a 'New Star' (that is: an emanation). [56] A short quotation of his second sighting makes this all abundantly clear:

> '[B]ut on November 7, almost at the end of the Julian year 1639, when, after a few days, weeks even, of ongoing clouds at Cetus, the skies were finally clear again, I by chance went out and observed the phenomenon, and it can still be observed by anyone on this day.'[57]

This is the last bit of new information Holwarda published on Mira Ceti. It is obviously not the account of a researcher who, after years of precise observations (which would have been required), had just established that this star disappears after being visible for five months and then reappears another six months later. This cycle was in fact calculated by Ismaël Boulliau (1605-1694) in 1667, after years of intensive observations.[58] Thus, the attribution to Holwarda of the periodicity not only disregards Boulliau's hard work, it also shows a lack of historical insight.

Soon after the publication, it was already suggested that Holwarda had not discovered something new. In a disputation at Utrecht University, defended under professor Jacob Ravensberg (1615-1650), it was suggested that Holwarda had merely rediscovered what Fabricius had already found. It was already in 1660 that the famous astronomer

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[56] Holwarda finds a particularly strong advocate in the Dutch journalist Govert Schilling, see for example Schilling, *Atlas van astronomische ontdekkingen*, 40-42, but also others attribute this to him, see for example North, *Cosmos*, 565.

[57] 'At die 7 Novembris anni jam labentis 1639 Iuliani post continua aliquot dierum, imo septimanarum apud nos nubilas, vesperi coelo tandem aliquando claro, forte egressus illud observavi, atque etiamnum cuivis observare liberum relinquitur, eodem praecise loco, eodem situ, quo ante.', in: Holwarda, *Dissertatio*, 285-286.

[58] Hoskin, *Stellar Astronomy*, 24-25. The origin for some of these misconceptions might be: Wolf, *Geschichte der Astronomie*, 416, see also, Boeles, II.1, 179.

Johannes Hevelius gave a nice table of the sightings of Mira Ceti and affirmed the suspicions of Ravensberg.[59]

It is clear that Holwarda in fact discovered nothing; neither did he name anything, nor was he the first to calculate the cycle. But his booklet on the 'New Star' made waves, and after its publication precise observations of Mira Ceti were made. This did not happen after Fabricius, and it is the surge of research that followed Holwarda's book that can be seen as his great merit. He had once and for all put the star on the maps of astronomers.

5.3.5. Small is beautiful. The ideas behind the Dissertatio

To start a wave of astronomical research would not have been Holwarda's main objective with his book. He most likely had different objectives for his publication, and some of these can be revealed when taking a close look at the actual booklet. Holwarda had published his findings on the 'New Star' in 'a wonderful little book'. All the specimens of this book that I have seen are simply, but nicely, bound and cut. The ink smears on some pages because of this small size, but the size made it possible for the book both to fit in one's pocket and to be read with ease. Even more importantly, the size of the book made its distribution easy. Because of this, as I will show, the book found a good audience.[60]

Furthermore, the size of the book is a reference to the most common of all academic publications of that time: disputations. Some of the disputations printed in Franeker around that time have exactly the same size as this book. However, their size was normal, and none of those disputations proved to 'stir up' the world of astronomy, or anything of that sort. It was Holwarda's book that was remarkable and stood out, precisely because it was so small and causing a stir. But the size did show

[59] Ravensberg, *De systemate mundi*, thesis 32. I thank Rienk Vermij of the University of Oklahoma for drawing my attention to this disputation. During a visit to the library of the former Hoheschule in Herborn, Germany I actually found a copy of this disputation; on Hevelius account of the discovery, see Hevelius, *Mercurius in Sole*, passim.

[60] Hevelius calls the book 'Elegantissimo Libello', see Hevelius, *Mercurius in sole*, 147. There are many other remarks on the size and the appearance of the book besides the one made by Hevelius. Van Berkel for instance calls it 'A small but in the history of astronomy controversial little book' ('Dit kleine, maar in de geschiedenis van de astronomie geruchtmakende boekje'), see Van Berkel, 'Wiskundige boeken', 87. John North calls it a 'brilliantly devastating little book' in North, *Cosmos*, 399. I have handled the copies of this book in the following libraries: Tresoar in Leeuwarden, sign: A 3059, University Library in Groningen sign: UB PM 3 Magazijn, University Library of Leiden, sign: 522 G 33 and University Library of Cambridge, sign: Kkk.608. I have seen a 'microprint' of the copy of the University Library of Oklahoma. The Herzogin Anna Amalia Bibliothek in Weimar Germany catalogued the book as being printed in 1649, but there never was such a print. However, some copies do seem to indicate that year. Only a closer look reveals that this is nothing but a smear of ink. It is, however, impossible to verify this with the copy in the Anna Amalia Bibliothek; it was lost in the 2004 fire.

that it was a publication written in an academic setting. It looked like a disputation, but was something with higher academic aspirations.[61]

Holwarda's book was not a normal academic publication, however much it looks like one. It was published by Idsardus Alberti († 1656), the son of the university printer, instead of by the master printer himself. It is in fact the first book Idsardus Alberti ever printed for somebody affiliated with the university. In that respect, it was also a master proof for this printer, who went on to become his father's successor as the official university printer in 1651. If it had been an ordinary disputation, his father would have been obliged to print it. [62]

In addition to these details, there were two things that made the book attractive to read apart from its claim to have found a new celestial phenomenon. The first of these concerns the first half of his dissertation: his attacks on the moon tables of Lansbergen and his critique of Hortensius' ideas. These alone were useful and made the book desirable. In the historiography, this is often neglected because the discussion has always focused on whether or not Holwarda had discovered Mira. The second attractive feature was an attack on old Aristotelian values combined with a witty style of argumentation.[63]

In the book, Holwarda validated his credibility by referring to Tycho and to his own master Metius. To describe Tycho, Holwarda often used words like '*Virum inter omnes*' (A man among men), or even '*Nobilissimum Heroa Tychonem Brahe*' (Most revered Hero Tycho Brahe). With his discovery of a new star, he placed himself explicitly as a successor to this hero, who had discovered a new star before him in 1572. His teacher Metius, who was also seen as a successor to Tycho, could count on the praise of Holwarda. But with Metius he dared go a step further; Holwarda corrected certain tables made by Metius and complained about the sextant he inherited from him, which was at his disposal at the University of Franeker. He did acknowledge, however, that it was precisely this sextant that made it possible for him to make his observations. In other words, he was aware of being part of the

[61] Holwarda himself testifies in the epilogue of the book that he had discussed the matter of size with his publisher, see Holwarda, *Dissertatio*, 277-278.

[62] On university printers in the Dutch Republic, see Van Netten, 'Tot gerief'; on the university printers of Franeker in particular, see Boeles, I, 307-316 and Fuks and Fuks-Mansfeld, *Hebrew Typography*, 65-94. Holwarda's remark that Alberti started the printing process already in 1639 makes it probable that this work by Holwarda was earlier than another book that Alberti printed that year for a member of the university community. I thank Ferenc Postma who pointed out to me that Idsardus Balck and Idsardus Alberti are not the same person, something I wrongfully stated in Dijkstra, 'A wonderful'.

[63] About his style Holwarda makes the following remark: 'Ludimus hic, non laedimus, nec magnorum Virorum, famam mordaci calamo proscindimus', see Holwarda, *Dissertatio*, preface XII.

Tycho-Metius tradition, but being a member was not enough; he wanted to contribute to this tradition.[64]

Holwarda did so most vehemently with his central strategy, a strike at the Aristotelian world picture. To make this move he used cleverness and wit. He wrote about certain Aristotelians who attacked his findings because they could not find the star in the skies. In the same sentence in which he introduced these critics he made fun of them as well. He claimed that the only reason why they could not find the star was that they were too inexperienced, whereas he was a more than capable astronomer. But in the Aristotelian philosophy this would not function as a recommendation, Holwarda argued, because it was Aristotle who had called experience 'the mistress of fools and unbelievers'. Thus, he made himself (the able and experienced one) a fool and the ones who could not find the star (the inexperienced ones) the opposite of fools, according to Aristotle.[65]

It is with rhetorical tricks like this that Holwarda addressed one of the big issues in the scholarly world of his day: Aristotle's philosophy. He was clear about his stance; the old philosophy of Aristotle needed to be replaced by a new way of philosophizing. A central point in this new program, he argued, should be that of Copernicanism. From the start of the book he made clear his belief that the earth orbits the sun. In this he would become only the second professor at a Dutch university to actively promote a Copernican worldview, the other being Hortensius in Amsterdam. But Holwarda's attacks on Aristotle went back to discussions predating his own academic education. From the second half of the sixteenth century on, there had been strong opposition to the dominance of Peripatetic philosophy not only in Franeker, but in universities all over Europe as well.[66]

It is probable that other scholars connected to the University of Franeker attacked Holwarda's discovery of the 'new light' with Aristotelian arguments. It is important to note that it was exactly his defence against them that helped Holwarda gain a position at the University of Franeker. In Franeker it seems to have been the practice to have professors for and against the old philosophy appointed in the faculty of philosophy. His propagated views may thus have helped Holwarda gain a university position as associate professor with a salary

[64] On Holwarda's complaints see Holwarda, *Dissertatio*, V and 201. On his use of the sextant see, Ibidem, 72, 196 and 280.
[65] Holwarda, *Dissertatio*, 199.
[66] On Holwarda as a Copernican see Vermij, *The Calvinist*, 120 and 129-130. Holwarda seems to have sought a connection with the Ramist movement, which had built the strongest case against Aristotelian philosophy until the publication of Descartes' *Discours de la methode* in 1637. Holwarda is more explicit about this in his *Skiagraphia.* See Holwarda, *Skiagraphia*, 4 and 6.

of 400 guilders a year. At Utrecht University, for example, the fierce debates between advocates of Aristotle and advocates of new philosophies were outlawed in 1643.[67] In Franeker, Holwarda continued building a successful career, gaining full academic honours at the age of twenty-nine in 1647, when he was appointed as full professor.[68]

Another detail about the way Holwarda presented his newly found star that cannot go unaddressed is the date he gave to it. He claimed that the data he used in his book were collected on 25 December 1638. It can hardly be a coincidence that he chose exactly the night on which the star announcing the birth of Jesus, the most famous of all extraordinary stars, is believed to have appeared in the night sky.[69]

Word of his discovery spread quickly in Friesland and, besides his personal gains, his university also benefited. The Deputy States of Friesland gave the university extra funds to expand their instrument collection, which the university used to buy the collection of the late Adriaan Metius. His widow profited from this since she sold the instruments for 450 guilders. Holwarda already had the collection at his disposal before this purchase, however. Following the publication of his *Dissertatio* (which was not his doctoral thesis!) Holwarda also got his 'privatim' doctorate in medicine. In Franeker, his discovery and the way he presented it were well received. For this, Holwarda's book can be considered a success. It was written and published for the local market, and he used it to impress the local regents and make a name for himself in the Netherlands. The book itself was, after all, dedicated to the local regents.[70]

With Holwarda being firmly established as an associate professor of Logic, and with friends in high places, what all of this meant for the other heir to Metius, Bernhardus Fullenius, was a question that would soon arise. What would happen to the actual professor who held the chair in mathematics would doubtlessly be influenced by this clever young academic, who labeled himself publicly as a 'mathematician'.[71] And this is precisely why Holwarda's little book is of so much importance for a cultural history of mathematics; it shows that a young, talented and ambitious academic could have a significant influence.

[67] Galama, *Het wijsgerig onderwijs*, 37-38 and 223-225
[68] For Holwarda's promotion to a full professorship, see Schippers, 'Johannes Phocylides'.
[69] On the sighting on Christmas Day, see Holwarda, *Dissertatio*, 190. Even today it is still believed that Mira Ceti was the actual star that would have pointed the way of the Magi to the stables in Bethlehem, see http://www.quodlibet.net/articles/sigismondi-mira.shtml (retrieved 12-03-2008).
[70] Holwarda referred to the extra funds in Holwarda, *Dissertatio*, dedication (unpaged). On the money received by Metius' widow see Bokkinga, *Extraordinaris*, II, 18/207.
[71] Comp. Vermij, 'Johannes Phocylides Holwarda', 143.

What Holwarda did mattered both on a European level, and on the Franeker scale as well.

5.4. Conclusion

When his ‘little book’ left the press, Holwarda did not stop trying to shape its reception. He even wrote a manual on how to interpret the book in the form of an afterword, although even that did not ensure that it was received in an unambiguous way over time. The text and the diagrams proved to be less solid than one might first expect. The book did not prove to be immutable, but instead asked for ongoing attention from its writer. Holwarda never had full control over it, even though he tried very hard to have it. His use of print for the sake of self-promotion can be considered exemplary due to the possibilities that that medium created for the Franeker academics.

Holwarda recognized these opportunities at a young age and profited from them. The *Dissertatio Astronomica* was Holwarda’s ticket into the university and into the Republic of Letters, but it also provided opportunities to others. It brought his mentor, Bernhardus Fullenius, into contact with famous astronomers. It was the first book printed by Idsardus Alberti, a young printer who was born and raised in the city of Franeker. Following the publication, the University of Franeker received formal ownership over an important collection of instruments.

Holwarda’s publication was possible because he used the accumulated resources available to him to their full potential. He built upon the foundation that Metius had laid. For his research Holwarda used the expertise of his teachers, the books in the university library and the instruments at hand. He used a local printer and press, which made it possible for him to keep a close eye on the printing process. Holwarda put these typical local conditions to good use when he marketed his ‘New Star’. It was this process that turned Holwarda into a producer of knowledge who was recognized by the outside world.

Of course, Holwarda’s flexible approach toward the printing press recalls the practices that were in place under Adriaan Metius. After all, this great predecessor had only died a few years earlier, and Holwarda made full use of the infrastructure that Metius had created in Franeker. Holwarda can be said to have continued math in Franeker as a site of observation and discovery. The detailed account of the publication of the *Dissertatio* once again reminds us that his astronomical ‘research’ was part of a broad and multilayered academic and scholarly culture. Holwarda, however, would also address natural philosophical points, and with that he took his education a step further.

Meanwhile, Bernhardus Fullenius senior, the actual successor to the chair of mathematics, also built on the legacy of Metius, but along different lines. He played a crucial role in maintaining the chair and in the education of the *idiotae*. He did this by attuning it to the changing academic world. Despite the tensions and pressures involved in the process, he further institutionalized mathematics and turned the chair into the centre of education for surveyors. It was under this professor that the *idiotae* started becoming regularly examined and consequently graduating with degrees in land surveying. With this he confirmed what was started before him; land surveying was part of the chair of mathematics and consequently part of the field of mathematics.

Fullenius senior can be considered the typical Early Modern professor and this means that he defies our modern expectancies of what a professor should be. He built on the legacy of his predecessor: by publishing his works and by bringing some focus to his chair. The case of Fullenius, like other cases in this study, also shows that the assessment of the 'importance' of an Early Modern scholar did *not* lay in doing original research, as other historians have already argued. Nevertheless, historians have often concluded that the Early Modern academic was somewhat uninteresting and probably just a teacher. Fullenius' case shows, rather, that the Early Modern academic had a niche somewhere between doing research and simply taking care of business. In Holwarda, he supported a student with the talent to go beyond the traditional boundaries of *academia* and he also found a way to anticipate changes in the socio-cultural landscape of the University of Franeker and of Friesland in general by preventing 'mathematics' from becoming a relic of times past.

Both Fullenius and Holwarda built on the work laid by Metius, but in two different directions. The first showed that the education of mathematics was not something to be taken for granted. The second found a way to make some convincing connections with philosophy. Their stories did not stop there; in the decades to come, both professors would search for new ways to continue along these lines. Their respective stories would reveal how porous the concept and the field of mathematics still was.

6. Three Mathematicians: Holwarda, Amama and Rosaeus

6.1. Introduction

While Fullenius tried to get the *idiotae* to become more and more a part of the Franeker academic tradition, Holwarda set out on a completely different path and it is that path that deserves full attention here. Holwarda tried to detach certain parts of mathematics from the chair in that field. As one of his students recalled, he heard his professor state:

> 'No one who recklessly rejects the mathematical arts can be considered a philosopher, but rather a sophist. Nor will anyone be considered great, in whose eyes they are not considered great [...]. For these arts (according to the unanimous judgment of all learned persons) are the only infallible foundation of all natural sciences and arts which are practiced today for the welfare of humanity.'[1]

This meant that the study of mathematics could have far greater possibilities than simply settling legal disputes over the circumvention of a piece of land or the content of a barrel of wine. Of course an approach toward mathematics as being useful for philosophers was viewed by the other Franeker academics with suspicion. Tensions surrounding Holwarda's ideas grew stronger as his name began to shine brighter. At the same time Holwarda sought to valorise this fame with publications that were strictly part of the domain of philosophy.[2]

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[1] Translation taken from Van Bunge, 'Philosophy', 314. The original quote can be found in Holwarda, *Friesche sterrekonst* (1652), fol.*2verso.

[2] With the domain of philosophy I mean the field as it was taught at university: Natural Philosophy, Metaphysics, Logic, Rhetoric and Dialectic. I do not refer to the entire faculty of philosophy or of arts, which encompassed the education of the languages and of mathematics. For a thorough study of this subject, see Galama, *Het wijsgerig onderwijs*. Galama defines this specific domain simply as dialectics, but I think he deviates from this very narrow definition himself on numerous occasions. See Ibidem, 28 and passim. Holwarda published his books as 'professor in philosophy'. His publications prior to 1647 give him as professor in Logic, after 1647 as professor in philosophy.

This chapter examines the path Holwarda set out on, firstly by looking very closely at his publications aimed at *academia*. What did he write about? How did he present his ideas in those works? What tensions did this cause? Interestingly, the appropriation of the ideas of Petrus Ramus, which had been so present since the beginning of the seventeenth century in Franeker, resounded in these works by Holwarda. I will argue that the central place Ramus had given to mathematics in his alteration of the university curriculum was important to Holwarda. It is in fact why Holwarda would ultimately present himself as a mathematician and why he is of so much importance in this current study.

But Holwarda is not the only person studied in this chapter. The second part centres around one of the most notorious episodes in the history of the University of Franeker. In 1648 one out of ten volumes of the University Library was stolen. I will show how that specific case presents some unique clues to interpret what was happening behind the scenes of the official university curriculum. The theft was attributed to the very same student who said that he had heard Holwarda mentioning the central importance that mathematics held for philosophy. At that time, the student was working on a project in which he tried to bring Holwarda's ideas into practice. I will argue that this project can be understood as part of an attempt by Holwarda to demonstrate the importance of math at the University of Franeker. In the third and last part of this chapter, I will give an interpretation of the rapid changes the university went through around that time and show how all this influenced the position of the *idiotae*, who were after all still the only ones who matriculated as students in mathematics.[3]

All these apparently different stories reveal the contours of how mathematics was regarded at Franeker in the middle of the seventeenth century. They reveal what the possibilities were for those studying mathematics and the stories show how many shapes mathematics could take. With that they also reveal how little defined the field still was. Together these stories give a strikingly different picture from the one that can be taken from Metius' period as professor. By the 1650s mathematics was much more divergent. It was divided among people other than just the professor of mathematics, as had been the case under Fullenius.

When Holwarda published his *Dissertatio* in 1640, he held the promise of a highly talented philosopher. However, Holwarda died in 1651, before he could fulfil this promise completely, and around that time his most important works were still unpublished. It is the period

[3] Obviously they were not the only ones who took classes in mathematics. As I have argued above, every student did so in the propaedeutic phase.

between his rapid rise and his untimely death that I discuss in this chapter.

6.2. *Professor Phocylides Holwarda*

6.2.1. Jeremiah Horrocks

One of the astronomers who may have taken notice of Holwarda's *Dissertatio*, was the Cambridge based, Liverpool born astronomer Jeremiah Horrocks (1618-1641).[4] It is tempting to make a more prolonged comparison between this brilliant young Englishman Horrocks and his Frisian counterpart Holwarda but even a short comparison reveals how much they were part of a similar system. Horrocks was Holwarda's senior by just one year, and he published an influential treatise on a celestial phenomenon in 1639, precisely one year before Holwarda would turn to the press for the first time. Horrocks is said to have calculated and discovered the period between the two transits of Venus through the sun, as observed from earth. As a consequence he famously predicted the transit of that planet through the sun for 1639. For his part, Holwarda was attributed discoveries and predictions connected to the celestial phenomenon of Mira Ceti. Holwarda seemed to be closely following the footsteps of the man who has been branded the 'father of British astronomy.'[5]

Both astronomers used similar instruments. They both made use of telescopes and both worked with a version of Metius' sextant. Holwarda had Metius' own sextant, while Horrocks had designed a sextant himself for which he was possibly influenced by Metius' design.[6] But there is more; both Holwarda and Horrocks were young academics observing the skies and deploying the results of those observations for the benefit of their academic careers. They belonged to a very small group of academics who early on adhered to Kepler's theories.[7] Their astronomical pursuits also got them the admiration of Johannes Hevelius. In fact the international name of Horrocks was built by one of Hevelius' books, *Mercurius in Sole visus*, in which he published the results of Horrocks' observations. It was precisely this same book that

[4] That Horrocks made use of Holwarda's *Dissertatio* is discussed in the following chapter.
[5] My understanding of the life and times of Horrocks is taken from the account given by Augthon, *The Transit of Venus*, where Horrocks is branded the 'father of British astronomy.' While this 'epitaph' reveals that Aughton's account may be a bit too hagiographic for a scholarly approach, the book itself shows how rewarding a more popular approach can be. Aughton's book plays a crucial role in an episode of the English television series *Inspector Lewis* (Season 4 episode 2: Dark Matter): This episode has introduced Horrocks to millions of people.
[6] Roche, 'The Radius Astronomicus', 26-27.
[7] See for instance Donahue, 'Astronomy', 588; Thoren, 'Kepler's second law', esp.247; Vermij, 'Johannes Phocylides Holwarda', 143.

brought Holwarda's name to the attention of the international world of astronomy in the 1660s. Both Horrocks and Holwarda (as well as Hevelius) were astronomers that filled the space between Tycho and Cassini; they were keen observers who struggled with the legacy of the ancient Greeks and of Brahe.[8]

One of the reasons why neither Holwarda nor Horrocks grew to the stature of Hevelius is that they both died young. Horrocks died in 1641 at the age of just 24. Holwarda would only live a decade longer and die at the young age of 33. Holwarda nevertheless turned that 'extra' decade into a productive period, a period that, if anything, shows that a young astronomer did not necessarily keep to astronomy. During this time, Holwarda proved himself to be a man of many talents. That he was given a little more time to develop these talents is perhaps the biggest difference between him and his English *doppelganger*.

6.2.2. Textbooks

Holwarda's first publication as a professor at the University of Franeker was a textbook on astronomy: *Epitome Astronomiae Reformatae Generalis* (1642). Some of the known copies of this book are bound with Holwarda's *Dissertatio*, which suggests that they may have been bought or sold together.[9] If this was indeed the case, it underlines the entrepreneurship of Holwarda and his publisher; they sold this new volume together with the wonderful little bestseller.[10] The new book was also clearly aimed at an academic audience.[11]

The book is therefore telling in another way, precisely because it deals with astronomy and cosmology. As I have discussed in chapters 3 and 4, astronomy was part of the tasks that the professor in mathematics in Metius' days dealt with, and it was something that was practiced mostly in times of peace, as Metius himself explicitly pointed out.[12] Fullenius would also have been teaching astronomy when he took over as professor in mathematics, since it was Fullenius who came to Holwarda's assistance in observing the star in Cetus, and it was Fullenius

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[8] Hevelius was an astronomer who stood between the revolutions of Netwon and Tycho Brahe's old way of practicing astronomy. An up to date and comprehensive study of his life is lacking, but new research was announced following his '400th birthday' in 2011.

[9] This is the 1642 copy; a reprint that was published in 1654 was probably sold separately. There are copies of the 1642-edition in de British Library, det Kongelige Bibliotek Denmark and the Universitätsbibliothek Göttingen; sign. 8 ASTR I, 1477 (1). The copies in Copenhagen and in Göttingen seem to have been bound with the *Dissertatio*, while for the one in London this is not clear. I have not checked these copies myself, but take my information from the online catalogues of the respective libraries (retrieved 12-04-2011).

[10] I know of no copies in old inventories that can be identified as this first printing and bound separately from the *Dissertatio*.

[11] Buma, 'Parentatio', comp.; Galama, *Het wijsgerig onderwijs,* 293.

[12] See chapter 3 above.

who would observe the skies in the years to come.[13] Yet, it was Holwarda who wrote the new Latin textbook on astronomy, a book that was arguably used in his own classes.[14] This is a clear indication that Holwarda was also the professor who would teach the astronomy discussed in his book around the time it was published. There are, however, no lecture notes that prove this definitively, and from the lecture lists that have survived from this time it cannot be determined if Holwarda was officially the professor who gave these lessons on astronomy or not. Yet, that he did this book for his own classes on astronomy (whether publicly or as *privatissima*), can be taken from the preface, where Holwarda writes that the book is specifically aimed at students.[15]

This is not the only thing that the introduction makes clear: from the outset Holwarda makes it clear that his book is meant to be an introduction to the current state of affairs in the world of astronomy. He dates his preface, for example, on the twenty-seventh of December in 'the common style' 1642, which is the sixth of January 1643 'in the true style'.[16] This is, of course, a division between Julian and Gregorian styles. In Friesland, however, the Gregorian style was not yet the official way to date the year. With his words Holwarda opposes this official style. It can be taken as a characteristic of this work; as with his *Dissertatio*, he would not avoid controversy,.

After the introduction, the main text of the book immediately makes a division between astronomy and astrology. At the beginning of the book, there is a first part (I) that can be divided in two sections (I.1 and I.2). The first section of this first part (I.1) begins with the basis of astronomy. For example, Holwarda introduces the universe and explains several astronomical symbols to the reader. In the second section (I.2), the stars and the constellations are introduced. Holwarda of course refers to his *Dissertatio* when he arrives at Cetus, but most constellations only receive the briefest definition.[17] The moon is discussed at some

[13] See chapter 4 above; see also Hevelius, *Mercurcius in sole*, 148.
[14] Like Metius, Holwarda published first of all for his own students. This is not only revealed by the preface of this specific book (see following footnote), but also by the fact that his other Latin textbooks were clearly geared toward his own students.
[15] Holwarda, *Epitome astronomiae*, fol.A2 verso.
[16] Idem, fol.A3 verso. The dedication to his *Disseratio* was dated on the 'first of January 1640' in the old style, which made it impossible perform such a trick there, since the year would not change by stating the 'new style' as well. Of course it may have been only a small lie to antedate it one day, but there are no indications that Holwarda was tempted to do so. But Holwarda may have had different motives to not refer to the New Style (which he does not seem to do) in his *Dissertatio*. If he would have dated it along those lines, his sighting of the New Star would not have fallen on Christmas Day. See Holwarda, *Dissertatio*, 190; comp. the previous chapter above.
[17] That he did not elaborate extensively on Cetus would be the logical thing to do if the book indeed was commonly sold together with the *Dissertatio*. In the 1930s the fact that he

length, but here Holwarda also keeps to the title of the book and only summarizes. Several celestial phenomena also figure in this second section. The second part (II) consists of an introduction, followed by a single section (II.1). This whole section is devoted to the astronomical method. The division here is one between principles and method, with method being seen by Holwarda as a way into the theory of astronomy.[18] What follows in the Epitome are two appendices, which include a letter to *'the star-loving Reader'* and a second letter, which is a defense of one of his critiques of Metius.[19]

In the book Holwarda reveals himself again to be an adherent of Copernicus. He had already done so in his *Dissertatio*, but here he seems to take that to a new level, likely because this book was aimed at a student public. Since he openly advocated Copernicanism in the book, it can be seen as an important step in popularizing that theory within the walls of academia.[20] From a modern view point, this may in fact be one of the most important features the book holds; this was the very first textbook written by a university professor, printed by an academy printer and used at a university in the Dutch Republic to openly advocate Copernicanism.[21]

It was also an important and decisive break from a Franeker point of view. Holwarda was, after all, breaking away from the very same tradition that had given him his education. In Franeker, mathematics had mostly consisted of arithmetic, geometry and astronomy. In most of his publications Metius had, in some way or another sought a connection between these different fields. In his life he had almost personified all of these fields; Metius was mathematics in Franeker. This was, of course, reciprocal; if Metius was known for anything, it was for

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did not do this caused some amazement in the personal correspondence of H.K. Schippers, who did not have the bibliographical overview the digital catalogues provide us today. See his letters to and from Cohen in his personal archives, which are kept at Tresoar, FLMD.

[18] Although a division between practice and theory seems to be imposed here, that would be an anachronism. Holwarda's 'principles' contain aspects of what today would be branded 'practice'.

[19] Holwarda, *Epitome astronomiae*; the numbering is mine, which I have made to clarify the structure of the book. I use the following structure for both the 1642 and the 1654 print (the second being a 'letter for letter'-reprint, follows the exact same paging).
I 'Proemium', 1-2;
I.1. 'Sectio Prima. De Spaeris & Circulis', 2-20;
I.2 'Sectio Posterior. De Stellis', 20-44;
II 'Mantissa', 45-51;
II.1 'Methodus Astronomiae', 52-60;
III 'Lectori Astrophilo', 61-66;
IV 'Additiuncula in Momum', 67-77.

[20] Vermij, *The Calvinist*, chapter 7, esp, 120, 129-130.

[21] For example in part II, where Holwarda discusses the 'Astronomical method', he defines the earth standing still as a 'Ptolemaic' hypothesis and the moving earth as a 'true, delightful and Copernican' hypothesis. Holwarda, *Epitome astronomiae*, 54: thesis 18.

his textbooks on geometry, arithmetic and astronomy. With Metius, mathematics had become something worth studying. But Holwarda was *not* the professor of mathematics, although he was, despite his young age, a renowned astronomer. Bernhardus Fullenius senior, who was the professor of mathematics, followed in Metius' footsteps by doing the opposite of what Holwarda did; Fullenius edited, published and used Metius' books.

That this was a change in attitude is perhaps most apparent by the differences that can be listed between Holwarda's textbook and those written by Metius. When Metius published his last *Astronomy* in 1633 with Willem Blaeu, it had become a massive work. It counted over 700 pages, was printed in a nice quarto volume and had one of the best paper astrolabes of the seventeenth century enclosed as a standard feature.[22] Although his first textbooks were clearly aimed at a student audience, Metius had drifted from that toward the end of his career. His name had become so well established that he could aim at a higher segment of the market. The book itself contained endless explanations about every facet of astronomy. Meanwhile Metius carefully avoided almost all controversy. Holwarda's booklet was published in a duodecimo format; it was concise, and contained virtually no explanations nor any examples, precisely the sort of content that characterized academic textbooks. In addition, the book was quite controversial, making for further contrast between the two authors.

Apart from the modern content, Holwarda's *Epitome* resembles the work that Metius had probably encountered during his spell in Jena in 1595. It is much like the classical textbook *De Sphaera*, written by the thirteenth century astronomer Johannes Sacrobosco (c. 1195- c. 1256). The primary task of those books was listing theses on astronomy that would be explained in classes at university. They functioned much like simple versions of *Euclid*, only without the proofs. They also worked to complement the lectures of the professor of mathematics, much like how Metius had given privatissima in Jena. Those main lectures were probably not much more than enumerating definitions that together formed the basis for geometry and astronomy. In the 1640s, the young Holwarda had taken the role that had been occupied by Metius' professor in the 1590s, and Holwarda's *Epitome* was no more than printed lecture notes; without proper explanation, the young students the work was intended for would possibly still have a very hard time understanding astronomy.

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[22] Metius, *Astrolabium* (1633), fol.AaBbCc2verso. Here Blaeu presents a line that is precisely the length of a folded astrolabe. Those astrolabes were already advertised in: Metius, *Fundamentale* (1626), fol.(?) 2recto. See also Jensma and Dijkstra, 'Wiskunde als familiebedrijf' and Van Netten, *Koopman in kennis*, chapter 2.

All in all, the core of the *Epitome* was that of a typical university textbook, in which astronomy was clearly understood as part of natural philosophy. It is a cosmological understanding of astronomy, which can be distinguished from positional astronomy whose goal is to measure the position of the stars. That cosmology was taught by a philosophy professor was not exceptional for Early Modern Europe in general; for seventeenth century Franeker, however, it was.[23] It is the only known textbook from Franeker, *not* written by a professor in mathematics, in which all of the different parts of astronomy are so clearly organised.[24]

In the last two parts of the *Epitome*, the two appendices, Holwarda partly reveals his attempts to defend his position at the University of Franeker and possibly get a better one. In these two appendices he explicitly contrasts his ideas with those of Metius, like he had done previously in his *Dissertatio*. Both appendices also give a final characterization of the book. In the first appendix, one of Holwarda's own observations is discussed, together with a method for how to measure and chart observations (this included a woodcut taken straight from the *Dissertatio*, on which Holwarda's New Star is depicted).[25] It is more or less the only exercise question of the whole book, no doubt a welcome addendum for the teacher using it. In the second appendix, Holwarda again defends his criticism of Metius, by reasoning that it was never intended to be offensive. Nevertheless, it underlines the polemical character of Holwarda's work; he always sought to debate with his peers.[26] The contrast with Metius could hardly have been better underlined.

6.2.3. Logics

Directly following his *Epitome*, Holwarda also printed a *Skiagraphia* on logic, still in 1643. This book was followed by an *Elementale Logicum* in 1648. Both the *Skiagraphia* and the *Elementale Logicum* have been considered lost by historians of the University of Franeker, but today several copies can be traced in libraries world-wide.[27] Both books show

[23] Generally this differed from university to university. Sometimes it would be done by a professor of philosophy, the next time it could be done by the professor of mathematics.
[24] That this was exceptional is also clear from the fact that for Fullenius senior's successor, it can be established beyond doubt that he taught 'cosmology', just like this had been the case for Metius. For De Grau see for example Nienes, *De archieven*, 101 and De Grau, *Disputatio uranoscopica de cometis*.
[25] Holwarda, *Epitome astronomiae*, 60.
[26] See the chapter above, where a brief sketch of Holwarda's days as a student is presented. See also Vermij, 'Johannes Phocylides Holwarda', 140-141.
[27] Terpstra, Sassen and Galama list the books as missing, which are in fact available in the British Library, Cambridge University Library and the Bibliothek of the Hohe Schule in Herborn – where I have handled them. Det Kongelige Bibliotek Denmark also holds both

similarities with the *Epitome*, although they are less brief than that textbook. Through these publications, Holwarda shows himself to be a master in comprising material in a comprehendible fashion.

The books give some benchmarks in the development of Holwarda's ideas. In the *Skiagraphia* (1643) Holwarda voiced strong support for the ideas of Petrus Ramus, who wanted – as I discussed in the introduction of this book – to reform the entire schooling system and who therefore proposed a radical break with the classics and with the Aristotelian inspired scholastic tradition. Holwarda lauds the French humanist philosopher with applause, calling him 'Quorum facile princeps fuit magnum illud Galliae lumen & ornamentum'.[28] This is far from surprising, since Ramus and Holwarda shared some key characteristics. They both had a fondness for mathematics, but were instead teaching logic a large part of their time. Ramus had in fact proposed to reform the entire educational system, reserving a central place for mathematics in his new teaching system.[29] Likewise, Holwarda was a professor of Logic with a strong preference for mathematics; he too sought a more prominent spot for that in his teachings.[30] Finally, Holwarda and Ramus shared what can be called a 'common enemy': Aristotle. Ramus had famously and ferociously attacked the ancient philosopher and his followers, and in his *Dissertatio* Holwarda had taken a similar approach.[31] However, in 1647, when he addressed his inaugural lecture, Holwarda referred to a change of heart he had undergone. To use Holwarda's own words, he stated that the curators of the university 'liberated' him from 'a period of enviousness, or should I say evil darkness', so that he could pursue his passions, be it with a certain reserve.[32]

'missing' volumes (which I did not handle): see Terpstra, *Friesche Sterrekonst*, 67; Sassen, *Geschiedenis van de wijsbegeerte*, 130; Galama, *Het wijsgerig onderwijs*, 292.

[28] Holwarda, *Skiagraphia*, 4 (praefatio ad lectorem); see also 7.

[29] A clear introduction on how Ramism functioned is given by Hotsen, *Commonplace Learning*, 38-100. In that chapter Hotson traces how Ramism was introduced and functioned in Germany in the late sixteenth and early seventeenth century. He more or less stops around the time Holwarda took up his position at the University of Franeker. Van Berkel, 'Franeker als centrum', gives an assessment of Ramism at Franeker and although he recognizes the importance of the years around 1650 for the spread of Ramistic ideas in the Republic, he explicitly does not investigate it, see esp. 424-425.

[30] See for example Van Bunge, 'Philosophy', 314

[31] Holwarda was, indeed, also one of the very few university professors who openly attacked the *peripatetics*. His contemporary colleague at Utrecht Henricus Reneri, for example, did take a strong stance against Aristotle, but not in his teachings nor in his university publications. Hopefully the anticipated PhD dissertation of Robin Buning will shed more light on this. See Verbeek, *La querelle d'Utrecht*, and Vermij, *The Calvinist Copernicans* for examples of how strong Aristotle's ideas were woven into the Dutch university system.

[32] Galama, *Het wijsgerig onderwijs*, 92-93; I thank Han van Ruler, from whose notes on Holwarda I have benefited greatly. Holwarda writes: Holwarda, *Philosophia naturalis*, 431.

What this new reserved passion was, Holwarda showed in 1648. From his *Elementale Logicum* it is clear that he had left his appreciation for Ramus behind and turned to Bartholomew Keckerman (1572-1608) and Alsted as his new heroes.[33] This is what modern day historians may brand as moving from being a Ramist, to what is labelled as a post-Ramist.[34] It looks like a complete transition, but in fact it is more an appropriation of the earlier ideas into a model that better suits the older peripatetic philosophies. This move fit Holwarda's career, because with his new position it may have been expected that he would cause less controversy and align with the opinio communis to a greater extent.[35] That was precisely what this post-Ramism was; it has been called a 'highly efficient pedagogy in the service of wider reforms'.[36] It was still a Ramistic approach toward education, but one that had dropped its sharp edges, such as its virulent anti-peripatetic stance. Central in Holwarda's program, however, was the fondness for mathematics, which is something that can be found in both Ramistic and post-Ramistic pedagogies. It was clear that Holwarda would not stop trying to reform university education and that he would also not stop trying to find a more important spot for mathematics.

6.3. Claes Amama

6.3.1. A troubled student

The question is of course how Holwarda gave shape to his attempts at giving a more central place to mathematics. The answer to that can possibly be found in a collection of disputations whose existence was reported in the eighteenth century.[37] These theses, which were defended under Holwarda, may give more insight into his ideas about how his teachings on logic and mathematics were related. A problem is, however, that they have been missing for two centuries.[38] Nevertheless, there is

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33 Holwarda, *Elementale Logicum*, fol.*5recto (dedication); comp. Holwarda, *Skiagraphia*, 8.

34 Hotson, *Commonplace*, 169-273; if anything Holwarda fits the frame Hotson gives for post-ramist eclecticism.

35 More than one author alludes to this, but it is perhaps best voiced by Schippers, 'Johannes Phocylides Holwarda'.

36 Hotson, *Commonplace*, 42-43.

37 In several bibliographies, a set of 12 disputations defended under Holwarda is mentioned. It is probable that of all those who published on this set, Vriemoet was the last (and only one) to have possibly seen those disputations. See for example Risse, *Bibliographia philosophica vetus*, 291, and http://poortman.kb.nl/long2.php?TABEL=T_TITEL&ID=15242 (retrieved 12-04-2011), comp. Vriemoet, *Athenarum Frisicarum*, 361 and Galama, *Het wijsgerig onderwijs*, 282-283.

38 As I noted above very recently, a single disputation has been found by Ferenc Postma in det Kongelige Bibliotek in Denmark, Holwarda, *Disputatio physica de mixtione & temperamentis*. This was defended by the Danish student Andreas Petrus Heide and deals

something to say, when a closer look is taken at one of Holwarda's most famous students, Claes Amama, and at David Rosaeus, a very peculiar professor of the late 1640s. Both characters happened to be among the most intriguing persons that roamed Franeker in the 1640s and 1650s, because both explicitly sought to use mathematics, albeit in completely different ways. It is therefore rewarding to examine them in detail. Amama was part of the philosophical turn that Holwarda tried to make.

To begin, Nicolaus Sixtini ab Amama, or Claes Amama (1628-1656), is not only the most famous of Holwarda's students, but he was also said to have been Holwarda's favourite.[39] Nicolaus was the son of the former Franeker professor in Hebrew and Greek Sixtinus ab Amama.[40] He was born in Franeker in 1628, a year that is often wrongly given as 1618.[41] Amama matriculated as a student in Franeker in 1645 at the age of 17. He was immediately one of the more ambitious students, defending several disputations and writing *carmina* for his fellow students.[42] With this he

with *physica*; see *ASF*, no. 4434: Andreas Heidius, Christianiensis, Norwegus, phil et ling orient, and APF, 31-3-1646; Unfortunately, I have not handled the booklet myself, but I rely on the description of this disputation given in the *Bibliotheca Danica*, II, col. 149, where it is listed as a disputation on chemistry. I thank Birgitte Ørneborg of det Kongelige Bibliotek for providing me with a scan of the title page of that booklet.

[39] A strong qualification of this relationship can be found with Vriemoet, *Athenarum Frisicarum*, 172-173. From the fact that Amama edited and published Holwarda's work, as well as from numerous other instances, historians have assessed this relationship as a very good one in terms of 'teacher' and 'student'. It is therefore very remarkable that most historians have given the birth date of Amama at 1618, the same year Holwarda was born. If both men had the same age, would a relationship in terms of friends not have been much more likely? However, the two men were not of the same age; Amama was in fact 10 years younger than Holwarda (see below). One of the very few who gives his birth date correctly is Piter van Tuinen in his 'Pallas en Mercurius', 180n19; There Van Tuinen also problematizes the relationship by asking if Amama was perhaps looking for a father figure. The only historian I came across who doubts whether Holwarda and Amama were really that close is Lydia Wierda. See Wierda, *Armamentarium*, 21. There Wierda writes 'Engels suggests that Amama, as the most beloved student of professor Holwarda, possibly had gotten hold of his keys. It can be questioned if Amama was indeed Holwarda's 'most beloved student', since the previous prohibition of the defence of his disputation.' ('Engels suggereert dat Amama, als lievelingsstudent van professor Holwarda, mogelijk beslag had weten te leggen op diens sleutels. Het is echter maar de vraag of Amama inderdaad Holwarda's 'meest geliefde leerling was', gezien het eerdere verbod zijn dissertatie te verdedigen.') However, Holwarda seems to have had little to do with the banning of Amama's disputation, and Wierda gives no other evidence in favour of her claim. Oddly enough Wierda fails to spot that Engels had not mentioned that Amama's father had been a librarian of the University Library, which would have been a more just criticism of Engels account. See also Engels, *Franeker folianten*, 21 and Engels, 'De Franeker academiebibliotheek', 273-274 and below the section on Amama.

[40] On Sixtinus Amama, see Platt, 'Sixtinus Amama'.

[41] On his date of birth see Stamboek, I, 21. See also Zijlstra, *Het geleerde Friesland*, 01149; and the introduction to this chapter.

[42] He is mentioned a stunning 19 times as author or defendant of *carmina*, disputations or as editor of Holwarda's work in the *Auditorium*: 34/1654.1a (4 mentions) 53/1648.3, 53/1648.6, 53/1648.10, 53/1649.5, 53/1649.12, 53/1649.19, 53/1649.34, 53/1649.37, 53/1650.5, 53/1650.6,

seems to have copied Holwarda's days as a Franeker student. It could well be that Amama was trying to build a career that was aimed at getting him a professor's robe. Under the guidance and protection of Holwarda, he started private tutoring somewhere in the second half of the 1640s.[43] As such Amama may have been the successor of Laurentius Banck (1617-1662), who on and off acted as the philosophy tutor until he was appointed associate professor in 1647 in law.[44] This may seem a trivial fact, but it could be an important stepping-stone to understanding Amama's career, which will help to understand the functioning of mathematics at Franeker. [45]

The first thing that needs to be stressed is that the philosophy faculty, or to be more precise, the philosophy professors, worked with tutors. Those instructors have only been discussed sporadically and as a side-note in the history of the University of Franeker.[46] The second remarkable thing is that these tutors, at one time or another, worked for *all* of the professors in philosophy, even though those professors may have had completely different beliefs. In the academic archives, Holwarda and Arnoldus Verhel are both mentioned as patrons to Amama's predecessor Laurentius Banck, although Holwarda was an atomist with a Ramist-inclination and a mathematical fascination, whereas Verhel was a staunch peripatetic.[47] They could both support Banck because he was explicitly forbidden to give public lectures ('acta

54/1651.1, M/1651.1, M/1651.6, M/1652.3. Few students ended up more often in that bibliography. This has partly to do with Amama's particular career at Franeker; see below for some analyses of him reoccurring in the *Auditorium*. For an analysis of the contents of his disputations see Van Ruler, 'Amama'.

[43] Van Tuinen, 'Pallas en Mercurius', 180ftn19. Van Tuinen here quotes Vriemoet, *Athenarum Frisicarum*, 172-173. See also the introduction to this chapter.

[44] Boeles, II.1, 195-198. Banck was not allowed to act in public.

[45] Boeles, I, 333; vgl Galama, *Het wijsgerig onderwijs*, 35-36. This has been wrongly translated in the published 'Repertorium van Savois', Nienes, *De archieven*, 70, where it is stated that he was no longer allowed to 'follow' ('volgen') privatissima. However, the original sources clearly state that he was no longer allowed to give them: Archief 181, inv.no. 17, 77, vlg. Wierda, *Armentarium*, 19, where the 'follow' interpretation is given and thereby it is overlooked that Amama was a tutor or *Privatdozent*.

[46] Galama, for example, unfortunately only discusses Stellingwerff as *Privatdozent* at some length, because he was the only one who had a 'profound influence' on the history of Franeker, see Galama, *Het wijsgerig onderwijs*, 36.
A more plausible explanation would have been that the *Privatdozenten* are very hard to trace through the sources. See also Boeles, I, 332-337, where both lectores and *Privatdozenten* are discussed. Boeles too seems to underestimate the impact these tutors had.
Of course every university attracted numerous different types of teachers. See for an introduction to the several types Van Miert, *Illuster onderwijs*, 96-106.

[47] Galama, *Het wijsgerig onderwijs*, 35.

publica') and to talk about any heterodoxy.[48] It shows that these tutors were nothing short of handy helpers.

That Amama became involved as a tutor is not just remarkable, it also offers an important clue because it arouses the suspicion that he had obtained a degree of some sorts. The education of university students was from the Middle Ages onward explicitly reserved for those who held such a degree. A doctorate would grant the right to settle as a *Privatdozent*, a bachelor's, master's or licentiate degree could grant the right to teach under university protection.[49] Although these rules were not too strictly imposed, every day practice was based on them.[50] If Amama indeed obtained a degree at Franeker, this has gone completely unnoticed until now. The fact that he never actively used a Magister or a Doctor's degree, suggests that they are out of question. Apparently he had obtained a lower rated bachelor's degree of some sorts, not at all that uncommon in Franeker.[51] The question of what can be discovered about such a graduation is eminent here. To answer that question it is rewarding to inspect Amama's paper trail with some precision.

In 1644 Amama had signed the *album studiosorum* in Franeker as 'phil primum, deinde philol', which means that he was a student of philosophy and the languages (much like Holwarda). He was supported during his studies as an alumnus of the province.[52] His first guide in philosophy was professor Verhel, nicknamed 'father Verhel' by students because of his long spell at Franeker. Verhel had also taught Holwarda

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[48] Boeles, II.1, 195.

[49] The lowest of these was the baccalaureate. It is my assumption that Amama would need at least that if he wanted to teach. The first to receive a baccalaureate in Franeker was none other than Johannes Saeckma. The title officially gave the right to assist and lead(!) public disputations (although the professor in question will have remained responsible). See Boeles, I, 368; on Saeckma, see http://home.wanadoo.nl/mpaginae/, passim (retrieved 10-12-2011). Of course next to a degree, the permission of the Senate to teach in Franeker was also obligatory. It is probable that Amama did not have that, or if he did, he did not keep it for very long.

[50] In Franeker in the seventeeth century, several tutors and *Privatdozenten* were around. They probably were allowed to practice as teachers based on their degree in combination with the permission they had from the university. In the eighteenth century this changed, as can be concluded from a recorded incident. In 1749, Dr. Bosma wanted to start giving private lessons to students. He considered himself eligible to do so based on his doctorate. Nevertheless, he was forbidden from doing so by the Franeker Senate. See Galama, *Het wijsgerig onderwijs*, 35-36, esp. 36, footnote 1. See also Boeles, I, 368.

[51] See Boeles, I, 367-368. Apparently students were not really proud of their baccalaureate, see for example Otterspeer, *Groepsportret*, 224, who brands the baccalaureate 'of little importance' ('van weinig belang'). Schotanus, the intellectual father of the Franeker disputation tradition, also complained about this. See Boeles, I, 367-369, and Postma, 'De Hongaren en het onderwijs', 27.

[52] *ASF*, no.4345; on Amama being an alumnus see Schwartzenberg, *Groot placcaat*, V, 523.

and was a colleague of Amama's father.[53] His classes, as well as the disputations defended under him, were not just strictly peripatetic; in the 1660s he would even launch an outright attack on all 'modern philosophers'.[54] Looking at the rest of Amama's career, it will become clear that this was not the teacher he was looking for.

Sometime in 1647 Amama turned to Holwarda to complete his studies in philosophy, although it has proved impossible to date this precisely. This shift of teachers set the scene for a famously banned disputation, an episode that reveals some important connections and therefore needs closer inspection.[55] On the 25th of May 1648 Amama was planning to defend a disputation under Holwarda, when the Senate prohibited him to do so. All copies of the already printed disputation were confiscated by the Senate.[56] These measures were extremely successful; today not a single copy is known to have survived, neither handwritten nor printed. All that remains is the title, which was mentioned in the decree of the Senate: *Examen problematum philosophorum selectorum quorundam*.[57] Apparently this was supposed to be Amama's 'examen', a final disputation, in philosophy. By 1648, he had been studying for four years, which would have been a normal time

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[53] Together, Sixtinus Amama and Verhel filed a complaint against Maccovius, see Galama, *Het wijsgerig onderwijs*, 57 and
http://home.wanadoo.nl/mpaginae/BrvnSaeckma/brsframe.htm(retrieved 10-12-2011). This did not mean that they were of the same signature; Verhel was a convinced Aristotelian whereas Amama clearly had ramistic sypmathies. See, Meerhoff, 'Le ramisme itinérant', 174-180.

[54] *Auditorium*, 34/1654.1a, 12-14 and 28. These disputations were printed in 1654, but no. 28 was defended by Amama much earlier. All disputations in these series have a double set of defendants. The first of these doubles always has a matriculation from around 1644-45. The second are announced with 'nunc repetens' and have defendants who matriculated around 1653. Amama is the one exception; the no.'s 12-14 were defended when he was a young student by one of his 'classmates', and around 1653 he had to redo that. After he got expelled from university (1653) and stripped of all dignities, he was probably forced to completely redo his studies: see below.
On Verhel's attack, see Lüthy, *Gorlaeus*, 156-157; comp. Galama, *Het wijsgerig onderwijs*, 91 and Vriemoet, *Athenarum Frisicarum*, 201.

[55] Nienes, *De archieven*, 139; this is recorded as him being removed from the 'Album', which was decreed in a second ruling. Nobody has bothered to look at the source where it is referred to; there it is clear that his testimonium was revoked: see, AUF, inv.no. 132 'Sententieboeken', 136.

[56] Although the Senate indicates that at a later moment they may be given back, it appears that this never happened, see Galama, *Het wijsgerig onderwijs*, 36 and Van Ruler, 'Amama', 19.

[57] The full decree given by the Senate was: 'Proposita disputatione sub titulo 'examen problemati philosophicurum selectorum quorundam', praeside D. Phocylide, responsuro Nicolao ab Amama, placit exemplaria eius disputationis et utrumque pedellum et promotorem a praedicto Amama exigi et auferri atque in Academiam asser uanda(?) differri eidemque Amama interdici disputationi, donec decretum senatus intellexerit.'; See also Wierda, *Armamentarium*, 19. She claims Amama was not allowed to defend his disputation because he had not handed in enough copies of his disputation.

period for completing a study in philosophy. Holwarda, meanwhile, would likely not have been too pleased. Disputations were an important part of his teachings and the ban will have felt like a firm slap on the fingers.[58]

It is my assumption that the defence of Amama's *examen* was supposed to obtain him the missing degree. It is the surrounding date of his disputation that vaguely hints toward this. Thursday the 25th of May 1648 was a date that more or less marked the opening of the 'promotion season' for the academic year '1647'.[59] However, it seems that Amama fell victim to a 'querelle de Franeker'; his attempt to get a degree was crushed in what seems to have been a conflict between his two philosophy professors: Verhel and Holwarda.[60] It may well have been an intellectual assault on Verhel, the professor who reigned the university as *Rector Magnificus* that year, to have Amama defend an undoubtedly provocative thesis. Verhel had not hesitated to defend Aristotelianism at Franeker with conviction in the past, and he would not hesitate to do so in the future.[61] Another incident points to the fact that animosities towards Holwarda's teachings were rising. Only weeks before the planned defence by Amama, at the beginning of May, a curious incident took place. Something forced Holwarda to write a sealed letter that was added to the academic archive (of which the rector was the keeper).[62] There is no trace of the letter, nor anybody discussing its contents, but Holwarda's rather theatrical and dramatic step may well have indicated a looming conflict that was about to burst. Banning Amama's thesis may have been part of that particular process.

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[58] On how important disputations were to Holwarda, see his *Elementale Logicum*, 138-141. Right in the middle of the 1640s the whole practice of disputations at Franeker attracted the attention of visitors; apparently this was a important part of the Franeker curriculum. See Alexander, 'Curiosities of University Life', 48-49.

[59] A brief survey of the listed disputations *pro gradu* in the *Auditorium* and the *APF* reveal that initially March had been the month when the most students defended their thesis to obtain a degree. However, in the course of the seventeenth century this preference shifted. In the 1640s, May, June and July were the months that are chosen for this. For 1648, however, there are no known promotions for the entire first half of the year, neither from the academic sources, nor from surviving printed disputations.

[60] I use the term 'querelle de Franeker' as a reference to the famous Querelle d'Utrecht. See Verbeek, *La querelle d'Utrecht*. In fact many Early Modern universities seemed to have been infected with partisanship. See the second chapter of this book for another example. However, the fact that this did not always have severe personal consequences also needs to be pointed out. In Franeker, for instance, the Cartesian Alting the Younger and the avid anti-Cartesian Marerius lived under the same roof, without notable problems, see Alexander, 'Curiosities of University Life', 43 (also note what is recalled of what Steubing says on Herborn on page 44).

[61] I already pointed out that Holwarda had retraced his steps as a young, new and ambitious philosopher when he obtained his full academic chair just a year earlier; the conservative forces in Franeker seemed to have been strong.

[62] AUF, inv.no. 13 'Adversaria Academiae', 107; see also Nienes, *De archieven*, 135 and 151.

Because events would unfold rather grimly in the years to come, Amama's name was partly removed from the academic archives, which makes it impossible to determine when he did obtain this possible degree.[63] But even with this deliberate attempt to cloud his paper trail, his traces are more abundant than those of most of his contemporaries. What is clear is that from 1648 onward, he started studying medicine under Johannes Antonides vander Linden, and that around the same time his privatissima got under way.[64] What the events surrounding Amama's banned disputation clearly reveal is that both Holwarda and his students were not safe from the interferences of the conservative forces in Franeker. In the following six months, Amama, Holwarda's protégé, would get into a lot more trouble, and those new problems reveal that his philosophical ideas were partly the cause for the turmoil he found himself embroiled in, the very same ideas in which a central place for mathematics was claimed.

6.3.2. A bookish thief

In June 1648, at the beginning of the academic year, the aging professor Arnoldus Verhel stepped down as *Rector Magnificus*. He also quit his job as university librarian.[65] From 1633 on he had been combining this function, with his (peripatetic) lectures in philosophy.[66] He would stay on as professor until 1663, but handed over the keys to the library to Johannes Antonides vander Linden. Both professors had been instrumental in Holwarda's education; Verhel was his guide in philosophy, and Vander Linden was his promoter in medicine. Both acted as Amama's teachers in their respective subjects as well. One of the first actions taken by Vander Linden was a cataloguing of all university owned books. There are no reasons given why he decided to do this, but the outcome was revealing; one out of every ten books was missing.

A committee of four professors was established in order to perform the book count. The first member was Vander Linden as acting librarian, the second was Holwarda, the third was Johannes Wissenbach (1607-1665), who had just stepped down as a member of the Senate, and the fourth was the famous theologian Johannes Coccejus (1603-1669), who was an acting member of the Senate. The committee used the printed

[63] AUF, inv.no. 132 'Sententieboeken', 136; see also Nienes, *De archieven*, 139.
[64] Van Ruler, 'Amama', 19, see also, *Auditorium*, 53/1648.6, 53/1648.10, 53/1649.5, 53/1649.12, 53/1649.19, 53/1649.34, 53/1649.37, 53/1650.5, 53/1650.6.
[65] Yet, Verhel kept a seat in the Senate for the medical faculty; see Nienes, *De archieven*, 309.
[66] Galama, *Het wijsgerig onderwijs*, 56-60

catalogue of 1644 as its standard.[67] On August 17 and 18 they counted that no less than 122 volumes were missing from the library, which had a total of some 1.000 volumes.[68] A carpenter soon afterwards discovered no less than 56 book clamps and chains behind the wood panelling at the library. The thief, or thieves, had unchained the books and dumped those at the scene. The Senate ordered a thorough investigation; an agent was sent to Amsterdam to scout auctions and bookshops for the missing volumes, without result. Nonetheless, a suspect was soon found when fingers were pointed at Nicolaus ab Amama.[69] In September, a search of his rooms was ordered and indeed the academic police found ten of the missing volumes there.[70]

Amama was always a likely suspect, because he was known as a rough student. Together with his brother, Gellius Amama (1620- after 1658), he was over time convicted of several different crimes by the Senatus Judicialis, the academic court.[71] Nicolaus was indicted for the first time in 1645. Over the years he would have at least five different cases in which he was summoned. The indictments ranged from violent behaviour, to indecent language toward women, to the theft from the academic library. With this behaviour, both he and his brother would build a reputation as true Franeker-loskoppen (wild heads), the nickname this type of students would get in historiography. He seemed the prefect candidate to pin the theft on, both by his contemporaries as well as by historians. After all, the ten missing volumes were found in his rooms, and Amama confessed to the fact that most of those books indeed came from the university library. [72]

Upon finding the books, Amama was immediately taken into custody by the academic police and his belongings (including the books) were confiscated. When he was formally accused, he admitted to taking several books from the library, although he persisted that among the confiscated books there were at least two volumes that were his.[73] What happened next remains very fuzzy.[74] That he was formally accused,

[67] The actual copy in which they noted the missing volumes is preserved. The books that were missing were signed with the word 'desideratur'. See Engels, 'De Franeker academiebibliotheek', 273.
[68] Tresoar, *Catalogus librorum bibliothecae* (1644), shelf mark Zq 1; see Engels, 'De Franeker academiebibliotheek' and Wierda, *Armamentarium*, 19-20
[69] AUF, inv.no. 17 'Diarium actorum', 34-35.
[70] These were 9 books in 10 volumes. Amama claimed at least 1 book in 2 volumes was his own. See below.
[71] Gellius Amama acted as a tutor as well, see Veen, *Recht en nut*, 256.
[72] Engels, 'De Franeker universiteitsbibliotheek', 274; AUF, inv.no. 17 'Diarium actorum', 35, 26 October 1648. Wierda fails to mention that Amama confessed to the theft of the 8 books, Wierda, *Armamentarium*, 19.
[73] Engels, 'De Franeker universiteitsbibliotheek', 274
[74] Engels claims that Amama was expelled until 1653; that is not the case (see above); Engels, 'De Franeker universiteitsbibliotheek', 274

sentenced and ultimately removed from the university is crystal clear, but whether this was for the theft, or for one of his other crimes, is not.

When Amama's father died in 1629 the academic and political environment in Friesland felt for Amama's mother. She was left in dire straits with five children, as is recorded more than once, but she also received aid from several benefactors.[75] This aid gave her the possibility to pay for the education of at least two of her sons. There was, in other words, a strong inclination to help the Amamas. This sentiment has to be taken into account concerning the saga of the book theft. The circumstances surrounding the event stress this even stronger; all of the key figures in the story surrounding this theft had close ties with Nicolaus in one way or another. Verhel, as a teacher and from time to time rector and librarian, had been a close colleague of Amama's father.[76] Coccejus, several times a member of the Senate and a member of the 'counting commission', had been a student of Amama senior, even choosing Franeker over Leiden, because of him.[77] Finally, Holwarda had been particularly close to Amama junior. Nicolaus seems to have taken these advantages to full benefit; he got chance upon chance to redeem himself for all his mischief and misbehaviour, but he spoiled those chances ever so often.

To blame Amama because he admitted to taking a few books thus seems an easy reading of the sources. The theft is surrounded by many obscurities and questions. For example, many books found their way back to the library. From the 122 volumes counted as missing, about twenty volumes were present in the library in 1656.[78] The most obvious reason for this is that the committee miscounted; some books were bound in with other volumes.[79] But the professors had taken two days to do a thorough count, in which they may have overlooked a few books. However, to count one out of every six books as missing seems a little too much. It is more than likely that some of these volumes were actually 'lent out' at the time of the count. This was against library rules, but it did happen more often. For example, one of the titles that was missing was listed as 'Verhel habet' – indicating that he had the book at home. Next to that the count also brought to light no less than 44 volumes that were not in the catalogue of 1644, possibly indicating that

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[75] See for example a letter by Meinardus Schotanus to Johannes Saeckma, http://home.wanadoo.nl/mpaginae/BrvnSaeckma/brsframe.htm (Schotanus 11; retrieved 10-12-2011); see also ASvF, inv.no. 2673, fol.135; comp. Bokkinga, *Extraordinaris*, II, 19/309.
[76] See above; Galama, *Het wijsgerig onderwijs*, 57 and Sprunger, *The Learned Doctor*, 84, who lists Amama senior and Verhel under the same 'law-and-order' party.
[77] Van Asselt, *Johannes Coccejus*, 20.
[78] *Auditorium*, 18-22.
[79] This seems to be the case with *Archangeli Picolhimini Praelectiones*, Tresoar sign. 446 Ntk fol; see *Armentarium*, 362.

when the catalogue was made these books had also been lent out.[80] While it may have been against the rules, it was possibly a common practice for some professors and students to take books home. This then seems a plausible explanation for a number of books, but not for the hundred that are still missing today.

It may, however, provide a more probable account for the books found in Amama's rooms, especially since the books he had taken home were works he used for his studies. The following list can be distilled from the sources (nine books, in ten volumes):

1. Bartholomaeus Keckermann, *Operum omnium quae exstant* (Cologne 1614);
2. Paulus Vallius, *Logica Pauli Vallii romani* (Leiden 1622);
3. Franciscus Vallesius, *Controversiarum medicarum et philosophicarum* (Hannover 1606);
4. Joannes Baptista Silvaticus, *Controversiae medicae numero centum* (Frankfurt 1601);
5. Euclides, *Elementa* (Pisa 1572);
6. Jacob Zabarella, *Opera Omnia* (Cologne 1597);
7. Andreas Laurentius, *Historia anatomica humani corporis* (Paris 1599);
8. Franciscus Patricius, *Discussionum peripateticarum tomi IV* (Basel 1581);
9. Johann Heinrich Alsted, *Encyclopaedia* (2 vols; Herborn 1630)[81]

Even a superficial glance at the list of books reveals what was the common dominator of these books. They are the books that a student with a strong interest in anti-Aristotelian philosophy and mathematics would want to study.[82] Those were precisely the subjects Amama was excelling in. If he had taken these books to keep them, it would have been a dim-witted theft. Not only would his teachers at university and the students he tutored have known about his philosophical preferences, he was also preparing a large volume himself in which a clear influence of these sorts of works is present: his *Disertationum* (sic!).[83] Instead of contraband, this list offers a unique insight in the scholarly world of

[80] Wierda, *Armamentarium*, 19.
[81] See Engels, 'De Franeker universiteitsbibliotheek', 274; comp. Wierda, *Armamentarium*, 19 and 356-364; UAF, inv.no.17, 34.
[82] The individual books may not all be that revolutionary, but from Amama's work it can be taken that he did use them to give body to his more radical ideas. Other, even more radical works, were not abundantly available at the University Library.
[83] For the philosophical ideas of Amama, see both publications by Van Ruler, 'Amama' and Idem, 'Substantie'. For a brief survey of the influence of these specific books on his *Disertationum*, see the following paragraphs.

Amama; it gives sources to the ideas of this young philosopher. Of course none of this provides proof of what he intended to do with the expensive folios after he was finished with them. Nevertheless, to view this list merely as proof of a theft seems very much like a missed opportunity.

With his *Disertationum* of 1651, Amama joined a polemic on mechanism and Cartesianism. It was clear that he defended those philosophers who were in favour of this modern philosophy, but Amama did not blindly follow those he defended. Instead he added new elements and new ways of reasoning to the discussion. The historian and philosopher Han van Ruler has pointed out that Amama 'had the opinion that flat mechanism [...] did not comply to the requirements of the laws of natural philosophy'.[84] Amama thus tried to give a new twist to the discussion. He would deploy the knowledge from the books in his rooms for a similar cause. Those books provided building blocks argue mathematics had central place in philosophy.[85] Precisely what Holwarda had previously argued.

Keckermann(1) and Alsted(9) are Post-Ramists.[86] Alsted was, like Amama, an open critic of Aristotle. Keckermann was a defender of the ancient philosopher of some sorts, but he was also the one peripatetic who could count on Holwarda's support.[87] That Amama had a strong interest in his works is hardly surprising. Franciscus Patricius(8) was another anti-peripatetic and thus fitted right in Amama's scheme.[88] Likewise Vallius(3), loudly condemned Aristotle and argued that mathematics was an important part of philosophy.[89] That same importance was given to mathematics by Zabarella(6). In fact, both Zabarella and Vallius were used by Galileo when he wrote his treatises on logic.[90] The two medical books (4 and 7) can hardly have been a

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[84] Van Ruler, 'Substantie', 130; Van Ruler contrasts Amama's ideas with those of the Utrecht philosopher Henricus Regius: 'En toch was Van Amama van mening dat het platte mechanisme dat Henricus Regius (1598-1679) destijds in Utrecht vertegenwoordigde niet aan de natuurfilosofische vereisten voldeed.'

[85] Very telling is for example Amama, *Disertationum*, 70; where Amama cites both Alsted and Vallesius, as if he had been working on those pages when the books were found in his rooms.

[86] On Keckermann and Alsted and how they fitted the post-Ramist ideas, see Hotson, *Alsted* and Idem, *Commonplace*; Keckermann is frequently cited by Amama (too often to mention specific pages) in the first part of the dissertation (until page 300). Alsted is cited by Amama, *Disertationum*, 70.

[87] Holwarda refers to him as 'doctiorem peripatus', see Holwarda, *Dissertatio*, 210.

[88] Francesco Patrizi of Cherso (1529-1597) was also a strong anti-peripatetic. See the entry on him in the Stanford Encyclopedia of Philosophy: http://171.67.193.20/entries/patrizi/ (retrieved 12-01-2011); On Amama's use of Patricius, see below.

[89] Amama uses Zabarella on the following pages at least, Amama, *Disertationum*, 371-375; Vallesius is cited at least on Ibidem, 70 and 436.

[90] See the fascinating article by Wallace, 'Galileo and the Paduan Aristotelians'.

surprise in Amama's rooms, since medicine was his main focus in the second half of 1648. But both books were also not free of controversy and were critical of the existing practice. Finally, Euclid's *Elements*(5) was a standard work for anybody with an interest in math, and would stay that way for at least a century to come. It was at the same time also a work that was referenced by the more critical philosophers from the sixteenth century onwards.[91]

In his *Disertationum*, where numerous references to these specific authors can be found, Amama defends the Cartesian philosopher from Utrecht, Henricus Regius (1598-1679), against the ideas of Lambertus vander Waterlaet (ca.1619-1678). However, Amama never refers to Waterlaet with his actual name, instead using the funny jibe 'Wat-te-laet', which translates as 'a little too late'.[92] This mocking, student-like behaviour also resounds when Amama seems to allude to the book theft in his *Disertationum*. When citing Patricius (no.8), he tells his readers that he had once borrowed that book from the library of his teacher Johannes Antonides vander Linden.[93] Vander Linden was the university librarian at the time of the discovery of theft, so this is no casual reference! There are two more reasons why Amama's remark is very interesting. First of all, it may seem to point toward certain privileges that Amama may (thought to) have had. For example, perhaps he was allowed to borrow books. Amama, after all, was far from a normal student. Both his many disputations and his impressive *Disertationum* are evidence of that. He may have been very rough, but he was also a very studious boy. Add to this that his father had been librarian of the university and perhaps it was tolerated that he take home some books from time to time. Whether this was the case or not, he clearly overused his privileges at a certain point.

Secondly Amama's remark seems to be a reference to the fact that (although he got many chances) his contemporaries were far from weak hearted. It was precisely Johannes Antonides vander Linden, as the new librarian, who described his former pupil as being a 'tomb raider'. As acting librarian, Vander Linden restored the library, and with the help of

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[91] Goulding's recent study on the use of Euclid by both Petrus Ramus and Henry Saville is very revealing in this respect. See Goulding, *Defending Hypatia*. Amama cites Euclid for example on *Disertationum*, 457.

[92] Van Ruler, 'Amama', and Idem, 'Substantie', 130; see also Amama, *Disertationum*, 320.

[93] Amama, *Disertationum*, 154: 'Inspecto autem loco citato Patricii, (quem benigne mihi supeditabat cl.vir J.A. Vander Linden ex bibliotheca sua, omnis antiquitatis et raritatis exstructissima:)' Although Amama seems to refer to the library of Vander Linden himself, I think this should be read as a reference to the University Library. It was after all Vander Linden who would go through a lot of trouble acquiring new books for that library, making him the most important librarian Franeker ever seems to have had. Next to that does it seem all too coincidental that Amama borrowed this book of the man that would brand him a 'sacrilegious hand', see below.


CLARISSIMVS AC DOCTISSIMVS
DOMINVS,
IOHANNES HACHTINGIVS,
LIB. ART. MAG.
LOGICES PROFESSOR ORDINARIVS
ISTA OLIM OPERA
BARTHOLOMÆI KECKERMANNI
ORNAMENTVM BIBLIOTHECÆ,
ADIVMENTVM POSTERITATI,
MONVMENTVM DENIQVE SIBI
SVAQVE MANV
DONAVIT, SACRAVIT, POSVIT.
QVAM CVM SACRILEGA MANVS DELEVISSET,
VT NE INTERIRET TAMEN MEMORIA
VIRI MERITISSIMI,
SVI ID OFFICII ESSE PVTAVIT
JOHANNES ANTONIDES VANDER LINDEN,
DOCT. ET PROF. MED. ET ANAT. ORDINARIVS,
ACADEMIÆ BIBLIOTHECARIVS
ANNO CIↃ IↃC XLIX.

An example of a leaflet Van der Linden had put into the books he acquired for the University Library, following the theft of 1648. Tresoar, Leeuwarden.

numerous benefactors he acquired over one hundred new books for the library.[94] In the process he turned the disaster into a possibility; books that had contained somewhat outdated knowledge were replaced by newer books that were more up to date for academic teaching. Vander Linden had a certificate, which commemorated the benefactor, placed in all of the new acquisitions. Two of the nine books found at Amama's rooms have such a certificate.[95] On one of these two, there is a printed message that claims that the book was once stolen by a 'sacrilegious hand'.[96] It is clear who Vander Linden blamed for the theft.

The precise details will probably remain a mystery, but there are some final observations to be made in relation to Amama's involvement. It is warranted to inquire whether he was made a scapegoat. Important is that Amama was only convicted for the folios he had in his rooms, and not even for all of them. As such, he was far from being the only or even the most important perpetrator. What also needs to be taken into account is that the stolen books were very large, making it improbable that the book thief acted alone. One hundred folios are not easily

[94] Engels, 'De Franeker universiteitsbibliotheek', 274-275. Engels explores the 'refurbishment' of the library and makes some intriguing connections. For example, he shows that part of the library of the famous mathematician Cardinael ended up at Franeker, as well as parts of the library of the Leiden professor Constantijn de l'Empereur.
[95] Engels, *Franeker folianten*, 20-21.
[96] Galama, *Het wijsgerig onderwijs*, 57,87 and 89.

smuggled out of a library, not to mention out of the city of Franeker.[97] Whatever precisely happened, hardly any of the more old-fashioned philosophers in Franeker was very happy with Amama, and that was because of his philosophy, which reserved a central place for mathematics.

6.4. David Anguila Rosaeus

6.4.1. A professor extraordinarius

There was another 'mathematician' who showed up in Franeker weeks before the book theft was discovered and who had very bad credentials: David Anguila Rosaeus, or Rosée and also De la Rose († before 1670).[98] His story gives ground for suspicions concerning the book theft and more importantly it also gives some more insight into what could be achieved with mathematics, or how knowledge of mathematics could help improve ones social position or cultural standing.

Rosaeus was a particularly shady figure who came from Holland to the province of Friesland prior to 1647. In Friesland he obtained an influential patron in none other than the Stadtholder Willem Frederik (1613-1664). In 1640 he had already once tried to find strong support, when he wrote and dedicated a poem to the Stadtholder and States of Holland. That poem was entitled *The treasure of Holland* and showed Rosaeus' skills in rhyming elaborate praise.[99] He started pursuing more exact goals when he published a book on land surveying in 1647.[100] In the

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[97] A single folio could weigh up to 10 kg, the total weight of all books stolen (some 100 volumes) was thus somewhere between 500 and 1000 kg. It is hard to believe that the bulk of this theft may have taken place over a longer period of time; some of the library cabinets were missing 5(!) out of a total of 16 volumes. That cannot have gone unnoticed. It is, however, possible that smaller amounts were stolen, before a bigger raid was done. Whatever the case, it would have taken a lot of organization to get the books out of the library. If a single person had undertaken the theft, he would have entered and left the library over 30 times (taking a maximum of three volumes a time).
Stacking and moving the loot would not have been easy either. A single folio volume could measure up to 50*30*10cm=15.000cm3. This means that the volume of all books stolen would have been more than a cubic meter. Or to put in more contemporary terms, as much as several barrels of books.
Oddly enough the theft seems to have continued. In 1656, just eight years later, several new 'desiderata' were added to the library collection. For figures, see Wierda, *Armentarium*, 356-364; also see her own comments on her counting, Wierda, 'Over boektellingen'.

[98] Boeles, II.1, 198-200 and 'De korte carriére'; It may be that this Rosaeus is the same person as the David Rosaeus who published a pamphlet addressed to the Stadtholder of Holland, Frederik Hendrik, in 1640 in the Hague. That pamphlet consists of a long poem on the greatness of the province of Holland. However, I have not been able to trace any certainty on his time before he came to Friesland.

[99] Rosaeus, *Den schat van Hollandt*.

[100] He is probably the same as R. de Rose who published a treatise on barrel measuring (or wine gauging) in Leeuwarden in 1637, see Rosaeus, *Meet en pegel-const*. For both barrel

tradition of Metius he did so with a version in Dutch and in Latin, both published in Leeuwarden.[101]

The two books were published under the title *New Education in Land Surveying* and the Dutch version is presented as a literal translation of the Latin book. The books promised to give a six-day course in land surveying, without any arithmetic or calculations. As if that were not enough, the title page also promises a short method to study and understand the whole of theology. There are numerous errors in the measurements presented and at times Rosaeus is unclear about his direction, his sources and his solutions.[102] He also (inevitably) claims to have a solution to squaring the circle, which he does not reveal. Still, the book's overall impression is not entirely bad. Rosaeus provides some clear and nice examples on how to measure the surface of several geometric figures. If one can indeed learn to be a surveyor from this in only six days is questionable. The quality of the etchings(!) of mathematical figures on the other hand is particularly bad.[103] Rosaeus even had a long and circuitous apology printed for these, as a sort of preface to the book. But his excuses are not really convincing and the idea is easily perceived that Rosaeus made his own etchings to save some money.[104]

What was convincing was his dedication.[105] The States of Friesland were offered the Dutch book, while Willem Frederik was offered the Latin version. This was most likely the moment when the latter became Rosaeus' patron. Through the influence of the Stadtholder, the Deputy States in March 1648 appointed Rosaeus as professor in 'politicam didacticam, sagatam et togatam,' and also 'linguas exoticas' (politics, didactics, classical drama, and also foreign languages). They did so without consulting the Franeker Senate or the curators.[106] Even before

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measuring and land surveying, an official oath had to be taken because both professions would either influence the amount of taxes someone had to pay, or the claims someone could make on property. For a more in depth analysis of how this was done in the Early Modern Dutch Republic, see Dijksterhuis, 'Fit to measure'.

[101] Rosaeus, *Hectameron geometricum* and Rosaeus, *Nieuw onderwijs der Lant-meterye*. There is also mention of an astronomy (which would even be more in line with Metius' writings), but I could not find a copy of that.

[102] See for example Overbeeke, 'Frans van Schooten', 7.

[103] It is quite remarkable that the book is illustrated with etchings, rather than woodcuts, especially since they are of an extremely simple composure. It would have been much easier, both in terms of the production of the master plates, as well as the printing of the book, to work with other graphic material. Even when Rosaeus was speaking the truth (and the images were added at a late moment), the choice for etchings seems odd, unless, of course, they were added after the actual book was printed. See next note.

[104] Rosaeus, *Hectameron*, fol.*8-*9 verso.

[105] Rosaeus, *Hectameron*, fol.*2-*4 verso.

[106] Boeles, II.1, 198. Other sources also talk about Logic, (Dutch) History and Hebrew, see Nienes, *De archieven*, 172. It is quite possible that he was appointed for foreign languages,

he was formally introduced, he was strongly opposed by both the Franeker professors and the curators alike. Together, they made several written complaints and asked the States to drop Rosaeus' nomination.[107] The States, however, persisted, and on the 25th of June Rosaeus' appointment was confirmed, although by then it had become clear that he was going to be an associate professor, without any salary. Shortly afterwards Rosaeus arrived in Franeker and held his inaugural lecture on the 29th of June.

The Senate and the curators had good reasons to object to Rosaeus' appointment. From the city government of Delft, they had obtained a testimonial on Rosaeus' bad name and even worse manners. Meanwhile in Friesland complaints were voiced on his morals as well.[108] That the States persisted must be read as an indication of Rosaeus' formidable patron. The force backing the appointment of Rosaeus is in fact unparalleled in the history of Franeker. That academia and provincial politics so openly took different sides would not occur again in over a century.[109]

This can all be explained if we take a closer look at Rosaeus' patron, who remains largely unknown to historians: the Frisian Stadtholder Willem Frederik. He patronized Rosaeus because of the dedication of the land-surveying tract. But there was more to it than a mathematical booklet with the arithmetic left out.[110] This is clear from a letter Rosaeus sent to Amalia van Solms (1602-1675) in 1648. She was the widow of Frederik Hendrik (1584-1647), the stadtholder of Holland, an aunt to Willem Frederik (and from 1652 his mother-in-law). She had been instrumental in linking Rosaeus to the Frisian stadtholder. When it turned out that the appointment was going to be without a salary, Rosaeus started complaining to her, without much effect. Yet, despite all of the local pressure he was able to cling on to the position for almost a year.

In the end, however, even this strong support could not help Rosaeus. In the course of 1648 his behaviour had given all sorts of causes for the protestant Franeker community to feel grieved and apply over and over for his removal. A girl from Leeuwarden had given testimony that Rosaeus had vowed to marry her and make her pregnant in the process. However, Rosaeus was (still) married to another woman and

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since Louis Parent, who seems to have been his successor, lectured in these subjects. See Boeles, II.1, 200.

[107] These complaints were filed in March and June 1648.

[108] Boeles, II.1, 199-200.

[109] Differences with the local government of the city of Franeker occurred much more often. See the Amama case below.

[110] I thank Djoeke van Netten for this phrase.

thus could not stand his word.[111] There are no known reports of him lecturing in Franeker; there are however several of Rosaeus partying and drinking with students, even on the eve of the Eucharist celebration (one of the very few sacraments in the Dutch protestant church). This led him to finally be indicted by the Senatus Judicialis in January 1649, which was marks the start of the definitive downfall of his short academic career.

Next to the official prosecution, the protesting professors turned to Willem Frederik once again, indicating that they must have known that he was the man behind the appointment to begin with.[112] Rosaeus, however, continued to offend his colleagues and never showed up to face the accusations in the Senatus Judicialis.[113] There it was decided in March 1649 that Rosaeus would be fired, but not without a reward. If he would show up to turn in his letter of appointment, he would still receive a payment of three hundred guilders. His patron clearly had not dropped him altogether. This serves as yet another indication of the commitment of the Nassau family.

There is one vague indication that his contemporaries linked Rosaeus' behaviour to the theft of books. The Senate decided to have two specific broadsheets between the years 1648-1650, both containing an extract of the *Statutes Academiae*.[114] One displayed law 25, stipulating the library rules, obviously a kind reminder to what the purpose of the library was ('to keep and save, for general use of the descendants').[115] The second broadsheet depicted law 45, which stipulated that students be placed under the care of the professors who were obliged to guide them. Therefore, it was not allowed for them to loan money to students. This law was almost inevitably aimed at Rosaeus, who was accused of immoral behaviour toward his students. The Senate almost never printed these broadsheets; from the entire two-century history of Franeker only one other example is known.[116] It is far from solid proof, but it could have been a way for contemporaries to publicly complain

[111] Boeles, II.1, 199-200 and 'Ut 'e argyfkast', LC, 27-12-1986.
[112] Willem Frederik, *Gloria Parendi*, VII, 50 and 55. Although Willem Frederik did show interest in academic affairs, the scholars hardly ever sought his direct advice. According to Willem Frederik's published diaries, which run from 1643-1649, 1651-1654, this is the only time he was consulted in matters of an appointment.
[113] When he was summoned to show up in front of this court, his eloquent reply was that he had nothing to do with the business of the professors, 'et cum dicto manu percussit nates, digitis concrepuisse, ore sibilum edidisse atque dixisse *Poup*, mandantem insuper haec ad ipsum Senatum referre.' *Poup* is in this case Dutch for poop. See Boeles, II.1, 200; comp. Huussen and Hempenius-van Dijk, 'De Franeker academie', 144.
[114] *Auditorium*, M/1648.1 and M/1648?.2; see also Jensma, *Universiteit*, 141 and 167. Martin Engels convincingly argues that the broadsheet containing the library rules was printed in 1650: See Engels, 'De Franeker universiteitsbibliotheek', 275.
[115] For a Dutch translation, see Engels, 'De Franeker universiteitsbibliotheek', 275-276
[116] This was printed in 1758, see *Auditorium*, M/1758.3.

about the behaviour of this well-connected, but highly unwelcome colleague.

As little that is known about the remainder of Rosaeus' career, it is all in character with his behaviour in Franeker. Some time after he left he promised to marry an Amsterdam woman named Annetje Roest. He never actually did. He did give her control of a medicine in the form of a fluid, which he presumably had invented and that could be used to cure all sorts of illnesses.[117] This attracted the attention of the Danish scholar Laurens Foss who wrote about it to the president of the Royal Society in 1670.[118] By that time Rosaeus himself had died.[119]

Land surveying without arithmetic, the squaring of the circle and a lotion to cure all sorts of diseases; it all fits the picture of Rosaeus. It is also the intriguing other side of mathematics, one that was both fantastic and spiked with magic. Rosaeus' case is so important because he painfully showed that a 'mathematician' like him, could all of a sudden enter academia.

The book theft, meanwhile, was never solved. No-one was convicted for the enormous amount of folio's that had gone missing. It did, however, offer the possibility for a thorough modernization of the university library. Dozens of new patrons were found to support this reconstruction and from their money hundreds of new books were bought under the guidance of Antonides vander Linden. In the end, the university library was the big winner of the whole affair.

6.5. University reform: academics and idiots

The cases of both Rosaeus and Amama reveal some particular details about the Franeker community in the middle of the seventeenth century, especially concerning the part of this community in which mathematics played an important role. Both cases are also preludes to a thorough reshaping of the entire university that started in 1650. On the one hand, this reshaping resounded in the entire European Republic of Letters. On the other, it offers a background for understanding the process of the institutionalization of mathematics that continued during that time under the supervision of Fullenius senior.

Fullenius senior had 27 known students in mathematics who graduated in land surveying, but much like with Metius, there were many more that attended his lectures over the years. At the same time there were also land surveyors who did not study, nor graduate in Franeker. They were examined in Leeuwarden by a special board or a special meeting of the judicial High Court of the province. That not

[117] *The correspondence of Henry Oldenburg*, VII, letter 1510.
[118] *The correspondence of Henry Oldenburg*, VI, letter 1412
[119] *The correspondence of Henry Oldenburg*, VII, letter 1510.

everybody went to Franeker can easily be explained. The university town could be a long way from home and studying there could prove a costly affair. Normal students, who were citizens of academia, were exempted from certain taxes. The *idiotae*, or students in mathematics, were not. In 1656 the university Senate explicitly ruled them out, a ruling that was probably spurred by certain academic developments.[120]

There were good reasons not to exempt the mathematicians from the tax breaks. First and foremost they could not read or write Latin – they were after all *idiotae*. This set them apart from all other university citizens. Secondly they paid fewer fees.[121] Thirdly they were not eligible for an academic post upon graduating. An *idiotus* was very unlikely to become a professor. And fourthly their work was something that was part of the 'normal' non-academic world. They would measure wine barrels for taxes and surfaces of land for ownership. This was hardly comparable to the work done by medical doctors, by lawyers and judges and by theologians and ministers. Land surveyors had to be capable, but did not have academic pursuits. Their educations has been dubbed a 'vocational training' in Dutch historiography.[122]

That they were not eligible for citizenship of academia, nor for the benefits that came with it, was a reason that the *idiotae* generally matriculated at the very last moment. They were obliged to do so before they could take their degree, but they only did so at a moment they were absolutely sure that their promotion would take place. Traditionally they would inscribe the *album studiosorum* only a day before they took their exams. Only when they had finished their courses and the subsequent diploma could not elude them, did they pay their fees.[123] From the moment Fullenius took office as professor in mathematics, the visibility of the *idiotae* in the academic community grew. With Fullenius senior, more and more students were leaving a mark, as shown in the academic archives, whereas under Metius they had virtually been invisible. The fact that the *idiotae* became more noticeable would have been the first reason why the Senate felt it was justifiable to explicitly exclude them from academic citizenship.

A second reason why their exemption was articulated can be found in certain developments Franeker was going through at the time. In the 1640s and 1650s the university was rapidly changing. Student numbers

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[120] Nienes, *De archieven*, 139; comp. AUF, inv.no.17 'Diarium actorum', 144.
[121] AUF, inv.no. 17 'Diarium actorum', 216-217 and 301.
[122] Van Winter, *Hoger beroepsonderwijs*. 'Vocational training' is his translation into English, see Ibidem, 126.
[123] My ideas contradict Van Winter's conclusion (not his analyses!) as to why math students matriculated at such a late time, see Van Winter, *Hoger beroepsonderwijs*, 56 where he states that this was a 'kwalijk insluipsel' for all students, except for the students in mathematics.

were reaching an all time high.[124] The institution became internationally acclaimed, with approximately 300 matriculations of foreign students per decade between 1640 and 1670.[125] These numbers put pressure on both the Senate and the Frisian States to articulate who were among the university citizens and who were not.

Initially, the main reason for the University of Franeker was to educate ministers, to teach and spread the Reformed faith and to guide God's flock. There was a high shortage at the end of the sixteenth century, with the church growing fast but lacking enough ministers.[126] By the 1650s this shortage was completely dissolved, and freshly graduated theologians were no longer automatically ensured of a job.[127] At the same time the future looked bright for the Dutch and the Frisians alike. Around 1650 Friesland was at the top of an economic cycle. The Peace of Westphalia had just been signed and it marked the end of what had roughly been a century of economic prosperity. It was precisely the moment to make investments.[128]

These developments had their effects on the University of Franeker, and it was a cause for all sorts of changes. An ambitious program of expansion at the university was embraced by the Deputy States and the curators.[129] The focus of this development was on the medical faculty. New professors were added to the roster, new university buildings built and even new fields of education adopted. This resulted in a house, an *oranjerie* (a sort of greenhouse) for the professor in botany and a 'chemical laboratory'.[130]

The motor behind the modernizations of Franeker's medical education was Johannes Antonides vander Linden. Vander Linden's reform programme was aimed at a practical and chemical approach to

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[124] Bots and Frijhoff, 'De studentenpopulatie', 57.
[125] De Ridder-Symoens, 'Buitenlandse studenten', 77; comp. De Graaf, 'Buitenlandse studenten'.
[126] EVF, 365-369.
[127] Balthasar Bekker may be a good example of this trend. Even though he was a promising student, he had to settle with the job as rector of the Franeker grammar school upon graduating. See below for more details.
[128] Faber argues that 1650 was an important hinge in the seventeenth century Frisian economy and proves at numerous places how decisively the period after 1650 differed from that before 1650, see for examples: Faber, *Drie eeuwen*, I, 60, 132, 141, 344.
[129] The actual enlargement has been briefly discussed, for example by Karstkarel and Terpstra, 'Van Jeruzalem', 214-215; Coccejus made a short poem that was inscribed in one of the facades and is still visible today: 'Herba es, homo, fragres, sis vescus, sis medicina. Fl[orebis] dio lumine planta Dei.' This has been, rather brilliantly, translated by A. Sizoo as:
'Wees als de plant, o mensch, die ge in den kruidhof teelt;
Maak dat door goeden geur ge uws naasten zinnen streelt;
Wees smaaklijk als het ooft of nut als medicijn:
Dan zult ge in 't hemelsch Huis Gods bloeiend kruid eens zijn'. See Sizoo, 'Een epigram'.
[130] Boeles, I, 395.

medicine. With this approach he had made his name as a professor in medicine and he attracted numerous foreign, especially English, students. One of his most famous pupils in Franeker was William Hamilton, a Scottish nobleman and trustee of Samuel Hartlib (ca. 1600-1662). He had left his home country after he had gotten himself into trouble. He travelled to Amsterdam and there he met with Johann Moriaen (c.1591-1668). Moriaen, a former colleague of Vander Linden, kept the Hartlib circle informed on what was happening in the Dutch Republic, and it was he who pointed Hamilton in the Franeker direction.

It so happened that in October 1650, when the Franeker *laboratory* was just completed, Willem Hamilton wrote to Hartlib: '[I] intend presently for Franeker; when god willing I mynd to setle for some tyme.' [131] And he gives a clear picture what he expects to find there:

> 'Tuo motives I have, *tha*t make [me] goe to Franek befor any other place; 1. *th*e easienesse of living ther, cheaper then elswher, & 2. a pwblick chemicall laboratory, *tha*t is ther erecting, (as Mr Morian informs me) by Vander Lindens means, who is a favorer of chemistrie.'[132]

In November 1650 Hamilton arrived in Franeker and in another letter to Hartlib he exemplified his hopes:[133]

> 'One motive, amongst others, why I rather came to Franeker, then elswher, was for Doctor Vanderlindens caws, of whom I heard great com*m*endatione from Mr Morian, & *tha*t by his means, *th*e States in Frisland wer setting up a chemicall laboratorie, & thinking perhaps of some provisione for a professione therin, at least so farre, as [to] teach *th*e students of medicine, all com*m*on [operalis*?*] for use in physick, which is all I desyred, & thowght it a singular providence, & good occasione.'[134]

The Frisian states initially wanted to give the university a simple refurbishment, explicitly at the lowest possible costs.[135] But according to these letters, Vander Linden had been able to get a lot more done. Franeker was poised to become a centre of medicine.

The actual buildings that were constructed to house the *oranjerie*, the laboratory and the professor's house, are among the best visible

[131] Hartlib, *The Hartlib Papers*, 9/11/25A
[132] Hartlib, *The Hartlib Papers*, 9/11/25A
[133] Hamilton matriculated on November 8 1650. See *ASF*, no. 5062.
[134] Hartlib, *The Hartlib Papers*, 9/11/27A-B.
[135] Boeles refers to the original sources, see Boeles, I, 395.

remnants of the university in Franeker today. The university employed Philippus Nicasius as a special stonecutter to make the decorations that celebrated this event.[136] Nicasius was an able stonecutter who did various ambitious projects in Franeker in the second half of the seventeenth century. For this specific commission he was allowed to matriculate at the university as a 'math' student, thus receiving all benefits of an academic citizen. Yet there is no evidence that he ever mastered Latin, nor that he showed an interest in academic affairs. His matriculation must be seen in light of what had been custom at the beginning of the seventeenth century, when academic printers, beadles and the like were also all listed in the *album studiosorum*.[137]

In the process of modernizing the university, the Frisian States were also drafting rules concerning who could be considered academic citizens and who not.[138] At the same time, ever more students were matriculating as students in 'math' or 'geom'. They were possibly following the example set by Nicasius. This resulted in a verdict by the Senate that left little to the imagination: Mathematicians who could not write nor read Latin, were excluded from the privileges. The statutes, drawn up by the States of Friesland, did not list these 'academic idiots', according to the Senatus Judicialis.[139]

These outspoken words made clear how the *idiotae* were regarded by most academics. Graduating in mathematics in the 1650s was not seen as a proper academic exercise, although it was allowed to be practiced within the walls of the university. As I showed in this chapter, this did not refer to the practice of mathematics in general. Holwarda called all who pursued philosophy without understanding mathematics *sophists* and it was of course around this time that the ideas of Descartes were also gaining strength.

Franeker was trying to stay a true academy; it had international aspirations and it did indeed appeal to an international audience. At the same time, Fullenius, as the professor in mathematics, was successful in a more local market, recruiting all his graduates from the Dutch Republic and Eastern Frisia, no less than 20 of the 27 from Friesland proper. In the 1650s the *idiotae* resembled an uneasy balance between Friesland and the outside world, between an international community of scholars and a province in need of surveyors. Fullenius' position lay clearly between academics and idiots.

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[136] On the life and work of the largely unknown figure see the wonderful article of Ten Hoeve, 'Philippus Nicasius'.
[137] *ASF*, no. 5133.
[138] Boeles, I, 44 and see also Idem, 319-320.
[139] AUF, inv.no.17 'Diarium actorum', 144. See also Nienes, *De archieven*, 139.

6.6. Conclusion

This chapter has dealt with three completely different 'mathematicians': Holwarda, Amama and Rosaeus. At first sight they do not even seem to be proper mathematicians, but at closer inspection mathematics lay at the core of their activities. The thorough discussion of Amama and Rosaeus reveals important details on how mathematics was practiced at Franeker and the porosity of Early Modern 'mathematics'. The cases of Amama, Rosaeus and Holwarda show how contemporaries were at least trying to demarcate mathematics. In this sense they show how fluid the boundaries of mathematics were, both in terms of discipline and in social/cultural terms.

The tragic case of Nicolaus ab Amama shows how 'losers', who tend to be invisible in history, can reveal important features of Early Modern culture. The numerous conflicts surrounding him make it fruitful to study him in detail. These details reveal how a dedication could hold political implications and result in academic positions, how a theft could be blamed on a student and how that student could be offered the opportunity to redeem himself time and again. This is of great significance for this study, since Amama was also trying to find a place for mathematics within the actual domain of natural philosophy. Amama tried and he used the works of numerous mathematicians in the process. He may not be immediately recognized as 'a mathematician', but he practiced mathematics. His case reveals the enormous possibilities mathematics could bring to philosophy, just as it reveals the troubles a student with too much love for mathematics could get himself embroiled into. This was also not just the result of his love for mathematics, but that did hurt his case. Once again, as with Roggius, Amama's case is one of a career that was nipped in the bud by academic-political machinations.

David Rosaeus also was no success story, although he started out as one. He came from outside the academy and used courtly mathematics as an entry. This shows that it was not just the academic chair of mathematics that defined how this field could be played. Rosaeus succeeded in obtaining a very powerful patron, the family of Nassau, with his works on land surveying and astronomy, which without a doubt have a mathematical nature. The content of these books differed enormously from the works of Holwarda and Amama. Rosaeus did not succeed in holding the position he acquired through his powerful patron, but this was due to his indecent conduct. Interestingly he may have met Amama in the process, but that seems to be a process of coincidence, not of their occupation with math.

The case of Holwarda once again shows that a-historical categories of 'mathematics' do not help to understand the history of the field. He was a non-mathematician but maybe the most prominent mathematician after Metius. At the same time he did something similar to Fullenius by finding ways to embed mathematics (astronomy) into academic culture: by connecting it to cosmological and philosophical issues and debates. In this way he continued the 'Hfraneker' part of the legacy, and kept math at the international agenda of the Republic of Letters. These developments cannot be understood solely from within 'mathematics' – understood as an a-historical category - but only in terms of the reconfigurations of mathematics and philosophy of the middle seventeenth century. The case of Holwarda, and also later of Grau, shows that this reconfiguration can take various forms, and that theirs was more than a Cartesian or Galilean model, which is the main focal point for most historians of mathematics. According to Amama, Holwarda gave mathematics a central spot in his *philosophy*, or his system of understanding how the world functioned.

Holwarda showed that there was a place for certain parts of mathematics outside the world of the *idiotae* and outside that of the ordinary academic propaedeutic phase. He is even said to have argued that mathematics was essential for any study in philosophy. It is important to note that he used mathematics to enhance his academic career. This, however, does not mean that he was not interested in those forms of mathematics as well, as I will show in the following chapter. He was more than interested in all sorts of mathematics, and because he was so inquisitive he kept on attracting attention.


ΠΑΝΣΕΛΗΝΟΣ
Ἐκλειπτικὴ Διαυγάζουσα.
Id est
DISSERTATIO ASTRONOMICA
Quæ
Occasione ultimi Lunaris
Anni 1638 Deliquii
MANUDUCTIO
Sit ad Cognoscendum
I. Statum Astronomiæ, præsertim Lansbergianæ.
II. Novorum Phænomenωn Exortû & Interitum.
Autore
IOANNE PHOCYLIDE Holwarda.

FRANEKERÆ.
Typis Idzardi Alberti, ejusdemq; & Ioannis Fabiani Theuring, impensis. 1640.

Title page of Holwarda, Dissertatio. *Tresoar Leeuwarden.*


OHANNES PHOCYLIDES HOLWARDA LIB.
G: MED: DOCT: et ORD: PHILOSOPHIÆ PROFE

7. Holwarda's Legacy

7.1. Introduction

> 'There sets a Light, a new Star
> A Supreme Spirit at Franeker
> The farmers do not understand his name
> Yet he is sold to them all the same' [1]

Somewhere in 1644 Johannes Phocylides Holwarda had offended Petrus Baardt, one of Adriaan Metius' old students. The most likely way in which Holwarda may have done so was by writing and publishing an almanac of some kind.[2] We know this because Baardt wrote a clear refutation of Holwarda's work in the form of the above poem and he had this published in his own almanac for the following year.[3] With the first line he identified Holwarda through the reference to

« *Unknown artist,* Johannes Phocylides Holwarda (1618-1651).
Museum Martena, Franeker

* Parts of this chapter have previously been published as Dijkstra, 'A Wonderful Little'. I kindly thank LIT-verlag for letting me use it again.

[1] Petrus Baardt, *Almanach*, 1645, [4], ianuar. See Breuker, 'De betekenis van de Franeker academie', 160.
'Daer rijst een Licht, een nieuwe Ster,
Een Opper-Geest tot Franeker,
Wiens naem de Boeren niet verstaen,
Noch veylt men hem de Boeren aan'
The English translation is from Paul Carls, for which he owes my gratitute.

[2] My understanding of the Dutch almanac leans heavily on the praiseworthy study by Jeroen Salman, *Populair drukwerk*. In his first chapter he gives a thorough description and definition of this ephemeral print in Early Modern times: print that has a calendar as a fixed base is also always supplemented with texts of an informative and/or morally instructive and/or entertaining nature. ([D]rukwerk dat als vaste basis een kalender heeft, maar daarnaast altijd aanvullende teksten van informatieve en/of moreel-instructieve en/of diverterende aard bevat). See ibidem, 17. These almanacs appeared once a year and functioned as calendars for the year to come, therefore the dating is always one year off: the almanac for the year 1645 would have been published in the year 1644, but is dated on the title page as 1645.

[3] The poem is also cited by Philipus Breuker, who identifies the printer and bookseller Johannes Arcerius as the supreme light in Franeker. However, the first line is such a clear reference to Holwarda that I believe it leaves no doubt that he was the author Baardt has a go at. See Breuker, 'De betekenis van de Franeker academie', 160.

his 'New Star'. With the second line he mocked Holwarda, as it is in fact a jibe against the whole of academic society which may have consisted of Supreme Spirits – and Baardt was no longer part of it. The third line was a reference to Holwarda's posh name Phocylides. Lastly the farmers got a gentle slap on their fingers for buying something that this Supreme Spirit had produced. The short poem holds a lot of information that is otherwise unknown and which until now is not discussed in literature on Holwarda. That in 1644 Holwarda's work was already sold to farmers, for instance, points to unknown publications in the vernacular. All that has survived from his hand prior to 1644 are academic works in Latin. But information like this can only be extracted from the poem if it is read in a culturally specific context. To investigate the reception of Holwarda's work in a specific context is what I set out to do in this chapter.

Before I can start that approach, an important distinction needs to be made: the fact that Holwarda wrote books in the vernacular does not necessarily mean that he also taught his classes in that language. Just like the fact that Fullenius published one of Metius' treatises in the vernacular did not mean he had stopped working in Latin altogether. Holwarda's books in Dutch were aimed at an audience outside academia, and the only known examples handed down were even printed outside of Franeker. They may have been used by the *idiotae* and discussed by his fellow academics; however, they were aimed at an ordinary layman audience.

The aim of this chapter is to make a comparison between the academics and the *idiotae*, between those interested in Holwarda's scholarly work and those interested in his vernacular work. Holwarda's attractiveness to those two groups is best understood when a comparison between them is made. This is also a comparison that offers some highly interesting details. Holwarda exercised influence over the Frisian mathematical scene that for a large part functioned outside the walls of the University of Franeker. He also drew attention from the Republic of Letters, which obviously also existed far beyond the Frisian academy. To reach both groups Holwarda used quite different strategies. He aimed his *Dissertatio Astronomica* at the Republic of Letters, while his well read, but vernacular, publication the *Friesche sterrekonst* (*Frisian Astronomy*) was geared toward an audience of people who were not schooled in Latin. In this chapter I split up the reception of Holwarda's books along the lines of those two groups.

My approaches are quite different, because both stories are very divergent. This divergent character is why my research into each reception is quite different. An academic book will be commented on by scholars and other learned men. It shows up in their libraries and in their often published and even more often saved correspondences. The popular book is much less likely to be found in those collections of sources. The paper trail of both publications thus differs enormously. Therefore, I will apply an academic investigation into the *Dissertatio*, showing who read it, commented on it and ultimately refuted the ideas in it. My sources on the reception of the *Friesche Sterrekonst* are much more modest. I will therefore take an approach that can be categorized as 'a history of books', which that will offer a peak into the audience of this specific specimen.[4]

Before I present the results of those different approaches, I will start with the publications where the *Dissertatio* and the *Sterrekonst* more or less came together, the almanacs.

7.2. Popular and academic print

7.2.1. Almanacs

Both the *Dissertatio* and the *Sterrekonst* shared an important feature: they introduced and defended Copernicanism and the ideas of Johannes Kepler to a public that was rather new to it. The *Dissertatio* was one of the first academic publications that openly advocated these ideas, proving that Holwarda was one of the very first university professors to candidly and actively adhere to Copernicus and Kepler.[5] The second book introduced those ideas to a Dutch speaking audience. Holwarda was not the first to have referred to Copernicus in the vernacular, but his *Sterrekonst* gave a lengthy and comprehendible explanation, by a credible and trustworthy author: a university professor. He was one of the first to do so. The *Sterrekonst* appeared just ahead of the enormous polemic on Copernicanism that originated in Utrecht and would stir up the Dutch Republic from 1656 onwards.[6] The influence his book had on that pamphlet war is hard to assess, but it may have been large.[7] Long before 1656 Copernicanism was already discussed in almanacs, and in those same almanacs the reception of Holwarda's ideas was visible.

It was Petrus Baardt who discussed both Copernicanism and Holwarda's ideas. In an almanac written for 1639 and published in 1638 Petrus Baardt remarks on the idea that the sun is the centre of the

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[4] Darnton, 'What is the History of Books?'; my understanding of the practice of 'book history' is very much influenced by the work of and conversations with Djoeke van Netten, see Van Netten, *Koopman in kennis*, 14-19.

[5] See above; comp. Vermij, *The Calvinist*, 120. Holwarda's *Epitome astronomiae* was one of the first textbooks to do so.

[6] On this Velthuysen affair, see Vermij, *The Calvinist*, esp. chapter 13.

[7] Central in this is that Dirck Rembrandtz van Nierop's publications played an important role in the Velthuysen affair. His publications in turn were influenced by those of Holwarda. See below for a brief survey of that influence. On Van Nierop see Vermij, *The Calvinist*, 193-196.

universe.[8] Baardt states that some people in Friesland discuss the world systems. He explains that he tried to keep his almanacs from becoming part of a discussion like the one 'overly scholarly people' are having on the idea that the sun stands still and the earth moves.[9] These ideas were apparently widely debated in the Frisian academic world at the end of the 1630s, widely enough to make a reference to it in an almanac.[10] However, contrary to what he claims, Baardt would prove to be all too eager to lure his almanacs into academic discourse when he had the chance.

The paper trail of almanacs is very problematic. Some of them were printed in numbers that reached over 10.000, but because of the ephemeral nature of most editions not a single copy survives. During his life Baardt may have printed up to 19 yearly almanacs. Only from two years, 1639 and 1645, have copies survived.[11] This is especially sad, because Baardt often gives some unique background to the things he was witnessing himself; he was a *chroniqueur* of his time. The reference to Copernican ideas is an example of that, as is his little poem, quoted above, that was meant as a criticism of Holwarda. In the first place he claimed that he did not want to get involved in scholarly discussions. In the second place he launched an outright attack on a university professor.[12]

The poem was published in the almanac for 1645, which was accompanied by a prognostication.[13] That leaflet makes Baardt's

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[8] This may have been a first reference to Holwarda, who was advocating those ideas in his *Dissertatio* precisely around this time.

[9] ''[...] gedenckt men het nu so veel doenlijck is, te holden buyten sodanige dispuyten of de son sig beweegt ende het Aertreijck stille staet, dan of het ter contrarie is, naer 't gevoelen van eenige al te geleerde menschen', see Baardt, *Almanach* (1639), [2].

[10] Salman, *Populair drukwerk*, 93. It may be remarkable that Baardt also refrains from astrological comments, or, that he even mocks their possibility. For example, he gives no weather forecast for the whole year, but says that 'it will normally rain when the weather is wet and freezing starts when the cold comes' ('doch wilder yemant weten wanneer 't regenen sal, dat als gemeenlijck by vochtig Weer geschieden ende de vorst sal ordinaris met colde sijn aenvang nemen') see Baardt, *Almanach* (1639), [3]

[11] See Salman, 'Een descriptieve bibliografie'; a prognostication from Baardt's hand for the year 1630 also survives.

[12] In fact, this is an almanac of a different kind than the others that have survived from Baardt's hand, or that were printed under his name shortly after he died. This specific almanac was printed considerably smaller than those others.

[13] Traditionally a prognostication would be added to the almanac as a separate booklet, or to the first few pages of the almanac, and it would contain an actual forecast of the coming year, or sometimes stories that would amuse the buyer of the booklet, or inform them on current affairs. Baardt's prognostications never seem to have dealt with actual forecasting, but he would use them to give a political stance or, as in this case, his view on something that was more broadly discussed. Comp. Salman, *Populair drukwerk*, 74. How important these prognostications were has been convincingly argued by Robert Westman, 'Two cultures or one?' and more recently in his voluminous *The Copernican Question*.

eagerness to start a debate with Holwarda even clearer.[14] Traditionally, prognostications may have been astrological; yet Baardt avoided making predictions. The prognostication of 1645 is the only one by his hand that has survived, and it is a commentary on both his own almanac and on society. Yet, it is above all a fierce attack on Holwarda. It starts with Baardt's typical mocking and joking style:

> 'In the way of our dear ancestors, who have been lovers of the mathematical arts, it is with no less use that we can observe in this, our times, from some droll and remarkable heavenly signs, that the Heaven is on all its sides round.'[15]

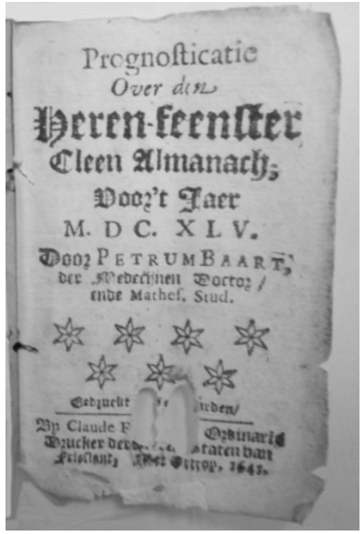
Baardt was a master of insults and with this joke he sets the perfect scene. It is constructed to offend Holwarda, whom he identifies as 'the rudest and bluntest master' (meester lompert plomert), or 'Le Duc de Phoca'. Before he turns his prognostication into a name-calling contest, Baardt makes sure that everybody knows he is talking about Phocylides Holwarda. He does so by adding a jibe against the first part of Holwarda's *Dissertatio*. This first part was a refutation of Lansbergen's moon tables. In the prognostication Baardt talks about 'hoge Landtsbergen', a pun, which means 'high mountains'. He then goes on to identify Holwarda definitively, and lays out the problem he had with this astronomer. In discussing the subject of his attacks, he says:

> '[He] furthermore tried to point out to the world a new Sun, a new Moon, new Planets, new Stars, new Quacks, new Almanacs, that before were known by no-one, that were never [unreadable], ever seen.'[16]

The new sun, moon, planets and stars are an exaggeration of Holwarda's New Star. The new almanacs are again a reference to the unwelcome competition Holwarda offered. Baardt's text then continues by describing how this 'Upper man' ends up in a 'shithouse' (kackhuys), where he loses his 'Letters, Diplomas, Books and Appendices'. These are again references to Holwarda and to his *Dissertatio*. After all, Holwarda had both a LAM and a doctorate in medicine, and he had published at least two books by 1644, of which his *Dissertatio* had a famous appendix. Unfortunately, it is unclear what Baardt is referring to with the 'letters',

[14] Because of the ephemeral nature of this very unknown text, it is added as appendix 1.
[15] See appendix 1 for the source, my translation.
[16] See appendix 1 for the source, my translation.

Baardt, Prognosticatie *(1644).*
Tresoar, Leeuwarden.


Prognosticatie
Over den
Heeren-Feenster
Cleen Almanach;
Voor't Jaer
M. DC. XLV.
Door PETRUM BAARDT,
der Medecijnen Doctor /
ende Mathes. Stud.

but it incites the possibility of the young professor corresponding with someone famous and bragging about it in the Franeker community.[17]

The main character of Baardt's prognostication, and the subject of his fury, ultimately turns to publishing almanacs.[18] It needs little imagination to conclude that according to Baardt these almanacs were no good at all. By publishing those 'new Almanacs', Holwarda had moved into Baardt's niche; with his libellous booklet, Baardt wanted him to pay the price for that. Interestingly, Holwarda and Baardt shared some important features; they were both doctors in medicine and practitioners of mathematics, and it seems safe to conclude that Holwarda had at least tried to establish himself on the almanac market.

Unfortunately, there are no known copies of any almanac that can be identified as written by Holwarda. However, several of his students can be identified as almanac writers. Nicolaus ab Amama turned to this market in the early 1650s, shortly before Holwarda died. A few years later another source points at the possibility that Holwarda's academic heirs used these almanacs to spread their own ideas and to discuss Copernicanism. In 1656, the Senate of the university clearly objected to the writing of almanacs, banning them from the press of the academic printer. The reasons they gave were that almanacs not only mocked the

[17] Was this correspondent possibly Hevelius? Holwarda did have contact with the Gdansk astronomer; they refer to each other in their works and Holwarda donated to the Franeker University Library, in fact, Hevelius' *Selenographia* after his death. Of course, there are numerous other famous astronomers that could be the possible correspondents of Holwarda.

[18] See appendix 1.

regents in both church and government, but they also agitated the common man with their unnatural depiction of the way the sun and the earth related to each other. Apparently the Franeker based academy printer had published (again) on Copernicanism in a common almanac.[19] This may have been a reaction to the discussion that was stirred up in Utrecht by the theologians at precisely that same time. It shows how easily these booklets adapted to new trends and currents, even if they came from academic discourse. It is also one of the best examples of the crossover Holwarda achieved. His *Dissertatio* was discussed in popular Frisian booklets, which happened to be a medium in which both he and his students were active as well.

7.2.2. *Dutch and European success for the* Dissertatio

Holwarda's *Dissertatio* was not just a success in Friesland. Soon it reached other circles of men who started looking at the phenomenon Holwarda had discovered. In Dutch academic circles the book was critically assessed almost upon publication. It was also discussed in the Hartlib Circle in England and Hevelius, who positioned himself as a successor to Tycho (as Metius had done), got hold of a copy. Holwarda's phenomenon became one of the most researched celestial objects of the time and his name always stayed closely connected to it.[20]

An intriguing question that surrounds the spread of Holwarda's ideas is how his book travelled through Europe. Within a few years most important astronomers seem to have gotten hold of a copy. Perhaps Antonides vander Linden, who had granted Holwarda his doctorate, was instrumental in this. Vander Linden had strong links with the Hartlib Circle in England. He arrived in Franeker in 1639, just when Holwarda was about to 'rediscover' his star. When the book appeared the following year, somebody sent a copy to England immediately. It was discussed by the Hartlib Circle as early as 1640.[21] If it was Vander Linden, he brokered Holwarda into the Hartlib Circle and granted Hartlib's men access to Holwarda's work.

It was in 1640 that John Twysden (1607-1688), a friend to Samuel Foster (ca. 1600-1652), handed a copy to John Wallis (1616-1703). From a letter Wallis sent to Hevelius in 1663, it seems that Holwarda's book

[19] Breuker, 'De betekenis van de Franeker academie', 160-161. Breuker offers the possibility that the text of this almanac has survived in an almanac printed more than 100 years later. This idea deserves a thorough investigation.

[20] Next to the aforementioned Ravensberg in Utrecht, the book was also discussed in a disputation defended under Antonius Deusing by Johannes Achterkercken, see Deusing, *De novis Stellis*, fol.B3ro.

[21] On the connection of Franeker and the Hartlib circle, especially between Van der Linden, Hamilton and Moriaen, two letters from 1650 by Hamilton are telling, see Hartlib, *The Hartlib Papers*, 9/11/27A and 9/11/25A. On Hamilton in Franeker see chapter 6 above.

came exactly in time, for at that time they were very keen on new celestial observations. The famous learned men in England had also seen the star in Cetus and were making their own assessments. Men like John Palmer (1612-1679) and the inevitable Jeremiah Horrocks were discussing their results with Wallis and others. All these astronomers and mathematicians probably took notice of Holwarda's little treatise, which provided a discussion and observations of the celestial event that had their interest.[22]

The most obvious connection between Franeker and the Hartlib Circle, however, may have been through the French monk and mathematician Marin Mersenne (1588-1648). Mersenne corresponded frequently with Philips Ernst Vegelin van Claerbergen (1613-1693), the secretary of the Frisian Stadtholders. It was Vegelin who kept the Hartlib Circle up to date on what was happening in Friesland from 1641 onwards. He did so mostly via Mersenne, and sometimes through a Theodorus Haak (1605-1609). Vegelin, however, only learned of Holwarda's treatise in 1642. He immediately brought it to Mersenne's attention and offered to have a copy sent to Paris. What the learned father's reaction was is unknown. Regardless, this particular case reveals how Holwarda was broadly discussed by various members of the Republic of Letters.[23]

How Hevelius first obtained a copy is not clear, but it is evident that he had gotten hold of one. His attention was arguably not just drawn towards the much-discussed second part of the book. It was more than probable that the first part of the book also caught his eye. Holwarda had written on the moon and on lunar tables, which was Hevelius' field of study at that time. He was preparing his much-praised *Selenographia*, which would be printed in the late 1640's. In this he made a first reference to Holwarda's little book.[24] In later writings, Hevelius came back to the wonderful star in Cetus, to which he dedicated a long section in his *Mercurius in sole visus* (1662). But this was not all the attention Hevelius gave to the matter. Apparently he started corresponding with several people on this star already in the early 1640's. One of these contacts was Holwarda himself. Another was Holwarda's colleague and old mentor Bernhardus Fullenius. The publication of *Mercurius in sole visus* marks the moment at which astronomers stopped seeing Mira as a

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[22] On all the men mentioned in this paragraph, see Wallis, *Correspondence*, 83-86; on them using Holwarda, see idem, 86. Horrocks published a treatise in 1639 on the passing of Venus through the sun, as observed from earth. This was printed in 1639, but it contains no mention of the star in Cetus, see Hevelius, *Mercurius in sole*.

[23] The link between Vegelin and the Hartlib Circle is established in Malcolm, 'Six Unknown Letters'; On Vegelin writing to Mersenne about Holwarda's book, see Mersenne, *Correspondence*, 114-115. There are some letters from this lot that have eluded the attention of historians until now. They will be discussed in the following part.

[24] Hevelius, *Selenographia*, 170. I mentioned above that Holwarda donated a copy of this book to the Franeker University Library.

phenomenon and started regarding it as a variable star. One could argue that it completed the process that had started with the publication of Holwarda's treatise.[25]

The contacts between Franeker and Gdansk seemed to have persisted. In the following chapters I will discuss in more detail the fact that in the 1670s Fullenius' son went to make observations with Hevelius and his wife. These contacts in turn brought the youngest Fullenius into contact with one of the famous Bernoulli brothers. That is just one example of how important it could be to correspond with important learned men. Of course, these contacts did not solely originate from Holwarda's book, but it did obviously play a role in introducing astronomers to each other. For example, the book was an excuse for Fullenius to start corresponding with Hevelius. The results of new observations were consequently something about which to keep the correspondence going.[26]

Ismaël Boulliau, who in the 1660s did some important work on Mira Ceti, also seems to have gotten hold of a copy of the book. He only got his copy sometime after 1644. This can be established from the following. In 1639, just a year prior to Holwarda's *Dissertatio*, Boulliau had published a book on Copernicanism.[27] Holwarda discussed that book in his *Dissertatio*. Concerning the place of the sun in the universe, he recognized in Boulliau a kindred spirit. Also, they both were admirers of Pierre Gassendi (1592-1655).[28] His praise for Boulliau's book is enormous: 'This is a man of exceptional cleverness and erudition in all branches of scholarship; he is not the lesser man of anybody, in my opinion.'[29] It was perhaps the best review Boulliau could have had. Yet, he does not seem to have known of it. For example, in December 1644 he was still complaining to Mersenne that he did not know how his book on Copernicanism was received. This is a strong indication that Boulliau had not read the *Dissertatio* extensively. By 1667 this had changed, and Boulliau used some of Holwarda's observations to recalculate the periodicity of Mira Ceti. Boulliau narrowed this down to 333 days, which was much more precise than the periodicity Hevelius had calculated

[25] Hevelius, *Mercurius in sole*, 140, ff.
[26] On the connection between Franeker and Gdansk, see Van Berkel, 'Wiskundige boeken', 86; on more connections between these two centres of astronomy see the following chapter.
[27] Because he was afraid of the possible consequences in his hometown of Paris, he had it printed in Amsterdam with Joan Blaeu (1596-1673).
[28] Galama, *Het wijsgerig onderwijs*, 100. Gassendi would be highly influential to Holwarda's atomism, see Galama, *Het wijsgerig onderwijs*, 100.
[29] On Holwarda's comments on Boulliau, see, Holwarda, *Dissertatio*, 260-261.

earlier. Precisely when Boulliau got hold of his copy of the *Dissertatio* is impossible to tell.[30]

The German Joachim Jungius (1587-1657) worked on Mira Ceti while he was a teacher at a German secondary school and he also seems to have known of Holwarda's *Dissertatio*. The Dutch scholar Isaac Vossius (1618-1689) owned a copy of the book. And as late as 1675, the English Astronomer Royal Flamsteed (1646-1719) mentioned Holwarda's book to the president of the Royal Society, Henry Oldenburg (1619-1677). It is safe to conclude that the book was widely read by all kinds of scholars and learned men.[31]

The *Dissertatio* did not just have a good reception in Franeker and Friesland. The mere fact that Twysden found it worthwhile to send it from London to Wallis can be seen as a token of this. But there are even more indications that Holwarda's work was well read at the time. Michael Langrenius (1598-1675), an astronomer of the Southern-Low Countries referred to Holwarda on his map of the moon. Langrenius was the first ever to create such a map and he named one of the craters on the moon after his colleague from Franeker. In his correspondence on his lunar map Langrenius explicitly stated that it might be best to name a good deal of the craters after 'noblemen' and 'learned men' from the Dutch Republic. He feared that if he neglected to do so, the Protestant Dutch would soon come up with their own maps, and Langrenius was eager to avoid this competition.[32]

As Baardt's mocking prognostication showed, the book was also discussed in publications that were not aimed strictly at academics. Incidentally he made clear that Holwarda's audience was wider than just academia and mathematical scholars. There are more indications to suggest this. For example, the seventeenth century Dutch historian and bon-vivant Lieuwe van Aitzema also mentions Holwarda's discovery of a new star.[33]

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[30] On Boulliau complaining about the attention his book received for its heliocentricity, see Robert Hatch http://web.clas.ufl.edu/users/rhatch/pages/11-ResearchProjects/boulliau/06rp-b-lttrs.htm (retrieved 12-03-2008); cited is a letter from Boulliau to Mersenne from 16 December 1644. The original is in the Bibliothèque Nationale in Paris, N.a.f. 6205, 228-231 [f 112r-113r, ad.v]; On Boulliau's oberservations of Mira see Boulliau, *Ad astronomos*.

[31] On Flamsteed and Henry Oldenburg, see Flamsteed, *Correspondence*, 412 and 417. It is a remarkable coincidence that Holwarda is mentioned in the same sentence as Horrocks.

[32] On Langrenius, see Van der Krogt, 'De Maankaart'. On Holwarda mentioned by Langrenius, see Holwarda, *Philosophia Naturalis*, 399-400; and Whitaker, *Mapping*, 196; Phocylides Holwarda's name is misspelled as Phorilidi. On the maker of the first moon map's motives in naming a few craters and 'lakes' after public figures in the Dutch Republic, see Puteanus, *Honderveertien*, passim.

[33] Van Aitzema, *Historie*, 809.

Holwarda's book was read by many people, acquiring some strong allies for the author in the process. Holwarda was often referred to in subsequent research on the phenomenon, including the observations, the calculations and the discussions that followed. But his explanations were not taken for granted. As he had done himself, others refuted his ideas. For example, Hevelius disproved the idea that Holwarda was the first to observe Mira Ceti. In the end, as Holwarda had tried to do to Lansbergen and Hortensius, he became a subject of discussion himself. Perhaps this was the best sign that his ideas had become part of the discussions that astronomers were having in the seventeenth century. [34]

7.3. Frisian Astronomy

7.3.1. The Frisian Light Extinguished

Holwarda lived through most of the success of the *Dissertatio* and meanwhile he started publishing almanacs and university textbooks. In the early 1650s he had another book in preparation in which all these features would be brought together. It was a handbook on astronomy in the vernacular, in which Holwarda introduced new ideas and the results of his own astronomical research: *Friesche Sterrekonst* (*Frisian astronomy*). However, before the publishing process was fully finished, he fell ill of tuberculosis and he knew that his final hour was fast approaching.[35] It may have been his experience as a medical doctor that told him this. In December 1650 he made a last dramatic showing in church, where he enjoyed the protestant Eucharist celebration for a last time.[36]

In a tragic document of Phocylides' own hand, one of the very few manuscripts that survive from him, he describes his personal woes. Holwarda, who had been so successful in his professional life, met blow upon blow in his personal life. The document lists the time, date and place of birth for himself as well as for his wife Marijcke Piebinga, his marriage, his four sons and his sole daughter, Elisabetha (1646-1687). All the boys died within a year of their birth and their deaths are also chronicled. Where Holwarda's hand stops, that of his wife takes over. In a beautifully crafted handwriting, she gives the date of Holwarda's death, January 22 1651. After this, more than thirty-six years later, the death of Elisbetha on January 29 1687 is recorded, again by the hand of the mother (but in a completely different style of writing). Three years later

[34] Without a doubt the most famous ally Holwarda would get was Hevelius, although the Gdansk astronomer was ultimately also the one who would reveal that Holwarda in fact did *not* discover Mira Ceti, see Hevelius, *Mercurius in sole*.

[35] See Schippers, 'Johannes Phocylides Holwarda', 15; comp. Galama, *Het wijsgerig onderwijs*, 91; and Buma, 'Parentatio', 12.

[36] Galama, *Het wijsgerig onderwijs*, 94.

on October 27 1690 the mother would die, which is also recorded on the same piece of paper by one of her cousins. Within half a century, Holwarda's family line had died out. By that time, Holwarda's name had become a thing of the past.

At the time that Holwarda was ill, but still working on his family genealogy, late 1650 or early 1651, he was also taking care of his intellectual heritage, which most notably took the form of his *Friesche Sterrekonst*. It was supposed to be a manual for shippers and navigators and probably expected to sell in high numbers. Interestingly, Holwarda included all kinds of new astronomical research.[37] He advocated the Copernican theory, presented proof for Kepler's theories and he gave some of his most modern views. Most astonishingly, he did so in a fashion that was accessible for laymen. Phocylides never saw his ambitious project finished. When he died he had seen the printing process of just the first part completed, and of that edition only a single copy survives. It was Nicolaus ab Amama who would edit the remainder of the book and reissue the first part in the process. However, the single copy of that first edition has a lot to tell.

When Amama reissued the book, he wrote a new dedication, replacing the one Holwarda had written (and printed) introducing the first edition. This was not a normal procedure; ordinarily the dedication was not even altered when a book was reprinted, even if that was done centuries after the first print and in a completely different setting.[38] The act by a dedicatee to accept a work was called 'toe eigenen', which can be translated as 'claiming'. It meant that they actually *owned* the book. A new edition or print of a book would therefore almost always contain the original dedication. Even pirated copies had these letters printed![39] This, of course, is an argument that Holwarda's first print never reached his dedicatee, and that Amama had good reasons to change Holwarda's preface.

Holwarda had dedicated his book to the Frisian Stadtholder Willem Frederik van Nassau. He had written a down to earth dedication that explained why he had decided to publish the book and in which he gave a short summary of the book. The main point Holwarda stressed was the usefulness of his book. According to him almost everybody could benefit from it; he literally says thousands will benefit from his works. The one central theme at the heart of his introduction is that this usefulness will be to the advantage of the entire commonwealth of the Dutch Republic,

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[37] See appendix 1.

[38] Although I know of no in-depth studies on the practice of reprinting dedications, I have seen enough examples to warrant this conclusion. Metius reprinted his dedications whenever he clearly reprinted a book, only when he altered the main text would he 'rededicate' the book.

[39] See Metius, *Eeuwighe handt-calendier* (1627; and 1628).

or ‘Nederlandtsche Natie’.[40] Holwarda stresses that the central language in his book is Dutch, because he wants to reach as many people as possible. He says: ‘[t]o strengthen this ambition further, [...] I have written this Frisian Astronomy in our Nether-Dutch language’.[41] The dedication was dated January 1650.

In the summer of that year the Stadtholder of Holland, Willem II (1626-1650), together with his brother-in-law and cousin, Willem Frederik laid siege to Amsterdam in an attempt to gain full control over the Dutch Republic. This attack put all political relations in the United Provinces under high tension. Things eased up a little when Willem II died in November. Because his living heir, Willem III, was only weeks old, all eyes were on Willem Frederik. A dedication focussing on the strength of the commonwealth may not have been welcome at the time. Perhaps this caused Amama to slightly alter the dedicatee and to completely alter the letter of dedication.[42]

Of course Amama had more reasons to do so. As we have already seen, he was in trouble because of accusations regarding the book theft. By 1651 he had also been accused of slandering the daughter of a professor in an almanac.[43] As if this was not enough, he had taken on (or was about to take on) what seemed to be the entire academic community with his new *Disertationum*, in which he advocated new ideas that went directly against those of the staunch Franeker community.[44] These two points, judicial problems and philosophical modernity, are both reflected in what Amama did to the introduction of the *Friesche Sterrekonst*.

Beginning with the dedicatee, Amama changed the dedication from directed toward Willem Frederik, to directed toward Willem Frederik and the Deputy States of Friesland, as well as toward the financial governmental board of the province.[45] Holwarda's original dedication overly stresses the usefulness of the book, while Amama's new dedication reflects the reality of the political situation at the time. At a time when there was a struggle for power in the Dutch Republic, it may have been wise to ask for support from both the aristocracy and the regents (who were standing eye to eye in Holland). Next to that, it seems

[40] Holwarda, *Friesche Sterrekonst* (1650), fol.*2verso.

[41] ‘Om dan desen yver meerder te verstercken, [...] heb ick dese Friesche-Sterre-Konst in onse eygene Nederduytsche spraecke voor-gestelt.’; see Holwarda, *Friesche Sterrekonst* (1650), fol.*2verso.

[42] The introduction by Amama has attracted the attention of some historians over time, all of which seem to have missed that Amama deviated from the original dedication. Galama, *Het wijsgerig onderwijs*, 96; Van Bunge, ‘Philosophy’, 314; and Van Ruler, ‘Amama’.

[43] The so called ‘reekenmeesters’ not to be confused with an ordinary *reekenmeester* (arithmetic master) like the below mentioned Dirck Rembrandtz van Nierop.

[44] See also what Van Ruler says about this in his, ‘Amama’.

[45] AUF, inv.no. 17 ‘Diarium actorum’, 87; See also: Nienes, *De archieven*, 200.

unlikely that Willem Frederik would himself have had much time for the case of Amama, who had gotten himself into a lot of difficulties. The Deputies, however, may well have had more time to give to the Frisian boy.

There are more apparent changes that were made by Amama. He completely altered the tone and focus of the introduction, almost doubling its size. In this new dedication, Amama points at the importance of mathematics. As quoted above, he talks about how he had often heard from Holwarda that 'No one who recklessly rejects the mathematical arts can be considered a philosopher, but rather a sophist'.[46] It is almost as if Ramus himself is speaking to the reader. Furthermore, while Holwarda had stressed the important usefulness of his work, Amama argued that mathematics was of even more importance because mathematics was something that 'all men who were enlightened by God' practiced.[47] From there he moved on to show that scholastics had always worked against those who loved mathematics. Ultimately Amama claimed that this was due to the un-Christian and pagan roots of that way of philosophising: due to their 'idol', Aristotle, they sought wisdom from the wrong authors.[48] It was this way of thinking that was a danger to all of Christianity, Amama argued, concluding with a thrust aimed at the Aristotelians, saying, '[...]Christians should live Christian-like, that is wiser and more perfect.'[49] Clearly Amama was not trying to make friends at the academy.[50]

The book itself was probably one of the best Dutch textbooks on astronomy printed at the time it first appeared. The first part of the book deals with stars and star signs, and strongly recalled the start of Holwarda's career. It is clear that Holwarda had made extensive observations for his book with measuring and surveying instruments, as well as with the use of the telescope. Holwarda offers a method to practice his astronomy through the use of circles and triangles (trigonometry: 'the pearl of all sciences'). Important are the many calculation examples he gives, turning the book into a proper textbook.

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[46] Holwarda, *Friesche Sterrekonst* (1652), fol.*2verso: 'Niemandt is voor een Philosooph te achten, maar voor een Sophist, die de Mathematische Konsten reuckeloos verwerpet'.
[47] Holwarda, *Friesche Sterrekonst* (1652), fol.*3verso. 'van Godt verlichte mannen'.
[48] Amama is also clear on where to find true and good knowledge, with his friends Socrates and Plato. See Holwarda, *Friesche Sterrekonst* (1652), fol.*4verso-*5verso.
[49] Holwarda, *Friesche Sterrekonst* (1652), fol.*5verso. '[...] Christenen behooren Christelijck, dat is wijser ende volmaeckter, te leven.'
[50] It may also have been directed at Vander Linden, who was a known critic of Descartes and a defender of Galenus, except Vander Linden had left Franeker only weeks after Holwarda died. See, Napjus, *De hoogleraren*, 50-68, esp. 55, see als: Engels, *Franeker folianten*, 21. See above.

The second part of the book contains ways to calculate the true and the apparent motion of the stars. It contains many tables and detailed descriptions on how to use the tables. This part also contains tables on how to interpret the declination of the compass and how to use it for navigation. The book is, as his previous Latin textbooks had been, a continuation of Metius' tradition, with the difference being that Holwarda did incorporate all sorts of new and philosophically modern material. It is, for example, the first textbook in the Dutch language to defend Copernicanism, but the book was also a milestone for its reception of Kepler's ideas. This drew the attention of the *rekenmeester* (arithmetic master), Dirck Rembrandtz Van Nierop (1610-1682), who lauded Holwarda with praise for these accomplishments. He wrote an addendum to the book, which is often seen as an integral part of it.[51]

Amama kept the first and foremost beneficiary of this posthumous edition in mind, Holwarda's widow. As was clear when Holwarda himself published his *Dissertatio*, it was important for a widow to get the attention of the Frisian administration. This helped them gain financial security for the years to come. Holwarda's wife would have been fully aware of this when the book was published. Amama also knew how important this could be; only five years later, in 1656, his brother would republish a book written by their father.[52] Another important achievement of both Amama and Holwarda cannot go unnoticed: in 1651 Amama published the posthumous philosophical works of his teacher. This *Philosophia naturalis seu physica vetus nova* established Holwarda as one of the most outspoken adherents of the 'philosophia novantiqua'.[53] After this Amama continued publishing, possibly for financial gain, but those publications only seem to have gotten him into trouble once again.

7.3.2. *The Frisian Astronomy revisited*

There were four different editions of the *Friesche Sterrekonst*, although there had only been one print. The first part of the book was printed in 1650, when Holwarda was still alive. The second part of the book was printed between 1650 and 1652. The book was most likely printed in Harlingen, the main port town of Friesland. This is surprising, since Harlingen did not have a proper printing press until the late 1640s. In

[51] For a more detailed (but somewhat odd) summary of the book, see Terpstra, *De Friesche sterrekonst*, 71-74.
[52] Amama, *Anti-barbarus biblicus* (1656), 784(!).
[53] Galama, *Het wijsgerig onderwijs*, 96-100; see also Van Ruler, 'Holwarda'. The book Amama published also contained Holwarda's inaugural lecture of 1647 and his *Eulogy* by Buma, see Holwarda, *Philosophia*.

fact the *Sterrekonst* probably is the first complete book that was printed there.[54]

Until this book, Holwarda had all his work printed on the Franeker press. An edition of Sebastiaan Franck's (1499-ca. 1543) famous *Weltbuch*, which Holwarda translated and introduced, appeared in 1649 with the Bolsward publisher Samuel van Haringhouck, but that too was actually printed in Franeker. Van Haringhouck pretended to have his books published in his hometown by printing this on the title page of his books, but an analysis of the actual print letters shows that he had them made in Franeker. For example, Focco Johannes, Holwarda's father, had a series of sermons printed and published by Van Haringhouck in 1648. This book was also issued as a separate edition in Franeker by Idsardus Alberti, who until then was the publisher of all of Holwarda's work. A comparison between the two books shows that both books are of the same print, only the title page differs. The press on which it was printed was clearly the same Alberti used in Franeker.[55] Incidentally, it was the same press on which Holwarda had his edition of Sebastiaan Franck's *Weltbuch* published.

In publishing the *Sterrekonst*, Holwarda set several precedents. He left Franeker and went to another Frisian town to find a printer: Harlingen. He was one of the first academics to have an important publication printed outside Franeker or Leeuwarden. The book also marks the beginning of a small enterprise of navigational handbooks to be printed in Harlingen. This is not only because the *Sterrekonst* should be considered as a handbook on navigation, but also because several other handbooks of the same genre would follow.[56] The Holland based author Dirck Rembrandtz Van Nierop was especially instrumental in this enterprise.[57] In Harlingen he published an appendix to the *Friesche Sterrekonst*. This appendix consists of several astronomical and mathematical tables and his own *Nederduytsche astronomia* (*Dutch*

[54] The STCN gives some twenty publications in Harlingen prior to the *Sterrekonst*. Most of these are either the sixteenth century Biestkens Bible, which (if printed in Harlingen) has virtually nothing to do with the seventeenth century printing practice. The rest are pamphlets and ephemeral publications, which may have been printed in Harlingen but cannot be seen as proper books. The Kalma-Eisma system at Tresoar gives a few titles that do not appear in the STCN (among which a book called *Letterkonst* which I was unable to trace and could therefore not examine). Even if they were printed in Harlingen, the *Friesche Sterrekonst* would still be one of the first proper publications to come from port town.

[55] Johannes, *Proef-praedicatien*. I have looked at three different copies of this book, all of which are currently in Tresoar in Leeuwarden. The Van Harinhouck edition has shelf mark B 257, the Alberti edition has shelf mark B16847.

[56] They are traced most easily via the STCN, although a search through the Kalma-Eisma system is also helpful.

[57] On Van Nierop, see Vermij, *The Calvinist*, 193-196; see also Smit, *Dirck Rembrandtsz van Nierop*. A good biography is greatly desired.


FRIESCHE
STERRE-KONST.
Vervatende, in twee Deelen,
Een kort, doch volmaeckt begrijp
der gantscher
ASTRONOMIA,
met de Nuttigheden van dien.
Beschreven, ende uyt eygene fondamenten en speculatien uyt-gewerckt,
DOOR
JOH. PHOCYLIDES HOLWARDA,
Medecinæ Doctor, en Philosophiæ Professor, &c.
Te HARLINGEN,
Gedruckt by HENDRICK JANSZ, woonende aen de Voor-straet, 1650.

Title page of the extremely rare 1st issue of Holwarda, Friesche sterrekonst. *Tresoar, Leeuwarden.*

Astronomy). The latter of these documents, whose title is more than a jibe at the '*Frisian astronomy*', is more or less laudatory of Holwarda's book. To fully grasp this, it may be enough to look at the very first pages of the book. They do not just reveal the 'preface history', but also give a good indication of the tradition the content of the book can be placed in.

To do this properly it is essential to list the order in which the different editions were published and in which Van Nierop's appendix was published.

1650	*De Friesche Sterrekonst*; the first, and unfinished edition is published under Holwarda's supervision, by Hendrick Jansz in Harlingen.
1651-1652	*De Friesche Sterrekonst*; Amama's edition appeared, also in Harlingen.
1653	*Nederduytsche astronomia*; Van Nierop's astronomy is published, by the same publisher.
1654	*Een kort by-voeghsel op de Friesche sterre-konst*; by Van Nierop and according to him, it was necessary to have the full benefit of the *Sterrekonst*.
1658	*Nederduytsche astronomia*; a new edition is printed and published by Gerrit van Goedesbergen in Amsterdam.

1660	*Een kort by-voeghsel* reprinted, again published by Jan Schouwenburgh.
1663	*De Friesche Sterrekonst*; reissued by Hero Galama
1668	*De Friesche Sterrekonst*; Hero Galama reissued the book for a second time.

There are two things that this short list immediately reveals. Firstly that Van Nierop's *Nederduytsche astronomia* seemed to be sold out much faster than Holwarda's *Friesche Sterrekonst*. Of course, this fact by itself does not say very much, since figures on the number of copies that were printed are completely absent. Secondly Van Nierop's *by-voeghsel*, or appendix, also sold out quite fast, which required a second print. It seems safe to conclude that the printer had learned from his massive first edition of Holwarda's work. Apparently he got stuck with a large back-list and he approached his new ventures much more cautiously.

This, inevitably, leads to a somewhat painful conclusion.[58] The fact that the *Friesche Sterrekonst* had more than one edition is not a sign of its success, as has been assumed in the literature thus far. It is rather a sign of a failure of selling the stock. It was not necessarily a bestseller, but more probably a slow runner. The publishers had to think up all sorts of marketing tools to have the book sold, like the reissuing and the printing of an appendix. That the publisher learned from this and downsized his numbers of future publications can be concluded from the fact that those publications (like Van Nierop's *by-voeghsel*) were probably printed in smaller numbers. Although it was not uncommon to print mathematical books in high numbers, as was already clear from Metius' *Institutionum* of 1608, that can only partly explain the long selling run of the *Sterrekonst*. It thus seems probable that the printer (and perhaps Holwarda himself) overestimated the demand of the book. The book's several editions can then be partly attributed to the inexperience of the printer. It is impossible to say which of the two reasons was most important. But whichever it was, it is clear that the mere publication of the *Sterrekonst* says nothing about Holwarda turning Franeker into a centre of layman astronomy.[59]

However, there is more to it than just numbers, or, perhaps, it is the numbers that reveal the other side of this story. The book consisted primarily of many tables depicting all sorts of astronomical data that

[58] The book has always been one of the classics in Frisian history. This ultimately culminated into H. Terpstra's book with the title *Friesche sterrekonst*.

[59] Terpstra, *Friesche sterrekonst*, 12 and also 74. On page 12 Terpstra is most explicit when he writes: 'In de tweede plaats is deze titel (of the book) gekozen uit waardering voor het voortreffelijke werk van Joh. Phocylides Holwarda, waarmede hij de popularisering van de sterrenkunde in Friesland in sterke mate heeft bevorderd en ter gedachtenis aan deze jonge, vroeg gestorven, natuuronderzoeker.'

Portrait of Holwarda, which is often bound together with his Friesche sterrekonst. *Tresoar, Leeuwarden.*

Holwarda had collected over the years (and probably data he had 'borrowed' from Metius).[60] Overall these tables were of such high quality that they prompted Van Nierop, who can be seen as one of the most able Dutch astronomers of the second half of the 17^{th} century, to write his *by-voeghsel*. It was not just the appendix that shows how much Van Nierop valued his predecessor. His own *Astronomia* is perhaps the best example to tell this story.

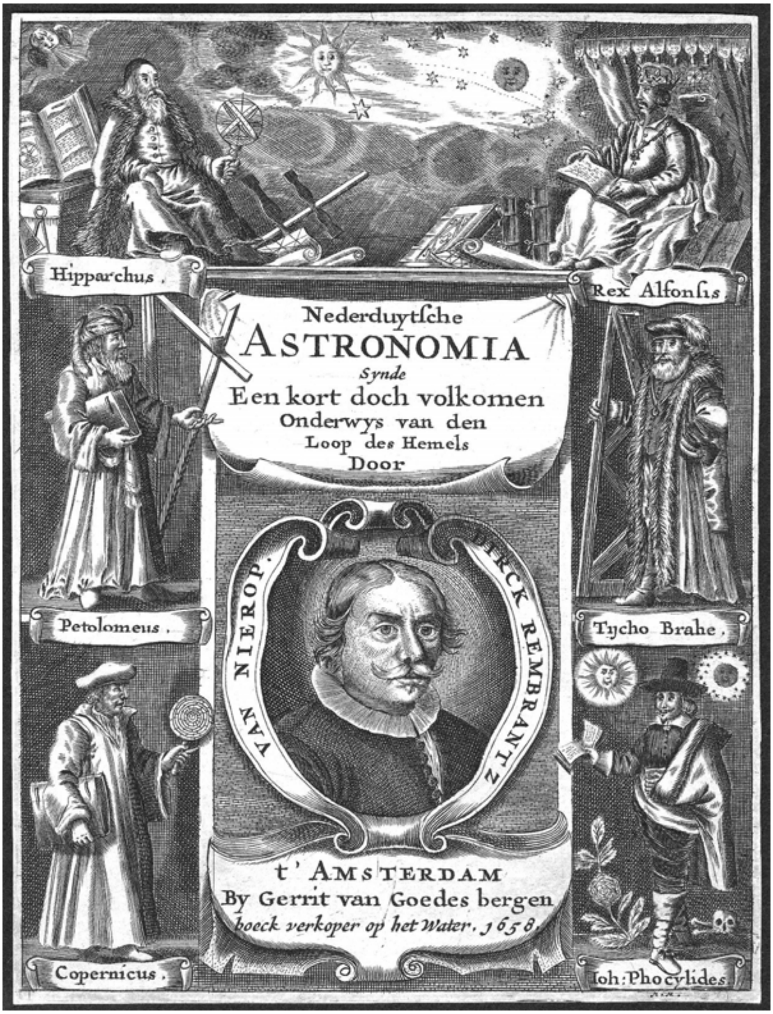
The frontispiece of that handbook on astronomy depicts Van Nierop surrounded by the great names in the history of astronomy. This frontispiece recalls the title pages of two books on astronomy that originated in Friesland: the *Tabulae Frisicae* by Mulerius (1611) and the *Primum mobile* (1631) by Metius. Mulerius' book had simply shown the great astronomers: Hipparchus (ca. 190 BC-ca. 120 BC), Ptolemy (ca. 90-ca. 168), Alfonso the Wise (1221-1284), Tycho Brahe and Nicolaas Copernicus, all of whom hold an instrument or a book that had been vital for their practice of astronomy in their hands. For example, Alfonso holds the tables that were dedicated to him and Copernicus shows a

[60] See also Vermij, *The Calvinist*, 129.

Title page of Metius, Primum Mobile.
Tresoar, Leeuwarden.

model of the universe on which the earth orbits the sun. Some twenty years later Metius' book had a very similar title page printed, with one addition: in the middle, between these famous astronomers, Metius himself was depicted as the writer of the book.[61] The friends Mulerius and Metius both showed how they, as true humanists, were part of the long tradition of astronomers.[62]

[61] For an in-depth analysis of these title pages, see Remmert, *Widmung*, esp. chapter 6.
[62] Interestingly Metius' widow donated this book to the university library when he died in 1635. That copy was, of course, stolen by the 'sacrilega manus' in 1648 and never returned.



Title page of Van Nierop, Nederduytsche Astronomia.
Scheepvaartmuseum, Amsterdam.

Obviously Van Nierop, or his publisher, was familiar with these frontispieces.[63] But when Van Nierop had his own portrait surrounded by these famous astronomers, Metius was removed and another character was added: Johannes Phocylides Holwarda. The other

In the 1990s the Provincial Library (heir to the University Library of Franeker and predecessor of Tresoar) acquired a copy of this book through a donation from a Mexican medical doctor. The donation was brokered by Arjen van der Sluis. http://home.wanadoo.nl/m.bourgonjen/Descartes/Eekhoff.htm (retrieved 03-05-2011).

[63] Lansbergen also had himself depicted in a similar fashion, see Remmert, *Widmung*, 174. Remmert also provides an analysis of these sorts of images.

astronomers all kept their known instruments, and Holwarda held a book (presumably his *Sterrekonst*), a rose, skull, and the sun and the moon. The exact same attributes were also depicted on a portrait that was sold together with the *Friesche Sterrekonst*.[64] Van Nierop would live almost until the end of the century. He was to publish numerous almanacs, handbooks, tables and other material.[65] His handbooks played important parts in the reception of Copernican and Cartesian ideas in the Dutch Republic.[66] This specific frontispiece makes clear that Holwarda was an essential element of Van Nierop's astronomy. Through his book in the vernacular, Holwarda had briefly received a spot among the greatest astronomers known in history.[67]

7.4. Amama's death

What happened to Amama in the meantime? He entered the almanac market with a libellous almanac. In his almanac for 1651 he insulted a professor's widow and her daughter. This, along with the earlier accusations of theft, and possibly one or two instances of violent behaviour, got him into a lot of trouble with the Senatus Judicialis. But when the professor's widow wanted to have his almanacs burned, the Franeker Senate felt that went too far.[68] However, when they themselves became the subject of his malign, they confiscated his goods, imprisoned him and ultimately banned him from university in 1653. Amama, who would have known how hopeless his situation had become, sought refuge with the city government. This created a conflict of jurisdiction over Amama, who was both a citizen of academia as well as a Franeker civilian. The case was eventually taken to the Court of Friesland, the highest judicial institution to turn to.[69] This time, however, Amama did not escape a due penalty. He was banned for 'a few days' from Franeker and stripped of all academic honours by the Franeker Senate, which meant that all of his academic achievements were nullified. However, his city did not abandon him completely. The burgomasters of Franeker negotiated a deal that allowed him to be re-admitted to the university and to re-start his studies immediately following his banishment.[70] This

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[64] For another example of how these images were used, see Vermij, *The Calvinist*, 232. I am very grateful to Tim Nicolaije who directed my attention to this frontispiece.

[65] Smit, *Dirck Rembrandtsz van Nierop*.

[66] Vermij, *The Calvinist*, 193-200.

[67] Lieuwe Willemsz Graaf, who will be discussed in chapter 10 below, quite probably also owned a copy of Holwarda's Friesche Sterrekonst.

[68] Salman, *Populair drukwerk*, 293.

[69] AUF, inv.no. 55 'Stukken inzake het geschil'; see also Telting, *Regsiter*, no.102; Sannes, 'De schoolmeesters', 212.

[70] These burgomasters were Agge Eijtses and Folkert Jensma. They were accompanied by Van Ghemmenich (a usual member of the college of burgomasters). See AUF inv.no. 55 'Stukken inzake het geschil', especially the page listed as no. C.

happened, but it made for some embarrassing scenes when Amama literally had to start from scratch. In 1654 he was forced to enrol in a course on logic that he had already taken in the 1640s. His teacher, inevitably 'Father' Arnoldus Verhel, did not refrain from having the disputations defended by Amama printed.[71]

In 1655 things once again took a turn for the worse. That year Amama was indicted for slanderous language toward the Academic Senate, again in an almanac.[72] This time the consequences were definitive: Amama was forced to leave the university permanently. He showed up in Britsum, a small village just north of Leeuwarden, as a tutor to the young Menno van Coehoorn (1641-1704).[73] Although he tried to come back to Franeker as a Latin School teacher, this did not succeed. In the process he gave one last glance at his life: he wrote one of the very few application letters that have survived from the seventeenth century, no doubt breaking numerous social conventions in the process. Claes Amama died prematurely in 1656 from the plague.[74]

7.5. Conclusion

Holwarda's most important work as an academic was no doubt his *Dissertatio*. It was this book that made his name in the Republic of Letters. Numerous different scholars and astronomers from all over Europe got hold of copies, discussed the ideas and ultimately refuted Holwarda's discovery. In the past, historians have somewhat regretted these refutations. Perhaps, if the greatness of the human mind is under debate, it may be regrettable. This debate and the ultimate refutation can, however, also be seen as proof that Holwarda was on par with all those who wanted to know about his ideas and talk about his findings. If the culture in which Holwarda worked is the subject of study, the refutation is not regrettable. Rather, the refutation serves as one of the best examples of how the international scholarly networks functioned.

Holwarda's most-printed work was without a doubt his *Sterrekonst*, a book in the vernacular that was still reissued two decades after his death.

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[71] *Auditorium*, 34/1654.1a

[72] Wierda states the following on Amama's return: 'De Acta zwijgen over het vervolg, maar uit het feit dat Amama in 1655 werd vervolgd wegens het uitgeven van de almanak voor 1655 en het laten drukken van lastertaal over de Senaat kan worden geconcludeerd dat hij toen nog steeds althans in de nabijheid verkeerde van de Franeker universiteit', in her *Armamentarium*, 19. The Acta are far from silent on Amama's return to university. In May of that year he appeared before the Senatus Judicialis. See AUF, inv.no. 17 'Diarium actorum', 171; comp. Nienes, *De archieven*, 85.

[73] Menno van Coehoorn would grow up to be one of the most famous fortification engineers of the seventeenth century. He was a nephew to Bernhardus Fullenius senior and thus a full cousin to Bernhardus junior, who would accompany him on his journeys along fortifications. See the following part for more details.

[74] Van Tuinen, 'Pallas en Mercurius', 180 and 190, where the entire letter is cited.

Since Holwarda was discussed by Baardt in his almanacs, Holwarda's ideas were arguably well spread among many layers of society. Unfortunately, few of these almanacs have survived. A lot is thus unknown about both the *Sterrekonst* and the almanacs in Friesland, even though both have been studied by historians. What a closer look reveals is that mathematics at the university trickled down to a segment of society that is not always traditionally linked with *academia*. Baardt, Holwarda and his students, like Amama, were all members of two worlds, on the one hand of the university and on the other of society at large.

Holwarda made some important contributions to larger discussions in the Dutch Republic, contributions that have gone largely unaccredited. That is best shown by the fact that Van Nierop used Holwarda's ideas for his own works. In turn, Van Nierop is also a mathematician whose contributions have not always been acknowledged. All of this is of importance in understanding how mathematics was used and practiced at the University of Franeker in the middle of the seventeenth century. It is also a fresh reminder of the important place the *Sterrekonst* took in the larger history of the Dutch Republic. The book was a typical product of the University of Franeker, yet if it is discussed in studies that take a general look at the history of science, it is a typical product of the Holland school of mathematicians. Such an analysis does not do justice to the setting in which this book was first assembled.

This last chapter has shown that Holwarda was also keen on what there was to gain outside the walls of the university. The ever-ambitious academic, Holwarda sought a market for his ideas in both the Republic of Letters and in the world of vernacular textbooks. This is what separated him most from Metius, who had designed his publications strictly along pedagogical lines. This is also what separated Holwarda from Fullenius, who also seems to have shaped his entire career along educational purposes. The professors were teachers, but the university also offered a space for other mathematicians. That was a lesson those professors could learn from Holwarda.

As we have seen in the previous chapters, Holwarda and Fullenius reshaped the field of mathematics by proceeding down different paths. Fullenius continued to teach, as was required of him, while Holwarda was more innovative and adventurous. This was a pretext for some of the troubles Amama got himself into; his philosophical extravagances were indebted to Holwarda's ideas, and it was those ideas that lay at the base of his troubles. At the same time, Rosaeus showed other possibilities when he took a more sturdy approach. All three, Holwarda, Amama and

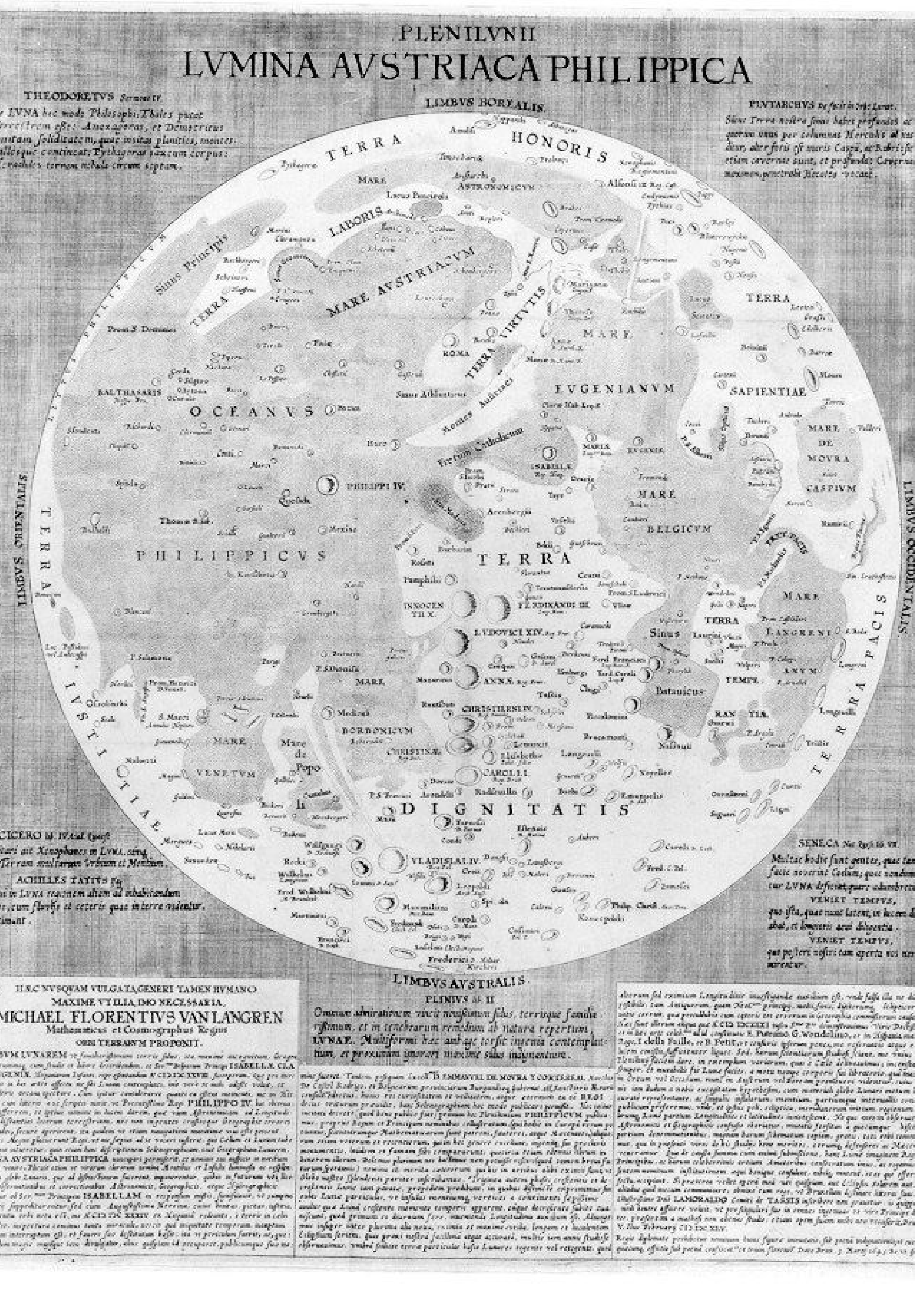
Rosaeus, had sought to valorise their ideas (which were at least partly based on their mathematical expertise) within the walls of the university.

Together, Holwarda, Rosaeus and Amama show that there were multiple roads to 'mathematics': via logic and natural philosophy, via court fashioning, and via being a career academic. In other words, Early Modern 'mathematics' did not have strict boundaries; it was a porous domain. Finally, the most famous Franeker textbook in astronomy, which will be discussed in the next chapter, was published by a professor in (natural) philosophy. This transgression of boundaries much resembles Holwarda's appointment as a professor in Logic, which was based upon the publication of his famous *Dissertatio*.

Meanwhile, the university came in very fast waters. It was growing at an unprecedented rate and attracted ever more students from all over Europe. This not only spurred a modernization of its buildings, but it also gave ground to an implicit definition of who precisely was an academic. Students who could *not* write and read Latin were *not* academics. Yet, these *idiotae* kept coming to Franeker, even after they lost their academic privileges. Mathematics and the laymen had come to stay at the university. It was publications by Holwarda – who else? – that made the combination of *academia* and *idiotae* once again very clear. Around 1640 his ideas were hotly debated at the university; in almanacs his fame was discussed in a similar fashion around the same time. He would continue influencing how mathematics was practiced in Franeker, even becoming a proper 'local hero'. This can easily be established, for example, in the archives of the university where the sextant, which was designed and commissioned by Metius, can be found listed as 'has been used by the famous Phocylides Holwarda'.[75] In local historiography, Holwarda surpassed his predecessor.

Lunar map by Van Langren, on which a 'lake' is named after Holwarda (although his name is miss-spelled). University Library Leiden. »

[75] This listing was made around 1760. The instrument is accidentally taken to be an octant, rather than a sextant. The very nature of this 'poor mans sextant' probably made it hard to distinguish between an 'octant' and a 'sextant', since these astronomical instruments looked a lot alike. Beyond that, by the time this listing was made, the name 'sextant' had become common for a completely different instrument, the hand held device used for navigation we still know today. The full listing reads: 'Octans Astronomicus quo celebris Phocylides Holwarda usus fuisse videtur, in gradus et minuta divisus.' The fact that no sextant was listed and that the division between degrees and minutes is mentioned leaves little reason to doubt that this was indeed Metius' and not Holwarda's sextant. See AUF, inv.no. 1 'Register', 341.


PLENILVNII
LVMINA AVSTRIACA PHILIPPICA
LIMBVS BOREALIS
LIMBVS AVSTRALIS
LIMBVS ORIENTALIS
LIMBVS OCCIDENTALIS
TERRA HONORIS
MARE ASTRONOMICVM
LABORIS
MARE AVSTRIACVM
Sinus Principis
TERRA
TERRA VIRTVTIS
MARE EVGENIANVM
TERRA SAPIENTIAE
MARE DE MOVRA
CASPIVM
OCEANVS
PHILIPPICVS
PHILIPPI IV.
MARE BELGICVM
TERRA
INNOCEN TIIX X.
FERDINANDI III.
LVDOVICI XIV.
ANNAE
CHRISTIERNI IV.
CAROLI I.
CHRISTINAE
VLADISLAI IV.
MARE BORBONICVM
MARE VENETVM
Mare de Popo
DIGNITATIS
Sinus Batauicus
TERRA LANGRENI
MARE LANGRENIANVM
TERRA PACIS
TERRA IVSTITIAE
TERRA SABIEI
THEODORETVS
PLVTARCHVS
CICERO
ACHILLES TATIVS
SENECA
VENIET TEMPVS
HAEC NVSQVAM VVLGATA, GENERI TAMEN HVMANO
MAXIME VTILIA, IMO NECESSARIA,
MICHAEL FLORENTIVS VAN LANGREN
Mathematicus et Cosmographus Regius
ORBI TERRARVM PROPONIT.
PLINIVS lib. II
Omnium admirationem vincit nouissimum sidus, terrisque familiarissimum, et in tenebrarum remedium ab natura repertum, LVNAE. Multiformi hac ambage torsit ingenia contemplantium, et proximum ignorari maxime sidus indignantium.

III

The Making of a Professor: Abraham de Grau and Bernhardus Fullenius (c.1660-1707)

« *Unknown artist,* Bernhardus Fullenius junior (1640-1707).
Museum Martena, Franeker

> '[Comets] point their tail away from the sun, just like, as seems to me more likely, the boys' kites point their tails away from the wind, because by the force of the damping exhalations, their lighter parts are drifted away from the sun.'[1]

IN HIS *DISSERTATIO*, Johannes Phocylides Holwarda spent a few words on comets, which reveals a good deal about the young man. That story does not just concern the origin of comets, it is also a story that harkens back to when Phocylides was running kites as a schoolboy, a moment in his life that he had just left behind. When Holwarda wrote his famous little book he was in his early twenties. Childhood games were fresh in his mind and he had seen kites, but he had never really laid eyes on a comet.[2]

Still, Holwarda's account on comets provides some important philosophical pointers that the mathematicians at the University of Franeker could hold onto after both he and Bernhardus Fullenius senior died. On the one hand, the future of astronomy, both in Franeker and elsewhere, would be dictated by the sightings of several comets on which numerous mathematicians would comment. On the other hand, the reference to boys playing with kites was a prelude to the men who would be appointed as professors in mathematics in Franeker: they were all of Frisian decent and they would at least partly be preoccupied with typical Franeker matters. What would be the position of the professor at the University of Franeker? What would be his position in society in general? How would he deal with the legacy of Metius? And what of the

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* I thank Gerrit Boeijinga for sharing his information on the family Fullenius with me so freely. This whole dissertation has benefited from that and that is especially true for this third part.

[1] The whole quote is: 'Protendunt autem in aversam a Sole partem Caudam, quod, ut mihi probabilius videtur, tanquam puerorum dracunculi, qui caudam a vento avertunt, vi sumantium vaporum partes leviores a Sole altius protrudantur.' Holwarda, *Dissertatio*, 276-277.

[2] Of course there had been comets visible in the year Holwarda was born, 1618; his wife Maijcke Wijbes Piebinga was even born under the last 'great' comet of that year. She was born on December 17 1618. The comet had been visible from November that year until January the following year.

ideas of Holwarda? The work of Fullenius senior? What could they do with the *idiotae*?

The professor who would succeed Fullenius senior was Abraham de Grau, who had received an important part of his training at Franeker. He would pursue many of Holwarda's objectives and comets would especially provide him with the right pretext to do so. De Grau was succeeded by Fullenius junior, who was born and raised in Franeker. Fullenius junior will doubtlessly have played with kites, much like the boys Holwarda talks about. Also, just like De Grau, he too had a specific interest in comets.

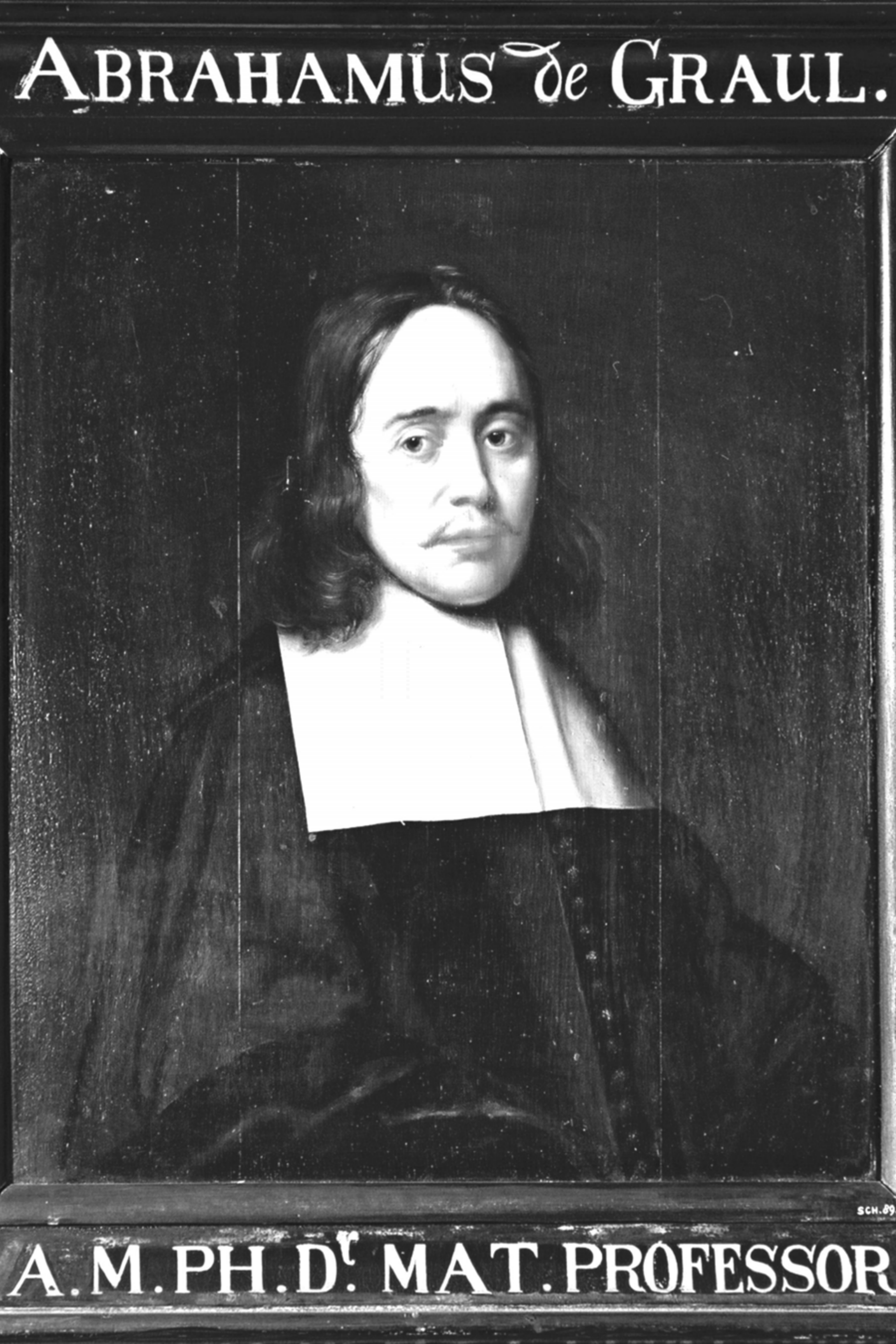
Comets were arguably among the most debated subjects of the seventeenth century. Their appearance always spurred a massive amount of popular literature as well as scholarly debate. Several different comets were visible in 1618, 1664 and from 1680 to 1683. In Franeker, all three instances stirred up numerous ideas, reflections and theories. In this third part of the thesis, the sightings of 1664 and of the 1680s are important starting points for investigation, because the Franeker mathematicians made some important contributions to international debates on these ominous signs.

Besides these heavenly pursuits, the education of the *idiotae* continued as well. When Fullenius senior died at the beginning of 1657, a large question mark over the position of mathematics at Franeker lingered. What was to happen with the field? Who would take over? What direction would the new professor take? The Franeker Senate and the Board of Curators picked one of the most promising natural philosophers to have graduated from their university in the previous years: Abraham de Grau. They gave him two years to fully prepare for his professoriate. When De Grau accepted his chair in 1659 it immediately became clear that he was ambitious and wanted to complete the process that had started under Holwarda; De Grau strove to combine mathematics with natural philosophy. Meanwhile, he also took care of what can be seen as Fullenius' heritage; De Grau had a special eye for the *idiotae*. This offers the intriguing question of whether or not De Grau combined the trajectories of both Holwarda and Fullenius. Did he find a way to merge what, under his predecessors, was separated?

Only weeks before Fullenius died, his oldest son had matriculated at Franeker with the specific purpose of studying mathematics. He would ensure the future of mathematics some twenty-five years later, when it was De Grau's turn to pass away. Much more than De Grau, this youngest Fullenius was crucial for how historians have evaluated mathematics at Franeker. His spell as professor has been characterized as the end of the deplorable situation that previously beset mathematics there.[3] Yet, an almost unsolvable problem lies at the core of his career. When Fullenius accepted the chair in mathematics he was an acting burgomaster in Franeker. To move from government to university in this way was a step that was virtually unprecedented in the history of the Dutch universities. What can be said about this particular move? Whatever it was, it does not seem to have been a demotion. Fullenius voluntarily chose to make the move from a public, political office to *academia*. It makes him the perfect historical figure to tell the story of the social rise of mathematics. What makes Fullenius all the more attractive is that he was a brother-in-law and one of the best friends of Balthasar Bekker (1634-1698), the most famous church minister of the whole Republic in the late seventeenth century. It was Bekker who would popularize some of the most radical ideas on comets in the late seventeenth century.

Both De Grau and Fullenius junior successfully tied the *idiotae* to the Franeker academy. Yet they also met with ever-growing competition and attacks from mathematicians who acted completely outside the university. These were not *idiotae* in the sense of the word that I have used throughout this book. Although these mathematicians may not have known much Latin, they were not aloof to what was going on at the university. This does, however, not mean that they were completely uninfluenced by events taking place at university. They may have benefited, for example, from works like Holwarda's *Astronomy*, the books written by Metius or teachers who were trained at Franeker. I understand those *idiotae* who themselves had no academic training as a form of emancipated *idiotae*. The final chapter of this book is dedicated to a hard clash between one of these laymen mathematicians and professor Fullenius. It is the ultimate showdown between mathematics outside of academia and mathematics within it. These events showed that slowly, the university was losing its standing in Friesland as the foremost institution where mathematicians were to be educated. If the laymen could definitively prove that their education in mathematics was as good as the one received at the university, the whole position of the professor of mathematics would be called into question.

[3] Van Berkel. 'Het onderwijs', 226-227.


ABRAHAMUS de GRAUL.
SCH. 89
A. M. PH. Dr. MAT. PROFESSOR

8. De Grau, Fullenius junior and the comet debate

« *Unknown artist,* Abrahm de Grau (1632-1683).
Museum Martena, Franeker

8.1. Introduction

The story of this chapter is, again, a complicated one. Holwarda had set out on a path to add prestige to the field of mathematics, but he died before he had guided that process in a definitive direction. Meanwhile he had seemingly detached parts of astronomy from the chair of mathematics, a process that was stopped with his death and eventually reversed. Over time it became clear that all teaching in astronomy was again picked up by the professor of mathematics. More specifically, cosmology would again claim its spot under that professor, as was the case under Metius. But this did not mean that Holwarda's striving had been completely in vain or that it had been done only for his personal gain. He had made some lasting contributions to the way math was practiced at the University of Franeker.

Holwarda had shown how mathematics had value for natural philosophers at university. This had not gone unnoticed by the professors in mathematics who tried to do precisely the opposite, which in effect gives almost the same results. The next generation of Franeker mathematicians wanted parts of natural philosophy to become attached to the chair of mathematics. For them to teach philosophy would improve their own positions.[1] By pursuing this path, the mathematics professors showed what Holwarda had pointed out: mathematics was important for more than just freshmen students and the *idiotae*.

The main example for how this worked is the career of Abraham de Grau, who will be one of the focuses of this chapter. To understand how De Grau attempted to obtain a position teaching natural philosophy it is necessary to reconstruct his image. In literature on the University of Franeker he is seen as a somewhat bland and shy figure, who tried but failed as professor of mathematics. I will not only argue that by successfully modernizing the chair of mathematics De Grau met and dealt adequately with fierce competition from mathematicians who operated outside university, I also will show how he tried to claim a position as a philosopher. De Grau is better understood as an ambitious

[1] Van Berkel,'Het onderwijs', 218-219; comp. Vanpaemel, 'Gemengde wiskunde'.

professor, albeit a shy one, than as the pathetic figure that is made of him.

I will then focus on the son of Bernhardus Fullenius senior. While De Grau was busy reforming what had once been his father's professoriate, this younger Fullenius was building a public career as a patrician. He climbed the ranks of the Franeker city government, yet he also sought a way to become a competent mathematician. He traveled through Europe visiting scholars and he entertained mathematicians in Franeker. This would have resembled the activities of De Grau. What is more, both De Grau and Fullenius junior paid special attention to comets. Their activities made an important contribution to one of the most radical pamphlets printed on comets in the 1680s. This pamphlet was written by Balthasar Bekker, who had studied together with De Grau and was a brother-in-law to Fullenius. Bekker was also one of the most debated, most famous and most controversial ministers of the entire Dutch Republic.[2]

This chapter is construed around the so-called 'comet debate'. Recently Erik Jorink has shown how from the 1660s onward, a fierce polemic was waged in the Netherlands, in which the ominous power of comets was under investigation. This debate is traditionally studied within the context of Europe in the 1680s, but Jorink convincingly shows that it started earlier and that it initially had more of a Dutch character.[3] In this chapter I will show how this early Dutch prelude to the larger European confrontation was largely conducted from Franeker and by Franeker mathematicians.[4]

8.2. Abraham de Grau

8.2.1. De Grau's training and appointment

The story of this chapter starts with the figure of Abraham de Grau. The oldest son of a minister from the very north of the province, he first arrived in Franeker as a student in 1651. He studied philosophy, which included mathematics.[5] De Grau defended quite a few disputations, two in the same course where Nicolaus ab Amama was sentenced to his

[2] On Bekker and the reception of his ideas see Fix, *Fallen Angels*.
[3] Jorink, *Reading the Book*, chapter 3.
[4] Jorink already showed how Bekker and De Grau influenced this debate to a certain extent. I want to add to his analysis by showing how the Fullenius family contributed to the debate. It is this specific family that, in my opinion, bridged the gap between the several Franeker participants in this 'Dutch comet debate'.
[5] Perizonius delivered De Grau's Eulogy. This was reprinted in 1740, which is the edition I consulted. Perizonius, *Orationes*, 555-592. My account derives more from Galama than from Perizonius, Galama, *Het wijsgerig onderwijs*, 108-116.

'second round' of disputations in 1654.[6] During this time in Franeker, De Grau was surrounded by various students that he had met prior to his Franeker matriculation and who would play important roles in the Frisian academic world's future. For example, his best friend Ulrik Huber (1636-1694) came from Dokkum and had attended the same Latin school as De Grau.[7] Another friend was Balthasar Bekker, who studied with De Grau in Franeker.[8] All three of them, De Grau, Huber and Bekker, originated from the same area in Friesland around the city Dokkum. In Franeker they seem to have been marked for an academic career.

De Grau would continue his academic education in Groningen, mirroring the movements of Bekker who had enrolled there prior to coming to Franeker. Huber meanwhile set off on an impressive *peregrinatio academica*, taking him across Europe. In Groningen, De Grau lodged with the professor in mathematics, Joachim Borgesius (1585-1665).[9] His main focus, however, seems to have been natural philosophy and divinity. In 1656-1657, all three friends ended up in Franeker, where they found various teaching jobs. Although they were not necessarily happy with those jobs, this was a clear move back to the Frisian university. Huber was appointed as professor in eloquence, an appointment that he received during his *peregrinatio*, shortly before he was to defend his doctoral thesis in Heidelberg.[10] Bekker was appointed rector of the Franeker Grammar school, an appointment that Nicolaus ab Amama had been after.[11] (When, after 18 months Bekker got a calling from a Frisian congregation he was more than happy to leave this appointment behind.[12]) De Grau was named professor in mathematics and was to be the successor to Fullenius. Both he and Huber would get two years to fully prepare for their position.

Huber's appointment has always been seen as an early recognition of his enormous potential. That he was appointed was a visionary act of the

[6] *Auditorium*, 34/1654.1a, no.15 and no.16. See chapter 6 above. A third disputation was defended under Munsterus, see *Auditorium*, 63/1654.1.

[7] One of the sons of the rector of their Latin school was a fellow student of theirs as well. This Brungerus Gutberleth matriculated almost simultaneously with De Grau's brother Johannes; see *ASF*, no. 5273 (Johannes de Graew) and *ASF*, no. 5274 (Brungerus Gutberleth). The rector himself would write a carminum to one of De Grau's disputations, see *Auditorium*, 63/1654.1.

[8] Bekker would sign De Grau's *Album amicorum*, May 24, 1654. This inscription is kept at the Royal Dutch Library, shelf mark 121 D 3.

[9] Boeles, 'Levenschetsen',

[10] Boeles, II.1, 218-219.

[11] On Amama, see chapter 6 and 7 above. That Bekker as the rector of the grammar school was entitled to the same tax freedoms as the professors of the university may be seen as a token that he was more or less a member of the academic circle. He was, of course, not a full member of that community. See Van Tuinen, 'Pallas en Minerva', 182.

[12] Bekker writes that 'de goede God hem van deze post ontzette', according to Sannes, 'De schoolmeesters', 208.

curators. Huber would indeed grow to be one of the most famous professors Franeker has ever had.[13] Even today his work on the history of law is still consulted.[14] De Grau's appointment, however, has been taken as a token of poverty by historians. It was a time at which mathematics at Franeker was at its very low point, they argue. [15] Yet, the same curators who had appointed Huber had appointed De Grau. I think this was not out of poverty, but because they had high expectations for De Grau, who was described by his contemporaries as somewhat shy (which was a virtue!), but also as a very intelligent student.

On January 27, 1657 Bernhardus Fullenius senior died and in June 1659 Abraham de Grau officially succeeded him as professor in mathematics. De Grau accepted his post with an inaugural lecture on the utility of mathematics (*de usu et praestantia matheseos*).[16] It seems that this was the tone in which mathematics was discussed at the time. At several other universities around 1660, similar voices that explicitly discussed the utility of mathematics in comparison with other academic fields of inquiry were heard.[17] In any case, De Grau was enthusiastically received by the academic society. The book printer Johannes Arcerius (1612-1663) was, for example, very explicit in a poem to commemorate the event:

> 'Fullenius' Star-eye left our storied horizon
> Bearing a cross, now almost thirty months ago.
> Now De Grau, his Eye with celebration, will go
> in this Frisian Athens: I wish that he, with illumination
> for thirty years may upon our horizon glow'[18]

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[13] The most recent monograph on Huber is Hewitt-Turner, *Ulric Huber (1636-1694)*. His most important work was translated in English in 1939 under the title *The Jurisprudence of My Time.* I have predominantly used Tjeenk Willink, *Recht en nut*.
[14] Very telling in this respect can be the recently founded 'Ulrik Huber institute' in Groningen. See http://www.ulrikhuber.nl/ (retrieved 12-07-2011).
[15] Boeles, II.1, 217 en 226; Van Berkel, 'Het onderwijs', 217.
[16] Since this *oratio* is lost, it is impossible to judge why De Grau chose this theme. Van Berkel does provide an explanation; he brands the title a 'bad sign' ('veeg teken'), implying that the downfall of mathematics had already started in Franeker. See Van Berkel, 'Het onderwijs', 217, see also: Idem, 'De Groningse universiteit', 55.
[17] In 1661 in Wittenberg, an oratio was held under the title: *Oratio auspicalis de usu matheseos in causis ecclesiasticis et imprimis controversia paschali*; in 1663 there was a thesis defended in Leiden under De Lith with the title *De usu matheseos in medicina*; and in 1669 in Kiel a disputation was defended under the title *Disputatio philosophica de matheseos usu in theologia*. There have always been numerous disputations and orations pointing to the usefulness of mathematics. This can hardly be seen as a measure of how the field was regarded. See also Nicolaas Hoboken's defense of his combined chair in medicine and mathematics in Harderwijk a few years later: Van Berkel, 'Het onderwijs', 226.
[18] *Academici applausus*, A4verso.
Fulleni Sterren-oogh verliet ons luister-kimmen
Met kruis, dat nu by-naa drie kruiste-maanden is

De Grau would not last the entire thirty years, but his time as professor did span more than twenty. Did he live up to expectations?

8.2.2. *Theodorus Hoen*

To understand how De Grau adapted his chair to the demands of his time, it is first important to once again see what was happening outside *academia*. This is important because the education of *idiotae* was one of the parts of the university curriculum where the professor of mathematics had a relatively free role; he could teach what he thought fit. But it was also a part of the curriculum that other mathematicians could easily compete with. If a student of land surveying found a more capable teacher elsewhere, he was not obliged to go to university. He was not even obliged to take the university exam, but could in stead do this in Leeuwarden. The other forms of education the professor of math was occupied with (mostly the propaedeutic courses) were free of this form of competition.

The most important pressure on university-taught mathematics came from mathematicians who, by the 1660s and 1670s, no longer had any traceable academic affiliation: the almanac writers. Most of those authors lead lives that are very elusive to the historian. This has got to do with their paper trails. That of Petrus Baardt was still strong because he moved in academic and bureaucratic circles. However, the trails of his numerous successors remain hidden behind pseudonyms and very few details. For example, from the author of the *Breyders Almanac*, published in Friesland in 1650, virtually no personal details can be traced. The author informs his readers that he is a 'lover of mathematics' and a land surveyor, but even his name remains a mystery.[19] While he may be hard to pin down, this self-chosen characterization is of importance. Almanac writers considered themselves practitioners of mathematics in one way or another.

For this time period, the most noticeable writer in this genre in Friesland is Theodorus Hoen († 1670). He lived and worked in

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Verlêen: Nu sal de Grau syn Oogh met luister klimmen
in 't Fries Atheen: ik wens' dat hy met wondernis
Drie-kruiste-jaaren langh ons Kimmen mag beglimmen
The word 'kruist' refers to a decimal. The translation of the poem was made by Paul Carls. I kindly thank him for this.

[19] Unless his surname is Breyders, as is suggested by Salman; see the one surviving copy of the *Breyders almanach*, at Tresoar; see also Salman, *Populair drukwerk*, 50 and 246. The initials of this author are I.P., incidentally the same as those of Johannes Phocylides Holwarda. However, it seems unlikely that this almanac was written by one of Holwarda's students (he had died himself in 1653), because the contents of the preface of this almanac would sooner be from someone opposing an almanac written by an academic. See also Salman, 'Populaire leesstof', 74.

Leeuwarden, where he published the first of the *Saeghmans almanaccen*. This almanac would become the standard almanac in Amsterdam in the decades to come. Interestingly, Hoen also published an apology for astrology in 1659: *Natural astrology*.[20] As an appendix, this book contained a set of geometrical problems, which Hoen claimed to have collected over the past decades from all sorts of mathematicians.[21] Hoen claimed that he could solve all of the problems with *the rule of Cos*, that is algebra. With this, he showed that he had mastered a very modern way of practicing old-fashioned geometry, a way that was not often adhered to by his fellow *rekenmeesters*.[22]

Yet at the same time, his defence of astrology was quickly becoming outdated. In the course of the seventeenth century, astrology was divided in a judicial and a natural approach.[23] This distinction was made to keep the practice of astrology acceptable to the Reformed church. Natural astrology, which sought to predict the future, was commonly outlawed, whereas judicial astrology, which was supposed to subtract more general rules from the stars, was allowed.[24] Hoen did not seem bothered, and defended the right for both forms of astrology to exist. In so doing, however, he virtually gave no new arguments for doing so. He also referred to Paracelsus, Democritus and other philosophers, but he never mentioned any of the more recent developments in philosophy.[25] At the same time he objected to the use of instruments for astronomy.[26] It made for a strange combination of somewhat outdated astrology together with very modern mathematics.[27] Such a combination would not be easily found at the University of Franeker at that time.

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[20] In several bibliographies, a print from 1650 is listed, like the STCN. However, that edition does not exist. The only known copy from that print run that has allegedly survived is kept in Amsterdam. Inspection of the title page of that copy clearly revealed that it is not a separate edition, but rather a small typographical error that makes it look like an earlier version. See University Library Amsterdam, shelf mark OTM: OK 63-957. The STCN fingerprint of both editions is slightly different. This, however, is probably due to the fact that two different methods of collection were used by the makers of the STCN.
I thank Djoeke van Netten for her kind help in investigating this book.

[21] One of them being Pibo Gualtheri, the other Gualtheri's foe Beerentsz. See Hoen, *Natuerlycke Astrology*, 204-206 and 215-216; See also chapter 3 above.

[22] Tim Nicolaije is presently preparing a PhD-dissertation which will deal with these *Masters of Mathematics* in depth.

[23] Salman, *Populair drukwerk*, 42.

[24] See the introduction Salman gives on this distinction. He also gives references to other literature and he explicitly places Hoen in his discussion, Salman, *Populair drukwerk*, 41-102.

[25] Hoen, *Natuerlycke astrology*, 111, 118-119

[26] Hoen, *Natuerlycke astrology*, 111,

[27] Hoen, *Natuerlycke astrology*, 111; see also: Salman, *Populair drukwerk*, 125; Salman also shows a similarity to Cuningham's ideas, which were, published in Franeker at the beginning of the seventeenth century.

A plaque made by the land surveyor Sytse Gravius. It was both a sign board for potential costumers and a commemoration of him obtaining his degree at Franeker.

Although Hoen defended a practice of astrology that was seen by the church as devilish, he was never under threat of censorship. On the contrary, he dedicated his book to the States of Friesland, and they accepted this dedication, rewarding him 30 guilders for it.[28] Hoen succeeded in gaining status with his work, much like how David Rosaeus had received a public position after publishing a book on a different mathematical subject. Hoen was all the more remarkable, since he did something for which there was no place in Franeker. There are no traces of algebra being a part of the Franeker curriculum in the late 1650s, and Franeker professors had explicitly distanced themselves from natural astrology. Hoen may well have jumped into a void.

It was as if Hoen's book was pointing to the possibility of non-academics to compete with mathematicians at academia. But competing with the university was not the only possibility; some former students also cooperated with academics. From this period several of these crossover projects survive. For example, a local land surveyor in the Frisian village of Grouw had the date of his Franeker promotion, and his

[28] Salman, *Populair drukwerk*, 57.

consequent admission, cut into stone as a mathematical riddle.[29] He used it as a sign board for his house so that possible clients could find him. The actual stone was crafted by Sjoerd Ates Haacma, a land surveyor himself, who climbed to the rank of burgomaster of Leeuwarden. He was, next to a very able stonecutter (some gravestones from his hand have also survived), also one of the known draftsmen. Several maps of Frisian towns that he had made were published in the 1660s in a book whose main author was a Franeker professor.[30] Sometimes the work of the mathematicians re-entered the sphere of the university.

Around this time the Franeker *idiotae* firmly started becoming a group of their own. They tried to claim a position independent of the university. One of the effects of this emancipation was that the mathematicians outside university were becoming unwelcome competitors to the professors. Hoen, for example, was able to offer something that looked very learned and mathematical, but that was not available at the university. Still, the links between mathematicians from outside the university and the proper academics stayed strong. With mathematics becoming more and more visible, a reaction by the Franeker professor in mathematics could soon be expected.

8.2.3. The achievements of De Grau

Abraham de Grau found a way to deal with this. To him the Franeker *idiotae* were important. For example, in 1660, his first year as professor, he took two of them in his house and also had them matriculate at the university. This indicates that he had possibly found a way around the Senate ruling that the *idiotae* were excluded from academic liberties.[31] That they were still excluded from the university liberties was clear, when in 1664 the Frisian Deputy States reaffirmed their previous decision. They did so with an almost iconic description of the students in mathematics. They stated that '[c]raftsmen, sailors, or all others, who act in a civil trade of craft, even if they live in Franeker, and perhaps study some mathematics and land surveying, will under no circumstances be

[29] See Ferro, 'Een interessante gevelsteen' and Holsbrink, 'Een interessante gevelsteen' and Korenwinder's home page, http://staff.science.uva.nl/~thk/gevelsteen/gevelsteen.html (retrieved 12-07-2011).
[30] See the numerous maps that were published by Christianus Schotanus a Sterringa.
[31] See above, and *ASF*, no. 6219 and 6220. These students in mathematics were labelled 'laicus', but were allowed to matriculate. This was against the explicit ruling of the Senate of 1656. They distinguish from *idiotae*, who generally only matriculated at the very last moment. Possibly these two were De Grau's assistants, of which he must have used numerous, see Van Winter, *Hoger beroepsonderwijs*, 61; and: Galama, *Het wijsgerig onderwijs*, 111-112.

counted as students, and will not have their privileges.'[32] Clearly the *idiotae* were still very much a part of the town of Franeker; they were so much present that the politicians were forced to speak out on them.

This could be an attempt to suppress the *idiotae*, but it is more likely an indication of their success at the university. Abraham de Grau had kept on educating them, like his predecessor Bernhardus Fullenius senior had done. De Grau, however, was the first to explicitly combine this with educating the Frisian gentry.[33] With this he pointed to an important possibility that mathematics held: it could be of value to more than just the ordinary *idiotae*. He successfully gave lectures on geometry both in Dutch and in Latin. In fact, he was so successful that several sets of his lecture notes have survived.[34]

One of these sets was noted down by Jarich van Burum (1643-1685), Frisian gentry of the purest kind. His manuscript is telling in several ways. First of all it establishes that De Grau made a distinction in his classes. The lecture notes are partly written in Latin, partly in Dutch, which suggests that some were given in Latin and others in Dutch. Generally the division is as follows: when more everyday, practical mathematics were taught the preferred language was Dutch, which indicates that the *idiotae* were present. But when more advanced mathematics were discussed, the language was Latin, suggesting that those more difficult mathematics were considered more academic. When, for example, calculations were made for the ratio of a circle's circumference with respect to its diameter (today known as the number π), this was done with the practical value of 22/7, which is a famous

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[32] Van Winter, *Hoger beroepsonderwijs*, 55; and Schwartzenberg, *Groot placaat*, V, 732-733. 'Ambachtsgesellen, Zeevarende- luyden, ofte andere burgerlijcke neringhe ofte hanteringhe doende, oock selfs te Franequer wonenende, ofte schoon wat rekenen ende Landtmeten leren, sullen geensins voor Studenten gherekent worden, nochte der selver voor-rechten hebben.'

[33] Among his students that actually took a degree, several members of the Frisian gentry were present. The strong presence of the gentry is an indication that De Grau had a successful relationship with this social class. See *ASF*, 37-58. In 1673 there was the first promotion in Geom[etria] et Arch[itecturae] Mili[taris], which was a promotion that could have been created especially for groups that were more interested in geometry that was applicable in the army. That such a specific promotion was something different from an 'ordinary' promotion in Geom[etria] is proven, for example, by Adamus van der Keessel, who took a degree in this on July 17, 1688 and took a degree in the military variant two months later on September 14, see *ASF*, no. 8593. Both degrees were obtained under De Grau's successor Fullenius junior.

[34] From Metius only one set of lecture notes survived, but none from Franeker. From Fullenius senior no sets survived at all; this offers an important indication that De Grau was successful in raising the standard of his audience. The paper trail left by the aristocracy, in contradistinction to that of ordinary students, is much more likely to have survived over time.

approximation.[35] Most of those calculations in the lecture notes are in the Dutch. However, the manuscript also has a section on Ludolph van Ceulen's 20 decimals of this number. Not only is that estimate much more complicated than 22/7, it is also not very useful to land surveyors and the like. That section of the manuscript is completely in Latin, signalling a change in attitude; apparently the *idiotae* were not present then. Young gentry, like Van Burum, may have been interested in this sort of learned knowledge; the laymen were kept out of it.[36]

Consequently, another part of the notes that is done in Latin are the discussions of fortification and 'military' mathematics. This shows that the gentry could get an education in military engineering in Franeker. Furthermore, this education was given with a completely late humanistic approach, which consisted of discussing the military engineering's mathematical highlights, such as 'Ludolfs number'. If anything, this would have made the usefulness of mathematics clear to the Frisian regents and gentry. De Grau would preside over seventeen promotions in mathematics, slightly less than his predecessor, but far from a complete downfall of mathematics – as historians have claimed was the case. During De Grau's spell, it also became possible to do a promotion explicitly in fortification, or *Architectura Militaris*. He even had a German student take such a degree, the first foreigner (from outside the Republic) ever to do a promotion in mathematics in Franeker.[37] After Metius, the influx of foreigners studying mathematics in Franeker had not dried up, but they never took the exam that would grant them access to the office of land surveyor or wine gauger.

Another structural alteration of the mathematical education that De Grau oversaw was that of the education within the faculty of philosophy. In 1663 the Senate modernized the promotions in philosophy, effectively bringing the *L.A.M. et Phil. Dr* title on par with the other doctors titles of Franeker.[38] A year later, in 1664, the Senate ruled that it was required for

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[35] I found no reference to the calculation Metius's father made on this ratio (355/113). That number was perhaps more accurate than 22/7, but it was also less easy to use.
[36] Tresoar, 625 Hs, Euclides, *Elementorum libri xiv, ejus Optica et Catoptica Geometrie*. I have discussed Van Burum's manuscript in more detail in: Dijkstra, 'De opleiding'.
[37] *APrF*, 22-6-1673. It is clear that all of the other candidates who took a degree in mathematics originated from the Dutch Republic. Only for Udaeus Levini, who took a degree in 1643 under Fullenius senior and who matriculated in 1639 (no. 3597), could I not establish this beyond doubt. This is only logical, because the degree in mathematics had value within the province of Friesland. Foreigners would only have taken such a degree if they had really wanted to stay there. With De Grau's modernizations the new degrees had some value in themselves as *diplomas*, beyond merely serving as tickets granting access to the office of land surveyor.
[38] This is probably best illustrated by the fact that until 1663 a student taking a title in one of the other three faculties had to pay 40 guilders in fees, and one taking a title in Philosophy had to pay 12 guilders. After 1663 they all had to pay 40 guilders. See Galama, *Het wijsgerig onderwijs*, 28.

every student who wanted to obtain this *Liberalium Artium Magister*, the 'philosophical doctorate', to be examined in mathematics.[39] With this, mathematics would have gained some prestige; it was traditionally given right at the beginning of the course in philosophy, but now it was also *examined* at the end. With this ruling, the Senate firmly underlined the position of mathematics as an important branch of Franeker education and it explicitly showed that mathematics was an important part of a modernized philosophy course taught at university.

8.2.4. Historia Philosophica

Not withstanding these successes, it was De Grau himself who complained about the attendance of his lectures.[40] However, this complaint should be taken exactly for what it was: it was not so much a depiction of the situation, as it was a request by De Grau to broaden his activities and authority. Ultimately he asked to be allowed to teach more than just mathematics and consequently he even wanted to be authorized to preside over practice disputations in philosophy.[41] This did not necessarily point to a dislike of mathematics. Rather, it seemed to point toward an upgrade from mathematics to philosophy proper.[42] De Grau furthermore had good reasons to do so; he published some impressive works on philosophy.

In these works De Grau combined all sorts of different philosophies into the new philosophical approach. They contributed to an important current in philosophy in those days: the *Historica Philosophia*.[43] This philosophy did not have a blind spot for mathematics, but it also did not take mathematics as a starting point. Over time De Grau would develop into the champion of this way of practising philosophy. In fact, his own *Historia philosophica* (1674) is branded 'the most fully developed historiographical achievement in the Low Countries'.[44] His approach consisted of studying the ancient philosophers, such as Socrates, Plato and Aristotle, in an attempt to show that they were not as outdated as was suggested in his day. His ultimate goal was to reconcile them with the new ideas set out by Descartes, or to be more precise, to show that Descartes was not that original in the problems he tackled. To do this he

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[39] Nienes, *De archieven*, 161; see AUF, inv.no. 17, 298.
[40] Galama, *Het wijgerig*, 109.
[41] Boeles, II.1, 228-229; Boeles cites
[42] From Galama's account (and from Perizonius' and Huber's as well), it can be taken that De Grau was somewhat of a workaholic. This explains much more satisfactorily the fact that he requested for more work, as opposed to attributing it to the dwindling interest of students. See Galama, *Het wijsgerig onderwijs*, 108-116. Huber's recounting of the method De Grau used to index classical authors is especially impressive.
[43] My understanding of the Historica Philosophia is derived from second chapter Santinello, *Models of the history of philosophy*, 205-278, esp. 259-278.
[44] Santinello, *Models of the history of philosophy*, 276.

had adopted a sort of monk-like working method, making large overviews of the Ancients' ideas. He compiled indices and assessed each and every idea he seemed to have gotten his hands on. Huber gave a thorough description of this method, which consisted of meticulously reading the philosophers and then making large volumes with directories, often longer than the original work. He was taught how to perform this analytical method by Borgesius, his professor in mathematics in Groningen. The outcome led De Grau to the idea that Descartes' writings were not quite as bad:

> 'In conclusion, then, I should like to warn those who profess themselves hostile to Descartes and his disciples, and who dismiss their conclusions as suspect. After they have read these pages of mine, they should not judge too harshly or hastily in individual instances, nor condemn what has not been properly examined and inspected in every detail. Perhaps, if they enquire in this manner, they will find, even among Descartes's teachings, things fortified by the authority of the ancients, which will not displease.'[45]

De Grau showed that Descartes' ideas had very old roots.[46] Of course, this has not become the main narrative of Cartesian thought, which is instead seen as something going spectacularly against tradition.[47] Although it was De Grau's intention to show continuity, by applying a completely new method, he himself more or less broke with a tradition as well. This meant that as a professor he acted completely different from Fullenius senior. The extensive search in the ancient texts may recall the humanists of the sixteenth and early seventeenth centuries. In De Grau's case this search was emblematic for his modern approach. He tried to valorise his position at the university by performing research, writing new philosophical works and contributing to the important discussions of the time. This was not a requirement for the chair, but it was a possibility at which De Grau jumped. He filled the footsteps of Holwarda rather than those of Fullenius.

Yet, De Grau's ambition backfired. The professor in philosophy proper, Johannes Wubbena († 1681), was outraged and complained that De Grau should focus on mathematics. He even went so far as to accuse the mathematics professor of neglecting his own profession. Subsequently, the right for De Grau to teach philosophy and preside over

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[45] Cited and translated in Santinello, *Models of the history*, 268.
[46] See Galama, *Het wijsgerig onderwijs*, 113; comp. for example De Grau, *Historia*, 698-702.
[47] Although that can be contested too. My view is greatly indebted by the work of Lüthy, see for example his, 'What to Do With'.

philosophical disputations was withdrawn. Only when Wubbena was unmasked as a notorious drunk, fraud and liar, and consequently fired in 1680, did De Grau once again obtain this right.[48]

This course of events reveals how serious the rising position of the professor of mathematics was taken by the fellow professors. By 1680, De Grau had successfully claimed authority in the field of philosophy, was appointed *Rector Magnificus* and had set out on a thorough and ambitious reorganization of the university archives. This last undertaking was likely a prelude to the approaching first centennial of the University of Franeker, but it was also implicit testimony that De Grau appreciated the institute he worked for.[49] At work was no longer an academic who tried to rise through the ranks, using the chair of mathematics as a first stepping stone. De Grau was a professor of mathematics and exploited and expanded the cultural capital that came with this position.

8.3. Bernhardus Fullenius junior

8.3.1. Grammar School

The most important student in mathematics in Franeker during De Grau's professoriate, in light of this current study, is without a doubt Bernhardus Fullenius junior, the son of the professor with that same name.[50] Bernhardus junior was born on March 16, 1640. During his life he would never reside outside Franeker, although he did travel through Europe. He attended the local Latin (or Grammar) school and was introduced to the rudiments of mathematics by his father. It is unlikely that he ever even moved out of his parental house, which was not just big, but also ideally located in Franeker.[51] He lived just down the street from university and across the street from city hall, next door to the *burse*, and close to all of the other professors. The family house of the

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[48] Wubbena's testimony is behind the remarks quoted in Boeles that De Grau had to reinstitute mathematics to its former glory. Since Wubbena was a notorious liar, these remarks cannot be taken all too seriously. See Boeles, II.1, 229; on Wubbena see (for example), ibidem, 233-239; and see Galama, *Het wijsgerig onderwijs*, 105-107. The testimony of Bekker, cited by both Boeles and Galama, is especially telling in this respect: 'Dese man, eerst willende mijn vriend zijn, en daarna geslagen vijand wordende, om dat ik volgens last en plight hem synen bosen handel onder oghen stelde, is d'opperbaats van al dien onraad en dat ongemak geweest, dat my weervaren is. 't Was hem onlydelijk, in 't openbaar van 's Heeren Tafel afgehouden en dat borgers gekastyd te worden, die over meer dan borgers heerschte.'

[49] AUF, inv.no. 32 'Index utriusque senatus'; see also Idem, inv.no.18 'Diarium academiae', 350; and Nienes, *De archieven*, 115.

[50] De Grau is said to have been his teacher, see Collot d'Escury, *Hollands roem*, 64.

[51] Today this is 45 Voorstraat in Franeker; see the map in chapter 5.

Fullenii also provided with enough space for the impressive book collection Bernhardus would accumulate of the decades to come.[52]

His initial education in mathematics was for the best part done by his father, who did some 'experiments' with the young Bernhardus and took him to make observations in Leiden with the astronomer Samuel Kechel ab Hollesteijn (1611-1668). According to Fullenius junior's eulogy, the father was amazed at the talent the young Bernhardus showed.[53] Yet, despite all his talents, the son was not groomed to become the next mathematician in the family, but a public servant. According to that same eulogy it was Fullenius' mother Ebel Hinckena van Hinckenborgh who explicitly told her son that he should study law and pursue such a career.[54] Ebel Hinckena was a daughter of Frisian gentry; a career as burgomaster or lawyer for her son would have fitted that background better than that of a mathematician. A good example of the Fullenius family's effort to gain prestige and respect in Frisian society can be seen in Fullenius junior's first appointment. Remarkably, in March 1648, just before he had reached the age of 8, he was appointed a secretary to a company of soldiers. Of course he could not fulfil this job, and consequently his uncle Willem Homsboot substituted for him.[55] This form of favouritism is an indication of the advancement the family had made over the years. The grandfather had been a minister, the father was a professor, and already at a young age the son was destined for a public career. It would be the perfect fulfilment of a family history.

To prepare him for such duties, Bernhardus junior was off to Grammar School, where he was educated by Johannes Hipstedius (1612-1682). In Fullenius' eulogy this name is misspelled as 'Opstedius', but no such person was a teacher anywhere near Friesland at the time.[56] Hipstedius, or Hypstetus, was rector in Franeker until 1650. His involvement with the family is clear from one of the very few autographs of Fullenius senior that is known today.[57] This comes in the form of a

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[52] As in the previous chapter, all details on the Fullenius family can be found in: Boeijinga, 'Fullenius'.

[53] Coeter, *Laudatio*, 17-19, the following quote is especially telling: 'Pater puerilia experimentorum rudimenta miratus est, & ingenium pueri exosculatus, tradidit ipsum mathematicis, & insignis celebrisque prae caeteris in iisdem disciplinis extitit.'

[54] See for example Boeles, II.1, 306; Van Berkel, 'Het onderwijs in de wiskunde', 219; Evertsz, 'Friesche wiskundigen', 8 and Boeijinga, 'Fullenius', 36; Ekema, *Oratio*, 25-26; The original source for this is Coetier, *Laudatio*, 11.

[55] Boeijinga, 'Fullenius', 42

[56] See Boeles, I, 306; comp. Coetier, *Laudatio*.

[57] This is not counting the university archives, where Fullenius as acting rector left quite a few notes and written statements, which, unfortunately, tell very little of his personal history.

letter to Hipstedius dated June 23/ July 3 1656.[58] Unfortunately it gives no real details on the lives of either father or son Fullenius, but it does have some information on how mathematics may have been regarded. Fullenius senior recounts some details about a forthcoming marriage and explicitly says that the woman is ‘practiced in both *musica* and arithmetic’.[59] These parts of mathematics were seen as praiseworthy activities for schoolboys and women, but they were hardly matters that really helped the more serious accomplishments Fullenius junior was set to achieve.

During the second half of the 1650s, the rector of the Franeker Grammar School was young Balthasar Bekker. He would have guided Fullenius’ last steps before he went to university at the end of 1656. That it was Bekker who headed the Grammar school that year was sheer coincidence, but it would make a big mark on how events unfolded in the decades to come. Bekker had just returned to Franeker, shortly before De Grau and Huber would be appointed at the university, as I noted above. All three, Bekker, De Grau and Huber, came from the same part of the province; Huber was born and raised in Dokkum, and the other two came from within the vicinity of that town. In fact, De Grau’s first wife was also a widow of a Dokkum burgomaster.[60] And Bekker’s second wife was none other than Frouck Fullenius (1634-1721), the oldest daughter of the father and thus the oldest sister of son Bernhardus. She had been previously married to a regent from Dokkum as well.[61] These are clear indications that those men formed a group within a group. That they were members of academia is crystal clear; that they were connected to the practice of mathematics in one way or another was as well. But their marital strategies show that they also stuck together, keeping a strict social group.[62] The first contours of this ‘maagschap’ became clear right about the time that Fullenius went to university in late 1656.

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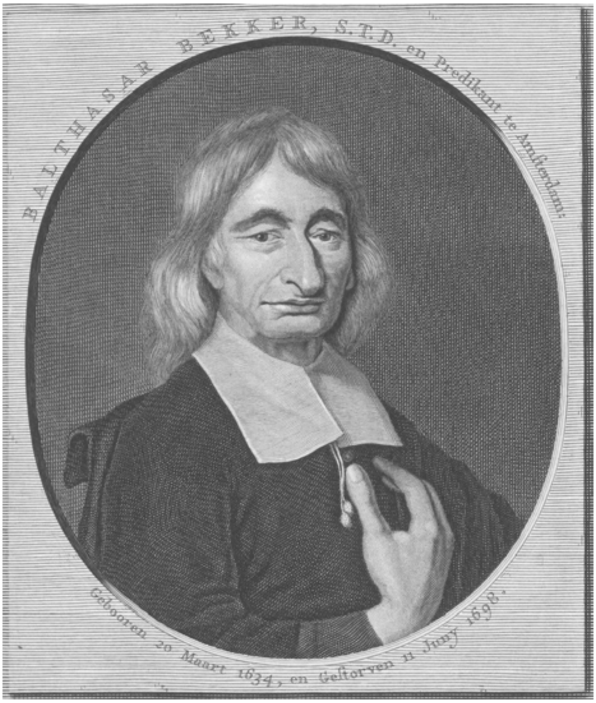
[58] Bernhardus Fullenius Sr. to Johan Hipstedius, 23 June/3 July 1656. Staatsbibliothek zu Berlin, inv.no. H1636 (1). I thank Wiebke Wemheuer who provided photos of this letter to me and Ron Gruijters who helped me with understanding its contents.

[59] Bernhardus Fullenius Sr. to Johan Hipstedius, 23 June/3 July 1656. Staatsbibliothek zu Berlin, inv.no. H1636 (1)

[60] Rixt Doenga, see Boeles, II.1, 229, esp. ftn.2; This was allegedly an unhappy marriage, because Doenga was said to have been thieving and stealing, something that would have caused a stir in the small Franeker community. Galama remarks ‘Even in his marriage he was not happy’, (‘Ook in zijn huwelijk was hij niet gelukkig geweest’), see Galama, *Het wijsgerig onderwijs*, 111.

[61] Boeijinga, ‘Fullenius’, 31.

[62] For social strategies to keep or help family and kinship (=maagschap) in power, see Kooijmans, *Vriendschap*; Pollmann, ‘Dienst en wederdienst’; and more specifically for Friesland, see Janssen, *Creaturen*. A very recent example of how this worked in every day practice for writers and publishers is discussed in Geerdink, *Dichters en verdiensten*.



Balthasar Bekker (1634-1698). One of the most famous and outspoken ministers of the Dutch Republic. A friend and brother-in-law to Fullenius junior. http://www.geheugenvannederland.nl

8.3.2. Family ties

Fullenius was told to study law, yet his matriculation was in 'ling[uarum] et math[ematicae]'. He matriculated on December 15 1656 and he inscribed in the *Album studiosorum* together with his cousin Keimpe Fullenius (1641-1705), whose intention to study law was much clearer. Keimpe's matriculation read: 'phil[osophiae] et iur[is]'.[63] Just a month after they had inscribed, father Fullenius died in January 1657.[64] Even though it would take two years before De Grau was officially installed, several students still matriculated to study 'math' in the meantime.[65] Perhaps a temporary solution, like with Christian Otterus earlier, had been found again. If so, who filled in as a substitute professor in unknown.

Just as from the days his father was a student, very little has been handed down from Fullenius junior's student years. Not a single disputation he defended is known today and just two *carmina* are known

[63] *ASF*, no. 5725 and 5726.
[64] Boeijinga, 'Fullenius', 21.
[65] *ASF*, no. 6002, 5945, 5884 and 5832.

from his hand.[66] After he finished his studies – initially without a known degree – it may not have taken Bernhardus long to set out on a journey through the southern parts of Europe. His *peregrinatio* thus resembled more what was slowly becoming known as a 'Grand Tour'. The difference between the two is that the first was the tradition of students to visit places of learning, which could be dispersed all over Europe; the second was a southward bound journey toward Italy. Of Fullenius' journey, no particularities are known other than the destination, which can be found in a single remark made years after his death by Gisbertus Cuper (1644-1716).[67]

Once back in Franeker, Fullenius was ready to start his career. He was elected a member of the city counsel (vroedschap) in 1666. An election as burgomaster would follow in 1670. With this last office the rise of the Fullenius family had more or less been fulfilled. The burgomaster was the most important local dignity in the whole of the Dutch Republic. In Friesland it was the one function that could open doors to all kind of other jobs. The appointment made the Fullenii officially a part of the regents in Friesland. It also gave Fullenius time off every few years. When not elected a member of the council or a burgomaster, he apparently had no job. He is not a known trader or investor and although the family grew more wealthy, the management of their estate does not seem to have been a full time job.[68]

Bernhardus seems to have continued his studies and also engaged in completely different activities. He may have picked up drawing and etching as a hobby; there is a reference to him being a fond artist and he even published the frontispiece of a book. It was published with a work of his (by then) brother-in-law Balthasar Bekker. Bekker had a catechisation printed in three different volumes, all rather pictorially titled. The first part was a book for very young children, published under the title 'Child's Milk', the second, entitled 'Sliced Bread', was for the somewhat older and finally, in 1670, he published 'Solid Food'.[69] This last book, which was said to contain strong Cartesian theses, caused quite a stir in the Frisian church, one that would echo for a long time afterwards. It was even banned for a few years. It was precisely for that book that Fullenius etched the title page.

Bekker was at that time a minister in Franeker, where he also tutored several university students in divinity. He was openly trying to obtain a

[66] *Auditorium* M/1659.5 and M/1659.7: One is on Johannes Wubena, who was installed as professor in logic that year. The other is on Idzardus van Bloemendaal, the first husband of his sister Frouck, and was published when Van Bloemdaal took his degree.
[67] In a letter by Cuper to the French abbé Bignon of 23 April 1709; see Cuper, *Lettres de critique*, 213.
[68] Boeijinga, 'Fullenius'.
[69] Van Sluis, *Bekkeriana*, 18-21.

Title page of Bekker, Vaste Spijze (Solid food). *This page was engraved by Fullenius junior (and it depicts a prospect of the town of Franeker). Tresoar, Leeuwarden.*

university post, but his outspoken and controversial ideas prevented him from ever obtaining such a post.[70] As a minister he was, however, well liked. The frontispiece from Fullenius' hand contains a poem by one of Fullenius' brothers, a prospect of Franeker, a scene in which sinners are relieved and one in which Bekker himself is a central figure. This last scene is that of a minister celebrating Eucharist with his communion. Bekker is not explicitly singled out, but it needs little imagination to see that he is the central figure here.[71] Oddly enough just two years later Fullenius would be in precisely that same church to receive Bekker's blessings during a very particular ceremony.

The Dutch generally refer to the year 1672 as the 'year of disaster'. The Republic was attacked by German princes from the east, the English from over sea and Louis XIV from the south. Outnumbered on every

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[70] Kalma, 'It rampjier en de dûmnys', 152-153.
[71] Van Sluis, *Bekkeriana*, 20.

front, the provinces united in their struggle for survival. Ultimately it forced the return of the family of Orange as Stadtholders of the province of Holland, a post they had been denied for over twenty years. In Friesland, the Nassau Stadtholders saw their position strengthened during the same period of turmoil.[72] At the beginning of the conflict, the situation seemed so hopeless that even the city of Franeker, about as far from all fighting as thinkable, mobilized and actively helped defend the Republic.

It was Bernhardus Fullenius junior who, as the presiding burgomaster of that year, took charge of the Franeker regiment of soldiers. Before he actually left the town to march to the Frisian border (at the other end of the province), he guided his soldiers to the Martini Church in Franeker, where his brother-in-law blessed him and his men.[73] The regiment never saw war; the enemies of the Republic were ultimately fended off. But Bekker saw a chance to gain something from the whole situation. In Leeuwarden he lead a 'people's revolt', which saw the Frisian Nassaus brought back into power.[74] The controversy over the catechisation book went away in the following years, and it was finally allowed to be sold in 1675, possibly after the Nassaus – repaying his support – had exercised some pressure.[75] It is tempting to think that the title page etched by Fullenius was only then added to the book and that it in fact referred to that heroic moment in the family history. What is certain is that it shows once again how strong the bond between Fullenius and Bekker had grown.[76]

After the war Fullenius prepared to obtain a degree in law and he shortly re-entered university for this; in April 1674 he was granted the doctoral honour by Ulrik Huber.[77] At the same time, Fullenius also kept schooling himself in mathematics and astronomy. Directly after having obtained his degree, he left for Gdansk to pay a visit to Johannes Hevelius. The degree and the subsequent trip rounded up all of Fullenius' academic activities. His status as a mayor, the family capital and his degree in law guaranteed him a very good spot in Frisian political life. Hevelius can serve as a sounding board, being an astronomer and a burgomaster as well.

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[72] Breuker, 'De vestiging'.
[73] A. Telting, 'Oer B. Bekker, De Fulleniussen', III-XV
[74] Kalma, 'It rampjier en de dûmnys'; see also Breukers' interpretation of that crucial year: Breuker, 'De vestiging van een politiek'.
[75] That the Nassaus' sympathy for Bekker immediately vanished after 1672 seems a little hard to believe, since he played such a crucial role in 1672. See for example Breuker, 'Calvinisten', who argues the opposite.
[76] How important the relationship with Fullenius was is argued (although with strong rhetorical instruments) in the nineteenth century novel 'Balthasar Bekker in Franeker', see Diest-Lorgion, *Balthasar Bekker in Franeker*, passim.
[77] *APrF*, 28-4-1674.

8.3.3. *Johannes Hevelius*

Just before Fullenius arrived in Gdansk, Hevelius had gotten himself into a conflict. This would have lingered over Fullenius' visit and would prove to play an important role for mathematics at Franeker. It therefore pays off to make a close examination of what it precisely was that Hevelius had been doing.

On March 26, 1674 Hevelius wrote a letter to the Royal Society in London. This was read aloud at the meeting of April 23 that year by Henry Oldenburg, the president of the Society and a close friend and ally to Hevelius.[78] In his letter Hevelius discussed some important matters, accidentally giving a perfect summary of what was going on between him and certain members of the Society. Firstly Hevelius informed the Society that he had recently purchased Kepler's manuscripts and that in these he had unearthed some of Kepler's ideas on dioptrics. He states that he expected difficulties regarding telescopic sights based on the ideas he had found.

Actually, Hevelius was at the time already embroiled in a vehement discussion with Robert Hooke (1635-1703) and John Flamsteed (1646-1719), important fellows of the Society. Hooke was *curator by office* of it and Flamsteed would soon become the first *Astronomer Royal*. Their discussions with Hevelius would derail later that year, precisely on the point of using telescopic sights and the exactness of Hevelius' instruments and observations. That Hevelius decided to raise problems concerning the use of the telescope is therefore no surprise.[79] It should also not be surprising that Hooke took strong opposition against a letter by Hevelius, because he seemed to take every chance to attack Hevelius.[80]

Interestingly, Hevelius' letter also contained information on a book that Matthias Wasmuth (1625-1688) was about to publish and of which he had seen the manuscript. He loudly questions Wasmuth's theories.[81] This Wasmuth will play an important role in the final chapter of this book, when I will shortly return to these details. For the moment, it is enough to focus on events taking place in 1674 and to observe that

[78] Birch, *The History*, III, 133. The letter was partly published in the *Philosopical Transactions*, and it was explicitly referred to by Hevelius in the introduction to his *Annus climatericus*, 17-18 and again in a letter to Flamsteed, ibidem, 69-70. He published a complete transcript of that letter in that same book, ibidem, 49-53 (including Hevelius' reply). Hevelius thus had Fullenius' positive account printed three(!) times in this single book.

[79] Dijkstershuis, *Lenses and waves*, 45-46.

[80] Hooke was a known troublemaker; there are plenty of examples of him fighting. The seminal text is Rupert and Marie Hall, 'Why blame Oldenburg?'

[81] This book would be published as: Wasmuth, *Annalis coeli*.

Hevelius' relationship with the Society was of an explicitly international character.

Still in 1674, Hooke would publish an outright attack on Hevelius in a treatise called *Animadversions on the First Part of the Machina Coelestis*. Hevelius had published that first part of the *Machina Coelestis* in 1673. This book contained an elaborate description of his instruments and how to use them; Hooke felt obliged to refute the work in the sharpest possible words.

It was precisely when all of this was taking place, in the summer of 1674, that Fullenius arrived in Gdansk for his visit to Hevelius. Arguably his main goal was to use those instruments that Hooke so vehemently criticized. Fullenius stayed with Hevelius at least from July to September, assisting the astronomer and his wife with their observations for the second volume of the *Machina Coelestis*.[82]

When Hooke's publication came out, Hevelius was deeply hurt by the attacks. And although the *Animadversions* would have reached Gdansk a few months after Fullenius left, Fullenius would still play an important role in how Hevelius dealt with the matter. The treatise forced Hevelius to write a long letter to Flamsteed to complain about Hooke and to defend himself. As his most important witness *décharge* he cited none other than Fullenius. On June 14 1676 he firstly introduces Fullenius to Flamsteed:

> 'On 18 September 1674, with my then guest the most eminent and distinguished Mr Bernhard Fullenius, Dr of Law and Councillor [/Burgomaster] of Franeker (son of the Fullenius who was formerly Professor of Mathematics in the Franeker Academy), who, as a great supporter of mine with particular esteem for astronomical concerns and for my instruments, as for all mathematical matters, was then visiting me in order to devote himself to making observations with me over a period of several months [...].'[83]

Hevelius then continues to give the actual data collected by him, his wife and Fullenius and he then cites a letter from Fullenius in which the latter give a very positive testimony of the instruments used by the first:

> 'As for your instruments, there is no reason for anyone to doubt their accuracy, reliability, and ease of use, which I have

[82] The first known observations Fullenius made are from the first of August; the last known are from September. Hevelius talks about Fullenius staying for 'several months', see Flamsteed, *Correspondence*, 466.
[83] Flamsteed, *Correspondence*, 466.

> experienced to an extent that I would not have conceived of had I not been an eye-witness of your observations. The evidence lies in innumerable observations all made by Your Eminence in my presence, testifying to the instruments' trustworthiness and accuracy[...].'[84]

To avoid confusion, Hevelius states that he does not cite this for his own glory, or promotion ('Far from it, I say, far from it!'[85]), but to contradict his 'enemies'. Fullenius was brought to the stage by Hevelius as an objective referee in the debate on the accuracy of Hevelius' observations. Soon after the letter was written another witness was sent to Hevelius, namely John Wallis. He would assist in Gdansk as well and return to England with laudatory testimonies on Hevelius' observatory. In 1679 the observations to which both Wallis and Fullenius had assisted were published by Hevelius in his *Machina Coelestis*, with reference.[86]

Fullenius' role in this was an important one, although it has been almost completely ignored.[87] He was not just a strong advocate of Hevelius' interests, as a burgomaster he was also a trustworthy witness. This was perhaps what was most crucial about it, and what can also be seen as the reason why Hevelius published Fullenius' name several times in the second part of his *Machina Coelestis*. Trust and credibility were (and are) the most important points of reference in international correspondence networks. In almost every discussion, polemic or argument they can be seen as vital to all parties. It must have been ideal for Hevelius to have his expertise defended by someone who was credible both through his ancestry (son of a professor) and his function (a burgomaster).

When Fullenius returned home, he wrote Hevelius a long letter in which he recalled the observations and explicitly greeted Hevelius' wife.[88] From that same letter it is clear that Fullenius also practiced

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[84] Flamsteed, *Correspondence*, 467.
[85] Flamsteed, *Correspondence*, 468.
[86] Hevelius, *Machina Coelestis*, passim. The Franeker University Library held a copy of this book, which resides at Tresoar today. The remark in their catalogue that this book was a gift by Johannes Phocylides Holwarda is impossible, since the book was published more than twenty years after he died. It seems fair to assume that the library collected important works, in which Franeker professors had participated or were cited. It also seems likely that this particular book was purchased by the university library after 1685. In that year the books were 'unchained', although this book never seems to have been chained. I thank Martin Engels who pointed this out to me. See also Van Berkel, 'Wiskundige boeken', 86-88.
[87] One of the few times he is mentioned in the historiography, he is said to have come from Frankfurt an die Oder instead of from Franeker. See *The Gresham lectures of John Flamsteed*, 35.
[88] Cook, 'Johann and Elizabeth', 10 and 12.

astronomy back home; he even mentions an assistant.[89] When the following year Johannes Heinricus Gutslaff from Gdansk arrived in Franeker to study divinity, Hevelius recommended him to Fullenius.[90] This suggests that the contacts between the two seemed to have remained friendly, although according to available sources, they were not very intense. Some caution is in order, however, since a large part of Hevelius' correspondence was destroyed in a famous fire, and from Fullenius' papers virtually nothing has survived.[91] Nevertheless the connection between the group of Franeker scholars and Hevelius, which had been established by Holwarda and Fullenius senior, had been transferred to the next generation.

8.4. The Franeker kite runners

8.4.1. Astronomers in Franeker

Both father Fullenius and Holwarda had corresponded with Gdansk as well. No letters from either professor have survived, but there is enough evidence to assume this.[92] Furthermore, it is more than likely that De Grau was also in contact with Hevelius. Fullenius would thus have benefited from contacts that were made by previous Franeker mathematicians.[93] What he may not have overseen is to what extent several important contributions to the Dutch comet debate were made under the influence of these contacts. To fully understand this situation, it is necessary to take a close look at the different parts played by the several Franeker mathematicians and at their contacts with Gdansk in the various debates that were waged in the same years that Fullenius was building his career as a burgomaster.

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[89] This letter was first published in the seventeenth century in an edition containing a selection of Hevelius' letters, Olhoff, *Excerpta ex literis*, 149-151. I obtained a copy of the original via Huib Zuidervaart, for which I am very grateful. Dr. Zuidervaart did not just print this letter; in the OdP in Paris he also looked for other letters that may have been exchanged at that time between Franeker and Hevelius. Unfortunately there were few additions in the surviving Hevelius correspondence.

[90] Gutslaff to Hevelius, 11 July 1675, OdP, Hevelius Correspondence, letter 1689.

[91] The fire in Hevelius' observatory was first described and discussed in Capello's account *De incendio Heveliano Gedanensi* (Hamburg 1679). A twentieth century reprint and translation made that account widely available. See McPike, *Hevelius, Flamsteed and Halley*; with that fire the stock of most of the copies of the second part of the *Machina Coelestis* was also destroyed, making the book very rare. Fullenius did obtain a copy, as is clear from the auction catalogue of his library.

[92] See for example Olhoff, *Excerpta ex literis*, 96 where Holwarda is cited in the correspondence, and Ibidem, 31-33 where Holwarda's *Philosophia naturalis* is cited at length.

[93] With this paragraph I follow up on the suggestion done by Van Berkel, 'Wiskundige boeken', 86-88.

Bulthuis en Bendorp, The Church of Dokkum. *Depicting an 18th century kite runner in one of the other Frisian towns.*
Private collection.

Holwarda's 'little book' was known to Hevelius as early as the 1640s, and in the 1660s the German astronomer had observations from Fullenius senior at his disposal. Of course, Father Fullenius corresponded frequently with several European astronomers in the 1640s and 1650s. He played an especially prominent part in the correspondence of the German, Hamburg based schoolteachers and astronomical observer, Joachim Jungius. Fullenius may more or less have functioned as a broker between Holwarda's ideas and astronomers with whom Jungius corresponded. Since Fullenius continued Holwarda's observations already when the latter was still alive, he seemed especially important in spreading Holwarda's ideas.[94]

In turn, Hevelius was highly important in promoting Holwarda's little treatise, but his involvement with Franeker did not stop there. He kept contact with people in Friesland, as, for instance, the visit of Fullenius junior suggests. When De Grau was installed he could easily tap into these old contacts and immediately seems to have had access to the appropriate circle in Hevelius. This may explain why the Polish

[94] *Jungius Briefwechsel*, 680-681. Already in 1647 Hevelius, Lorenz Eichstadt and Jungius knew of Fullenius' observations. Hevelius would ultimately publish them in his *Mercurius in sole*, see the chapter 7 above for more details.

astronomer and close associate to Hevelius, Stanisław Lubieniecki (1623-1675), consulted De Grau for his *Theatre of Comets* (a comprehensive history of all comets). Lubieniecki was right to do so, since Franeker had not given up on astronomy. De Grau proved to be a worthy successor to Holwarda and Fullenius in this respect. He had sighted several comets and happily shared this information with Lubieniecki.[95]

His lengthy contributions to the *Theatre* reveal that De Grau had a strong fascination for comets; he was nothing less than an active 'comet hunter'.[96] But they also reveal how important the institutional continuity in Franeker was for the practice of astronomy there. For his observations De Grau not only consulted the university library, he also used Metius' instruments. These were the same resources Holwarda had used for his *Dissertatio*.[97] From the university archives it is clear that Fullenius senior had also been using them during his spell as professor.[98] The Franeker astronomy 'tradition' leaned heavily on the heritage of Metius. Thus, when Lubieniecki asked De Grau for observations of a comet that appeared in 1664-1665, De Grau was readily able to supply these. Fortunately, he also complained about the instruments, giving a short description of his 'majori Sextante', making clear that he was still using Metius' sextant.[99] This complaint about his instruments incidentally revealed how well the institutional permanence worked.

Lubieniecki's book shows how Franeker remained important in the German astronomical world, as it had been when Holwarda published his little book. In the 1660s the European fascination for comets was reaching a new high; at the same time in the Netherlands, a debate on the nature of these phenomena was taking off. Those Dutch discussions were for a part fuelled by scholars who trained in Franeker. At the same time these Frisian astronomers found a way to function as a bridge between the Republic and the German lands. The foundations for this were laid by Holwarda and Fullenius senior, who had managed to lift Metius' legacy to a level were the results of original research became important. De Grau continued on that path, but it was Fullenius junior who was about to reap the full rewards of this process.

[95] Lubieniecki, *Theatrum*, I, 493; see also: Jorink, *Het boeck*, 155-156.
[96] Jorink, *Het boeck*, 155-156.
[97] See above chapter 5.
[98] Boeles, I, 417-418. Boeles wrongfully refers to the widow of Fullenius junior (who was never married) and cites from the following documents (which I have consulted for refence): AUF, inv.no. 18, 1 and 73; inv.no.19, 388 and 392-391.
[99] 'Penes quem sit error aut debeat esse facile aestimabit, qui e me didicerit, meas observationes majori Sextante, cujus radius septem sere pedum est, et in cujus ambitu minuta singula & minores divisiones notatae sunt, esse peractas', see Lubieniecki, *Theatrum*, I, 493.

8.4.2. *De Cometis*

To fully appreciate how important the Franeker contributions were it is important to briefly return to Holwarda's words on comets, cited above. Holwarda described comets with a reference to running kites: comets are driven away from the sun, like kites are driven from where the wind comes. Holwarda argues that this is because they are exhalations of the sun.[100] He continues by stating that that comets should not be used for predictions; such prophesies are blasphemous, condemned by the Holy Scripture and therefore he hates them.[101] He did not deem those predictions impossible, however. It was explanations such as these that would set the agenda of Franeker astronomers for the decades to come.

Holwarda may have found a follower in the young Fullenius. Probably somewhere in the 1660s or 1670s he wrote a tract on comets of which only the handwritten (in Fullenius' hand) conclusion survives.[102] It is unclear if Fullenius is also the intellectual author of this document, but there are some good grounds to assume this, as I will show. What has survived is a single folio leaf, which is the *Conclusio* to what was originally a longer tract. The reasoning in that single leaf seems to be that of a cautious man. Yet, upon closer inspection, a double message can be read; while pursuing one way of reasoning, it actually advocates the opposite.

To my knowledge, this document has not been mentioned in any prior literature on Fullenius, the University of Franeker or astronomy.[103] It is incomplete and not dated, yet it fits the longer Franeker tradition of astronomy very neatly. The author seems to pick up on Holwarda's reasoning, but also on the every day practice of the 'comet hunter' De Grau.[104] It was probably work like this that could help a young scholar build a name as a mathematician. Such a description fits Fullenius like a

[100] An explanation that seems to refer to the ramist Willibrord Snellius, see Jorink, *Het Boeck*, 137.
[101] He explicitly includes his New Star in this prohibition on making predictions. See above chapter 5, comp. Holwarda, *Dissertatio*, 277.
[102] In a Frisian family archive (fostering other important manuscript material) a single folio leaf is kept, which has been filed under the title 'De Cometis'. The original hand, however, titled it 'Conclusio', and that is clearly what it is: a conclusion to a longer tract. The hand in which it is written is that of Fullenius Jr. The document is not dated, but over time Fullenius' hand became less precise and a little less tidy, which could indicate that he wrote it sometime before 1680. I have looked at all of Fullenius' manuscript material, both to ascribe the manuscript to him and to analyse his handwriting. In the 1680s Fullenius' hand is clearly much less tidy than it had been in the past. Even letters to his patron, or his writings directed at the Frisian Stadtholder of the early eighteenth century, do not match the De Cometis document in tidiness.
[103] My analysis of this document would have been much less thorough without the splendid transcription and translation that Dr. R. Gruijters made for me. With his consent I am publishing both his transcription and his Dutch translation as appendix 2 of this book.
[104] Jorink, *Het boeck*, 155-156.

glove; he corresponded over these matters with some of the best-known astronomers of the day, such as Hevelius and Jacob Bernoulli. The influence Fullenius had on his brother-in-law Balthasar Bekker, who would write one of the best-read tracts on comets of the second half of the seventeenth century, was perhaps the most important.

The text begins with a platitude: ‘As history shows: Splendid comets are followed by mayhem’.[105] With that said, the text is clearly constructed to prove almost the opposite: comets could very well be bad omens, but they are impossible to interpret. The author points out that it is impossible to know what comets specifically warn for, and that comets can only be understood when compared with other comets. And since no two comets are alike (they all appear somewhere else in the skies, have a different magnitude, last a different period, etc.) it is therefore impossible to interpret them in the right way. That interpretation is knowledge only available to God, the text claims, and this ‘can certainly not be investigated by a mathematician’. The text nowhere attributes actual powers to the comet; a comet can be an omen, but not a cause for disaster. What is more, this omen cannot really be interpreted. It seems that the author is tying to tear the predictive power of the comet into useless pieces, without looking for a direct confrontation with those who would defend the comet’s powers.

Perhaps this short text is best summarized by the *Conclusio*’s conclusion. The writer gives three reasons why God has created comets. 1. So people turn their eyes to the heavens and realize that they do not know God’s plans but still have to subject themselves to them. 2. As long as people do not make their lives better, the comets show that God can be upset. 3. Comets are a token of mortality, because they ultimately disappear. When they disappear they remind man to prepare himself to go to ‘the other world’. If that moment indeed comes, people will be happy that they have prepared, and – the texts ends with an ironic joke – if that moment does not come, people (who do not go to the other world) will still be happy to have been fooled by the astrologer.

The text seems to be a typical product of the seventeenth century Dutch comet debate that Erik Jorink has recently identified. It fits in with other texts that were written on the subject, from the 1650s onward, but especially in the years 1662-1666. Most of these texts were disputations on comets that were defended at the Athenaeum Illustre in Amsterdam. The future Amsterdam burgomaster Nicolaes Witsen (1641-1717) wrote one of these disputations, as did his uncle, Johannes Hudde (1628-1704), one of the most powerful regents of that city. This indicates that comets were discussed in the highest of circles. Another disputation stands out because it openly and bluntly doubts if comets influence

[105] All references are to appendix 2.

events on earth or even have predictive powers.[106] Fullenius makes precisely the same point, although in the disputation it is posed more carefully. These theses were defended under the Amsterdam professor Alexander de Bie (1623-1690), and he was not the only one who openly expressed such doubts. His Utrecht colleague (and successor to Schotanus) Johannes Graevius (1632-1703) went even further when in his *oratio* in 1664 he systematically denounced all belief in the powers of comets as superstition.[107] These academic discussions lay at the core of the Dutch comet debate.[108]

As he had foreseen, the Utrecht professor Graevius was immediately attacked by several of his university colleagues; the divinity faculty took an especially fierce stance against his ideas.[109] It is hard to pinpoint what the objections against Graevius' ideas about comets were, since many theologians agreed that interpreting them as omens that foretold future disaster was impossible, or perhaps even blasphemous.[110] Yet Graevius had publicly taken it a step further when he advocated that it was reason that had led him to his conclusions.[111] As Graevius argued, reason had dictated that comets were nothing more than signs that God was capable of creating celestial bodies that were obedient to His eternal laws. These laws were not to be explained and understood by reading the Bible; they only became clear by actually studying nature.[112] Thus Graevius *cum suis* argued that the Bible should be read with reason.[113] This was precisely the point against which the theologians objected. That comets were demystified was already hard to agree upon for some; that it took reason to show this was for many a step too far.

The *Conclusio* seems an addendum to this. It may not be as straightforward as Graevius had been in his *oratio*, but it still voiced the same principles. Although probably no reader needed to take an offence to what the *Conclusio* discussed, its aim was very clear: to cast doubt on both the influential and predicative powers of comets. In fact, precisely because of the cautiousness, the text holds a lot of persuasive power. That vigilant approach is in character with what we know about Fullenius. For example, in the 1680s when he was asked by one of the

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[106] Van Miert, *Illuster onderwijs*, 209.
[107] Graevius is yet another seventeenth century mathematician/astronomer who is mostly known as a philologer.
[108] Jorink, *Het boeck*, chapter 3, esp. 161-172.
[109] Jorink, *Het boeck*, 162.
[110] Jorink, *Het boeck*, 166.
[111] Jorink, *Het boeck*, 167: 'Onder vaandel van de 'natuurwetten' werd de oorlog verklaard aan al degenen die niet de Rede als voornaamste kenbron erkenden.'
[112] Jorink, *Het boeck*, 163-164.
[113] Jorink rightly points out that Graevius did not attack the nature of the Bible as a divinely inspired book. He argued to read it with more of an eye for the moment and time these revelations were made.

Frisian courtiers why a horoscope for one of the Nassau princes was far off from reality, Fullenius did not hesitate to point at the many influences that could alter a good star sign. He provided the same courtier with horoscopes, but also made clear that he did not practice astrology himself.[114] When speaking publicly Fullenius was always somewhat ambiguous toward astrology.

The content fit the Dutch comet debate, and the hand of writing, as well as style of arguing, are those of Bernhardus Fullenius junior. But most noticeable is perhaps the underlying principle of the text. Much like with Graevius, its doubts over the power of comets are based in reason. Although God is mentioned, his power plays no role in the structure that is summed up at the end. If it was indeed Fullenius who had constructed the text, he had found a way to voice objections against the interpretation of comets. If he had just copied the text, he had at least become very familiar with those objections. Either way, it shows that he was interested in the matter, probably somewhere in the 1660s. It also reveals that he practiced mathematics, much like how his fellow regents Hudde and Witsen in Amsterdam did. They have been recognized as great patrons of the arts and possible friends of Spinoza. Fullenius collected art, and he acquired lots of musical instruments during his life. What is more important, however, is that he was closely related and befriended to Balthasar Bekker; and it was Bekker who would take the next step in the debate.

8.4.3. Bernoulli

In the 1680s new comets were sighted and the debate would flare up again with new vigor. Under influence of the new sightings (among them Halley's Comet, which was not yet recognized as such), several pamphlets were published. Whereas the debate of the 1660s had primarily been waged in Latin, with primarily academics expressing their thoughts in print, in the 1680s the discussion was mainly done in Dutch, with the numbers of authors dominated by ministers. Shortly before the Dutch really reopened this polemic, a young German mathematician paid a visit to Fullenius, after he had visited several other scholars who were interested in these matters. This visitor was Jacob Bernoulli (1654-1705), and he was in correspondence with several great mathematicians

[114] Fullenius to Vegelin: 22-12-1683; Fullenius to Vegelin: 29-1-1685; Fullenius to Vegelin 8-7-1686. In this last letter Fullenius remarks 'but I kept no notes of the horoscopes', clearly indicating that it did not have his full attention. See EVC, 3615, Brieven van Bernhardus Fullenius (1640-1707) aan Philip Ernst Vegelin van Claerbergen (1613-1693).

of his day, including Nicholas Malebranche (1638-1715), Robert Boyle (1627-1691), Robert Hooke and Chrisitaan Huygens.[115]

Before Bernoulli arrived in Franeker in 1681 he had discussed the nature of comets with Johannes Hudde in Amsterdam. Hudde was not only interested in astronomy, which already had become clear from his involvement in the disputation of his nephew Witsen, he was seen as an important mathematician in a broader sense of the word. He developed mathematical ideas on how much weight ships could carry, but also made important contributions to the theory of calculations, worked on optics and almost certainly corresponded with several of the other mathematicians Bernoulli had visited. In the process Hudde created a rather particular paper trail; since his prime occupation was that of a politician, it is noteworthy that so much of his mathematical work has survived today and is valued so highly.[116] It is, however, not remarkable that Bernoulli paid him a visit. Hudde was a man with both the competence to understand and help further difficult mathematics, as well as a man with the power to patronize mathematicians.

The second visit Bernoulli paid was to Fullenius, who shared a lot of Hudde's characteristics, although perhaps in somewhat different qualities. Like Hudde he was a burgomaster and an ever more important politician in his home province; but unlike Hudde his city and province were not Amsterdam and Holland. This is perhaps the largest difference. Contrary to Hudde, Fullenius' paper trail is much weaker than Hudde's.[117] Therefore, frustratingly little can be said about Fullenius' mathematical work. It is therefore all the more important that the reasons for Bernoulli visiting Fullenius are known. The Swiss mathematician came to Franeker to dedicate a book to Fullenius.

When he visited Franeker, Jacob Bernoulli was still at the beginning of his career as a mathematician. He spent three days in Franeker during which he discussed mathematical matters with Fullenius. To be more precise, he discussed Johannes Hevelius' ideas on comets with Fullenius.[118] Bernoulli came to offer a Latin translation of a small tract on comets that he had published in German a year before: *Essay on a new system of comets* (1682).[119] The book was dedicated to both Hudde and Fullenius.

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[115] See for a short biography and references to the relevant literature: Bernoulli, *The art of conjecturing*, esp. 4-19. Some criticism is in order, since the editor of this work, Dudly Sylla, fails even to mention the connection with Fullenius.

[116] Vermij, 'Bijdrage tot de bio-bliografie'; and Vermij and Atzema, 'Specilla circularia'.

[117] One expects the works of a university professor based and at an 'institute', an association that tends to 'develop' a greater historical awareness, to have a strong paper trail. This is not the case however; the strength of a paper trail is frequently dependant on coincidence.

[118] Van Berkel, 'Het onderwijs', 219.

[119] Bernoulli, *Conamen novi systematis cometarum*.

Bernoulli himself noted in his diary the following sometime between August 26-29 1681: 'H. burgenm. Fullenius das Cometentractätlein offeriert' (Offered the gentleman burgomaster Fullenius the comet tract). Fullenius in turn signed Bernoulli's *album amicorum* with a Hebrew phrase from Proverbs 3:13: 'Blessed are those who find wisdom, those who gain understanding', followed by 'Ornatissimo ac doctissimo Viro D. Jacobo Bernoulli SS. M.Cand. et Matheseos Cultori in sui memoriam posuit Bernh. Fullenius J. U. D. et Exconsul Franek.'[120] In his 'Cometentractätlein' Bernoulli discussed the course and size of comets, and even made predictions on the re-emergence of certain ones.[121] Bernoulli clearly wanted to join the swelling stream of publications. The book made some impact in the European Republic of Letters, although Bernoulli's ideas were soon refuted.[122]

When Bernoulli's book left the press (sometime in 1682), the comet debate was well under way. Whereas the Swiss mathematician had proposed a mathematical way to calculate the course of the comets, in the Dutch pamphlets the debate seemed to focus again on their predictive power and their influence on life on earth. In fact the pamphlets that defended those ideas were reprinted the most.[123]

8.4.4. Balthasar Bekker

In 1683 Balthasar Bekker published a first tract on what would grow to be his famous attack on superstition.[124] What prompted him to write this tract were the comets that had been seen in Europe in the years prior to 1683. The title already gives away his stance: *Investigation in the significance of comets*. He starts with mapping out what previous authors had said on the matter, incidentally mapping out the intellectual marriage between himself and his intellectual brethren: Descartes (Bekker's inspiration), Hevelius (Fullenius' teacher) and Bernoulli (Fullenius' visiting student). These are the three authors Bekker most prominently discusses.[125] It gives an important clue to Bekker's relationship with Fullenius. He argues that the significance of comets was to honour God, but not in any other way than the whole creation

[120] Information was kindly provided to me by Herr Dr. Fritz Nagel, Bernoulli-Forschungsstelle Basel of the Universitaetbibliothek of Basel.

[121] Bernoulli, *Neu-erfundene*, 13-14

[122] Bernoulli, *The Art of Conjecturing*, 105-106; it is remarkable how much the 'metaphysics' of Bernoulli coincides with the cautious approach of Fullenius.

[123] For example the pamphlet by the Leeuwarden minister Johannes van Holst, which was in print well into the eighteenth century. See Jorink, *Het boeck*, 173, see also Van der Holst, *Tractaat*.

[124] Israel, 'The Bekker controversies'; see also Van Bunge, *From Stevin*, 138-139.

[125] Bekker, *Ondersoek* (1692), 12. It seems that Bekker took up the 'challenge' posed by Bernoulli, who had stated that the explanation of the nature of comets had to be done by theologians, see Bernoulli, *The Art of Conjecturing*, 105-106.

already did. Comets, Bekker bluntly states, had no influence whatsoever; they were in no way signs of mayhem to come, and whoever thought they were, was extremely misguided.[126]

Bekker almost literally points to several practitioners of Franeker mathematics in the chapter that forms the crown of this pamphlet. For example, when he reaches the conclusion that it is ungodly to assign powers to comets he turns to mathematics, saying, 'Do not abuse God's holy Words by ignorance of his Works'. Becker continues:

> 'Man, the noblest of God's works, created to look up, should not be so blind, especially in a land like this, which [exists] through navigation, as navigation exists through the course of the stars, that he [=man] should not understand mathematics. If one would go through a gate in Holland, then on it there could be freely stated: especially in Amsterdam, like in the times of Plato: [...] No one untrained in geometry is allowed to enter.' [127]

It is almost as if Metius had guided Bekker's hand.[128] Mathematics, Bekker argues, was a useful tool to help understand the world. Again echoing Metius he continues this line of arguing with a reference to the 'two wings with which man flies to the heavens', namely 'Geometry and Arithmetic'.[129] But Bekker did not stop by pointing out mathematics' usefulness, like Metius had done. He takes the reasoning a step further. He argues that most men do not use these instruments to understand God's Creation, which would honour God, because they are not schooled in these subjects. As a sort of social criticism he claims that most are even too 'stupid' to take time from the sun or the stars, let alone learn God's greatness from it.[130]

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[126] Bekker, *Ondersoek* (1692), esp.chapter 31.

[127] Bekker, *Ondersoek* (1692), 95: 'De mensche, 't edelste van Gods werken geschapen om hoog op te sien, behoorde niet so blind te zijn, insonderheid in een land als dit, dat by den seevaart, gelijk de seevaert[sic!] by den loop der sterren leeft, dat hy sich der wis[c]onst niet verstaat. Somen door eene poort in Holland ging, daar moghtmen vrijelik boven stellen: voornemelik t'Amstetrdam gelijk eertijds Plato:[...] Geen onervaren in de Meetkonst magh hier binnen komen.'

[128] Obviously, numerous others had cited the same phrase. For example, the German reformer Melanchton used it, see Kusukawa, *Philip Melanchthon*, 97; comp. Goulding, *Defending*, 14; it is, of course, also prominent on the title page of Copernicus, *De Revolutionibus*. It was possibly placed on that title page by Rheticus or possibly by Rheticus successor as editor of the works of Copernicus (Osiander?) see Rosen, *Copernicus and his Successors*, 63.

[129] Comp. Metius, *Institutionum* (1614), introduction, see also above, chapter 4 where I discussed the Metius reference to Melanchthon in relation to the remarks made by Gualtheri. Bekker obviously was not alone in quoting Plato on this; numerous others had quoted this dictum.

[130] Bekker, *Ondersoek* (1692), 96 and 98.

That Bekker was educated in Franeker and Groningen is common knowledge. He is seen as someone who combined a radical form of Cartesian thought with a form of Reformed orthodoxy.[131] What has gone almost unnoticed is that a strong fascination for mathematics lies at the core of his argument. Bekker owned copies of several of the books published by Metius and Holwarda. He had studied under Fullenius senior as well as under De Grau, and Fullenius junior was one of his closest friends, as well as his brother-in-law. Bekker was well equipped to tackle the astronomical problem of comets, because he was well versed in mathematics, specifically in the mathematics that had flourished at Franeker.

The fascination itself has been signalled. For example, in the same year that he published his pamphlet on comets, Bekker also set out on a journey to England and France, of which he kept an informative journal. During this journey, Bekker measured almost everything he came across, taking a 'mathematical approach' to many cities, buildings and the like. His readers are informed of the size and shape of these objects and of the distances between them. For clarification he compares them with known examples in Friesland and Holland. This travel journal was probably written for close friends and relatives of Bekker, and was not published until the 1998. The editor, Jacob van Sluis, remarked that based on Bekker's preoccupation with mathematics, Fullenius might well have been one of the intended readers.[132]

Historians have always acknowledged the influence of this pamphlet; it has even been dubbed a turning point in history, and – together with similar attacks by Pierre Bayle, at the time a philosopher in Rotterdam – the starting point of *enlightenment* in the Netherlands.[133] That the comet debate predated 1683, and was already then full of enlightened elements, is a more recent insight, but it hardly undermines the importance of this specific pamphlet. Bekker's position as one of the champions of Dutch reasoning, and especially as an advocate of Cartesian ideas, has not been challenged. It is therefore remarkable that specific elements of "Frisian mathematics" are central in his argument. That Fullenius would have played an important part in how Bekker's ideas on comets were shaped has gone almost unnoticed. In any case, the pamphlet shows how diverse and heterogeneous mathematics was at the time, and where it could pop up. The comet debate could not have been voiced by a better educated and more equipped voice than that of Bekker in the Low Countries.

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131 Jacob, 'The Crisis'; See also Van Bunge, 'Balthasar Bekker', 144.

132 Van Sluis, 'Inleiding', 16 and 19. Bekker himself lists Fullenius Sr. as one of his teachers in Hebrew: see Knuttel, *Balthasar Bekker*, 16.

133 Fix, 'Bekker and Bayle'; Idem, *Fallen Angels*, 47-49; Jorink, *Het boeck*, 165.

8.5. Conclusion

By the 1680s, it became clear that it was the institutional continuity that gave ground for exciting new possibilities for mathematics in Franeker. Three names stand out: De Grau, Fullenius junior and Bekker. In one way or another, all three draw from the accumulated instruments, books and knowledge of the past, and all three try to use these resources to the best of their advantage. With this, they followed a path on which Holwarda and Fullenius senior had already set out. They too had profited from the past. De Grau, Fullenius junior and Bekker, however, met with their own challenges.

Abraham de Grau's main goal was to combine mathematics with philosophy. With this he did something similar to what Holwarda had done. But where Holwarda wanted mathematics to become important for natural philosophy, De Grau wanted to become a recognized philosopher. Meanwhile, he also found new markets for the education of the *idiotae*. De Grau did not just have them lodge at his own house; he also made his teaching attractive for the Frisian gentry. That he succeeded in this was possibly his biggest achievement for the field of mathematics.

The case of De Grau is a continuation of various themes I have discussed earlier, and it confirms the general impression that a professor needed to continue developing his chair and working on mathematics. He had to position mathematics in the university, both institutionally and intellectually, he had to secure a place for the teaching of *idiotae*, and he had to ground the chair in the extra-academic world by anticipating societal developments. Regarding the latter issue, De Grau explicitly bound a student population to the chair of mathematics: the gentry. He offered an education for becoming an expert in military mathematics, such as fortification.

Fullenius junior was of a gentry background; he was however not groomed for the army but for public service. He was to be a patrician and indeed he would claim a post as burgomaster of Franeker. With that appointment, the ambitions of his entire kinship seem to have been fulfilled. His grandfather had been a modest vicar from Germany, his father a scholar at the University, and now this young Fullenius established his family in a regent position. Yet, Fullenius junior seems to have had other ambitions beyond securing his family in Frisian culture. Fullenius kept on reading and studying mathematics; even after he had received a doctorate in law he still kept on pursuing mathematics and astronomy as a field of interest. This went well beyond the classes De Grau offered to the gentry. Fullenius was becoming a mathematician of some fame, travelling through Europe and visiting the likes of Hevelius, while at the same being called upon by visiting mathematicians. In the

1660s and 1670s, Franeker had in Fullenius an acclaimed mathematician apart from the professor at the university.

One would not expect a Balthasar Bekker to show up in a study of Early Modern mathematics. Nevertheless, he is entirely part of the story of math in Franeker. Balthasar Bekker showed a way to put into practice the ideas and products of both the mathematics professor De Grau, who had been his study friend, and the burgomaster Fullenius, who was his brother-in-law. When he published his daring pamphlet on comets he touched upon a hot debate and he found a way to spread the Franeker ideas to a larger audience. By this time mathematics was fast losing its innocence and becoming a field where potentially dangerous ideas could develop.

Detail of an engraving from Hevelius, Machina coelestis. *Hevelius welcomes an unknown visitor.*
Tresoar Leeuwarden.

Ordo Lection et Horarum (Franeker 1698) ».
Johns Hopkins University.

ORDO LECTIONUM *ET* HORARUM,

Quem, favente Deo, Illustris Frisiorum Academiæ Professores, post ferias Augustales, currentis hujus anni CIↃ IↃC XCVIII. usque ad ferias anni sequentis instituent.

HORA NONA.

D. CAMPEGIUS VITRINGA
Diebus Lunæ & Martis Sermones D. N. J. Christi; Die Jovis, illustriores quasdam Pericopas Propheticas explicabit: Veneris autem Historiam celebriorum Scriptorum Ecclesiasticorum illustrare perget.

D. ANTONIUS SCHULTINGIUS
Titulos Institutionum, qui de obligationibus & contractibus agunt interpretari continuabit.

HORA DECIMA.

D. JOHANNES Vander WAEYEN
Deut. Cap. XXXIII. explicare perget.

D. SEBASTIANUS SCHELKENS
Diebus Lunæ & Martis perget in exponendis Pandectis Justin. earumque controversiis, Jovis vero & Veneris, Jus publicum tractabit: collegia quoque Institutionum, Pandectarum, explicatoria, examinatoria & disputatoria; ut & collegia Juris Publici, Feudalis, & Canonici aperiet. Si qui sint qui publicis disputationibus delectentur, invenient me semper paratum.

D. JOHANNES SCHOTANUS à STERRINGA
Physicam Cœlestem juxta rationem & experientiam expositurus est.

HORA DUODECIMA.

D. HERM: ALEXANDER RÖELL
Diebus Lunæ & Martis typos ex Exodo explicabit; Jovis & Veneris de Cartesii Regulis Ethicis primo, tum vero de Lege Naturæ breviter commentabitur.

D. GULIELMUS COETIER
Diebus Lunæ & Martis extrema Vitæ C. Julii Cæsaris Augusti & Tiberii deinceps principia, ut illa Suetonius composuit interpretabitur. Jovis vero & Veneris Justinum à principio rerum explicabit.

D. JOHANNES LEMONON
Ex Episcopi Medelensis Introductione ad historiam Universalem Prælectionum desumet argumentum.

HORA PRIMA.

D. PETRUS LATANÉ
Morborum historiam, & quæ ad ipsam spectant, exponere perget.

D. JACOBUS RHENFERDIUS
Duobus prioribus diebus selecta loca Scripturæ ex Hebræorum antiquitatibus & idiotismis interpretabitur; posterioribus vero pro desiderio auditorum exercitia Talmudica vel Arabica instituet.

D. JOHANNES REGIUS
Oeconomiam animalem, præcipuasque ei inservientes partes, nec non earum in Homine & Bruto differentiam explicabit.

HORA SECUNDA.

D. HENRICUS PHILIPONEUS de HAUTECOUR
Christum in *Typis*, juxta ordinem Librorum Veteris Testamenti perget contemplari, & aggredietur explicationem Libri *Levitici.* Singulis etiam diebus Veneris, *Disputationem* publicam & statam in Auditorio publico *Synopseos controversiarum fidei* ordinem, habere continuabit.

D. ZACHARIAS HUBER
Diebus Lunæ & Martis Responsa *Papiniani* interpretabitur; Jovis verò & Veneris, *Institutiones Justinianæas* explicare perget.

D. NICOLAUS BLANCARDUS
Diebus prioribus Thucydidem, posterioribus elegantiores aliquot Luciani libellos interpretabitur.

D. BERNHARDUS FULLENIUS
Mathesin explicare perget.

LAMBERTUS BOS Linguæ Græcæ Prælector, Diebus Mercurii & Saturni hora Duodecima Græcæ Gentis consuetudines & opiniones exponet.

FRANEQUERÆ,
Ex Officinâ *Johannis Gyzelaar,* Illustrium Frisiæ Ordinum & Eorundem Academiæ Typographi Ordin. *1698.*

9. Professor Fullenius

9.1. Introduction

On December 4, 1684 Fullenius was officially inaugurated as the new professor in mathematics at the University of Franeker. It was Balthasar Bekker who delivered a poem that day to commemorate this special occasion. In the poem, Bekker reminded the present audience that Fullenius had given his life for the fatherland (=Friesland), but in the meantime had not neglected his studies. In reference to Metius, and citing Ovid, Bekker predicts that his brother-in-law will make sure that the mathematical arts will 'ascend to the heavenly mansions!'[1] With this he means that Fullenius will give the study of math divine proportions.

It is quite possible that Bekker wanted to shock his audience with his poem. During his spell as a minister there, he was ultimately forced to leave because of his Cartesian sympathies. The first lines of his poem bring this into memory, as he discusses how he was 'voluntarily banished' from Franeker. Yet the reading of this poem was not the most amazing event taking place in Franeker that day. The inauguration itself was extraordinary, because it meant that Fullenius, an important regent and burgomaster of the town, had made a move to the university.

The Fullenius family had for successive generations followed a markedly upward mobility trend. Grandfather Fullenius had been a minister, his son, Bernhardus Fullenius, had become a professor at a very young age, and Fullenius junior had brought the family into patrician circles. It seemed a logical career for a family rising through society, but then the youngest Fullenius took a remarkable step down: he accepted a post as professor of mathematics. By the 1680s he had shown both his expertise and his competence in this field. But his career had also made him ineligible for a post at academia, namely because he was overqualified.

It is unlikely that Fullenius swapped the city for the university because he was a bad regent. That would contradict all sources available on his time as a member of city government. Fullenius had been a

[1] That it is clearly Bekker who wrote this poem can be taken from the first few lines. They are a short autobiography of him. The reference to Ovid is given in the very last line: 'inque domos superas scandere cura fuit!' See Newlands, *Playing with Time*, 32 and 42.

successful public official and as such had been the culmination of almost a century of family politics. Other explanations need to be explored to come to a plausible answer to the problem posed here: why did Fullenius take the step down?

To come to this answer I will explore the details of his appointment process and I will argue that the post of professor of mathematics became available at precisely the right time and that Fullenius junior was the perfect candidate to combine the education of *idiotae* with expertise in mathematics. I will also reconstruct his practices as a teacher. What was it he would do at university? This approach will provide the picture of the *professor* Fullenius. The underlying assumption is that this picture is framed by the appointment. Fullenius can be expected to have lived up to expectations, there is no evidence he did not. This living up to expectations, reveals at least partly what those expectations were, but also what Fullenius had made of his appointment. It will thus provide the rationale behind his move from city to academia.

Before I can turn to this I need to explain why a new professor was needed, if only to keep track of the continuity of the story. Therefore it is time to discuss Abraham de Grau one last time.

9.2. Obtaining a chair in mathematics

9.2.1. The death of a professor

Abraham de Grau's first wife, Rixt Doënga, had previously been married to a burgomaster. Little is known about her, other than as the wife of De Grau she once stole her neighbour's silverware, a story that was covered up by academic society.[2] She died in 1682, shortly before De Grau turned 50. Within a year he had found a new wife. In May 1683 they married and set out on their honeymoon. This was supposed to be a new start for De Grau, but it instead all fell apart from there. He returned to Franeker ill and was forced to stay in bed.[3] He would die some weeks later on September 8, right at the beginning of the academic year. By this time it was already clear that Fullenius was the foremost candidate to succeed him.

What happened in those few weeks that turned the celebrated burgomaster into a candidate for this position? Fortunately all of the official protocols were followed and many are preserved, which offer a unique insight in how the eventual appointment was orchestrated. It would take a whole year before Fullenius could take up office, and it would take another three months before he gave his official inauguration *oratio*. It is precisely from this period that different letters written by and

[2] Boeles, II.1, 229. Boeles gives 1662 as the year in which Rixt Doënga died; this is incorrect.
[3] Terpstra, *Friesche sterrekonst*, 75.

to Fullenius have survived. They add dimension to Fullenius' entire paper trail and they also provide some interesting details about the scheming that took place behind the scenes.

The central node in the web of Frisian politics at the time was Philip Ernst Vegelin van Claerbergen, a German nobleman who made a career in the army and in politics. He arrived in the Dutch Republic in the 1640s with the prince of the Paltz.[4] At that moment Vegelin had already made some good contacts in the European Republic of Letters.[5] He was a correspondent for the Hartlib circle – as I have shown in chapter 7 – and as such functioned as a bridge with the French learned world, where he exchanged letters with Marin Mersenne. Vegelin thanked his position in Friesland to a personal intervention by Constantijn Huygens (1596-1687), court secretary to the Oranges in Holland and one of the key figures in that province both politically and culturally. In Friesland, Vegelin would make a similar career, becoming by far the most influential politician of the entire century and keeping a special place in the centre of cultural life.[6]

How far Vegelin's arm reached became eminent in 1664 when tragedy struck the house of Nassau in Leeuwarden. At that moment the Frisian branch of the family was poised to take over control of the family, and with that possibly the position of Stadtholder of the entire Dutch Republic. Prince Willem III (1650-1702) was the oldest Orange alive and, by right, the head of the family. But he had had been orphaned before he was a year old and was kept under control of the Holland regents. In 1664 Willem was just in his teens. The Frisian Stadtholder Willem Frederik, with Vegelin on his side, was clearly the acting head of the family.[7] But this ended tragically when he shot himself through the head while cleaning his pistols. He did not die instantly, but stayed alive for another two weeks, unable to eat or speak. While in this state, he communicated with his family through little notes. On one he expresses his specific trust in Vegelin. Next to an actual spatter of blood it reads: 'What gives some consolation in this affaire is that Veugelin[sic!] will stay with my wife and children.'[8]

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[4] A good biography on Vegelin is lacking. The best introduction is offered by Sterringa, 'Philip Ernst Vegelin'. An important addendum to this article is given in the study of Geert H. Janssen, who studied patronage under Willem Frederik. Because Vegelin served as Willem Frederik's secretary, quite some information on him can be found there. See Janssen, *Creaturen van de macht*; translated as *Princely Power in the Dutch Republic. Patronage and William Frederick of Nassau (1613-64)* (Manchester 2008).
[5] Malcolm, 'Six Unknown Letters'.
[6] Sterringa, 'Philip Ernst Vegelin', 30-34.
[7] Janssen, *Creaturen van de macht*, 175-219.
[8] 'wat raet help of troost siet ghy in dit werck dat Veugelin bij mijn wijf en kinder blijft', see Nienes, *Archieven*, 287 and Sterringa, 'Philip Ernst Vegelin', 32.

Taking care of the family was precisely what Vegelin would do over the following years. In those years to come this would culminate in the Nassaus establishing 'a relatively autonomous Stadtholderate' in Friesland around 1672.[9] Balthasar Bekker was instrumental in what has been described as a people's revolt to keep them in power in that year, as discussed above.[10] That same year Louis XIV (1638-1715), the king of France, wanted one of his daughters to marry the oldest son of the Frisian Nassaus. Vegelin recognized the problems such a marriage would cause and quietly, but tactfully diverted the Sun King. There is not one person to which Vegelin can easily be compared. He outlived most of his patrons, the Frisian Nassaus; his time at court encompassed more than half a century. If he resembles anybody, it would be Constantijn Huygens, a secretary to the Dutch Oranges. Still, Vegelin was more a military commander of aristocratic descent than Huygens, who was a humanist poet, a connoisseur and almost from the cradle destined to become a secretary to the Orange family.[11]

Yet both Vegelin and Huygens shared an interest in sciences (from philology to mathematics). And it was Vegelin who clearly wanted Fullenius to fill the void left by De Grau's sudden death in 1683. In the early 1680s he and Fullenius got personally acquainted and they established a proper patron-client relation.[12] Vegelin would broker contacts for Fullenius, and he would apply to Fullenius' mathematical skills in return. Over time Fullenius would recommend his own family to Vegelin.[13] As one of the most influential public persons and the secretary of the Frisian Nassaus, Vegelin kept a meticulous personal archive. That archive holds some of the very few preserved letters written by and to Fullenius.

9.2.2. The Bernoulli letter

One of the most intriguing letters in the entire archive was written by Jacob Bernoulli and possibly addressed to Fullenius. It has gone unnoticed in virtually all published literature on Bernoulli.[14] Since the

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[9] Breuker, 'De vestiging'.
[10] Kalma, 'It rampjier en de dûmnys'.
[11] Very telling on their relationship is the *editio princeps* of Japick's *Friesche Rymlerye* Vegelin that was given to Huygens. This document is kept at Tresoar today, see http://home.wanadoo.nl/m.bourgonjen/Huygens/Constantijn.htm (retrieved 12-12-2011).
[12] On how these patron-client relationships functioned, see Janssen's conclusions in his, *Creaturen van de macht*, 203-218.
[13] See Dijkstra, *Het vinden van oost*, 46; see also Fullenius' letter of 7 February 1689 to Vegelin, EVC, 3615, Brieven van Bernhardus Fullenius (1640-1707) aan Philip Ernst Vegelin van Claerbergen (1613-1693).
[14] The letter has gone completely unnoticed in Bernoulli's published correspondence. Fritz Nagel and I hope to publish an introduction on this letter, including a transcription and a translation.

actual addressee is only referred to with platitudes like 'Vir Consultissime' and 'Fautor Honorande' it is hard to determine who it was meant for. Bernoulli could have addressed any number of people with this, but the content makes it unlikely that he addressed it to Vegelin.[15]

The lot in which this particular letter is kept consists of several letters written by various correspondents, ranging from the French father Marin Mersenne to the German mathematician Athanasius Kircher (1601/02-1680), over the period 1640-1690.[16] Over the years 1683-1691 Fullenius and Vegelin exchanged several letters, of which most are kept in this lot, however, not all. Some letters addressed to Fullenius by others have also ended up in this specific archive. But there are also documents that used to be kept in this archive that are now elsewhere. For example, manuscript marginalia on a letter written by Christaan Huygens and addressed to Fullenius, suggest that it was once filed among those today kept in the Vegelin-archive, except, it is now found in the Staatsbibliothek Berlin.[17] It is therefore plausible that a letter written by Bernoulli, addressed to Fullenius, ended up there as well.[18]

But there are other reasons to assume that the letter was not directed to Vegelin, but to Fullenius instead. First of all, there are clues that suggest that Bernoulli wrote to Fullenius on precisely those matters that are discussed in the letter. When, years later, as the occasion came up, Gottfried Leibniz asked Johann Bernoulli, Jacob's brother, for some information on Fullenius, Johann recalled how Fullenius had helped his brother Jacob with Cartesian geometry. He even said that Jacob

[15] De Vries, *Het familiearchief*.
[16] Malcolm, 'Six Unknown Letters'.
[17] This is indicated by a note on a letter from Huygens to Vegelin in the Staatsbibliothek in Berlin, HS013188764. This note only reads 'Christianus Hugenius', but it is written in the same hand as the one that filed the letter written by Bernoulli. I believe that hand belongs to one of the sons of Vegelin van Claerbergen. However, other letters have drifted from this original archive as well, for example a letter written by Fullenius addressed to Vegelin from 1684, now in Das Germanisches National Museum. This last letter in fact deals with a letter that Vegelin forgot to forward. That letter was originally written by Huygens and sent to Fullenius for comments. Fullenius in turn forwarded it to Vegelin, who probably forgot to enclose it in a letter to Huygens. There is more correspondence that took such a route. A letter by Bernoulli to Fullenius ending up in the archives of Vegelin is therefore a valid possibility.
I kindly thank Wiebke Wemheuer for photographing the letters in de Staatsbibliothek for me.
[18] Vegelin had several descendants. Those who were in control of the family archives seem to have held their parent, and later their ancestor, in high regards. Therefore, his personal items have been relatively well preserved. Fullenius, on the other hand, had no direct descendants and most (if not all) of his books and papers were auctioned shortly after he died.

‘frequently consulted’ Fullenius.[19] These remarks by Johann imply that at least some correspondence between Jacob and Fullenius existed.[20] Furthermore, ‘geometry’ and ‘Cartesian mathematics’ is a fair description of parts of this specific letter.

But the Bernoulli letter deals with more than just that. The first part talks about a theory of dioptrica written by the addressee and handed personally to Bernoulli.[21] The Basel mathematician says openly that he hopes the dioptrics of the unnamed addressee will be published soon. From other sources we know that Fullenius had some highly developed ideas on dioptrica.[22] In fact, Fullenius was probably one of the leading experts in that field in the whole of the Dutch Repubulic.[23] At the same time the remark excludes Vegelin as a possible addressee. While he was an amateur enthusiast of mathematics, he was not about to publish a dioptrica; this would have been well below his dignity.

The second part of the letter deals with more geometrical and mathematical-physical problems and questions. Most of these Bernoulli had collected during his journey through the Netherlands and England. In his unpublished *meditationes*, which he kept during that long journey, he even literally noted down some of these passages. Bernoulli sent several of these problems, as well as his solutions to the addressee. These include geometrical problems on plains that intersect and touching circles, but also problems on crossing lines. The addressee clearly is the senior mathematician in this correspondence. The letter reflects a broad interest and enthusiasm for all different sorts of math, from plain geometry, to algebra and optics.

All in all, the most likely candidate is Fullenius.[24] He had not only mastered all fields discussed in the letter, he was in fact about to return to university because of his competence. This specific letter underscores two important qualities of Fullenius’ paper trail. Firstly, and this had already been clear from Bernoulli’s visit, Fullenius acted in a sort of tutoring position to the young Bernoulli, even before he became

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[19] See a letter of Johan Bernoulli to Leibniz, 15/25 August 1696 in: Leibniz, *Sämtliche Schriften*, VII, 104-105, where Johann states that ‘frater meus Dn. Fullenium crebro consulebat’.

[20] Vriemoet was the first to recall this in specific relation to Fullenius. See Vriemoet, *Athenarum Frisicarum*, 655; Van Berkel, ‘Het onderwijs’, 219.

[21] Unfortunately I could not find this treatise on dioptrics.

[22] They have only partly survived. He discusses them in later letters written to Christiaan Huygens and, still later, he posthumously published Huygens’s ideas on dioptrics. See for example OC, VIII, 489.

[23] Which was probably why Huygens appointed him to publish his posthumous works.

[24] In fact, the only other candidate would have been Huygens. However, the connection between Huygens and Vegelin may be as strong a possibility as that between Fullenius and Vegelin. A connection between Bernoulli and Huygens is much less likely than one between Bernoulli and Fullenius.

professor. Apparently the Franeker burgomaster had a strong fascination for mathematics, was recognized by members of the Republic of letters for having this fascination and discussed these matters with interested 'students'. His knowledge and skills were up-to-date. He was not just an able mathematician, he was probably the foremost mathematician of the whole of Friesland, challenged only by the man he was about the succeed: Abraham de Grau.[25] He was, in brief, a very capable tutor to Bernoulli.

Secondly, the location of the actual object, the letter, highlights who was the gatekeeper of the Frisian scholarly world in the 1680s: Vegelin. Very much in the same way in which Constantijn Huygens had been the grand figure in the arts and sciences in Holland, Vegelin acted as one in Friesland.[26] The fact that letters written by and to Fullenius ended up among his personal items is an illustration of the strong grip he kept on the Frisian intellectual world. Yet Vegelin never had enormous financial possibilities; he was not exorbitantly rich.[27] But he did have a strong vote in who would be appointed in various offices, which was a way in which he could execute his patronage.

9.2.3. Scheming for a professoriate

Fullenius seemed to be a more or less ideal candidate to succeed De Grau. Not only was his expertise in mathematics beyond doubt, he was also well liked in the best Frisian circles.[28] Yet upon closer look, his switch gets even more mysterious because of this. Apparently he already 'tutored' talented mathematicians of the likes of Bernoulli, a teaching relation that far better suited his social position than an official job like that of professor. Yet Philip Ernst Vegelin van Claerbergen seems to have done all that he could to have his favourite appointed professor; apparently he thought Fullenius was the man for the job.

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[25] Fullenius and De Grau were certainly not the only ones interested in mathematics. Others included Vegelin van Claerbergen, but also the Leeuwarden noble man Van Knijff. See Fullenius to Vegelin, 1683, EVC, 3590, Brief van Bernhardus Fullenius (1640-1707) aan Philip Ernst Vegelin van Claerbergen (1613-1693).

[26] On how Cuper had been a patron in Deventer, see Chen, 'Digging for Antiquities'; On Witsen see the recent biography of Peters, *De wijze koopman*.

[27] Vegelin married into money, which created possibilities for him. That he made his children keep meticulous accounts of their study expenses was not just a pedagogical tool. See Dijkstra, 'Vier Vegelins', 104-105. The money he inherited from his in-laws allowed him, for example, to lend money to the Nassaus (who were always short of that too), see for example Sterringa, 'Philip Ernst Vegelin', 36.

[28] Fullenius was shortly appointed commissioner for the Dutch East India Company in 1680, which was just one of many appointments. Even in 1689, when he had been a professor for more than 5 years, he acted as 'enlisting commissioner' (in Dutch: Monster commissaris) for the Frisian army, a highly sought after job which required him to inspect certain regiments of the Frisian army. See Boeijinga, 'Fullenius', 42.

The story sets off in early August 1683, shortly before De Grau died, and when his death seemed only a matter of time. August 10, Fullenius wrote a letter to Christiaan Huygens. In this long letter he gave an expose on optics, or dioptrica.[29] The letter is a true *tour de force*, in which Fullenius gives an impressive example of what he could do. Fullenius and Huygens had met some time in the past, but only recently Fullenius decided to write Huygens and inform him on his dioptrics.[30]

Fullenius did not send the letter to Huygens himself. Instead it was sent on his behalf by Vegelin on the 28th of August. The accompanying letter from Vegelin gives a perfect sketch of how the three men related to each other. In that short note, Vegelin firstly recalls how he met Christiaan Huygens and his father Constantijn only a few weeks earlier and he gives an excuse for not having written sooner. He continues with the main matter at hand: 'Monsieur de Fullenius Bourgemr. de Franeker m'a mis lenclose entre mes mains pour vous les faire tenir, cest dommage pour le publiq quon ne donne de l'employ a cest honnest homme.'[31] He continues with news that his 'Prince', the Frisian Nassau Stadtholder Hendrik Casimir II, was away in Germany to get married. The ten line letter clearly was just an introduction for Fullenius. The reference to Fullenius not having a public function is a bit odd; a burgomaster by all accounts serves in a public function. What is more, Fullenius held that post at the moment the letter was written, and it is also how Vegelin refers to him. This arouses the suspicion that he wanted a different public position for Fullenius, one in which Fullenius could practice the skills he so abundantly showed in the enclosed letter.

In that letter, which Fullenius had addressed to Huygens, he referred to Vegelin as 'amicus et summus fautor meus' (my friend and great patron).[32] This sums up their relationship quite comprehensively, because Vegelin proved to be a good patron. Over the following months he actively campaigned for Fullenius to replace De Grau. The fact that the Stadtholder Hendrik Casimir II (1657-1696) was away in Germany plays in favour of the historian here, because it forced Vegelin to keep a written correspondence with his prince where he normally would have informed him in person. On October 6 Vegelin tells the Frisian Stadtholder that De Grau had passed away and that Fullenius wanted to

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[29] The letter has survived in two handwritten versions, by Fullenius. One is kept in the British Library, shelf mark 21.524, lot no. 96 (in the inventory it is dated at 1633, which should be 1683); a second copy is kept at the University Library of Leiden, which was published in OC, VIII, 443-451, letter no. 2317.
[30] Fullenius talks about a work by Sturmius, which was provided to him by Vegelin.
[31] P.E. Vegelin van Claerbergen to Christiaan Huygens, August 28 1683, see OC, VIII, 442, letter no. 2316.
[32] Bernhardus Fullenius to Christiaan Huygens, 10 August 1683, see OC, VIII, 443-451, letter no. 2317, see also footnote 29 above.

take over as professor. Vegelin had written several letters to Hendrik Casimir after the news of De Grau's death broke, but apparently he waited until Fullenius' candidacy was a certainty. He recommends Fullenius as 'a very expert man'. In the week following this letter Vegelin informed the other regents and summoned support for Fullenius. Consecutively, he wrote on October 16 to Hendrik Casimir:

> 'The gentleman burgomaster Fullenius from Franeker finds large affection with all regents to fill the vacant professor's office of the deceased mathematician De Grau and he recommends himself in your highness' good grace.' [33]

The curators of the university, who were by now officially chaired by the Stadtholder (an office Willem Frederik had obtained in 1652), convened over the vacant post early in 1684. They had the right to nominate three candidates, of which the Senate of the university could pick the most desirable. Recently the notes of the curators have been found in Pennsylvania (U.S.A.).[34] These notes reveal that Fullenius was the preferred candidate, but also that he was up against some competition. None other than Pierre Bayle was mentioned as one of the possible candidates, as well as professor Brandt of the University of Marburg. Both were exempted from the final list of three, but it can nevertheless be seen as a sign of the ambition of the curators. Of the remaining candidates that were proposed, Vegelin had no doubt his favourite would secure the job. As he wrote to Christiaan Huygens on February 29 1684:

> 'Monsieur Fullenius, our shared friend, is on the verge of his advancement. The Messieurs curators of the university have named three people for the chair in mathematics: M[onsieur] Fullenius, M[onsieur] Neys a lawyer in Zwolle and a young man Joachimus Burcardus of Heidelberg who resides in that city.'[35]

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[33] Vegelin van Claerbergen to Ernst Casimir II, 6 October 1683; see SHA, Een elftal brieven van P.E. Vegelin van Claerbergen aan Ernst Casimir II. 'De Heere Burgemeester Fullenius tot Franeker vind bij alle de Regenten een groote genegentheit om tot het vacante Professors ampt van den overledenen Mathematicus Graew te geraecken en recommandeert sich ten besten in Uw. Hoochsten goede gratie.'

[34] Nienes, *De archieven*, 21-22. This inventory has been photographed and can be consulted online. A hard copy of these photos can be consulted at Tresoar, in Leeuwarden. http://hdl.library.upenn.edu/1017/d/medren/3768718 (retrieved 12-12-2011).

[35] Vegelin van Claerbergen to Ernst Casimir II, 16 October 1683; see SHA, Een elftal brieven van P.E. Vegelin van Claerbergen aan Ernst Casimir II. 'Monsieur Fullenius nostre commun amy est sur le point de son advancement. Mess. les Curateurs de l'academie ont nommé 3 personnes pour les mathematiques assauoir M. Fullenius, M. Neys advocat a Swoll et un jeune homme Joachimus Burcardus de Heidelberg qui demeure en ceste ville.'

Indeed, Fullenius was appointed; in September of the following year he started his work, and in December he gave his inaugural lecture.[36] The only hiccup was that the city Franeker did not want to let him go, nor have him combine the functions of burgomaster and professor. They were in their right to refuse this, and in the process they highlighted the fact that conventions were broken by this particular move.[37] The problem was soon solved; Fullenius gave up his position as burgomaster. However, despite this smooth transition, the process did touch a raw nerve.

Fullenius did not just change loyalties by moving from the one jurisdiction (the city) to the next (academia). He voluntarily took a step down. To be more precise, he was backed by one of the province's leading men to go from the highly valued post of burgomaster to the lower position of professor. This could have serious consequences for all regents in Friesland. The pretext for this move was given by the fact that Fullenius clearly wanted to transfer to the university. But that does not explain why Vegelin tried so hard to get him there. Any explanation for this switch needs to highlight that he was not an ideal candidate, even though he may have looked like one. His move broke important social conventions, which was no mere feat in at the time, both for Friesland and more broadly for Europe.

9.2.4. Taking a step down

Although there were several burgomasters in the Dutch Republic with a scholarly background and an inclination to the New Philosophy, none seemed to even consider taking a step down like Fullenius did. The only reasonable explanation for this is that it was precisely the Franeker setting combined with Fullenius' personal background that created the possibility for him to come to such a decision.

Perhaps Fullenius can be compared to Johannes Hudde. Like Fullenius, Hudde was a burgomaster and like Fullenius he had a strong interest in mathematics. Much like the Franeker burgomaster he hardly ever published a thing, but he still wrote some (allegedly) brilliant mathematics.[38] During his long life, in both Amsterdam and Leiden the position of mathematics professor became available several times. But both a position at the Athenaeum Illustre in Amsterdam and at the University of Leiden were so far below his status that it would not have even crossed his mind.[39]

[36] Van Berkel, 'Het onderwijs', 219.
[37] Boeijinga, 'Fullenius'. 35.
[38] Vermij, 'Bijdrage tot de bio-bibliografie', 25.
[39] Vermij, 'Bijdrage tot de bio-bibliografie', 26.

Another politician with mathematical interests can be found in one of Hudde's fellow students, the regent Johan de Witt (1625-1672). When De Witt had written something worth publishing, he had this done by his old teacher and professor at Leiden, Frans van Schooten junior.[40] Not only was the dignity of a professoriate below that of both Hudde and De Witt, they did not even bother themselves much with the publication of their own ideas. In fairness, they are likely both of an even higher social class than Fullenius. They were both hors-category regents and a public career in Franeker was not included in this status. But there are other cases available that even more closely resemble Fullenius'. One such is that of Bernard Nieuwentijt (1654-1718), again a burgomaster and a mathematician. For him it never seems to have been a real possibility to make the transfer to university.[41] Perhaps the best illustration is the case of Gisbert Cuper. This eminent scholar from the city of Deventer was appointed professor when he was 24 years old, an appointment that recalls those of De Grau and Huber in Franeker. However, by the time his political ambitions were materializing he laid down those professor's robes and concentrated on the more esteemed public offices he acquired. Nevertheless, he did not neglect his research, and kept a strong grip on his vast network of correspondents all over Europe. Yet he left the academic practice of teaching behind.[42] That was considered the normal path and Fullenius clearly deviated from this when he took it the opposite way.

In Franeker, the local professors and the burgomasters were not as remote from each other as the Amsterdam professor and burgomaster, or the Leiden scholar and the *raadpensionaris* of the province of Holland. From a local point of view Fullenius' pursuit of a mathematical chair may therefore be understood more easily. It was a step down, but for the son of a professor in mathematics it would not have been a plunge like it may have been for Huygens, De Witt or Hudde. Yet on one point Fullenius kept his regent habits: in contrast to his brother-in-law Bekker, Fullenius was hard pressed to put something in print. Nobody expected a university professor to publish much.

Firstly the chair in Franeker fit Fullenius' ambitions and interests perfectly. He was, for example, interested in the same matters De Grau had exploited as professor. Both studied comets, both wrote about them and they both were recognized by fellow members of the Republic of Letters for doing so. Secondly Fullenius was in his early forties when the possibility to become professor presented itself. He was not, and never would, get married, although he had enough money and income to

[40] See for an intriguing episode, Dijksterhuis, 'Moving Around the Ellipse', 120-122.
[41] Vermij, *Bernard Nieuwentijt*.
[42] Chen, 'Digging for Antiquities' and Peters, *De wijze koopman*, 271-303.

support a wife. The one thing that definitely can be concluded from this is that there was no direct heir to his social capital. Fullenius' decision to step down would thus not affect his children.

On the contrary, Bernhardus' move made his position available to Fransiscus Fullenius (1649-1692), his brother.[43] Fransiscus would be appointed burgomaster of Franeker shortly after Bernhardus had become professor. He would also be delegated to the Frisian States on behalf of the city, effectively saving the Fullenius family's career. Furthermore, Bernhardus actively supported his brother. He, for example, recommended Fransiscus in Vegelin's favour, exploiting his position as a confidant to the Secretary for benefit of the family. The remarkable step down allowed the Fullenius family to secure a spot in both the academic and the civil world of their time.

9.3. Lessons in mathematics

9.3.1. Mathematical expectations

Sources on how Fullenius organised his lessons are abundant compared to the other seventeenth century Franeker professors in mathematics.[44] There are several sets of lecture notes, remarks from visitors, lists of the books used, fairly reliable lists of graduates, a handwritten textbook by Fullenius himself and even bills that list the costs of a study with Fullenius. Yet these sources are not easy assembled in one place, and even if they are, they do not give away their secrets easily. This is mostly because they filled with commonplaces. It is, for example, hard to distinguish between the lecture notes of Fullenius and those of one of his predecessors or contemporaries. The best way to study these sources is of course in connection with each other.

To establish that very specific context, it is necessary to establish what was asked of Fullenius as a teacher. There is no known written assignment, or *leeropdracht* as the Dutch say, for Fullenius, nor for any of the Franeker math professors. And to focus just on what he actually did, would not necessarily unearth what was expected of him. There are some clues of what was expected of him, though. First of all, there is a short description of what De Grau was supposed to do in the year he died, shortly before Fullenius would take over. For that year there exists an O*rdo Lectionum* (lecture roster), the only one known to mention De Grau. His plans for the academic year 1683-1684 were 'Primum absolvet dioptricae Cartesij demonstrationem, postmodum Partium Matheseos

[43] Boeijinga, 'Fullenius', 35 and 45; see also Dijkstra, *Het vinden van oost*, 46.

[44] Although historians also agree that the amount of sources on his life leave a lot to be desired, see Van Berkel, 'Het onderwijs in de wiskunde', 219 and Van Maanen, *Facets of Seventeenth*, 180-181.

compendium tradere perget'.[45] It likely that Fullenius was expected to begin where his predecessor stopped, especially since the dioptrica was one of his expertises and since normal mathematics can be considered standard academic work.

A second important clue is given by one of the candidates Fullenius was up against when he was appointed. It can be expected that the curators wanted to have candidates with more or less similar qualities on their lists. If one of them would decline the position, or be passed over by the Senate, the next was supposed to be as good as the one they favoured. Of the initial list, which had six names, Pierre Bayle is best known. Bayle and Fullenius were probably representatives of the same philosophical current, because their contemporaries considered them both intellectually close to Balthasar Bekker.[46] In this case the curators wanted a teacher who was competent in what can be loosely phrased as 'Cartesian mathematics'.[47] Ultimately the curators felt Bayle was better suited for the actual chair in philosophy, which also became available around the same time.[48]

The final nomination consisted of three candidates, of which Fullenius was clearly the preferred choice.[49] Little can be said of Joachim Burchardus of Heidelberg, one of the two candidates Fullenius was up against. He was appointed as a Latin school teacher in Brielle in 1681 and married there in 1684.[50] However, on the other, 'Dr. Nyss' from Zwolle, a little more can be said. Hendrik Jasper Nuis († 1694) had studied in Groningen (1677) and Leiden (1679) and took a doctorate in law in Harderwijk (1680).[51] In 1686 he published two treatises on mathematics, which is more than Fullenius ever did. Both books deal with practical mathematics that could be applied by engineers and architects. One deals with a way of calculating the surface of plains, the use of several

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[45] Boeles, II.1., 229; see also Galama, *Het wijsgerig onderwijs*, 110.
[46] Bekker himself stressed this friendship with the published poem, cited at the beginning of this chapter.
[47] Cartesian not because Descartes was the sole influence on that sort of teaching, but because those contemporaries branded it as such.
[48] Labrousse, 'Documents relatifs'. To these documents, those in Pennsylvania can be added, see http://hdl.library.upenn.edu/1017/d/medren/3768718 (retrieved 02-19-2012).
[49] It was common practice to name the preferred choice first, which was Fullenius. Telling in this respect is also that the curators did not even know the Christian name of the second candidate.
[50] See http://www.stamboomforum.nl/hulp/2/3942/0 (retrieved 02-19-2012).
[51] http://www2.historischcentrumoverijssel.nl/zwolle/inventarissen/zow/zowinl1.htm (retrieved 20-05-2012); Streng and Van Dijk, *Zwolle in de Gouden Eeuw*, 28; Streng and Van Dijk make a connection between the mathematical abilities of Nuis and the 'reekenmeester' Bartjens, who had lived in Zwolle and whose name has received a proverbial meaning in Dutch for something like 'solid math'. Nuis may have known relatives of Bartjens, but Bartjens himself had already died in 1638.

Two different sets of lecture notes from Fullenius' classes, but with very similar title pages. The one depicted on the left is kept at the university Library, Leiden. The one depicted on the right is kept at Tresoar, Leeuwarden.

geometrical instruments and ellipses – a book ideal for land surveyors.[52] The other deals with deepening rivers and harbours with the goal of addressing the often encountered problem of silting.[53] It is likely that this was the foremost skill the curators sought in the new professor, the ability to teach practical mathematics.

From these sources two possible distinct facets of the teaching expected from Fullenius come to light. First of all he was expected to be a capable 'Cartesian', which meant that the newer forms of mathematics, like analytical geometry, had to be part of his repertoire. Secondly an important part would be practical mathematics; the land surveyors, navigators and fortification engineers were still an important part of the academic mathematical population. A third, possible, subject that Fullenius would teach is, of course, astronomy. Since Metius, all Franeker mathematics professors had excelled in this discipline, and it is safe to assume the same was expected from a noted astronomer. After all, Hevelius had explicitly referred to Fullenius in one of his most recent publications.[54]

[52] Nuis, *Regthoekig algemein* (1686).
[53] Nuis, *Reden en middelen van verdieping* (1686).
[54] Hevelius, *Machina Coelestis*, II.

9.3.2. Living up to expectations

Until now historians have focused on just one side of Fullenius' teachings – that of the *idiotae*. Thus far, this has led to the conclusion that in his lectures 'demonstrations were central and the abstractions of newer forms of mathematics were avoided'.[55] This assessment does not add up to what was possibly expected from Fullenius, since it was precisely the Cartesian mathematics that were considered to be those 'newer forms'. In fact, this assessment is based on just a single source, a remark from Zacharias Conrad von Uffenbach (1683-1734), a visitor to Franeker in 1711, years after Fullenius had died.[56] But about Fullenius' teachings a lot more can be said; the available sources indicate that he lived up to expectations.

The fact that a single remark of a visitor has colored the picture of Fullenius' entire career as a professor of mathematics has some broader causes. The fact that he never published anything and that his most famous students were not 'noteworthy' mathematicians all have contributed to this picture. But the most important factor to attribute to this image is the amount of graduated *idiotae* under Fullenius. In the 22 years he was a professor no less than 39 students would do a (vernacular!) promotion in mathematics. No other mathematics professor in the entire history of the University of Franeker would match that number. It is fair to point out that it was not all Fullenius' doing. The university was at the peak of its existence at the end of the seventeenth century, helping recruit students. Yet Fullenius does deserve some credit, since he did demonstrate that he could make most of the university's success.

Fullenius is also the first Franeker mathematics professor whose day-to-day activities are known in a little more detail. This allows for a limited reconstruction of his work. The one *Ordo Lectionum* that has survived (1698) on which Fullenius is mentioned only reads that he 'continues to explain mathematics', leaving open a number of possibilities.[57] That his activities were presented so vaguely may be because he gave different courses during an academic year. A note from a visitor is revealing in this respect. In December 1692 the Hungarian student Bethlen Mihály noted in his diary that the classes in astronomy

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[55] 'de aanschouwelijkheid centraal stond en dat de abstractie van de moderne wiskunde gemeden werd', see Van Berkel, 'Het onderwijs', 220.

[56] See Van Berkel, 'Het onderwijs', 220; see also Dirks, 'Aanteekeningen'; Uffenbach, *Merckwürdige Reisen*, 291 and http://home.wanadoo.nl/m.bourgonjen/Uffenbach/ZCvonU.htm (retrieved 12-12-2011).

[57] *Ordo Lectionum et horarum* (Franeker 1698). Johns Hopkins University, Vault .F9120 1698 c. I thank Ferenc Postma, who pointed this source out to me, and Ellen Keith who sent me a photo of it.

by Fullenius were almost ending.[58] He also mentioned that the 'Collegium Praxeos Mathematicae' would be given from March 4 to April 22 1693.[59] Apparently Fullenius gave an astronomy course in the winter, when the nights were long, and a practical mathematics course, like fortification, in spring, when practice in the field was possible. From one of Fullenius' letters to Vegelin it can be concluded that he intended to travel at the end of April, during which he would be away from Franeker for several weeks.[60] That his courses ended at the end of April, with the academic year ending on May 1, seems to corroborate this fact.

At the very end of the seventeenth century, Fullenius had a couple of very promising students. Two of them, Claes Ottes Jelbema (1680-after 1730) and Willem Loré (1679-1744), graduated on January 19 1700. Jelbema would become one of the most active mathematics teachers in eighteenth century Friesland. As such, he educated Eise Eisinga, the most famous of all eighteenth century Frisians.[61] Willem Loré was an orphan from the countryside, raised in Leeuwarden, and by 1700 he was the most important protégé of Fullenius. As a skilled mathematician he even took over some of Fullenius' privatissima.

From Loré's *Eulogy* we learn that even before he took his degree in mathematics he lodged with Fullenius. He would stay there for the remainder of Fullenius' life. Loré would get up at four every morning and rehearse whatever Fullenius had lectured the day before. From six in the morning until ten at night he would be at the disposal of 'honourable' students (most notably those of noble blood).[62]

One of these students was Assuerus Vegelin van Claerbergen (1687-1774), a grandson to Philip Ernst Vegelin van Claerbergen. He recorded meticulously well how much money he spent during his time in Franeker. Together with his brothers, he was asked (or ordered) to do this by his father, who had overspent during his time as a student and apparently did not wish to pay for debts made by his sons. From these bills it becomes apparent that the first and more talented son went to Franeker to study properly. He did everything we would expect an Early Modern student to do: spend money on drinking and clothing, but also on disputations and academic ephemera, as well as study books.

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[58] 'Collegium Astronomicum sub Domino Bernhardo Fullenio finitum'. See Bethlen, *Utinapolja*, 38. I thank Ferenc Postma, again, for his translation of the Hungarian.
[59] This period coincides with the beginning of the 'military year': works on fortifications and campaigns started traditionally in March. There are no known students to have graduated in math that year.
[60] Fullenius to Vegelin van Claerbergen, April 17 1685, GNM, Historisches Archiv, Autographen K.33. I kindly thank Birgit Jooss for helping me acquiring photographs of this letter.
[61] Terpstra, *Friesche*, 82 and Zuidervaart, 'Boerenprofessors'.
[62] Ypei, *Lyk-reeden*, 11. Fullenius and Loré grew so close that when the professor was on his deathbed, Loré as his – by then – assistant was the only person allowed to be close.

Assuerus Vegelin, however, looks like a student, but never actually became one. In fact he does not buy a single Latin book, making it questionable if he read Latin at all. He spent his money on student-like things that were helpful for a future soldier. He learned to fence, dance and play the lute. He took classes in French and in mathematics. For these last classes he bought a copy of the Abraham de Graaf's *Geheele mathesis* (*The Whole of Mathematics*), which seems like an ideal book to start a study in that field.[63] He paid Loré in cash three guilders and three nickels a month. He also bought several tables (which would have helped him with his calculations) and some simple instruments (rulers and compasses).[64] He also took some classes in mathematics with Fullenius himself, for which he paid the same charge. Although he matriculated at the university, he never paid any tuition money for that, just a first fee of 5 guilders. His brother did, but again, his brother was a student that behaved in a normal way.[65]

Finally, Assuerus bought several pamphlets pro and contra Menno van Coehoorn; these were used for the classes given by Loré. They recall the pamphlet written by Pibo Gualtheri, which Metius may have used in his classes. Van Coehoorn was a full cousin to Fullenius. Named 'the Dutch Vauban' he was one of the leading architects of fortification in the entire Republic. Being from the gentry, he had become highly skilled in military mathematics, precisely the education that would flourish under De Grau. However, Van Coehoorn is said to have been educated by Fullenius senior, but the sources for these claims remain inconclusive.[66] There were some clear links between the Fullenius family and Van Coehoorn. Not only were they related, they also intermarried and there are some recollections of them visiting each other.[67] That his pamphlets were used in Fullenius classes can thus come as no surprise. Next to that, the content of the pamphlets would have served a didactical purpose; they would have made the classes in fortification much more lively.

Thus, some simple instruments, a large volume on the whole of mathematics, tables with roots and square roots and a few pamphlets were the equipment a student of mathematics had to acquire for classes given under Fullenius. A final addendum to this could be a textbook composed by Fullenius himself. This was a more or less standardized

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[63] See the forthcoming dissertation of Tim Nicolaije, *Masters in Mathematics*.
[64] See Dijkstra, 'Vier Vegelins'; see also EVC inv.no. 3781, Stukken betreffende de kosten van de studies van Philip Frederik, Assuerus en Johan Vegilin van Claerbergen.
[65] Dijkstra, 'Vier Vegelins', 108.
[66] Van Coehoorn, *Het leven van*, 227-229; Hoof, 'Nieuwe manier, sterke banieren', 551.
[67] Boeijinga points at a visit Bekker paid to one of the Fullenii living in Breda. That particular Fullenius was married to Menno van Coehoorn's sister, and he (a cousin to Bernhardus) would also inspect the bulwarks in Namen at the request of the Frisian Stadtholder, together with a brother of Menno van Coehoorn. See Boeijinga, 'Fullenius', 63 and Sypesteyn, *Onuitgegeven stukken*, 256-257.

book, not in print, but handwritten. Yet it does show a lot of characteristics of a printed book. Two different specimen of it are known, which look remarkably alike.[68] What is more, Fullenius was indeed preparing a compendium on mathematics. A German visitor in 1698 noted in his diary:

> 'Lastly concerning the H[err]n Fullenius: we gathered from conversing with him, that he was a speculative mathematician who especially excelled in giving a lot of information in a short and concise way. Since he also said that, although he had completed a mathematical compendium, he did not have the courage to publish it. This was because he always feared that once it was published he would find something that he could have explained in a more concise way and would therefore, have to annul the entire work.'[69]

Fullenius would continue to hesitate to publish it, and when he died in 1707, among his papers was registered an *Arithmetica Bernhardi Fullenii*, no doubt this same book, still in manuscript.[70] Neither of the two known specimen of this book are written in Fullenius' hand, but they are written in the same hand; apparently a clerk had done this for Fullenius.

9.3.3. Surpassing expectations

At times Fullenius transcended the traditional lessons that were expected from him and his classes could also surmise to lessons fully packed with the latest mathematical developments. There are two distinct cases that give ground for such assumptions. The first is shown through a set of lecture notes of Fullenius' classes, which were noted down by Maevius Poll.[71] This local Franeker boy matriculated at the

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[68] Tresoar, sign. 628 Hs and University Library Leiden, Fullenius, *Arithmetica*, BPL 1967.

[69] Mencke, *Das Holländische*, 63. My translation: 'Was endlich den Hn. Fullenium anbelangt, so funden wir aus seiner Conversation, daß er ein sehr speculativischer Mathematicus war und insonderheit excellirte viel Sachen kurtz und nervös zu geben. Daher er auch sagte, daß er zwar ein Compendium Matheseos gefertiget hette, er würde es aber schwerlich zu ediren trauen, weil er allezeit befürchtete, er möchte nach dem Druck noch etwas finden, das er hette können kürtzer geben und darum das gantze Werck wieder cassiren.'

[70] Coetier, *Laudatio*.

[71] After his studies, Poll went to Sneek where he became rector of the Latin School, in 1690, see http://home.wanadoo.nl/mpaginae/Sneek/bestuur.htm (retrieved 12-12-2011); after this he would go to Deventer to be rector of the Latin School there, see Van Slee, *De illustre school te Deventer*, 82. This period was followed by a final term as rector of the Latin School in the Frisian capital Leeuwarden. Of this last period, a manuscript has survived in the University Library of Aberdeen, shelf mark MS 362; Maevius Pollius, *Compendium historiae universalis*.

university on August 30 1681, which was coincidentally precisely one day after Bernoulli left Franeker.[72] More importantly, this was three and a half years before Fullenius would officially be installed as professor of mathematics. If Fullenius had been his professor of mathematics right then, the manuscript would hardly have raised an eyebrow.

Yet Poll followed a class in mathematics with Fullenius four years later. During the autumn of 1685 and the spring of 1686, he loyally noted down what Fullenius taught him. Fullenius lectured on normal topics; he discussed algebra, conic sections and difficult linear calculations. It seems that this was a full course in 'Cartesian mathematics'.[73] It is impossible to say how often Fullenius repeated such thorough series, but it is clear that Fullenius was able to incorporate recent developments into his teachings. The traditional stance on university professors is that this was precisely the thing they did not do. A professor was a teacher of commonplace and practical knowledge. Yet, as this example shows, at the end of the seventeenth century there was a new breed of professors.[74]

From Poll's lecture notes it is clear that the difficult mathematics were taught as Fullenius' 'public lectures' in Franeker.[75] At the same time the Vegelin bills I discussed above show that Fullenius taught the more mundane mathematics as privatissima in his house. After 1700 he even had in Willem Loré a special tutor to take care of that for him. These are some strong indications that modernization and education were going hand in hand in Franeker at the time. This would set the scene for some new tensions within the walls of the University of Franeker.

9.3.4. *Imitating mathematicians*

Contemporaries may have felt that Fullenius was playing with fire when he started his courses with more difficult math, especially when they were combined with the ideas of his brother-in-law Bekker. This became particularly clear when a vehement discussion on 'mathematics as an example of how to practice philosophy' was waged at the University of Franeker, precisely when Fullenius was teaching the course noted down by Pollius. Fullenius' involvement is not mentioned in the discussion, but the circumstances make clear that this is highly probable. At the same time, Balthasar Bekker openly advocated the exact same principles.

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[72] ASF, no. 7882.

[73] The notes refer explicitly to Descartes. See for instance, Royal Library The Hague, shelf mark 73 J 16 Fullenius, *Praecepta*, fol. 24.

[74] It has been suggested that these difficult mathematics were only taught in the periphery of the University of Leiden, where Frans van Schooten junior discussed them with the likes of Hudde, De Witt and Huygens in the 1650s, see Van Berkel, 'Het onderwijs', 229.

[75] Royal Library The Hague, shelf mark 73 J 16 Fullenius, *Praecepta*, title page.

Whereas Fullenius always seems to take a careful approach, Bekker was more blunt in his assessments. Ultimately, this is because their goal was very different. Fullenius was interested in arithmetic and logarithms, he was interested in making observations and he was in very well informed on optics. Bekker was looking for guidance and interpretation of the Scriptures. Fullenius was an amateur patrician turned professor. Bekker was a famed Calvinist minister. Yet Fullenius' influence on Bekker may have been large, much larger than has been recognized, and Bekker's ideas in turn may have influenced what happened at the University of Franeker in the 1680s. In the spring of 1686, a disputation in Franeker was defended in which Bekker and Fullenius more or less came together: it philosophised based on a model of mathematics.[76] This was to a certain extent an extension and enlargement of the model Holwarda had pushed for: natural philosophy on a mathematical basis. It also reflects some of the tactics of De Grau, who also had sought a strong connection between math and philosophy, although this new approach was much more developed and mature.

The 1686 thesis caused an enormous scandal. It was defended by Gisbertus Wiselius Duker, a cousin to the newly appointed professor in divinity and philosophy Herman Alexander Roëll (1653-1718).[77] Although Roëll is widely considered to be the intellectual author of the disputation, Duker's role may be larger than has been presumed. The promoter was professor Johannes Schotanus à Sterringa (1642-1699), and the presiding professor during the actual defence was the then *Rector Magnificus* Johannes vander Waeyen (1639-1701). Ulrik Huber voiced the loudest objections against the thesis defended by Duker.[78] It was, in other words, a scandal that concerned the entire Franeker society. Almost every Franeker professor was embroiled in one way or another, including Fullenius, who is simply ignored in the historiography. To the contrary, it was mathematics that took a central place in the dispute.

At the core of the discussion the disputation caused, was the idea that the Bible should be read with reason – precisely the same argument that was at the core of the comet debate. Duker builds a complicated argument on this notion, an argument that is literally 'an imitation' of mathematicians. As he states, 'we see that surveyors and mathematicians are waiting with confidence for the results of their demonstrations'. If they can do that, so should the theologians, he reasons. Thus 'we imitate mathematicians', and that may perhaps ultimately lead to less knowledge, but that knowledge will be more trustworthy, so there is a

[76] An in-depth analysis of this, and a similar thesis, can be found in Bordoli, *Dio ragione*.
[77] Another good account and interpretation of these events is given by Van Sluis, *Herman Alexander Röell*, chapter IV.
[78] Van Sluis, *Herman Alexander Röell*, chapter IV.3. Huber had acquired a special spot in Franeker. He was the primus and only the rector to proceeded over him.

lot to gain.[79] If anything, Duker states that he was afraid that his argument would be confused with Spinozism, a very dangerous epitaph to get in the Dutch Republic at the end of the seventeenth century. To avoid that, he explicitly distances himself from Spinoza.[80] This was (of course) in vain; his opponents immediately raised the accusations he was so afraid of. What is more, those opponents came from all over the Dutch Republic.[81]

It seems that Duker's praise for math was heartfelt. Directly after he took his doctorate he did not leave Franeker, but stayed to study mathematics with Fullenius.[82] Unfortunately nothing is known of his accomplishments, but there are two important observations to be made. First of all, Duker's argument almost literally repeated things voiced by Bekker. Like Duker, Bekker stated that mathematics could provide a model to obtain 'certain knowledge'.[83] This clear similarity indicates the involvement of both Bekker and Fullenius. A full decade later Duker would even explicitly announce his sympathy for Bekker, although by then he himself hid behind a pseudonym.[84] The second observation that is important is the fact that Duker turned to mathematics the moment after he had taken his doctorate. This was almost an inversion of the times that Metius had first come to Franeker as a teacher of arithmetic and a lecturer to the freshmen a century before. Fullenius' course on complicated mathematics had become part of what can be somewhat anachronistically branded 'a post-graduate program'. This clearly was a completely different place for mathematics than a century earlier.

9.3.5. Promotion

Mathematics had climbed the ladder of cultural esteem in Franeker. Another example of this can be found in a disputation defended on the 28th of August 1695 by Christian Cole, a student born in Amsterdam but of English decent. He defended this disputation *pro gradu* to obtain his doctorate. The presiding rector was again Johannes vander Waeyen and the official promoter was again Johannes Schotanus à Sterringa. The disputation was entitled *On the movement, the distance and magnitude of the planets*, but most remarkably it was listed as a *Disputatio Physico-*

[79] Bordoli, *Dio ragione*, 195-196, see also Van Sluis, *Herman Alexander Röell*, 60.
[80] Bordoli, *Dio ragione*, 197.
[81] Van Sluis, *Herman Alexander Röell*, 62.
[82] Van Sluis. *Herman Alexander Röell*, 59.
[83] Bekker, *The World Bewitch'd*, 257.
[84] Duker did so as one of the authors of the 'Spinozistic novel' *The sequel to the life of Philopater*. His involvement in this has not been recognized in the literature on that book. I hope to publish an article in the near future in which I pursue Duker's intellectual and physical wanderings in more detail.

Mathematica.[85] It is the only known *pro gradu* disputation from Franeker that explicitly states that it is on mathematics.[86]

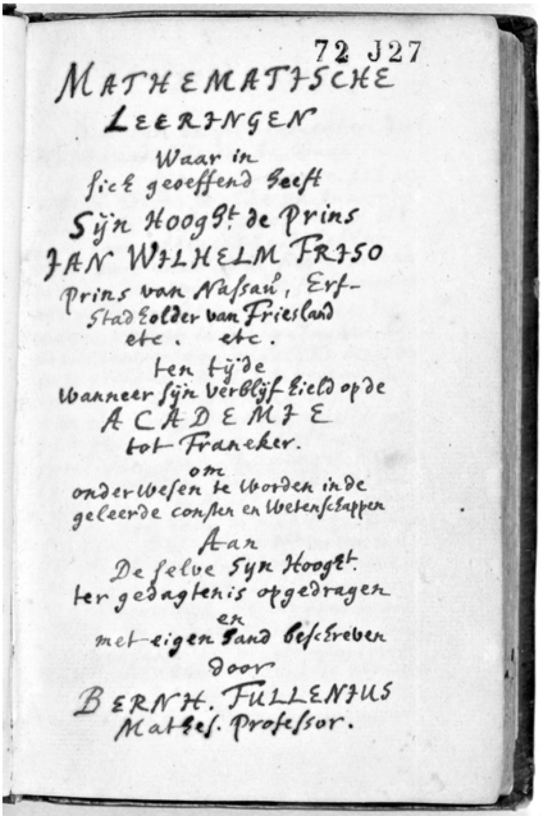
Cole defended a set of Copernican-theses, which was hardly spectacular anymore at the end of the century. Had it been defended 50 years earlier it would have caused an outright pamphlet war. In 1695 it did not provoke as much as a single reaction. Nevertheless, it can be seen as a crowning achievement for Fullenius' work. Although he had no official role in the promotion, the dedication makes clear that this time he was the *auctor intellectualis*. Cole dedicated it to both Hudde and Fullenius, like Bernoulli had done with his treatise on comets. Both 'consulari' are praised for their knowledge, Hudde is named as a patron to mathematicians and Fullenius is said to be a great honor to his teachers.[87] As so often, it is impossible to distinguish where in the *promovendus* Cole inserted his own ideas and where his teacher spoke. The disputation underlines once more how much things had changed and how much more of an academic subject mathematics had become.

9.4. The prince and the professor

In the early eighteenth century, Fullenius put a threefold crown on his career when he reached a position that was arguably better than he would have ever reached as a regent. First of all, the publication of Chrisitaan Huygens' posthumous work was printed. When Huygens died in 1695 he left his entire correspondence and all his manuscripts to the University of Leiden and he asked Fullenius and the Leiden professor Burchardus de Volder (1643-1709) to edit and publish his works. This momentous work was completed in 1703. Secondly, Fullenius had his most revered student, the (underage) Stadtholder of Friesland Johan Willem Friso, the sole heir to the entire Nassau and Orange families. His uncle was Willem III, by this time King of England, and Johan Willem Friso (1687-1711) was likely to inherit many of his titles and fortune. This young nobleman was sent to Franeker to study at the age of 13 and was taken into care by Fullenius. Thirdly Fullenius would act as *Rector Magnificus* to the university for the second time in his career in 1704-1705.

The editing and publication of the works of Huygens was something the European Republic of Letters was keenly expecting. The German mathematician Wilhelm Gottfried Leibniz in particular was inquiring

[85] Cole, *Disputatio.*
[86] Earlier that same year Alexander Roëll had a student defend a practice disputation on the use of mathematics. That was the only practice disputation from Franeker that mentions mathematics in its title. A connection between the two is easily suggested, although impossible to prove, see *Auditorium*, 95/1695.1 Kiraly, *Dissertatio philosophica de studii mathematici utilitate*, see also Van Sluis, *Herman Alexander Roëll*, 144.
[87] Cole, *Disputatio*, 2.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MATHEMATISCHE
LEERINGEN
Waar in
sick geoeffend heeft
Syn Hoogh.t de Prins
JAN WILHELM FRISO
Prins van Nassau, Erf-
Stad Eolder van Friesland
etc. etc.
ten tyde
wanneer syn verblyf hield op de
ACADEMIE
tot Franeker.
om
onderwesen te worden in de
geleerde consten en wetenschappen
Aan
De selve Syn Hoogh.t
ter gedagtenis opgedragen
en
met eigen hand beschreven
door
BERNH. FULLENIUS
Mathes. Professor.

Lecture notes Fullenius junior wrote for Johan Willem Friso. Royal Library, The Hague.

with his contacts if the process was progressing. But other scholars were equally eager to learn more about it. From these inquiries it can be taken that Fullenius also had possession over all of Huygens letters – perhaps he purged them a little, since relatively few of his own have survived.[88] The publication turned out to be a very fine print, which sold well all over Europe. Fullenius donated a copy to the University Library of Franeker himself.[89]

In the meantime Fullenius had been appointed the teacher of Johan Willem Friso. Although this prince died young (and quite dramatically), he is the first common ancestor to all reigning royals in Europe today, next to another dozen other families who have reigned in the past.[90] Of course this could not have been foreseen in the early eighteenth century, but it was clear that the boy was destined to become an influential

[88] Gottfried Wilhelm Leibniz, *Sämtliche Schriften und Briefe*, 332-333.
[89] Tresoar, sign. 46b Wk, Huygens, *Opuscula Postuma*.
[90] Johan Willem Friso drowned when his carrage drove into the water on a stormy night and he could not open the door, since there was no door knob on the inside of the vehicle.

nobleman. His pedagogues chose Franeker as his first university for political reasons (to stress the bond the family had with the province of Friesland), but they chose Fullenius on pedagogical grounds. It was highly desirable for a prince with these possible prospects to get a thorough education in fortification and military mathematics, and this is precisely what Fullenius gave him. He wrote a textbook for the young prince, which is a perfect and easy introduction to the potentially more violent elements of mathematics. It consists entirely of basic mathematics, which was useful for a soldier.[91] In the introduction Fullenius gave justification for this field of education.

> ‘Certainly, as I always take it for a sufficient reward from my labours when I see in my ordinary students that they have benefited from my teachings, You, L[ord], will conclude very easily from this that I will never need to see any greater satisfaction than to know that my little labour will have been fruitful for You, Lord.’[92]

In the summer of 1707 the last Bernhardus Fullenius died. The only one allowed to attend his deathbed was his protégé and assistant mathematics teacher Willem Loré.[93] Since 1700 Loré had taken over ever more of Fullenius teaching of the *idiotae*.

Like always, the university’s curators and the Senate immediately started looking for a successor, but it was clear that it would take some time before a new professor would arrive. Whoever would take up that position, he had some big shoes to fill. In the meantime, the university was stuck with several students who had been training for their mathematics exams and wanted to get the official land surveyors diploma. To solve this problem the curators granted Loré official permission to teach the *idiotae* and, much to Loré’s own surprise, granted him a pension of 250 guilders.[94]

Since the promotion of land surveyors could not be the official responsibility of Loré, he was considered an *idiotus* himself; a temporary solution had to be found. The Senate ruled that more ‘theoretical’ parts of mathematics would become the responsibility for one of the

[91] Royal Library The Hague, Shelf mark 72 J 27, Fullenius, ‘Mathematische leeringen’; Van Leeuwen, *Dutch Decorated*, 414.

[92] ‘Want seker, so ik in mijn ordinaire Discipulen het voor een genoegsame beloninge van mijn arbeid opneme als ik sie, datse van mijn onderwijsinge enigsins geprofiteert hebben, U H[eere] sal daar uit seer ligt besluiten, dat ik noit hoger vergenoeginge soude willen begeven als te mogen sien, dat mijn geringe arbeid met vrugt aan U Heere besteed sal wesen’, see Royal Library The Hague, Shelf mark 72 J 27,s ‘Mathematische leeringen’.

[93] Ypei, *Lyk-reeden*, 11.

[94] Van Winter, *Hoger beroepsonderwijs*, 62-64

professors of philosophy proper and that Loré would take examinations in fortifications. For specific ‘Geometrica practica’, another land surveyor was found; this became the responsibility of a Jacobus Doytsma. When in 1710 the new professor of mathematics, Wyer Willem Muys (1682-1744), was officially installed, this construction was partly abandoned, but it was not abolished. Loré stayed the teacher of land surveyors, while Muys would take the academic responsibility for their promotions. This would stay the official situation until Loré was promoted to associate professor in 1743.

Effectively already in 1707, Loré had become the academic official to teach mathematics to the students that did not know any Latin. With that they had become an official part of the university. It was recognition of this form of education on the one hand, but on the other hand it also freed the professor of mathematics to focus on the more academic side of his job. Loré becoming an official university lecturer in 1707 marks the emancipation of the *idiotae*, who finally got their own representative inside the corps of university teachers – albeit he was not yet a full professor. It also revealed that the other academics and the Frisian politicians had started to regard mathematics as a field that was in need of a professor that did not have to divide his attention between proper academics and *idiotae*. Fullenius’ death marked the precise moment when the professor of mathematics in Franeker no longer held an awkward position between academics and *idiotae*, but had become just another ordinary citizen of the university. The education of the *idiotae* was now officially in the hands of someone else.

9.5. Conclusion

The last seventeenth century professor in mathematics in Franeker had guided a definitive step in a process that had started a century earlier. Bernhardus Fullenius junior was a full member of the academic society, like all the mathematics professors in Franeker before him, but what differentiated him from his predecessors was that he had been able to turn his field into an academic domain as well.

The case of Fullenius jr. shows that a new kind of mathematician arose in the second half of the 17th century: the amateur patrician. His career as mathematician took shape outside *academia* and outside the circle of *idiotae* (and inside the Republic of Letters). Fullenius continued in his own way on the astronomical work of Metius, Holwarda and De Grau, but also became an expert in Cartesian mathematics. This would set the scene for him to make an unexpected, but highly intriguing turn in his life when he exchanged his regent position for the university chair. This was precisely the opposite from what his peers like Huygens and Hudde did.

For Fullenius this meant that he took a step down in his career. He had been a burgomaster and an amateur mathematician and became a full time professor in mathematics. Why did he do this? For the historian it is first and foremost an indication of Fullenius' affection for mathematics. It was also very important for him to make sure that his important position as a burgomaster was not lost for his family. But I think it is also an indication of the possibilities Fullenius may have seen in this field. Mathematics became a science where new, important developments were taking place. The idea that it could provide a model to obtain 'certain knowledge' (as his close friend Bekker phrased it) was becoming accepted by the Republic of Letters. It seems that Fullenius wanted to be part of that inside *academia*.

These philosophical and academic considerations were even furthered when at the beginning of the eighteenth century the sole heir to the families of Nassau and Orange matriculated in Franeker. It was Fullenius who would be handed the task of teaching this young prince all he could learn for battle. Certainly this was not a position he had envisioned when he started as a professor in Franeker, but it was the result of his labours that he could provide the famous student precisely with what he wanted to acquire in Franeker: a thorough education in practical mathematics.

To the modern day observer philosophical motives and the tutorship over a prince may seem to exclude each other on some level, but Fullenius' biography showed precisely where these came together: in the classroom. The prince, Johan Willem Friso, was the most famous of all the *idiotae* Fullenius junior or his predecessors had seen in their classes. With this Fullenius had raised the level of the education of the group of *idiotae* to an all time high. At the same time he also ensured that his teachings in mathematics became attractive for post-graduate learning. When the defendant of one of the most notorious Franeker disputations wanted to sharpen his mind, he took up Fullenius' classes. At the same time Fullenius gave lessons on modern Cartesian maths. All in all, he found a way to raise the overall standing of what had once been his father's chair. Even though his precise, personal, motivations will probably remain a little elusive, his achievements were impressive. Fullenius was a formidable teacher.

This is also the best way to understand Fullenius' most important contribution to the Republic of Letters, of which he had become such a remarkable citizen. He was one of the two editors of the posthumous works of Huygens and as such he made the legacy of the most important Dutch mathematician available to that learned Republic.

Bernardus Accama, portrait of Willem Loré (1679-1744).
Museum Martena, Franeker.


LIEUWE WILLEMS GRAAF

10. Finding East and West

10.1. Introduction

Ever since Adriaan Metius had started giving lectures in the vernacular at the beginning of the seventeenth century the position of the mathematics professor had been a particular one. By lecturing in the vernacular this professor found himself closer to the general public than he would have been had he only taught in Latin. This position was subject to debate and caused friction. Throughout the seventeenth century people stood up and raised their voice against the Franeker professors in mathematics.

The instances where *academia* clashed with society, or where the academics met with ordinary citizens, is one of the underlying themes of this book. The goal of this broad discussion has been to gain insight into how mathematics was practiced in the seventeenth century and to understand how the field functioned as an element of culture in an Early Modern society. The story that I have told up to now is the story of the professors of the University of Franeker in the seventeenth century. As this story is coming to an end in this chapter, I will discuss how the professor of mathematics clashed violently with an ordinary civilian.

This confrontation between the professor and a layman, i.e. Fullenius junior and a Lieuwe Willemsz, is analyzed in this final chapter because it shows precisely how important mathematics had become on the one hand, and how these confrontations shaped mathematics on the other. It reveals how high the expectations of mathematics had grown and what consequences the products of this specific field could bare. It is also a confrontation that reveals the political interests in mathematics, how the professor at times had to act as a courtier and at other times had to publish to defend his good name. It shows the possibilities for a mathematician, both inside and outside academia, who knew his way in the practices of Early Modern print. The clash also reflects some of the

« Lieuwe Willemsz Graaf (1645-1704).
Gemeentearchief, Amsterdam

most important international debates of the time and a few of the best known seventeenth century Dutch mathematicians played a role in it. It therefore also gives some clear indications of how the Dutch network of the Franeker mathematicians functioned. The central node in this story is the Franeker professor Bernhardus Fullenius. This episode of his professoriate highlights many of the different roles a mathematics professor could take at the end of the century, and it reveals precisely how mathematics was shaped and used in the space that was taken between the professor and an *idiotus*, between politics and academia, and between the printing press and social conventions. It shows once more how cultural this specific field could be.

During the 1680s Fullenius corresponded frequently with Christiaan Huygens. Although the Franeker professor was constantly stalling his replies (in the same way in which he would later be stalling his publications) their contact was very fruitful.[1] They discussed dioptrics, the use of instruments and astronomical discoveries. The one subject that really stands out is the problem of finding longitude at open sea, which was one of the major problems of the day. Governments promised extremely high rewards for the person who would think up a key to the problem. Philosophers came up with the most fantastic solutions, mathematicians thought up very complicated ones. Although sailors and helmsmen had every day practice to find routes across the ocean, every now and then whole fleets could crash on coastlines that were thought to be hundreds of miles away.[2]

Huygens was convinced he would find a working solution to the problem and he was proud to do so. But just when he felt he was about to crack it, a rather intriguing character showed up in The Hague, almost on Huygens doorstep: Lieuwe Willemsz Graaf, a Mennonite and a loud mouthed Frisian mathematician and almanac writer. As a result of his grand entry, a fierce and much read polemic developed between Fullenius – who defended Huygens case – and Lieuwe Willemsz. In this final chapter I will review this polemic to give one final exposé of what had become of the Franeker school of mathematicians and their local antagonists, the Frisian almanac writers. Initially this last group still had strong links with the university – Petrus Baardt, for example, was a former student and a protégé of Metius – but by the end of the seventeenth century these links seems to have been cut completely. That is why this clash is of such importance for this thesis. On the one hand Fullenius was to some extent the most distinguished of all Franeker professors in mathematics. On the other hand Lieuwe Willemsz was an *idiotus*, but one who no longer had anything to do with the university.

[1] See, for example, Shapiro, 'The Optical Lectures', 177ftn190 and Andriesse, *Huygens*, 341.
[2] Sobel and Andrewes, *The Illustrated Longitude*, 15-25.

This is why he can almost be considered a 'chemical indicator'; he reveals some of the essential characteristics of the nature of mathematics at the University of Franeker. Lieuwe Willemsz attacks, insults and enlarges everything he can, only to prove his point. He is therefore an almost perfect source to the historian.

10.2. Finding Longitude

In the Early Modern period navigational techniques were advanced, but to sail at open sea was still something that was not to be taken lightly. It was a vivid possibility for a captain to completely lose track of the whereabouts of his ship. A navigator had the instruments and techniques to exactly measure his latitude, the position between the North (or South) Pole and the Equator. But with that only half the position on the globe was found. This was especially a problem when ships took a course that was not from east to west, or from west to east (with a 'fixed' north-south-position). Christopher Columbus (1451-1506) could find his way sailing from de Maldives to Central America because he took a relative straight line from one continent to the next. But when the Dutch were sailing round Africa, a second coordinate was required.

This second coordinate is called longitude, or the position on the globe measured east or west from a prime meridian (a meridian being an imaginary line running from the North to the South Pole). If you know both your latitude and longitude, you know your exact position on the globe. Knowing just your latitude means that you have to guess your precise position on the globe, and guessing was the only option 17th century navigators had at open sea. That method is called *dead reckoning*; this involved recording the speed of the vessel, the distance travelled and calculating all this data to get a position. It was already very difficult to determine the exact speed, let alone to know the distance travelled. It was even harder to make a calculation with all of these variables. Perhaps the most difficult thing of all, in fact, was simply finding a navigator capable of doing both the measuring and the math correctly.

The most obvious solution to this problem was building a seaworthy clock. With this clock the time of the prime meridian could be kept on board a ship. At sea the exact local time could be measured. The difference between these two times can be calculated into the difference in distance on the globe. This was already suggested by the Frisian mathematician Gemma Frisius in the early 16th century, but since this seaworthy clock failed to materialize, other solutions were suggested.[3] All sorts of solutions were put forward. Thanks to research done by Umberto Eco, Digby's 'powder of sympathy'-method has today become

[3] Sobel and Andrewes, *The Illustrated Longitude*, passim.

famous. But there were numerous other solutions. None other than Galileo suggested an astronomical method, involving the observation of the moons of Jupiter. This, however, proved to be too complex to execute at open sea.[4]

Christiaan Huygens thought he had the best shot at solving this problem. Perfecting Galileo's ideas on the pendulum clock and using Gemma Frisius' method, he found that he was close to solving the longitude problem. There was, however, one obstacle: he was using pendulum clocks. On board a ship at sea there was too much interference for the clocks to keep time. Huygens invented all kinds of cunning ways for his pendulums to keep swinging regularly. Several times he thought he had finally found a way to get his clocks to work at open sea, but he never succeeded to full satisfaction.

Other methods were suggested and some of them were based on a strict reading of the Bible. It was believed that this might bring forth new astronomical knowledge, and with this, perhaps a way of finding longitude could be discovered. One of these theories was developed by Matthias Wasmuth, a German professor in Hebrew. He would become closely associated with Fullenius' adversary Lieuwe Willemsz. But long before Lieuwe Willemsz got to know him, Wasmuth had already made a name for himself in the European Republic of Letters.

10.3. Lieuwe Willemsz

10.3.1. The origins of a polemic

Matthias Wasmuth was a professor of logic and Hebrew at the academy in Rostock and he would also be a professor of divinity in Kiel. Both Rostock and Kiel are port cities in the Baltic region, from which Wasmuth's family stemmed. He had taken his training all over Europe, studying in Rostock and Wittenberg, but visiting many other academies and universities. In 1654 he matriculated at Leiden, allegedly to study with Jacobus Golius (1596-1667) and former Franeker professor Johannes Coccejus. Beginning in 1657 his own academic career kicked off. He was a well-read expert in oriental languages. At the end of his life he turned to chronology, calendrics and astronomy because he believed to have made a major breakthrough in those fields.[5]

That breakthrough was closely connected to Wasmuth's earlier work. As a professor in Hebrew he had worked on the accents, which are essential in the source texts of the Bible. He had found that when they were interpreted in a certain way, they enclosed much more information than at first glance. Wasmuth's Christian Kabala and his orthodox

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[4] See, for example, Van Helden, 'Longitude and the Satellites'.
[5] *Allgemeine Deutsche Biographie*, part 41, 230-232.

Lutheran theology had made him enemies, with some of whom he fought bitter disputes. But he believed firmly that it had also provided him an edge over all other astronomers; he had access to knowledge unreachable to them. When through divine revelation he found a way to perfect his breakthrough, Wasmuth acted as if he would be the new leader of the European astronomical world. He published large volumes with tables and thought up several ways to put these tables to use.

His earlier ventures had provided him with credibility in certain circles. When he thought up an 'Oriental College' in the 1660s, in which missionaries were to be trained, he found several patrons.[6] The plans never materialized, but in rallying support Wasmuth had sought the printing press. In the process he, like many others, found that printed works could build a case effectively.[7] For his new chronology and astronomy he used the same strategies and he was even more successful. But before he did so, he tried to find support in several learned circles all over Europe. Most notably he turned to Hevelius in Gdansk. Hevelius' relations with Wasmuth were troubled and ultimately not very friendly.

Right when Bernhardus Fullenius junior had arrived at Gdansk in 1674, Hevelius had been writing to the Royal Society in London, as I discussed above. A week after his first letter, the one to which Robert Hooke responded so vehemently, Hevelius sent another communiqué. This was, as was customary, read aloud in a meeting of the Society and partly published in the *Philosophical Transactions*.[8] This time Hevelius had written a refutation of Wasmuth's plans and ideas. Again Hooke seems to have been the first to voice his opinion, however, this time he did so to question Wasmuth and support Hevelius. Their shared opinion seemed to have found agreement with 'the members present', who felt that Wasmuth 'had promised too much to answer expectation'.[9] Wasmuth continued to look for support within the Society, but seems to have met scepticism time and time again. The loudest opposition apparently came from Adam Adamus Kochansky (1631-1700), a man from Poland who was also closely connected to Hevelius.[10] But there were others closely connected to the Royal Society who dismissed the ideas of Wasmuth with little ado.[11]

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[6] Friedrich, *Zwischen Abwehr*, 96-97.
[7] Inevitably, Wasmuth (and a friend) claimed a central place in his plan for the conversion of the Jews, see Friedrich, *Zwischen Abwehr*, 98. It seems that Wasmuth was well aware of what would sell.
[8] The best introduction is provided by the eighteenth century history of the Royal Society, Birch, *The History* III, 134.
[9] Birch, *The History*, III, 134.
[10] Döring, *Der Briefwechsel*.
[11] Like Johan Pell, who was based in the Dutch Republic for a longer period, see Malcolm, *John Pell*, 236.

It was this Wasmuth who would become Lieuwe Willemsz' intellectual guide. Wasmuth's career and claims once again show how much mathematics was intertwined with the study of languages, and that it could hold strong theological implications. That it was these ideas that played a crucial role in the confrontations between Lieuwe Willemsz and Fullenius is not a coincidence. It is instead very probable that Fullenius first learned about Wasmuth's ideas when he had visited Hevelius in the city of Gdansk.[12]

That last connection is a summary of almost a century of practicing mathematics in Franeker. After all, the contacts between the Frisian university and Gdansk originated from the time of Holwarda's publication of the *Dissertatio*. Furthermore, it was Holwarda who had been trained by both Metius and Fullenius senior. Fullenius junior learned about the ideas of Wasmuth from Hevelius, who was corresponding on these matters with the Royal Society, a correspondence in which Fullenius was cited as a very trustworthy witness, partly because of his social standing as a burgomaster. Now Willemsz, a Frisian almanac writer, came up with a solution to one of the biggest problems of the time, and he sought a way to exploit that solution to the fullest.

10.3.2. A shipper, a shoemaker, or a mathematician?

Lieuwe Willemsz was a man of a thousand trades. Branded an illiterate shoemaker by his adversaries, he was in fact a shipper, a mathematician, an Anabaptist preacher and a teacher of helmsmen and navigators.[13] He would grow to become one of the most feared almanac writers of his time. During his life this Lieuwe Willemsz published a lot in short hand press, like advertisements in newspapers and cheap pamphlets. In the 1690's he would eventually publish a large volume on navigation, which would even reach a reprint after his death. But much of this would take place after he had been in a fierce polemic with Bernhardus Fullenius junior

Lieuwe Willemsz was born in the city of Harlingen, the main port of Friesland, and lived there for most of his life. Little is known about his

[12] Not only had Hevelius been working on these matters around the same time Fullenius visited him, Fullenius also knew about the publication of Hevelius' letters in the *Philosophical Transactions*. This can be taken from one of the pamphlets that was published in the polemic with Lieuwe Willemsz, which was published by Fullenius' friend and brother-in-law Balthasar Bekker. In that pamphlet, Bekker explicitly cited Hevelius' letter and the issue of the *Philosophical Transactions* in which it had been published. See, Bekker, *Ondersoek* (1692), 'Berigt', 4-5.

[13] It was Bekker who branded Lieuwe Willemsz an illiterate, and although Bekker would retract that accusation, it has made the annals of history. Terpstra was among those to copy Bekker's 'joke', see Terpstra, *De Friesche sterrekonst*, 78-81.

education. He is said to have travelled at sea. In any case he visited Amsterdam, The Hague and several cities in Northern Germany at various points in time. It is also clear that he found other mathematical practitioners in all these places and discussed his ideas with them.[14] Unfortunately, the paper trail for Lieuwe Willemsz is virtually absent.[15] Yet even with those sources completely lacking, a fairly good picture of his network unfolds through his publications. A whole circle of practitioners that worked across the Dutch Republic and the German lands was in place in the late seventeenth century, and Lieuwe Willemsz was a part of this circle.

Still, Lieuwe Willemsz was of a completely different stature than men like Petrus Baardt, Pibo Gualtheri or Willem Loré. Whereas they had received a university education and stayed in contact with their teachers and their former fellow students, Lieuwe Willemsz seemed to have been of a different breed. This breed became visible in the second half of the seventeenth century and voiced its opinions using printed words and public rows. Perhaps Lieuwe Willemsz is best described as a mathematical polemicist, and in Fullenius he would find a formidable opponent. Not because the lingering and stalling professor had such a sharp and easy pen, but because he was aided by one of the most experienced publicists of the age: Balthasar Bekker.

Bekker had been embroiled in several fierce polemics over the course of his career. I already pointed at the opposition his catechization *Solid food* had met, as well as his pamphlet on comets. Yet his biggest pamphlet war was yet to come. This one centred on *The Enchanted World*, Bekker's bestselling book in which he refuted all supernatural events and ideas.[16] While he was working on this book, which took him from 1686 to 1690 to write, he met Lieuwe Willemsz in the summer of 1688 somewhere in Amsterdam. Precisely because of Bekker's pamphlet on comets, Lieuwe Willemsz brought his ideas on finding longitude to Bekker. On his own admission Bekker recognized the work of Lieuwe Willemsz as being too difficult for him to understand and in turn he advised the shipper to show it to his brother-in-law Bernhardus Fullenius.[17]

At Bekker's suggestion, in the fall of that same year Lieuwe Willemsz paid a visit to Fullenius. The professor later said he thought there was

[14] He met with Wasmuth in Hamburg, with Andreas Lughtenburgh in The Hague and with Stiffry in Amsterdam, see my *Het vinden van oost* for more details.
[15] All I have found is one possible signature in a volume of Holwarda's *Sterrekonst*. See below.
[16] On Bekker, see the introduction to part III above. On a broader overview of his influence, see Israel, *Radical Enlightenment*, 377-405
[17] Bekker, *Betekeninge* (1692), 19-20.

ONDERSOEK
Van de Betekeninge der
KOMETEN,
By gelegendheid van de gene die in de Jaren 1680. 1681. en 1682. geschenen hebben.
Dese Druk is vermeerdert met een Hoofstuk en een Nareden.
Gedaan door
BALTASAR BEKKER S.T.D.
Predikant tot Amsterdam.
Hier is noch bygevoegd een Berigt en Naberigt aangaande de Oost en Westvindinge, voorgegeven van Lieuwe Willems Graaf, door den selfden AUTEUR.

t'AMSTERDAM,
By JAN ten HOORN, Boekverkoper tegen over het Oude Heeren Logement, 1692.

Title page of Bekker, Ondersoek *(1692). http://www.geheugenvannederland.nl*

something fishy about Lieuwe Willemsz from the start.[18] In turn, the shipper said that upon this first meeting he gained Fullenius' trust and even aroused the jealousy of the professor. What is clear is that when Fullenius asked Lieuwe Willemsz to give him the exact basis of his calculations, Lieuwe Willemsz refused. Fullenius did so because he claimed that he could not check the works of the shipper without this 'foundation'. Lieuwe Willemsz refused because he was afraid that everything he had would be disseminated to the public. Fullenius wanted to discuss the method to find out if it was working; Lieuwe Willemsz wanted to shield his secret because he was afraid that all kinds of people might steal his ideas.[19]

Lieuwe Willemsz then started two campaigns. First he approached high Frisian politicians to gain support to get his method recognized. He needed this support. Even with the best method in the world it would be impossible for him to do anything, without the help of powerful patrons.[20] The second campaign he started somewhere in the fall of

[18] Fullenius, *Nodig bericht*, 9; This is corroborated by letters Fullenius wrote about the matter to Vegelin around the same time. See appedix 2; Comp. Dijkstra, *Het vinden van oost*, 72-73.
[19] See for example Davids, 'Openness'.
[20] Dijkstra, *Het vinden van oost*, 69-70; see also Davids, *Zeewezen*, 131 and 426.

1688. This was a libellous campaign against Fullenius, who had withheld his support from Willemsz. From Fullenius' letters it becomes clear that Lieuwe Willemsz was publicly criticizing Fullenius. He did so in such fashion that not only was Fullenius bothered, but Fullenius also had to answer to his patron Vegelin (who had gotten word of the quarrel) on the matter.[21] Fullenius justified his actions (which mainly consisted of not taking Lieuwe Willemsz too seriously) and he pointed out that by no means would Lieuwe Willemsz' method be successful in finding longitude at open sea.

Meanwhile Lieuwe Willemsz succeeded in getting support from local politicians, possibly from factions opposing those in which Fullenius had strong support, or possibly from politicians who would lend their support to anything that they felt might work.[22] He was allowed to first appear before the Deputy States of Friesland, who decided to back his bid at solving the longitude problem and gave him a letter of recommendation to present his ideas in The Hague for a commission of the Estates General.[23] Lieuwe Willemsz' appearance in Friesland in front of the Deputy States suggests that somebody already supported him, and the fact that he was supported all the way to The Hague makes this suggestion even stronger. Thus his two campaigns seem successful; his effort was backed and his slander reached the highest Frisian circles.

Although it is hard to find the concrete evidence of who it was that protected and aided Lieuwe Willemsz, it is clear that this protection was given. Lieuwe Willemsz' course of action once again shows how politicized and social the world of mathematics could be. Besides that, his colourful character recalls those of Rosaeus and Amama, who too sought and found protection and help from Frisian regents. It is ultimately not remarkable that Lieuwe Willemsz ended up in Franeker with his proposals. Any mathematical idea in Friesland in the seventeenth century could have benefited greatly from the support of the professor of mathematics there, but without this support it would have been more difficult for those ideas to be pushed forward.

10.3.3. Lieuwe Willemsz' method

Although Lieuwe Willemsz never fully disclosed precisely how he intended to solve the longitude problem, it is possible to reconstruct his

[21] Fullenius to Vegelin May 23, 1684, EVC, 3615, Brieven van Bernhardus Fullenius (1640-1707) aan Philip Ernst Vegelin van Claerbergen (1613-1693).
[22] The results of this support can be traced in the archives. For example, the decision to write a letter of recommendation for Lieuwe Willemsz can be found, see Davids, *Zeewezen*, 131. Unfortunately this provides no insight into the political machinations that doubtlessly can be found behind this decision. I could not find anything in other sources, apart from innuendo by Bekker, which was impossible to decipher let alone judge on truthfulness.
[23] Davids, *Zeewezen*, 131 en 426.

ideas to a certain extent. For such a reconstruction it is important to note that Lieuwe Willemsz only discussed his method in the vaguest terms and that whatever he did reveal was done in the form of examples or (as he liked to name them) proofs. Central to his method is the claim that he knew the exact course of the moon, a notoriously difficult thing to calculate.[24] He also claimed to have the date of every new moon from the day the world was created, the Divine Proportion and the true date of Eastern (all of which were famous problems in Early Modern times). But he took most pride in the fact that he had found a way to calculate longitude.[25]

First of all he claimed that two things laid the basis for his ideas: a divine revelation and the ideas of Wasmuth. The combination of these two had made it possible for him to calculate several tables. With the help of these tables, his solution was very simple. In order to calculate longitude an observer would measure the distance between the moon and a designated constellation: this would give figure 'x'.[26] With x the position on the globe could be calculated from Lieuwe Willemsz's tables. It was as simple as that.

The theory behind this stunningly straightforward plan is much less clear. Distance x in the sky correlated with a distance y in Lieuwe Willemsz' tables. That distance y would be the difference on the globe between the position of the observer and the biblical Garden of Eden. The backbone to his method was that by calculating x into y, the local time in that Garden of Eden was found.[27] Strangely, however, Lieuwe Willemsz found that the observer did not need to calculate the time of the place where the observation was made. If he had included this into his method, and if his tables had been true and reliable(!), his method would have worked.[28] However, without this he seems to have been playing with the evidence.

This, at least, was the conclusion of his contemporaries. Because x was the only variable that was taken from an observation, all others came from his tables. With only one variable, Lieuwe Willemsz could juggle his examples in any fashion he wanted. This is because x would find y every time, and y would give longitude.[29]

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[24] This was only resolved in the following century with the table of Tobias Meyer, see Wepster, *Between Theory and Observation*.

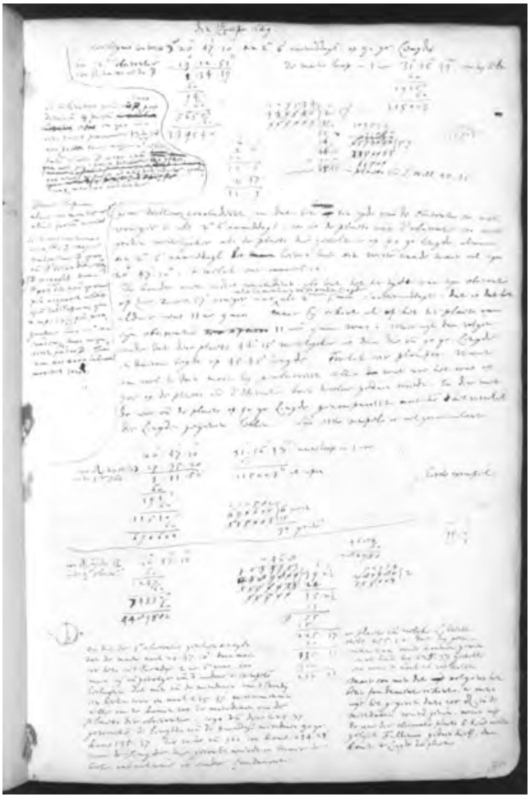
[25] Graaf, *Eenvoudig en onvervalscht*, 4-5.

[26] 'x' and the following 'y' are my terms.

[27] See also Graaf, *d'Eerste opening*. In this booklet Lieuwe Willemsz elaborates on his method, comparing it to the notes Huygens had made. Central for his time calculations is that he was able to calculate any time back to the moment of the creation of the world, all that was needed to do this was an observation of the moon. See Ibidem, 14.

[28] Of course for that to be possible, the Garden of Eden had to be on a specific place on earth and the measurements of the Moon had to be very precise.

[29] I give a more detailed exposé of this method in Dijkstra, 'Het vinden', 77-79.



The calculations Christiaan Huygens made on Lieuwe Willemsz' method. University Library, Leiden.

Lieuwe Willemsz had been able to calculate the exact position of the Garden of Eden because he had discovered what he calls a 'big secret'. That secret had enabled him to make all of his magnificent findings. He never fully revealed this secret; just like the tables he would keep to himself. He seems to have been very worried that others would steal his ideas, while at the same time he also wanted to profit from his findings as much as he could. One of his strategies, next to finding powerful patrons, was to be as loud as he could. Thus, he stirred things up.

10.4. The polemic

Shortly afterwards, Lieuwe Willemsz did indeed show up in Franeker, bragging about his tables and showing parts of them to Fullenius. The professor immediately had doubts about the calculations.[30] A few months later, he wrote to Vegelin that even after a few quick glances he

[30] Fullenius, *Nodig bericht*, 9.

NODIG BERIGT
VAN
BERNHARDUS FULLENIUS
Professor in de Mathematische Konsten tot Francker
Op seker Laster-schrift
GEINTITVLEERT
Eenvoudig en Onvervalscht Verhaal
ontrent het vinden der lengte van Oost
en West, uitgegeven onder de naam van
LIEUWE WILLEMS GRAAFF.
Waar in als met krijt en hout-kool aangewesen word, dat dese L. W. in sijn proeff-stuk aan de Heeren Commissarien van haar Hoog. Mog. overgegeven, in 't uitvinden van 't Oost en West meer dan 700 duitse mylen verdwaalt is, en dat hi dese misslag soekende te helen en te verschonen door 't nieuw opgeven van drie ongebreklijke en voltoide exempelen, so hi se noemt; al wederom verbystert is, in 't eerste exempel meer dan 800, in het twede meer dan 900, en in 't darde meer dan 700 duitse mylen.
Strekkende sulken botten misslag tot een onwedersprekelijk argument, dat sijn Konst t' eenemaal ondeugende is, en hi in plaats van een Oost en West Vinder den
SPORELOSEN O. en W. SOEKER
met regt genoemt mag worden.

Gedrukt tot *FRANEKER*,
By HANS GYSELAAR, Ordinaris Drukker der Ed. Mog. Heeren Staten, en der Academie van Friesland. 1690.

Fullenius, Nodig berigt. *One of the pamphlets Fullenius published during his polemic with Lieuwe Willemsz.*
Tresoar, Leeuwarden.

found 'many obvious mistakes'.[31] But this did not have much impact; this happened only when Lieuwe Willemsz refused to talk about the ideas behind his tables. He claimed he could not do that without revealing his 'secret'. Fullenius felt that this had ended the whole matter.

Yet, things did not end there. Word of Lieuwe Willemsz' invention and Fullenius' dismissal reached Vegelin, who in turn asked Fullenius what had happened. The professor now found himself dismissing libellous allegations that he had rejected the one solution to the problem

[31] Fullenius to Vegelin van Claerbereren, November 29, 1688, EVC, 3615, Brieven van Bernhardus Fullenius (1640-1707) aan Philip Ernst Vegelin van Claerbergen (1613-1693).

of finding longitude.[32] It is likely that Fullenius would have again thought that this was the end of it, but in the following spring the whole affair returned.

In April 1689 Lieuwe Willemsz was allowed to present his method to a committee of the Estates General. In two different meetings he was allowed to explain how he wanted to solve the problem of finding longitude. The committee convened in the Treves room in The Hague, nowadays the place where the Dutch cabinet assembles. The meeting consisted of politicians, but they had appointed two *examinateurs* to judge the plans of Lieuwe Willemsz. These were none other than Christiaan Huygens and the Leiden professor of mathematics Burchardus de Volder. Both dismissed Lieuwe Willemsz' ideas almost instantly. Huygens did not really want to show up for the second meeting, he wrote on the whole matter to his brother:

> 'Although I have been ill for a week, I still, at the request of the States-General, showed up in the Treves room on Monday and yesterday for a certain affair on Longitude that was definitely not worth while.' [33]

By now two more *examinateurs* were appointed: Jan Stampioen (1610-1690), Huygens' aging mathematics teacher, and Abraham de Graaf, writer of the *Whole of Mathematics*. Stampioen seems to have been the only one to have some appreciation for the method, but ultimately Lieuwe Willemsz was able to convince the politicians of his ideas. He was granted a reward of 2000 guilders and asked to publish his method for general benefit.[34]

News of the possibility of a solution to the longitude problem spread over the Republic quickly. Within days word reached Fullenius that Lieuwe Willemsz had received a grant from the Estates General of at least 36,000 guilders, and that this sum could rise to 100.000 guilders. To give an idea, the professor Fullenius had an annual income of 1150 guilders.[35] Although he could easily verify the actual amount that was promised, Fullenius still felt he had to take some action. He did so with a pamphlet aimed against Lieuwe Willemsz, and addressed it to a 'high

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[32] Fullenius to Vegelin van Claerberen, November 29, 1688, EVC, 3615, Brieven van Bernhardus Fullenius (1640-1707) aan Philip Ernst Vegelin van Claerbergen (1613-1693).
[33] 'J'ay estè mal toute la semaine passè, et pourtant je n'ay pas laisse de me trouver lundy et hier a une conference au Treves kamer en estant requis de la part de Mrs. les Estats pour certaine affaire des Longitudes qui certes n'en valoit pas la peine.': OC, IX, 315, brief no 2536 Christaan Huygens to Lodewijk Huygens, 24 april 1689.
[34] All this is based on Lieuwe Willemsz' own account of the affair. Other sources often corroborate what he writes, although the details remain completely impossible to check. Graaf, *Eenvoudig en onvervalscht*.
[35] See Van Berkel, 'Het onderwijs', 233.


Gedwongen
VERDEEDING
Van
LIEUWE WILLEMS GRAAF.
Of
Korte en klaare Aenwijzing eeniger grove missla-
gen, by den Professor BERNHARDUS
FULLENIUS in sijn beyde Geschrif-
ten tegens hem zelfs begaan:
Van welkers
Uytrekening, hy met Krijt en Houtkool aangaande de
mislag van tot 7, 8, en 900. Duitsche Mijlen verbijste-
ring aangewesen, gemakkelijk werden uitgewree-
ven; en niet alleen de boovengenoemde honderden
van Mijlen, maer dat hy *B. F.* met hem zelfs ver-
scheelt wel 1228. Duitsche Mijlen hier in betoont &c.

Gedrukt voor den Autheur. 1690.

Graaf, Gedwongen verdeeding*. One of the pamphlets Lieuwe Willemsz published in his polemic with Bernhardus Fullenius.*
Tresoar, Leeuwarden.

and distinguished nobleman in this province'.[36] This printed letter initiated a polemic, one that arguably was most beneficial for Lieuwe Willemsz.

There has been some debate as to who this 'high and distinguished nobleman' was. Nevertheless, from the letters Fullenius exchanged with Vegelin van Claerbergen, it is certain that he addressed the pamphlet to him. In fact, Vegelin gave Fullenius information of what had happened

[36] Fullenius, *Brief geschreven*.

in The Hague, sending confidential information to Fullenius[37] In order to understand what would happen next, it is crucial to unearth as much of the role Huygens played in the whole affair as possible, for Huygens role was at least a dubious one. He was by far the most revered mathematician in the whole of the Dutch Republic at the time. In the preliminary stages of the affair his role had been ambivalent. Although he was an 'expert witness' for the committee, he also tried to solve the whole longitude problem himself, with good hopes of succeeding. In fact he had applied for tests with his clocks several times and he would do so again in the future.[38]

But Huygens was not just a competitor to Lieuwe Willemsz; he was also genuinely annoyed with the man. His description of the meeting of the committee was already telling. In a following letter to his brother he described Lieuwe Willemsz as a 'certain nouveau pretendant tres impertinent', and when he was informed that Lieuwe Willemsz was advertising his method and that a test at sea would take place, Huygens grew even more irritated. In the margin of the letter that informed him on this he angrily noted that Lieuwe Willemsz is '[...] audacious and ignorant and they are about to make a test, which will certainly fail.'[39] Even in 1692 he would still complain about the matter to Leibniz.[40] The Huygens family was a patron to Vegelin, and Christiaan in particular was one to Fullenius. Fullenius, in turn a client of Vegelin, had been involved in the whole Lieuwe Willemsz affair from the start. It seems only logical that he was handed the task of openly and publicly refuting Lieuwe Willemsz.

Fullenius attacked Lieuwe Willemsz in a decent (almost gentleman-like) fashion. In his pamphlet he scrutinized what he thought was wrong with the method and with the way in which Lieuwe Willemsz operated. Lieuwe Willemsz struck back hard and never seemed to care about keeping things decent. In his reply to Fullenius' pamphlet, he blatantly twists the words of the professor and immediately starts accusing him. For example, Lieuwe Willemsz says that Fullenius had written that he got 36,000 guilders from the Estates General, ignoring the fact that

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[37] Fullenius to Vegelin van Claerberen, June 12, 1689, EVC, 3615, Brieven van Bernhardus Fullenius (1640-1707) aan Philip Ernst Vegelin van Claerbergen (1613-1693).

[38] Yoder, *Unrolling Time*, gives numerous thoughts on Huygen's clock-project.

[39] 'dit sijn onbeschaemde en onwetende en men heeft de proef onder handen, die noodsaeckelijck slecht uyt sal vallen'. Huygens uses the plural because by the time of the letter, Lieuwe Willemsz had found a partner in Andreas van Luchtenburgh. See Dijkstra, 'Het vinden', 59-62. Huygens informs after the success (or failure) of the test in letter no. 2716, to Abraham de Graaf. See OC, X, 204.

[40] OC, X, 270-271, 285 and 298. Huygens then dismissed it with the following words: 'Mais des gens comme Wasmuth et son eleve ne meritent pas qu'on en parle.' Leibniz would make a note that Wasmuth was 'un homme simple & visionaire', Leibniz, *Opera omnia*, VI, 330.

Fullenius had mentioned this only to tell that it was not true. Lieuwe Willemsz, however, cites the remark about the 36,000 guilders to show that the professor was wrong and how this showed that the professor of mathematics had ‘raw and thick judgment, [that] his mind [was] full of hatred, his heart full of deceit, his brain full of sorrow and that his eyes so full of envy that he had gone blind’. He was obviously not impressed with the status of his opponent.

A first reaction to these harsh words from Lieuwe Willemsz was published by Balthasar Bekker in Amsterdam. He had Fullenius’ pamphlet reprinted and added some content of his own. According to his the preface, he did this because he felt responsible (after all, he had sent Lieuwe Willemsz to his brother-in-law) and because he wanted to clear Fullenius’ name in the province of Holland, where his original pamphlet was not sold, but Lieuwe Willemsz’ was.[41] The rhetorically strong Bekker starts his refutation of Lieuwe Willemsz’ ideas with the remark that two things have yet to be discovered by mathematicians: the squaring of the circle and the calculation of longitude.[42] Bekker gives his entire account of the whole affair, delicately pointing out where, according to him, Lieuwe Willemsz lied. Strikingly, to refute the ideas of Wasmuth he cites none other than Hevelius. What is more, he did not pick a randomly chosen quote. Rather, Bekker gives the relevant passage of the letter Hevelius had published in the *Philosophical Transactions* of 1674, complete with a correct reference to that journal. It was this letter that was printed around the time Fullenius had visited Hevelius more than 15 years before.[43]

This interference on the part of Bekker only made things worse. He was regarded as one of the most radical ministers in the Dutch Republic and right at this time his magnum opus was in the final stages of completion. Word of this book, *The World Enchant’d*, was circulating, and the opposition to Bekker’s ideas was closing its ranks.[44] In this book Bekker gives a Cartesian interpretation of the Bible, completely denying any power to the Devil. The protest against the book was enormous, even before it had gone to press.[45] A year later the first parts of his book were published by the same publisher that had published Fullenius’ first pamphlet. A complete version of the book was published by the publisher that had published Bekker’s answer to Lieuwe Willemsz.

[41] Bekker, *Ondersoek* (1692), Berigt, 1.
[42] ‘Twee dingen zijn tot noch toe by de wiskonstigen te soek: het maken van een vierkant even groot als een rond; en het aanweijsen van plaatsen diemen niet beogen kan, hoe verre dat die Oostwaart of Westwaert[sic] van malkanderen gelegen zijn. Dit noemt men d'uitvindinge der Lengte van Oost en West.’, Bekker, *Ondersoek* (1692), Berigt, 1.
[43] See above par. 8.3.3.
[44] Monfils, ‘Een dominee’.
[45] Israel, *Radical Enlightenment*, chapter 21.

Bekker's opponents seized the possibility to attack him on this matter, and Lieuwe Willemsz welcomed all the support he could get.

He answered both Bekker and Fullenius with a pamphlet entitled: *Simple and pure story of what happened in The Hague in the Gathering of the High Mighty Gentlemen of the Estates General of the United Netherlands, on appointing a way of finding longitude of East and West and the true time measurement, as done by Lieuwe Willems Graef, serving as a notice to the friends and benefactors of the Truth, and as a contest of the lies and slander done by the enemies and distrusters of that [truth].* This pamphlet differs in style and rhetoric from other works done by Lieuwe Willemsz; it is better constructed and written much more clearly. Later in the 1690s, Bekker points out this was not written by the shipper.[46] This claim is substantiated by other authors from that period.[47] It is beyond doubt that Lieuwe Willemsz had the help of a ghostwriter for his project, although it remains unclear who this was.

Since Lieuwe Willemsz argued his ideas were based on a very strict reading of the Bible, his allies would have found him a worthy friend. But with this new pamphlet the polemic took a complicated turn. Lieuwe Willemsz' interests were defended by an unknown writer, with a completely different interest in the matter. Fullenius' interests, or perhaps they were Huygens's from the outset, were defended by his brother-in-law, which did the matter hardly any good. As if this was not enough, yet another party entered the stage. From Groningen a fierce attack was opened on Lieuwe Willemsz by Jacobus Koersma, which elicited a similarly fierce reaction by Lieuwe Willemsz.[48] Koersma was an able mathematician, who would also attract the attention of Huygens. Interestingly his pamphlet may have been printed in Franeker![49]

Ultimately the polemic was fought out in over a dozen pamphlets. With the number of pamphlets increasing, the level of the debate was lowered. Two titles may exemplify this. Fullenius' first pamphlet was published with Hero Nauta in Leeuwarden, the printer/publisher Balthasar Bekker often used. His second pamphlet was published at the official University publisher in Franeker. The title of this pamphlet gives away most of its content: *Urgent notice from Bernhardus Fullenius, professor of the mathematical arts in Franeker, to a certain libel entitled <u>Simple and honest story about the finding of east and west</u>, published*

[46] Bekker, *Betekeninge* (1692), 19.
[47] [Oostwoud], *Een t'samenkouting*, 4. Oostwoud gives convincing quotes for this accusation.
[48] Koersma, *Brief geschreven*.
[49] The printers' device on the title page is the same as the one that was published on the title page of Abraham de Grau, *Historia philosophia*. I do not know a second book or print from Groningen on which this was used, but I do know other works printed in Franeker with this device.

under the name of Lieuwe Willems Graaff. It is pointed out in here with crayon and charcoal that this L.W., in the evidence that he gave to the Gentlemen Commissioners of the Es. Gen. for calculating latitude, is off by more than 700 German sea miles, and that he, in trying to mend this mistake and by giving three new examples, so he calls them, again is off, in his first example by more than 800, in his second by more than 900, and in the third by more than 700 German miles. This blunt mistake makes an undeniable argument, that his Art is definitely unsound, and that he can be called with reason the trackless Latitude Wanderer instead of the great Latitude Finder.

Lieuwe Willemsz, in response (probably without the help of another writer), strikes back at Fullenius with a pamphlet that is entitled: *Forced Defense of Lieuwe Willems Graaf, or short and clear indication of a few rude mistakes, made by the professor Bernhardus Fullenius in his writings against him: of which the calculation, in which he has with crayon and charcoal pointed to a mistake of 7, 8, and 900 German Miles. This can easily be erased, and not just the aforementioned hundreds of miles, but it can be shown that he, B.F., differs as much as 1228 German miles etc.*

This way of commenting on each other of course did not solve the difference of opinion between both parties. Both parties aimed at ridiculing their opponent and tried to get ahead by using humor as an important instrument. Again this is already clear from the titles: Lieuwe Willemsz tried to refute Fullenius' pamphlet, not just by pointing to what he found miscalculated, but also by trying to bring a smile to the readers face by stating that the charcoal and crayon 'easily can be erased'.

The second thing that can be taken from these titles is how both authors tried to attack each other's status. Fullenius does this with the same weapon Lieuwe Willemsz uses: humor. By naming him a '*trackless* [...] *wanderer*' he ridiculed his opponent and he might have elicited a giggle from his readers. They did not stop there, though. In the 1690s the Fullenius-party published a portrait of Lieuwe Willemsz with a mocking poem, and Lieuwe Willemsz' harsh and loud scolding of Fullenius can be seen as an attempt to attract attention to the debate as well. Honor and status seemed to be under debate during the entire polemic, much like it had been in the letters written by Hevelius. The third point that is clear from these two titles is that the mathematical content was never far away. Even in the titles of these pamphlets numbers are presented, and inside the pamphlets both authors tried to prove their point with drawings and calculations.

The 700, 800 and 900 mile miscalculations are taken from calculations he made for a commission from the Estates General. Fullenius got these 'examples' from Christiaan Huygens, who was asked to check them. Whereas Huygens found Lieuwe Willemsz' mathematics ‘sound’, he considered Lieuwe Willemsz’ entire concept to be ‘very blunt’ (seer plomp) and ‘very stupid’ (seer onnoosel), as can be found in Huygens’ personal notations (the 700, 800 and 900 miles Lieuwe Willemsz erred were not due to his ‘dividing and multiplying’, but because of more complex details that lay at the base of his method). Next to this ‘inside information’ from Huygens, Vegelin gave Fullenius a copy of the notes that were taken during the commission’s meeting. This shows that both men were very much of help to Fullenius and it also suggests that they might have had something at stake.

Fullenius himself also had something to defend. More than once Lieuwe Willemsz accused him of being a bookish scholar with no real practical knowledge. He even attacked his relationship with Hevelius as something that disqualified him. The final word in the polemic was for Balthasar Bekker, who summed everything up in an appendix to a reprint of his tract on comets. He could have hardly found a more appropriate treatise to do this in. It was that tract that had shown how strongly he was involved with Fullenius all along. It was also the first print of this tract that put Lieuwe Willemsz on his path to begin with.[50]

10.5. Conclusion

In the early eighteenth century a short pamphlet that discussed Lieuwe Willemsz’ work and ideas appeared. It was written in the form of a dialogue, between a sailor and a navigator. When the latter was asked why he was so careful with his criticism on Lieuwe Willemsz he replied:

> ‘Are you still asking this, have you not experienced how badly he would make me look? [Make me out] for a slanderer, a liar, a know-nothing, who has no competence as a navigator, and who knows what more: and that he would not just do that vocally, but that he would depict me in a printed leaflet at the New Bridge [in the centre of Amsterdam], as spoiled goods, my friend? Who would, after that, still hire me as a navigator?’[51]

The gist of this is clearly that among the most important assets any Early Modern person had were his good name and his reputation, and Lieuwe

[50] Bekker, *Ondersoek* (1692), 4.

[51] ‘Vraagje dat nog, hebje nu nog niet genoeg ervaren, hoe leelyk hy my sou afschilderen? voor een lasteraar, leugenaar, weetniet, die geen bequaamheyt heeft voor Stuurman te vaaren, en wie weet wat niet al meer: niet alleenlyuk sou hy sulks mondelyk doen, maar hy stelde my wel dus in gedrukt biljetten by de Nieuwe Brug te pronk, was ik geen bedorven man, vriend? Wie sou my dan na desen voor Stuurman aannemen?’, see [Oostwoud], *Een t’samenkouting*, 24. This was written by Govert Maartenz Oostwoud (1671-1723), who turned out to be perhaps the sharpest, but in any case the funniest, critic of Lieuwe Willemsz. On this figure see Davids, *Zeewezen*, 145-165.

Willemsz appeared to be a master in destroying those. Paradoxically he himself proved in the process that even though these matters were considered enormously important, they were in fact not so crucial to everybody. Lieuwe Willemsz' own name was (to paraphrase Fullenius) written in dark charcoal, yet he was successful in obtaining influential patrons, he was awarded a large emolument by the Dutch government, he got assistance from a ghost-writer and he got his work printed time and time again.

What then to conclude from this? Both Lieuwe Willemsz and Fullenius were Frisians whose careers and stance in their polemic were influenced by almost a century of mathematics at the University of Franeker. Fullenius was the century's last professor in mathematics; he was born the son of a previous holder of that chair, he owned a large library with books on those matters, he traveled Europe explicitly looking for mathematical training and he corresponded with other mathematicians. He was a scholar and a gentleman. Lieuwe Willemsz was a sailor who started publishing on mathematical matters and who found a lively market of other amateur mathematicians in his native Friesland: the almanac writers. It was in this setting that Lieuwe Willemsz flourished, a scene that was initiated by Baardt and initially continued by other former Franeker students. It was an aspect of precisely this scene that was so characteristic to Lieuwe Willemsz' career: he knew how to play the printing press. He did so in a fashion that clearly showed he was neither a scholar, nor a gentleman, as even his contemporaries recognized.

With his aggressive tactics, Lieuwe Willemsz revealed the important distinction between practicing mathematics at university and outside university. He had much less at stake than the Franeker professor when he put his good name and reputation on the line. This example shows that mathematics had a very social and cultural face. This is one of the most colorful illustrations of the culture that animated mathematics in Franeker.

11. Conclusions and comparisons

IN THE DECADES after 1620, ever more students in Franeker are explicitly mentioned as studying 'math[ematica]' or 'geom[etria]'.[1] These students came from all over Europe, as far east as the outskirts of the Polish Kingdom, Transylvania, or from as far west as several cities and counties in England or Scotland. They travelled down from Denmark and 'Norway', or were natives of France. Some were born and raised in Holland or even closer in Franeker itself, or in the smaller Frisian villages surrounding the university town. Most of them left virtually no traces in the archives in Franeker or Leeuwarden. Today they are mere numbers in the books listing the students of the former University of Franeker. What was it they came looking for?

The short answer is that they came looking for mathematical knowledge and skills. But such an answer will prove to be highly complicated and problematic upon closer inspection. Even most intricate explanations of what 'Math' or 'Geom' consisted of will not be completely satisfactory upon scrutiny. This study offers an elaborate exposition to historicize and problematize the word 'mathematics'. It centres around the question what was considered mathematics in seventeenth century Franeker. To come to a satisfactory answer – one that goes beyond a real definition – this book has provided a thorough cultural history of mathematics and explored the many dimensions of what constituted the discipline. How was mathematics used, practiced, shaped, and valorised, and where was it situated in the seventeenth century? It was not something evident, but it was shaped and given meaning to in a complex setting of numerous cultural practices.

To only way to get a grip on fluid entity 'mathematics' is to follow the tribulations of people and things in their rich historical setting. This may seem anecdotal sometimes, but together these stories undercut several dominant – and often implicit – preconceptions regarding mathematical practices: education, textbooks, instruments, professorship. What I have shown is how every practitioner of mathematics, whether this was a professor, a student, an *idiotus* or an almanac writer, found a place for their business. With society changing and the university adapting, the practice of mathematics changed, and this did not happen in a vacuum.

[1] These figures come from my reading of the *ASF* and the *Auditorium*.

It could only take place within the boundaries set by the history of the University of Franeker and the demands that came from the surrounding factors, like politics, religion, commercial possibilities or scholarly currents. This was the place where the Franeker 'inventions', 'discoveries' and 'developments', like the telescope, Holwarda's New Star, or the education of the *idiotae* were shaped.

11.1. Franeker in the Scientific Revolution

A study of mathematics in the 17th century immediately raises questions regarding the Scientific Revolution. Did it take place in Franeker? In the mid twentieth century the essence of the Scientific Revolution was considered to be the rise of mathematical thinking.[2] Recent historiography has called into question the basic tenets of this view: history of science is not only intellectual history; the rise of mathematical thinking is not a matter of 'freischwebende Intelligenz', and categories like science and mathematics cannot be unproblematically applied to Early Modern times. Historians have started to interpret the development the 17th century primarily as a transformation of the traditional domain of natural philosophy as a result of the claims to explanatory knowledge by traditionally non-scientia domains like mathematics and crafts.[3] It was not the victory of 'science' over both scholasticism and pseudo-science, but a reconfiguration of conceptions of what was considered 'scientific'. Mathematics figured in both respects: via the increasing reputation of the traditionally subordinate, mixed mathematics and via the practitioners' mathematics.[4]

The work of historians like Gaukroger and Schuster has codified this idea of transformation of natural philosophy in a very precise and historicizing way, although tending to focus on intellectual history. Shapin and Schaffer have shown the social-cultural setting in which this transformation took place, focusing experimental philosophy and the knowledge claims of gentlemanly English culture. Dear has emphasized the role of the mathematical sciences in this process and the contested heritage of Jesuit scholarship in particular. In all cases, including the cultural histories of Shapin, Schaffer and Dear, the focus is on epistemic issues, contested knowledge claims, and the heterogeneous values of knowledge practices. This current study is not so much concerned with epistemic issues like these, but emphasizes the way cultural settings gave

[2] See for example Koyré, *From the Closed World*; Butterfield, *Origins of Modern Science* and Westfall, *The Construction of Modern Science*.
[3] Lüthy, 'What To Do With'.
[4] In particular the classic mathematical sciences rose to dominance in a development that can be called physicalization of mathematics, rather than mathematization of philosophy. See Schuster, 'Descartes—Philosopher'; comp. Dijksterhuis, *Lenses and Waves*, 225-235.

shape to disciplinary practices concerning mathematics. In this regard, it draws on Dears emphasis on the role of academic and disciplinary status in new knowledge claims of the 17th century. The focus, however, is on the actions and functioning of mathematicians and mathematics in academic culture, as well as local culture in general, to find out how 'mathematics' was given shape in the 17th century. How the protagonists of my study worked hard to find space for their business.

11.2. Franeker in Friesland

The site of this study is Franeker in Friesland. My focus has been almost compulsively on the university of that town. It was the world of mathematics in Franeker that I wanted to explore, understand and study because it was almost a perfect 'laboratory' for the 'experiment' I wanted to conduct, namely a cultural history of mathematics. The question that now remains is how what happened at Franeker compares to what happened at other universities and what happened to mathematics at large. For a large part this is a question that cannot be answered, since no other Dutch university professors of mathematics have been studied in this much detail. In fact, hardly any studies of groups of professors teaching in one subject over a longer period of time are made, other than the usual suspects: divinity, medicine and natural philosophy. There have of course also been occasional and individual studies of separate professors, or of whole universities, but there is still little work done looking at groups within academia. For example, professors of history are still very much unstudied.[5] Mathematicians are especially poorly studied in their cultural background, because many historians of mathematics focus on big names and/or the actual constructions and equations they made. Those historians want to know what the math added up to, not how it was practiced. This study shows how Early Modern mathematics can be approached as a cultural phenomenon and what issues need to be addressed to do so.

11.3. Periods

Mathematics at the university of Franeker can be divided into roughly three different periods, all of which saw a different professor take a central role, and all of which saw the practice of mathematics flourish in one way or another.

[5] Recently, Raingard Esser published a study on historians in the Dutch Republic in the first half of the seventeenth century. Interesting that study partly overlaps with this current study, since Johannes Pontanus, a former roommate of Metius, and professor in mathematics at Harderwijk, was one of the foremost historians of his day, see Esser, *The Politics of Memory*.

During the first period, Adriaan Metius guided mathematics at the university. During this period strong foundations for the practice of mathematics were laid. This was also the period in which still many different possibilities were pursued. Metius, it was mentioned more than once, was able to publish more than all his peers. In fact, he published more than all his seventeenth century successors combined. It is emblematic of the entrepreneurial stance Metius took and of the many possibilities he explored. Metius gave the classical mathematical sciences a secure academic reputation by the value it had within the then cultural setting of the new state. This was not the philosophical status Galileo acquired at the same time in Tuscany, but with a similar self-confidence and orientation on instruments.

The second period is best characterized by the figures of Bernhardus Fullenius senior and Johannes Phocylides Holwarda. The latter was probably as ambitious as Metius, both as an entrepreneur and as a scholar. He published on many subjects, such as logic and natural philosophy, and he even turned to the publication of almanacs. He also claimed the discovery of a New Star and he was actively engaged in Franeker university life. Yet, and this is where he differs most from Metius, he was not the professor in mathematics. That was Fullenius, who was busy reworking his chair, in order for it to keep a legitimate spot in the university curriculum. Importantly, their practices revealed how mathematics was appropriated to larger developments: under Metius the Dutch Republic was at war and 'warlike' math was important; under his successors more peaceful practices (like land surveying and astronomy) became fashionable. Holwarda's *Friesche Sterrekonst* is the best example of a book aimed at an audience outside the university. At the same time he also found a way to give mathematics cosmological significance inside the University of Franeker.

The last period started under Abraham de Grau, but was coloured by Bernhardus Fullenius junior. Although he was an unlikely academic, he did find an important place among the Dutch professors in mathematics and a similar spot among the Dutch *savants*, the patrician amateurs. He also brought the education of the *idiotae*, which had started under Metius, to an all time high, and after his death his activities were divided among two different university 'professors'.

In all three periods, the personal involvement of the historical actors was of great significance. It was not obvious that Franeker would become a steady centre for the practice of math; this was the result of the activities of Fullenius senior and Holwarda who both went beyond the role of caretaker. That is also precisely where the second period differs from the first: Fullenius senior and Holwarda had something to build on, while Metius had no such foundation. This does not mean however, that they were less important than Metius: all of them were crucial to maintain the position of mathematics at Franeker. It was not given to have a chair of mathematics, but it was created by Metius and then maintained and extended by his successors. 'Mathematics' in other words, required continuous upkeep and renovation. What De Grau and Fullenius junior did was again continuing down that same road, but they had even more possibilities. Over time mathematics was changing its face and these last two professors found a way to contribute and respond to that. This is why the last period ultimately differed so much from the first, but also significantly from the second. The accumulated resources, in the form of knowledge, instruments and practices provided a changed landscape in which the latter professors could work. Over the century that separated Metius and Fullenius junior, mathematics had grown from an auxiliary subject for young students into a full and accepted academic field.

11.4. Careers

In total I have discussed five different professors in mathematics and one in logic and natural philosophy to gain insight in the development of the chair of mathematics. All six of these professors had completely different strategies to gain importance for this field, although this may not have been their initial aims. They made their career as academics, not as mathematicians. Mathematics was a means to an end. Those careers were not the product of some master plan they realized, but a succession of decisions, reactions to challenges and taking opportunities, as well as the conventions of academic life (what was expected from an academic).[6] These conventions in the Early Modern academy were not centered around 'publish or perish'; on the contrary, original research was *not* the motor of Early Modern scholarship, but more a by-product of other interests such as court patronage, educational practices and publishing strategies. However, this did not mean that there was no originality to their works. On the contrary, those Early Modern academics very often did produce novel works.

The sixth Franeker professor, Johannes Phocylides Holwarda, who played such an important role in this book, is pivotal to understanding the entire history of mathematics at Franeker, despite the fact that he never held the post of professor in that subject. Holwarda seemed to constantly look for new ways to develop the field. He turned to natural philosophy when he got the chance and deployed mathematics for this,

[6] In self-fashioning literature there is often the suggestion, implicit or not, that protagonists had a master plan that they successfully or unsuccessfully realized. This is not a very realistic perspective: careers are in general the result of a series of choices determined by time and place. Comp. Biagioli, *Galileo Courtier*; Shapin and Schaffer, *Leviathan*. The cases of Early Modern scholars who met a premature death are among the most powerful illustrations of the bumps and turns a career could be met with.

but he also made numerous observations, filling all sorts of astronomical tables he also published. Holwarda shook the international world of astronomers with a publication on a star, and the local world of ephemeral print with almanacs. This flexible nature characterizes his approach to mathematics, and it is his ability to find what is extraordinary that make him so interesting.

Every other professor in mathematics also shared this flexible nature. Metius not only started the education of *idiotae* and had numerous books printed, he also played a crucial role in claiming the invention of the telescope, he was a part time alchemist and he was a proper academic. Fullenius senior found a way to reshape the chair of mathematics, delivering numerous graduates who left Franeker with a degree in mathematics. Such a degree made them eligible for the public office of land surveyor or wine gauger and it ensured Fullenius a position at university. Meanwhile the scarce sources that can be found on him suggest that he was a known astronomer all throughout Europe. De Grau was constantly looking for new challenges; his laborious studies of the ancient philosophers were famous in his day. Based upon a single remark that he was shy (which was a virtue!) he is depicted in historiography as a bland figure, one who also had no unconditional love for mathematics, but rather focussed on natural philosophy instead. This 'loser' of history, however, was much more exciting than a failed mathematics professor. He seemed to have been constantly looking for something to do and ultimately found new ways to combine math with his main love, *Historia philosophiae*. He wanted mathematics to be important for natural philosophy, he was a known comet hunter and, meanwhile, students still received their degrees in mathematics under him. Fullenius junior, the last of this short list, is possibly the best example of having the ability to adapt to his times. He not only graduated more *idiotae* than all other professors in mathematics at Franeker, he also lectured on modern mathematics and found a way to lift the entire education to a more abstract level. He had Willem Loré to teach the more mundane mathematics, while he himself tutored the heir of the ever important Nassau family.

The odd one out here is the very first professor in mathematics, Johannes Roggius. His short spell at Franeker contrasts strongly with the long one Fullenius had. Roggius had not come to Franeker to teach mathematics, as opposed to Fullenius who had left a position of burgomaster to do just that. Roggius instead came to help the strict Calvinists at the University of Franeker in their attempt to turn the institution into a beacon of orthodoxy. He had gotten the chair in mathematics because that field was somewhat connected to one of his expertises: Hebrew. These circumstances had turned his time as a professor into a series of incidents, which ultimately culminated into one of the darkest episodes the university ever had. Still he failed as an academic, not as a mathematician. Fullenius junior also had a political agenda and a religious opinions. His close ties to Balthasar Bekker and the polemic with Lieuwe Willemsz show that he too had these. Yet for Fullenius, the chair in mathematics was desirable in itself; it was not his stepping-stone into university, but his end station.

An overview of the careers of these mathematicians shows some general characteristics of the Early Modern mathematics professor and of the Early Modern academic in general. Most important perhaps is that these academics could not just lay back and thus keep their customers satisfied. They had to be active in academic and social life; they had to think about their teachings and change if necessary. It has long been recognized that research was not the most important activity for the careers of those academics, but this study show that there were enough possibilities left to those scholars to implement and contribute to new developments in their every day practice. In fact, it seems that it was almost a prerequisite for the professors of mathematics to be innovative and venturous. It is one of characteristics they all share.

11.5. Publishing Strategies

Of the six professors who take a central role in this book, no less than five published during their life-time – Roggius is again the odd one out. Of the numerous other mathematicians who play a role, many also used the printing press as a means to present their ideas on all sorts of material related to their activities. In this respect Franeker offers a case of European importance, since Metius was one of the best published mathematicians of the seventeenth century. What does this say about how mathematics functioned in Early Modern printing? And how do these several actors relate to each other?

Let us start with Metius. His activities involving print are astounding still today, not only because he published more than the other mathematicians, but also because he was a true innovator. It is important to note that in the early seventeenth century there were still few presses in Europe. For instance, in the whole province of Friesland there were probably no more than one or two at the time Metius started his activities. With so few presses, there were also few publishing houses and ultimately few possibilities to have something published. While this may have been a challenge to most people in Europe around this time, Metius seems to have turned it into an advantage. Precisely these circumstances created the space for him to obtain a dominant position in the market of textbooks on mathematics.

However, a close inspection of his work immediately reveals a problematic point, for after studying Metius it seems valid to pose several questions: What was a textbook? How was it used by Metius?

What was it to his successors? To answer, it was a book in which knowledge was presented to the reader in such a fashion that the reader could acquire that knowledge and ultimately work with it. However, to the producers of those books, like Metius, Fullenius and Holwarda, it was also a book in which a self-image could be constructed. Metius was depicted in his own works as a Dutch Tycho Brahe; from these works it can be taken that he was pivotal in the practice of astronomy in the Dutch Republic. The textbook was also present in the classroom, where the future edition of such a book was constructed. Students could contribute to it, and professors could hand out favours by getting students involved in these works. As such, it was used as a stepping-stone early in several careers, such as those of Baardt and Schotanus. Metius also used textbooks to publish on his observations of the stars. He discussed newly invented instruments, even enclosing paper and printed models of instruments with the books. He presented mathematics as a useful enterprise that built upon the use of clever innovations. This case shows that our understanding of Early Modern textbooks needs to be nuanced. They hold some surprising features which makes them differ enormously from our current textbooks, although they look a lot alike at first sight. These features offer countless clues to the past. Textbooks, however, are often neglected in historical study.

How important textbooks can be is not just shown by Metius. A look at all the other professors stresses this same point. Fullenius senior, for example, printed the works of Metius (and of Drusius and Amama, who were his predecessors in the chair of ancient languages) as a way to show the legacy he worked with. By editing and publishing Metius' work, he benefited from the good name that came with it. Holwarda used his famous Dutch textbook on mathematics and astronomy as a book in which he could present the truly revolutionary ideas of, among others, Kepler to a general audience and reach out to those people at the same time. It would ultimately establish for him too a place as a 'Dutch Tycho Brahe'.

It is in fact Holwarda's entire oeuvre that best resembles the publishing strategies of all four professors in mathematics in the seventeenth century. Holwarda's textbook in the vernacular stood in the tradition of Metius. Like Fullenius had done, Holwarda posthumously edited and reworked the work of Metius. Only Holwarda used it for that specific textbook, whereas Fullenius had done little more than reprinting earlier editions. In this Holwarda resembled Fullenius junior more than senior; it was after all the son Fullenius who would publish Christiaan Huygens posthumous works. The publishing of editions of famous predecessors was an honourable thing to do. Holwarda also published on natural philosophy and pointed at the possibilities mathematics could have for that domain. This was mimicked in the works of De Grau, who was not only a leading figure in the world of the *Historia Philosophiae*, but tried to benefit from this position to strengthen the chair of mathematics.

To the Early Modern professor, 'publish or perish' would have been an alien concept, even though all the professors central to this thesis were publishing at one time or another. It is Fullenius junior's case that maybe best reveals this. He only published when there was an absolute necessity, for example when his good name was publicly under attack, or when he got the chance to work on the papers of Huygens. But he did publish. That is the lesson these stories have to offer. It was not a case of 'publish or else', but the printing press offered great opportunities. It was thus more a case of, 'What now? Perhaps publish?' Publishing was a tool that had to be deployed with care and attention and if done so in the right way, it could have a great impact.

11.6. Inside the classroom

It has proven to be very hard to actually enter the classroom of the professors discussed. Only a few sets of lecture notes have survived, and not all of them from the time those professors worked in Franeker. The main conclusion that can be drawn from those sets is that the education given to the proper academics (i.e. not the *idiotae*) changed over time. It moved steadily in sophistication, from simple arithmetic to esoteric algebra. How does this compare to what happened at other universities and in math classes of individual teachers, of tutors all throughout the Dutch Republic? This is a difficult question to answer, especially since those lessons have not often been studied in a broad cultural setting. It is also difficult because all examples studied in this book show that education is not a simple transfer of knowledge and skills; that process is always reciprocal. Caution is thus in order for an all too definitive judgment.

However, with these reservations taken into consideration, some general remarks can be made. It is, for example, intriguing how vernacular courses in mathematics in both Franeker and Leiden started around the same time (1600).[7] In Leiden this was organized in a separate institute, the 'Duytsche Mathematique', which acted within the sphere of influence of the university, yet never became fully part of it. In Franeker it became a standard feature of the chair in mathematics, yet from time to time the students in these vernacular courses were threatened in their privileges.

In the middle of the seventeenth century mathematics at Franeker and Leiden drifted further apart. The reasons for this can possibly be

[7] Van Berkel, 'A Note on Rudolf Snellius'. 160-161.

found in the strategies the different professors in mathematics used to modernize their chairs. De Grau, as I have shown, seems to have had the special attention of the gentry, who could get classes in military engineering with him. The professor of Duytsche Mathematique, Frans van Schooten, whose job it was to teach engineering, made a move that resembled this, but which was in fact something different. He too responded to developments in Dutch society and he successfully tried to attract patricians, but the difference between these two professors is that Van Schooten's 'new' students came from a 'regent' background with an interest in government, while De Grau's students had more of a 'nobility' background and were eyeing careers in the army. De Grau's classes also had direct practical use to those students, whereas Van Schooten's education had a more humanist air. They were good to do as a hobby, but not necessarily applicable in every day life. Ironically what Van Schooten did looked a lot like the mathematics Fullenius junior would be embroiled in, in the near future. Van Schooten successfully detached his teaching to those esteemed students from his job as a professor at the Duytsche Mathematique. Ultimately that institution was abolished and with Van Schooten's death in 1660 the education of the sons of patricians ended too.

By the time Fullenius junior accepted the chair as professor of mathematics, the Duytsche Mathematique was already abolished. In Franeker his professoriate set the beginning of a long and very blossoming period for mathematics. Mathematics in Franeker proved to be more robust and enduring than even in Leiden. The university in Leiden was not, furthermore, the only institution where the Franeker strategies were mirrored to some extent. In Amsterdam at the Athenaeum Illustre some professors in mathematics were teaching in the vernacular.[8] In Groningen this may also have taken place. De Grau lodged, for example, with the professor in mathematics there. Interestingly the first professor in Utrecht in mathematics was a former student of Metius and a translator of his work, Bernhardus Schotanus. Incidentally, when the latter moved to Leiden later in his career he had the famous brothers De Witt lodging with him. Precisely around that time, those brothers attended *privatissima* with Frans van Schooten, who taught them some of the most compelling mathematics available.

These seemingly accidental relationships are of interest, for they reveal something of a lineage in the educational system.[9] A lot of the

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[8] Van Miert, *Illuster onderwijs*, 61-62.

[9] It may reflect something like the modern day *Erdös number*-system, although for the Early Modern mathematician the joint-publication would not have been of utmost importance. Rather, the visit, the *album amicorum*, or the correspondence were seen as more valuable. However, the *Erdös number* reveals first and foremost how relatively small the community of modern day mathematicians is. Interestingly, this is precisely what a

former Franeker students found their way to other universities and institutions, just like how students who had gotten an education somewhere else were active in Franeker life. This interaction created a ‘family of mathematicians’ who were related through their own education, the books they used, their correspondence and the visits they made. All this was ultimately part of the European phenomenon of a Republic of Letters. A student who travelled to Friesland because wanted to learn mathematics was no exception, because there were people travelling around all the time, on their way either to or from Franeker. Jacob Bernoulli is a concrete example of this, and there were thousands of others who took with them information and brought in ideas. In the exchanges that took place mathematics at Franeker was and stayed an important field.

Astonishingly, what was discussed, described and researched by the professors of mathematics varied enormously. The subject could be an instrument like the telescope, which had an alchemic connotation at the time it was first discussed. This is important because in the course of history it turned out to be a pure ‘mathematical instrument’, it is that course, that paper trail, which blocks our view on those historical processes. It is one of the many instances in which ‘mathematical’ proves to be very problematic. The same goes for a class given by the professor who was gunning for the chair in Hebrew, or the other way around the former professor in Hebrew who was now teaching mathematics. A book could be filled with commonplaces, or it could look like a book that was actually defending Copernican and Keplerian ideas, which at the time were far from accepted. The point is, when the professors in mathematics are followed, their practices show how colorful and rich mathematics could be. If what they discussed and wrote about is supposed to be mathematics, then the world of that field is a very exciting place.

Why was it that in Franeker mathematics was so successful in claiming the chair for a mathematician time and time again, while at other universities the professor of mathematics was often one of the first to feel cut backs in funding? If in Groningen the professor of mathematics died, it was always up for debate if a new one was installed. In Deventer a clever and slick talker could have a chair installed for his

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lineage system in the Early Modern period reveals as well. See also the ‘Mathematics Genealogy Project’ http://genealogy.math.ndsu.nodak.edu/ (retrieved 05-01-2012), which today is far from perfect. Metius, for example, has no known students in that database, he is listed as having obtained an Artium Liberalium Magister (of which I have seen no proof) and Brahe and Rudolph Snellius are mentioned as his ‘advisors’. All this reveals that the Genealogy Project is too anachronistic to be of use for any mathematician who existed before the nineteenth century.

own merit and for as long as he was available.[10] A larger contrast with Franeker is hardly imaginable, where during the whole of the seventeenth century there were no clear voices in favor of abandoning the chair, and where the charlatan (Rosaeus) was offered a chair but *not* the one in mathematics. It is my opinion that this has to do with what also happened in the classes of those professors: the education of the *idiotae*. It was this specific form of education that provided a tradition that would ensure that Franeker always had a professor in mathematics, and it was this tradition that gave ground for mathematics in Franeker to be such an interesting and entrepreneurial business. The education of these *idiotae* also gave the professors who were responsible for them a special place inside *academia*. The Franeker professors in mathematics had on the one hand to teach almost every student, because every student was obliged to take a course in mathematics. On the other hand were they the only ones who always had to teach laymen as well. This situation created a tension between these two important activities. To return to the comparison with the Duytsche Mathematique in Leiden, there the professors found no use in modernizing their classes in fortification, ultimately creating room for the patrons of the university to abolish that form of education. In Franeker, fortification became ever more important, next to the training of land surveyors. This gave the chair a use for society, which gave its professors room to investigate numerous other forms of mathematics.

The lesson to be learned from this is that Early Modern society was demanding of its universities. It was not publish or perish, but rather deliver or perish. As long as it had good use, academic liberties were granted and a spot in the curriculum secured. The other universities show that when this use dwindled, everything was up for debate. It was this constant pressure that ultimately ensured the high level of education and the continuity in mathematics in Franeker. It was these two conditions that were grounds for the academic lineage system that is seen in Franeker. Because the demands were so high, the Franeker mathematicians flourished. Ultimately, this set the Franeker practice apart from what happened at the other universities.

To the larger picture, that of the Scientific Revolution, this has some crucial implications. This study has shown that for generalisations on the practice of mathematics the details need to be considered to more extent than has been done so far. Those details reveal that our understanding of the practice of mathematics is far from complete, on most mathematicians very little is known, although there is a lot still to be discovered. They also show that not all generalisations are completely amiss, but often they are in serious need of focus and they need to be

[10] Dijksterhuis, 'Simon Tyssot de Patot'.

freshened up. To come to such a new focus the sources need to be reread, restudied and they often simply need to be found in archives and libraries around the world. For this to be done properly the paper trails of all the numerous historical stories need to be reassessed. In that respect this thesis was only a first attempt.

Whether the grand narrative of a Scientific Revolution needs to be replaced with a new great metaphor or with numerous smaller ones, a better and more thorough understanding of mathematics needs to be achieved. The demands of society, the periods in which mathematics was taught at other universities, the practitioners outside university, the conditions created by courts and regents all through Europe, they will all help understand mathematics better. It is my strong belief that such a broad approach will ultimately offer building stones that are crucial for understanding the processes that have often been branded science until very recently. Only when those building stones get the attention they deserve the new grand narratives will proof to be lasting.

11.7. The Descartes problem

The University of Franeker has claimed fame in the field of the history of science because Descartes chose to matriculate here in 1629, right after his move to the Low Countries. Evidently, Franeker had an impressive international reputation. René Descartes was without a doubt the most famous mathematician to enrol at Franeker. Some say he came to Friesland for the good air, yet he himself was not very pleased with that.[11] Others claim he came to study with Metius and learn about the telescope, there are those who say he possibly wanted to study with the professor in divinity Johannes Maccovius.[12] There is one particular expert who says Descartes was extremely disappointed with what he found in Friesland. In fairness there is little to be said on the matter until new material surfaces.[13] And we may probably never find out what Descartes was looking for at the University of Franeker. Nevertheless we now have at least a better image of what it was he found and what tradition he took part in.[14]

Descartes goes largely unstudied in the preceding, because he did not contribute to the shaping of mathematics in Franeker. At the same time he is considered the main protagonist of the Scientific Revolution, by the shape he gave mathematics in natural philosophy. Descartes elevated quantity to the essence of nature thus creating a natural

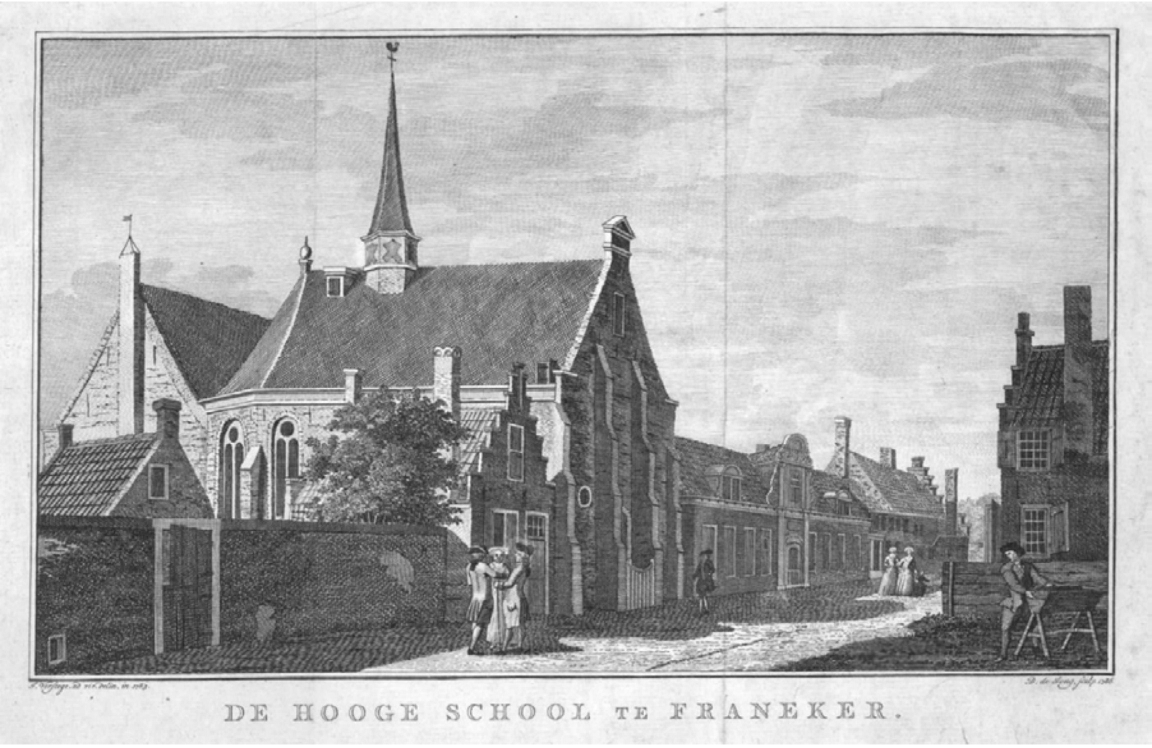
[11] Watson, *Cogito ergo sum*, 24-39; 156-157.
[12] Cook, *Matters of Exchange*, 229-231; Van Bunge assumes Descartes came to study mathematics at Franeker, Van Bunge, *From Stevin*, 34.
[13] I have found no unknown sources on Descartes' time in Franeker.
[14] And possibly why it turned out to be a disappointment to Descartes, see Verbeek, 'Meer melk dan honing', 6-7.

philosophy out of mathematics. The present study has shown, however, that the Cartesian model was not the only way in which mathematics and philosophy were reconfigured in the seventeenth century. Besides the canon of Galileo-Descartes-Huygens-Newton, efforts like that of Grau existed and it is against this background that the transformation of natural philosophy should be understood. Furthermore, Cartesian philosophy was not the only point of reference for 17th-century scholars, as historiography of the Dutch Republic in particular tends to present it. In the case of Franeker the various forms of Ramism were a constant point of reference. This was not so much on the level of systems of cosmology, ontology and method, but on the level of learning and education. This study has thus paid attention to the fact that philosophical systems were not necessarily the core and motor of the Scientific Revolution (and of history of science in general) but that educational doctrines, among other things, were equally important.

This is also apparent in a second line of influence that is conspicuous in Franeker mathematics: that of Tycho Brahe. What is important here is that the tradition of Tycho and Hevelius was not so much about cosmological systems, but primarily about exact mapping of the heavens with sophisticated instruments. Even in the history of astronomy this side of Tycho tends to be neglected, emphasizing his cosmological schemes. Astronomy in the seventeenth century was not only about world systems, it was about sophisticated observation and calculation and 17th-century astronomers emulated Tycho in this respect in the first place. They aspired to continue the lustre of Hven. The famous ones are Flamsteed in London, Cassini in Paris and Hevelius in Gdansk. But Metius, Holwarda, the Fullenii and De Grau clearly too undertook a successful attempt to create a 'Hfraneker'.

11.8. Frisian mathematics, mathematical Frisians

The final point of this dissertation is the subject I touched upon in the introduction of this study: was there a special place for mathematics in the world of the Frisians? The answer to that has to be yes. I have, however, found no special predisposition in the nature of the Frisians that made them exceptionally capable of mathematics. Instead I have traced numerous processes that ensured this special place, all of which are somehow connected to what happened at the University of Franeker. This obviously has to do with the focal point of this research, which is after all the University of Franeker. But I have also shown that mathematics in Friesland was much more than just what was going on in the classroom. There were numerous spin offs, all of them fascinating in one way or another, which created a dynamic of its own. Because of the ensured continuity at the University of Franeker, there was the possibility that a niche market came into existence. It was the professors in mathematics who shaped their chair and who were responsible for the ongoing education of the academics and the *idiotae* who created those spin offs.



Bulthuis en Bendorp, The University of Franeker *(1783).*
Private Collection.

Prospect of Franeker, mid-seventeenth century.
Tresoar, Leeuwarden.

Appendices

Appendix 1

Baardt, *Prognosticatie*, 1644. Transcription.

Nae de aert van onse lieve voorvaderen die lieff hebbers zijn gheweest van de Mathematische Consten, ist niet weyeniger nut dat wij bij dese onse tijden uyt eenige drollige ende wonderlijcke Hemels teeckenen mede connen bemercken dat den Hemel op alle sijne dwarskanten ront is. Dat wist den Stuyrman sonder Graed-boog, den Wever sonder Spoel, den Doctor sonder Bo[ecken], de Schrijver sonder reeckene[ingen], den Smidt sonder kool, den Weerd sonder krijt, dat dat altesamen [?] groten tut tut is, sey Ael[?] toffels. Maer daer is gesien voorgaende tijdt by onse older [??] Meester Lompert Plome[rt], [de]n Duc de Phoca, Alias on[sen] Opperman van alle beroem[de] [O]pper-luyden, die oyt Kalck [?] en andere Materialen tot [?]achtich Gebouw van Uriana hebben aen-gedragen, die hem vermetelijck heeft durven onderstaen, met vuyle Voeten over de steyle Alpes Pirenêen ende andere vermaerde Hooge LandtsBergen, ten Hemel op te steygeren ende met eenen den seer konstighen ender noyt genoech gepresen Astromischen[sic!] meet-maet van sijn plaets te willen verrucken (hoewel d'eerste voor hem in-accessibel, d'ander onnae-metelijck:) meynende voorts de Werelt aen te wijsen een nieuwe Son, nieuwe Maen, nieuwe PLaneten, nieuwe Sterren, nieuwe Quacken, nieuwe Almanacken voor dese by niemant noy[t] waren, noyt gekent, noyt ge[??] noyt gesien: Was dat niet een [??] mitst Opperman? Maer ach [?] [s]ijn opperen blixemde hem Phoebus met sijn schitterige Stralen soo [het?] vermetel gesichte dat hy blindelings achter over in een stinckende Modder-Poel tuymelde, daer lach mijn lieve Oppermantje en spartelde als een kat in kackhuys, doch quam der noch met perijckel uyt, door medelijdich voor-bidden van den ouden Meet-Meester, die nu veel by Phoebum ende Uraniam vermach, maer als sijn Brieven, Bullen, Boecken en Appendices bleven in den loop, alleen grabbelden hy der noch een bedreckte Almanack uyt/ die nu de Bergh-Landen soo door-stinckt, van vuyle Aerde, en verrotte Swaerde, datter de Boeren de Neus voor toe nijpen/ vresende puysten en karbunckels door dien buylen stanck te krijghen. Desen Opper-Geest, sine no[??e], segh ick, heeft voor uyt ko[nnen] sien, dat 't Jaer 1645 een go[ed] [vr]uchtbare tijdt soude zijn: jae, dat meer is soo vruchtbaer dat de [m]eysjes alse wel willen inneme de Pillen van ronda ronda, veel-voudighe Vruchten daer van konnen voort-brenghen, waer aff men nu vertelt een groten of cleynen Parabel, datter Homines sine ingenio in Stauria weunen, die durven seggen, dat de Maen driemael groter is als de Werelt, en de

Sterren op 't minste so groot als de groote Lanteernen sonder licht, die hier dagelijks by de straet gaen, dat wist Malle Wijtse wel, die sey 'habben en jaen, de tol is oes, mey Harmens Vrou, sijn flodder-kous': Maer nochtans als men daer wel om denckt dat het Aëra veel cleynder is als de circumvalatie van de rondte, hoe sou dan een Esels Cop groter wesen als den gehelen Esel? dat sou een wonder eten geven. Wat dunckt u van sulcke Maets, die liever disputeren by alderleye schone Dames? Jae dat's waer ageerde sinnelijcke Neeltje, om een rey datse de beloften gedaen, en daar by dil, dil, dil gespeelt hadde. Wat sullender nu dan al brave soete schone Vruchten van alderleye Natien voor 't licht comen, terwijlen Venus nu is regierende, ende de Buyck des Aerdtrijcks open staet, om alderhande schoone lieffelijcke Vruchten uyt en in te brenghen. Daeromme wacht u wel voor soodanige Vruchten, die dan soo heel soet niet en sullen smaecken als den Ooghst voor handen is, vermits Ceres dit Jaer de Vruchten wil rispelijck uyt-smijten, van Druyven, van Granen, en van Wijnen die in so grooten overvloedt hier in ons Patria sullen romen, dat Bachus, met alle sijn Bachanten wel dubbelt komen versadiche werden, waer door allerhande onlusten zijn voortcomende; als voornamentlijck by de Pleyt-siecke Boeren, wanneer sy haer Branen gerispt hebbende by een Procureur, Notaris, off Advocaetje haer schurfde Sake comen aen-gheven, die den slechten Boer alsdan het water in eenen houten Clomp soo besien, dat hem (arme Faer) Saterdaechs ter Stat uytgaende, niet een Duyt ontvallen can: dan ist daer mede noch niet genoech, maer segghen teghens de onnosele Bliedt, wij sullen vrelicht[sic] wel haest een goede Sentensy crijgen, waer toe ick hebben moet soo veel Payermenten; wanet een Saeke hoe cleyn of hoe groot de selvve mach zijn, wij ontleden en devolveren die in drie of vierderleye instantien, daer staet dan den goeden hals en kijckt als een Poel-Snip: dat geeft my geen wonder, sprack Gerritje Domp-Neus, waer souden sommige cailsen aers van leven? doch de Vroome blijven vroom hoort, hoort: al weer wat nieus: Cerberus. Poort-wachter van der Kellen, heeft nieuwlijcks een Request in gegeven aen Vrou-Venus, dat haer Majesteyt dorch soude willen gelieven Vulcanem te verbieden, sijn Godtloos smoocken te laten, want de Welle soo vol roocks en smoocks wierde, datmen geen Sijke noch Asem langer en ronde halen omtrent Pluto, Lucifer, Cerberus, ende andere Helsche Opper-Geesten dat oock de Kuypers voor al het smoocken mocht worden verboden, by verbodt van Neeringhe in der eeuwicheydt, die alleene het Moudt maer oock de Necotiaen soo dubbelt en dwars in slaen, datter stinckende brocken uyt-comen als vingeren; dien stanck was voor de Helschen Coninck Pluto niet langer te lijden. Off dat Iupiter ten minste mochte gelieven, Vulcanum rijckelijck IJser en Koolen te beschicken, op dat hij dach en mochte aen 't arbeyden geraken, om daer van te maken alderhande Cuppers (Cuypers?) gereetschap, op dat hy ende sy gestadich soo veel

aen-werks mochten hebben, dat hen tot smoken geen tijd quam over te schieten, zijnde 't Cuypen wel het beste hant-werk[sic], als sy maer aenwerck hebben, andersins worden de Kuypers door ledicheyt de grootste Smetse-broers die oyt in de Helle geweest zijn, zijn oock de grootste Staet-makers en Ampt-vergevers van Hemel, Hel, en Werelt, waer over sy doorgaens, veel Vyanden ende Misgunners krijgen; voornamelijck onde 't slecht Volckjen en Onder-Geesten, die qualijck soo veel nagelen hebben om haer eygen Gat mede te schrabben, ende dat al meest om dat de Kuypers de beste Ampten onder haer eyghen Bulde uyt deelen, ende dit slechte achter-oms Volckje niet en connen by comen: maer so haest de ampten verveven zijn, soo is 't gemeen geroep gheraes en getier, van dat snode Gespuys, Hie ick oes aed Merrijs Beaelgh, sulck Volckje behoort men met Pis-bomen ofte willigen Rijs te besteecken, op dat-mense daer aen mochte bekennen als sy ledich gaen: Doch terwijlen dese groote Meesters van de versmitste Kuypers verve goede cier maken en haer Daten met hoepen vast verbinden; staet den Hospes der Helle niet stil noch oock veel meer met hem maer schrijven en teykenen de Kaetsen wacker aen sonder krijt te sparen die sy't Bondt wel op een Daelder reeckenen dat haer omtrent een Bottje kost: diende derhalven Vulcanus en al de Kuppers het smoken verboden ende yeder ander aenwerck gegeven te worden om een generale Delsche Appointment Cerberus nu op sijn Request van Venus sal becomen staet te verwachten: hebt van patientie tot aen-comende jaer soo haest ons die ter handt sal worden gestelt sullen wy niet nae laten u-lieden daer aff den in houdt mede te deelen. Vernoegt u hier mede ende vaert wel.
FINIS.

Appendix 2: De Cometis

De Cometis – CONCLUSIO

Testantur Historiae: Cometis fulgentibus succedere aerumnas. Nunquam [e]n[im] impune comparent, sed veluti minaces Divinae ultionis oculi et irati Numinis linguae, tempestates, mortem Principum, pestem populorum, bella, aliaque innumera mala horrenda nobis portendunt. Quapropter Astrologi Deum et Naturam nobis hisce spectaculis non inaniter ludere, sed semper aliquid Mundo praenunciatum velle conspicientes, se certa horum Portentorum praesagia assequi posse putant, si modo varias Cometarum condiciones[1], cursus nempe, coloris, claritudinis, obscuritatis, caudae, domus caeli[,] signi Zodiaci, temporis, diuturnitatis, culminationis etc. observent. Sed falluntur. Nam si Prognostico ex Planetarum Aspectibus, qui tamen saepe fiunt,, deprompto fidendum non sit, nisi certis et indubitatis Exemplorum Inductionibus, quibus et Medici saepe uti solent, nitatur et tum demum certis Aphorismis includatur, Quid mirum ergo, si et haec ex variis Cometae condicionibus[2] desumpta Prognosis pro mera Coniectura habeatur, nisi et in certis praeceptis ac regulis iisque universalibus fundetur. Enimvero cum ex uno vel altero Individuo generalem inferre Conclusionem et Regulam non liceat, sequit[ur] plura etiam Exempla requiri, et quidem similia, sicut similes Planetarum Aspectus ita etiam similes Cometas, id est, ut plures eiusdem per omnia condicionis[3] Cometae apparuerint, quorum effectus aut eventus subsecuti maxima ex parte persimiles fuerint; At si attente legamus historiam Cometarum, nullus adhuc ostendi potest Cometa fulsisse alteri similis in figura, loco, motu, duratione, anni tempore etc., aut quorum inter se quoad plures condiciones[4] similium, similes quoque fuerunt effectus aut eventus ab ipsis significati. Quare omnem divinationem, omnemque ex regulis Ptolemaei vel aliorum Astrologorum, Cometarum prognosin, quae circumstantias illas motus, caudae etc. respicit, prorsus inanem censeo, quippe soli Deo cognitam, nec unquam hominibus revelatam, atque adeo etiam Mathematico impervestigabilem, cui cogitationes Omnipotentis Dei ante eventum introspicere nunquam licuit. Nam sicut Adolescentis amore saucii Musica, multae circum puellae perfunduntur eiusdem nempe Musices voluptate, neque tamen sciunt, cuius gratia ea personet potissimum, ita et nos etiam haec nova quidem intuentes

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[1] *conditiones* ms.
[2] *conditionibus* ms.
[3] *conditionis* ms.
[4] *conditiones* ms.

Phaenomena, sed quibus Regionibus et gentibus portendant, ignorare cogimur. Quibus consideratis et reiecta omnino Prognosi speciali, generalem quandam significandi rationem admitto, quae modo limites non excedat. Quapropter ego, non Prognosin huius Cometae, sed Admonitiunculam potius, id [e]n[im] et historiae, et sapientissimis viris tam Ethnicis quam Christianis dissonum non est, instituens, tandem concludo et denuncio: Variis de causis hunc Cometam a Deo nobis esse exhibitum, quarum tres hic refero: Primo, ut Mortales oculos in coelum erigant, et agnoscant multa esse, quorum causam et naturam ignorare coguntur, eoque Divinae potentiae se submittant. Secundo ut sit certum Indicium Irati Numinis, adeoque nisi serio mortales vitam moresque suos emendent, neque placet[ur] Numen, magnas etiam calamitates eventuras. Denique tertio, cum tandem e conspectu nostro evanuerit Cometa, et quasi mortuus sit, ut universis et singulis sit testimonium[5] mortalitatis suae, et admoneant[ur] decretum esse Deo, brevi bonam generis humani partem promiscuae conditionis, ex hoc mundo transferre, quod in genere certum quidem, sed de singulis incertissimum est. Et cum nullum robusto sit Privilegium prae Imbecilli, nullum Iuveni prae Sene, nullum denique Vati prae consulentibus, Monere ideo caelestem praeconem, ut pro se quilibet Deo reconciliet[ur], migrationi se paret, terrena negotia sic componat, uti optat a decessu suo constituta et composita observari. Quibus monitis, si pareatur, quemcumque etiam mors rapuerit, is feliciter migrabit, qui vero superstes vixerit, non indigne feret, se tam feliciter delusum ab Astrologo.
FINIS.

Translation in Dutch by Dr Ron Gruijters

[Over] kometen – conclusie

De geschiedenisboeken tonen het aan: ellende volgt op [de verschijning van] schitterende kometen. Want nooit verschijnen ze ongestraft, maar als de dreigende ogen van de goddelijke wraak en de tongen van de vertoornde godheid kondigen zij ons stormen, de dood van vooraanstaanden, de ondergang van volkeren, oorlogen, en andere ontelbare, vreselijke rampen aan. Daarom menen sterrenkundigen – omdat zij begrijpen dat God en de natuur voor ons deze schouwspelen niet zonder reden opvoeren, maar dat ze altijd willen dat iets aan de wereld wordt medegedeeld – , dat zij bepaalde voorboden van deze wondertekenen kunnen verkrijgen, als zij tenminste de verschillende omstandigheden van de kometen in acht nemen, de baan natuurlijk, de kleur, de helderheid, de verduistering, de staart, de plaats aan de

[5] ***Kepplerus*** *in margine*

hemel[,] het teken van Zodiak, de tijd, de duur, de grootte, etc. Maar zij vergissen zich. Want als geen geloof moet worden gehecht aan een voorspelling die is gebaseerd op de aspecten van de planeten, die toch dikwijls voorkomen, behalve als er kan worden gesteund op een zekere en ondubbelzinnige aanvoer van voorbeelden, zoals ook artsen gewend zijn vaak te doen, en pas dan met zekere algemene waarheden kan worden omgeven, waarom is het dan verwonderlijk, als ook deze voorkennis, die is verkregen uit de verschillende eigenschappen van een komeet, voor pure gissing moet worden gehouden, als niet ook deze op zekere voorschriften, regels en algemene begrippen kan worden gebaseerd. Omdat natuurlijk uit een of andere losse gebeurtenis geen algemene conclusie of regel getrokken mag worden, is het logisch dat meerdere voorbeelden gezocht worden, en zeker vergelijkbare, zoals vergelijkbare waarnemingen van planeten zo ook vergelijkbare kometen, oftewel: dat meerdere kometen, alle met onderling dezelfde eigenschap, zijn verschenen, en wier gevolgen en de daaropvolgende gebeurtenissen voor het grootste deel zeer vergelijkbaar zijn geweest; maar ook al lezen wij aandachtig de geschiedenis van kometen door, dan kan er nog altijd geen enkele komeet getoond worden die aan de hemel heeft geschitterd en aan een andere gelijk was in vorm, plaats, beweging, duur, tijd van het jaar, etc., of van welke – van diegene waarvan onderling meerdere eigenschappen vergelijkbaar waren – ook de door hen voorspelde gevolgen en gebeurtenissen vergelijkbaar zijn geweest. Daarom acht ik elke voorspelling, en elke voorkennis van kometen op basis van de regels van Ptolemaeus of van andere astrologen, die op die omstandigheden van beweging, staart, etc. is gebaseerd, in één woord ongefundeerd, omdat die voorkennis immers aan God alleen bekend is, en nooit aan mensen wordt onthuld, en die zeker ook door de wiskundige niet te onderzoeken valt, voor wie het nooit mogelijk is geweest de overwegingen van de almachtige God voorafgaand aan een gebeurtenis te doorgronden. Want zoals door het verlangen van een gewonde jongeman naar de dichtkunst vele meisjes overal ter wereld vervuld worden van een verlangen naar precies diezelfde dichtkunst, en toch bovenal zeker niet weten, wiens bevalligheid die zaken verkondigt – zo ook kennen zelfs wij, ofschoon wij toch naar deze verschijnselen kijken, noodgedwongen die aanstaande gebeurtenissen niet, maar wel aan welke gebieden of volken zij hun voorspellingen doen. Nu we dit overdacht hebben en een specifieke voorkennis in ieder opzicht verworpen hebben, wijs ik wel een bepaalde algemene grond van voorspellen toe, gesteld dat deze de grenzen niet overschrijdt. Daarom spreek ík niet van voorkennis op basis van die komeet, maar liever van een kleine waarschuwing, – want dat is niet in tegenspraak met de geschiedschrijving en de wijste mannen, zowel heidens als christelijk –, en concludeer en verkondig ik: dat deze komeet om verschillende redenen door God aan ons getoond is, van welke ik er hier drie geef: ten eerste, opdat de mensen hun ogen ten hemel richten, en zich realiseren dat er vele dingen zijn, van welke zij noodgedwongen de oorzaak en aard niet kennen, en zich daarom aan de goddelijke macht onderwerpen. Ten tweede dat er een zeker aanwijzing van de goddelijke toorn is, dat, zolang als de mensen niet in ernst hun leven en zeden beteren, en de goddelijke majesteit niet verzoend wordt, er ook grote rampen zullen plaatsvinden. En tot slot ten derde, wanneer de komeet eindelijk uit ons zicht is verdwenen, en als het ware dood is, dat er voor de algehele mensheid en de individuen een bewijs[6] is van hun sterfelijkheid, en dat zij gewaarschuwd worden dat door God is besloten binnenkort het goede deel van het menselijk geslacht van zijn gemengde schepping uit deze wereld weg te voeren, wat voor het geslacht als geheel weliswaar zeker is, maar voor ieder afzonderlijk hoogst onzeker. En dat, aangezien er voor de sterke geen enkel voorrecht is vergeleken met de zwakke, noch voor de jongeman vergeleken met de oude man, en ten slotte ook niet voor de priester vergeleken met hen die hem om raad vragen, de hemelse heraut daarom waarschuwt dat ieder voor zich zich met God verzoent, zich op de overgang voorbereidt, zijn aardse bezigheden zo regelt, zoals hij wenst dat ze na zijn dood op de manier die door hem is bepaald en geregeld in acht worden genomen. En na deze waarschuwingen, als er tenminste gehoorzaamd wordt, zal al wie de dood ook maar geroofd zal hebben gelukzalig naar de andere wereld gaan, maar wie nog zal hebben geleefd, hij zal niet boos zijn, dat hij zo gelukzalig door de sterrenkundige om de tuin is geleid.

Einde.

[6] in margine: Kepplerus

Abbreviations

ABF	Archief bestuursinstellingen Friesland 1580-1795, Tresoar Leeuwarden
Auditorium	Postma and Van Sluis, *Auditorium*
ASF	*Album Studiosorum Franekerensis*
ASL	*Album Studiosorum Lugduno-Batavae*
AUF	Archief Universiteit te Franeker, Tresoar Leeuwarden.
Boeles	Boeles, *Frieslands Hogeschool*.
DVF	*De Vrije Fries, mengelingen*.
EVF	Encyclopedie fan Fryslân
GNN	Germanisches Nationalmuseum Nürnberg
HoS	*History of Science*
KB	Koninklijke Bibliotheek, The Hague
OC	Huygens, *Oeuvres complètes de Christiaan Huygens*
OdP	Observatoire de Paris
OFAM	Winsemius, *Oratio funebris*.
SHA	Stadhouderlijk archief, Tresoar Leeuwarden.

Consulted Archives and Libraries

N.B. Since many libraries list manuscripts in their catalogues and since I have consulted many prints to check for marginalia I have listed those libraries from which I have consulted either handwritten material or printed material and when I have either visited the listed institutions myself, or received original photos from sources from those institutions (I have not listed the libraries of which I found original material online). Only if relevant I refer to specific collections, otherwise I will have referred to those collections in the footnotes.

Aberdeen, University library
Alkmaar, Regionaal Archief
    Familiearchieven Van Foreest
    Familiearchieven De Dieu
Amsterdam, Universiteitsbibliotheek UvA
Amsterdam, Universiteitsbibliotheek VU
Arnhem, Gelders Archief
Basle, Universitätsbibliothek
Berlin, Staatsbibliothek
Boston, Public Library
Cambridge, University Library Cambridge

Macclesfield collection
Manuscripts
Copenhagen, Det Kongelige Bibliotek
Deventer, Stadsarchief en Athenaeumbibliotheek
Dresden, Sächsische Landesbibliothek - Staats- und
Universitätsbibliothek
Franeker, Gemeentearchief
Franeker, Museum Martena
Göttingen, Universitätsbibliothek
Groningen, Groninger Archieven
Familie Gockinga (3), 1591 – 1965
Senaat en de faculteiten van de Groningse universiteit, 1611 – 1930
Harvard, Houghton Library
Heborn, Evangelisch Theologisches-Seminar
Heidelberg, Universitätsbibliothek
Hoorn, Westfries Archief
Kiel, Universitätsbibliothek
Leeuwarden, Fries Museum
Leeuwarden, Fryske Akademy
Apparaat Breuker - Boekelisten
Leeuwarden, Historisch Centrum
Archief bestuurders van het Sint Jacobs- of Sint Jobsleen tot Oldehove te Leeuwarden
Burmania, o.a. te Leeuwarden
Martena, o.a. te Leeuwarden
Natuurkundig Genootschap te Leeuwarden
Old Burger Weeshuis (O.B.W.) en Gabbema Gasthuis I te Leeuwarden
Leeuwarden, Tresoar Frysk histoarysk en letterkundich sintrum
Archieven van de Staten van Friesland
Stadhouderlijk archief
Archieven van de universiteit te Franeker
Archieven van de Classis Franeker
Archieven van de Classis Leeuwarden
Archieven van de familie Van Eysinga-Vegelin van Claerbergen
Archieven van de familie Van Harinxma thoe Slooten
Archieven van de familie Van Sminia
Algemiene biblioteek katalogus fan Tresoar
Frysk Letterkundich Museum en Dokumintaasjesintrum
Gabbema Collectie
Verzameling handschriften
Leiden, Museum Boerhaave
Leiden, Universiteitsbibliotheek

Codices Hugeniorum
Archief Universiteitsbibliotheek
Archieven van de Curatoren
Archieven van de Senaat
Collection J.T. Bodel Nijenhuis
Thysius archives

London, British Library
Middelburg, Zeeuws Archief
München, Die Bayerische Staatsbibliothek
Nuremburg, Germanisches Nationalmuseum
Nijmegen, Universiteitsbibliotheek RU
Oxford, Bodleian Library
Paris, Bibliothèque nationale de France
Rhode Island, The John Carter Brown Library
Rotterdam, Stadsbibliotheek
San Fransisco, Gleeson Library
Stockholm, Kungliga biblioteket
The Hague, Koninklijk Huis Archief
The Hague, Koninklijke Bibliotheek
The Hague, Nationaal Archief
Tübingen, Universitätsbibliothek
Utrecht, Universiteitsbibliotheek
Wolfenbüttel, Herzog August Bibliothek
Vienna, Österreichische Nationalbibliothek

Internet

When I have made use of information found on the world wide web I have referred to the specific web pages in the relevant footnotes and included the date when I retrieved that information. There is one specific website which is not mentioned in the footnotes, but which has been of the utmost relevance for my research: books.google.com Not only did it make countless books at least partially searchable, it also gave access to prints that are not available in the Netherlands and (accidentally) sometimes to manuscript material in the presented copies of books.

Onneias Cerarius [= Ioannes Arcerius], Franeker Almanach *(1658). With a prospect on Franeker. Tresoar, Leeuwarden.*

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Zusammenfassung

PROFESSOREN IN DER Frühen Neuzeit (1500-1800) stellt man sich oft als altmodisch, konservativ und ein bisschen langweilig vor. In ihrer Zeit wurde ihnen erwartet sich auf die Lehre zu konzentrieren, was eine starke Einschränkung ihrer akademischen Bewegungsfreiheit mit sich brachte. Professoren der Mathematik - insbesondere Professoren an kleinen Institutionen, wie den Universitäten Groningen, Harderwijk, Utrecht und Franeker – stellten dabei keine Ausnahme dar.

Dieses Buch befasst sich mit den Professoren der Mathematik an der Universität Franeker im siebzehnten Jahrhundert. Keiner dieser Professoren entsprach in der Realität dem Klischee des langweiligen und rückständigen Professors. Vielmehr waren sie alle aktive Wissenschaftler, welche stets versuchten die Möglichkeiten, die ihnen ihr Lehrstuhl verlieh, bestmöglich auszunutzen. Diese Beobachtung steht nicht nur dem bestehenden Bild des frühneuzeitlichen Professors konträr gegenüber, sondern weicht auch deutlich von unserer heutigen Vorstellung zeitgenössischer Professoren ab. Gleiches gilt für die frühneuzeitliche Universität, früh-moderne Wissenschaft und die früh-moderne Mathematik. All diesen Kategorien haftet in der modernen Gesellschaft ein Bild an, das sich deutlich von jenem unterscheidet, das sie im 17. Jahrhundert inne hatten.

Ziel dieses Buches ist es diesen Kategorien und ihren historischen Ausprägungen, mit Hilfe einer kulturhistorischen Betrachtung des Faches Mathematik, näher zu kommen. Dabei nehmen die folgenden Fragen eine zentrale Stellung ein: Wie wurde Mathematik angewendet? Wie wurde sie praktiziert, gestaltet und bewertet? Und welche Bedeutung wurde ihr im siebzehnten Jahrhundert zugeschrieben?

Für die vorliegende Dissertation wurde eine möglichst breite Palette an Forschungsmethoden angewandt. Darüber hinaus wurde einer möglichst großen Anzahl Quellen und Spuren untersuchter Persönlichkeiten nachgegangen. Dieser breit-gefächerte Ansatz schloss somit auch Quellen und Untersuchungsgegenstände ein, die in der Geschichtsforschung in dieser Form oft keine Betrachtung finden.

So wurden für dieses Forschungsprojekt nicht nur die Ideen, die Professoren mit von ihnen entwickelten physischen Instrumenten verfolgten in Betracht gezogen, sondern auch die Geschichten der Objekte selbst. Was machte ein Instrument im siebzehnten Jahrhundert aus? Wo wurden solche Objekte aufbewahrt? Wer fertigte sie? Wo befinden sie sich heute? Manchmal liefen diese Recherchen ins Leere, in den meisten Fällen aber brachten sie eine Vielzahl neuer Informationen über die alltägliche Praxis des siebzehnten Jahrhunderts ans Licht und erlaubten darüber hinaus Schlossfolgerungen darüber, wie sich unser heutiges Bild dieser Praxis über die Jahre und Jahrhunderte hin entwickelt hat. Dabei waren z.B. Briefe nicht nur ihres Inhalts wegen wichtige Quellen, auch ihre heutigen Aufbewahrungsorte konnten wichtige Informationen liefern. Ein Buch verrät nicht nur etwas über seinen Autor, sondern auch einiges über seinen Herausgeber und Drucker, über seine Leser, die ihre individuellen Spuren in ihm hinterlassen haben und die Bibliotheken, die es schließlich in ihre Sammlung aufgenommen haben. Das Untersuchen dieser Quellen war nur deshalb möglich, weil sie alle ihre eigenen 'Spuren aus Papier' hinterlassen haben: Randnotizen, Veröffentlichungen und andere Formen schriftlicher Informationen darüber, wie Wissenschaftler an ihr Wissen gelangt sind. Spuren solcher Art hinterließen wiederum ihrerseits welch in geschichts-wissenschaftlichen Publikationen, Inventarlisten von Archiven und in persönlichen Korrespondenzen über historische Forschung. Für diese Dissertation wurden zahllose dieser Spuren ausgewertet.

Während Kategorien wie Bücher, Instrumente und Unterricht nur dann verstanden werden können wenn ihre Produktion, Anwendung und Bedeutung breitangelegt untersucht werden, so gilt dies im besonderen Maßstab auch für 'Mathematik' und 'Professor'. Glücklicherweise ist es eindeutig wer im 17. Jahrhundert die Professoren im Bereich Mathematik waren. Durch das Porträtieren und Analysieren dieser abgrenzbaren Gruppe und das weitere Einschränken des Forschungsgegenstandes auf den Fall Franeker kann ein besseres und tiefer gehenden Verständnis historischer Realität erreicht werden. Mit anderen Worten: die historische Mathematik und ihre Protagonisten bekommen erst dann ihr eigenes Gesicht, wenn sie aus der Sicht ihrer eigenen Zeit heraus verstanden werden. Genau diese Vorgehensweise ist gemeint, wenn in der Dissertation von 'Kulturgeschichte' gesprochen wird.

Als Folge dieser komplexen Herangehensweise ist es unmöglich in dieser Dissertation eine eindeutige Definition des Begriffs Mathematik zu geben. Vielmehr ist genau dieses Unterfangen eines der zentraler Gegenstand dieses Forschungsprojekts. Nichtsdestotrotz kann etwas darüber gesagt werden wie der Begriff in der untersuchten Zeit betrachtet wurde. Allem voran war diese Betrachtung zwiegespalten. Zum einen war Matematik ein Fach, das an Schulen und Universitäten angeboten wurde und dort als Teil der propädeutischenPhase, also als Basiswissen, galt. Zum anderen war die Astronomie - die zu einem grossen Teil aus der Aufstellung von Berechnungen bestand - ein wichtiger Bestandteil der Mathematik an Universitäten. Gleichzeitig war es auch ein Fach, das aussergewöhnlich viel ausserhalb des Klassenzimmers studiert wurde - so zum Beispiel im Handel, aber auch von Feldmessern, Almanachautoren und Militäringineuren.

An der Universität Franeker kamen diese unterschiedlichen Formen der Mathematik auf besondere Weise zusammen. Die Universität des 17. Jahrhunderts war ein Bollwerk der Gelehrtheit dessen Sprache das Latein war. In Franeker durften hingegen auch solche Menschen Mathematik studieren, die des Lateinischen nicht mächtig waren. Die akademische Gemeinschaft bedachte diese Studenten geringschätzig mit dem Begriff *idiotae* - Analphabeten. Gerade deshalb, so wird unterstellt, bietet Franeker ein facettenreiches Bild davon was genau Mathematik im 17. Jahrhundert war. Das Rückgrat dieser Dissertation setzt sich daher aus den individuellen Geschichten der einzelnen Franeker Mathematikprofessoren zusammen. Die Mathematik, die sie betrieben wird untersucht indem eine Übersicht über ihre Aktivitäten geschaffen wird.

Zwischen 1594 und 1707 waren fünf verschiedene Mathematikprofessoren mit der Universität Franeker verbunden: Johannes Roggius (1594-1596), Adriaan Metius (1598-1635), Bernhardus Fullenius Senior (1636-1656), Abraham de Grau (1659-1683) und Bernhardus Fullenius Junior (1684-1707). Darüber hinaus kommt Johannes Phocylides Holwarda (1639-1651) - zu Beginn außerordentlicher Professor der Logik, später Professor der Philosophie - eine wichtige Rolle in diesem Buch zu. Jeder dieser sechs Professoren hatte seine eigene Art mit der Mathematik umzugehen.

Sie alle stellten ihre Kalkulationen auf - sowohl auf Papier, als auch in der Hochschulpolitik. Sie verfassten neue Bücher und gaben alte neu heraus. Sie konstruierten Instrumente auf und aus (!) Papier, aus Eisen und aus Kupfer. Mit diesen Instrumenten stellten sie Messungen an. Die Instrumente hierfür, wie auch die Ergebnisse der Messungen, wurden danach oft an die jeweiligen Nachfolger weitergegeben. Die Professoren hatten Studenten an ihrer Seite, die ihre Arbeit im und außerhalb des Klassenzimmers unterstützten. Diese Studenten waren gleichzeitig Adressaten ihrer Bücher und Vorlesungen. Wie andere Leute auch stritten sie sich, heirateten und starben. Sie benutzten die Universität um ihre eigenen Ziele zu erreichen und waren darin geschult für die Bekanntheit ihrer Universität zu werben. Jeder Professor ging dies mit seinen eigenen Mitteln und entsprechend seiner eigenen Persönlichkeit an. Viele dieser persönlichen Eigenheiten und Mittel sind daher Objekte dieses Forschungsprojekts.

Während des gesamten 17. Jahrhunderts studierten sowohl *idiotae* als auch normale Studenten Mathematik. Für die normalen Studenten gehörte Mathematik zur Basisausbildung am Beginn ihrers Studiums, für die *idiotae* war es etwas 'außeruniversitäres'. Das bedeutete, dass zum einen jeder Student auf die eine oder andere Weise mit der Mathematik in Kontakt kam und zum anderen, dass viele verschiedene Menschen an die Universitäten gezogen wurden, die normalerweise einen weiten Bogen um sie gemacht hätten. Für die Franeker Professoren stellte diese Diversität eine gewisse Herausforderung dar - sie mussten so zu sagen jederzeit dazu im Stande sein auf zwei Hochzeiten gleichzeitig zu tanzen. Stets wussten sie diese Herausforderung anzunehmen und stets waren sie auf der Suche nach Möglichkeiten sie zu meistern.

Mit dem Tod Fullenius Juniors 1707 fand diese Zweigleisigkeit in den Aufgaben der Franeker Mathematikprofessoren allerdings ein Ende. Nach Fullenius' Ableben wurde Willem Loré zum Dozenten für angewandte Mathematik ernannt und etablierte somit ein neues Fachgebiet neben der bisherigen Mathematik - die *idiotae* waren fortan separater Teil der Universität. 36 Jahre später - 1743 - sollte Loré, selbst Akademiker ohne Ausbildung im Lateinischen (wovon es nur sehr wenige im früh-modernen Europa gab), zum außerordentlicher Professor berufen werden.

Wie ihre Professoren wussten auch die Franeker Mathematikstudenten ihr Leben zu leben und ihr Wissen zu vermarkten. Sie schrieben Bücher und unterrichteten, sie stritten sich, sie stellten Kalkulationen auf, sie führten Messungen aus, sie kauften Instrumente oder ließen sie anfertigen, sie beobachteten die Sterne und navigierten Schiffe. Damit schaffen und bereicherten sie die Welt der friesischen Mathematik des 17. Jahrhunderts. Diese Welt wuchs unter ihnen zu großer Stärke an, blieb aber zugleich friesisch in ihrer Natur und dies obwohl die Mathematik zu dieser Zeit ein europäisches Phänomen war. Die Franeker Mathematikprofessoren wussten auf besondere Weise als Bindeglieder zwischen diesen zwei Welten aufzutreten.

Between Academics and Idiots - gearfetting

FAN PROFESSORS YN ier-modern Europe (1500-1800) wurdt faak tocht, dat se wat âlderwetsk, konservatyf en in lyts bytsje ferfeelsum wiene. Dy professors soene foaral omtinken oan ûnderwiis jûn hawwe. Dat soe ek jilde foar heechleraren yn de wiskunde, benammen foar professors dy't oan lytse ynstellings wurken lykas de universiteiten fan Grins, Hurderwyk, Utert en Frjentsjer.

Yn dit boek wurde de heechleraren yn de wiskunde oan de universiteit fan Frjentsjer yn de santjinde ieu ûndersocht. Ut dit ûndersyk docht bliken dat gjinien fan dy professors stoffich en efterbleaun wie. It gong hieltiten om akademisi dy't ûndernimmend wiene en harren learstoel sa goed mooglik brûkten. Dat is net allinnich oars as it besteande byld fan de ier-moderne heechleraar, it is ek in byld dat sterk ferskilt fan dat fan ús hjoeddeiske professor. Datselde kontrast kin ek makke wurde mei de ier-moderne universiteit, ier-moderne wittenskip en ier-moderne wiskunde. Dat binne allegearre kategoryen dy't yn de moderne maatskippy in klank hawwe dy't sterk ferskilt fan de klank dy't se yn de santjinde ieu hiene. It doel fan dit boek is om by dy âlde histoaryske kategoryen te kommen troch de wei fan in kultuerskiednis fan de wiskunde. Dêrby stean de fragen sintraal hoe't de wiskunde brûkt, beoefene, foarmjûn en op wearde set is, en wat de status fan wiskunde yn de santjinde ieu wie.

Opset

Foar it ûndersyk is sa wiidweidich mooglik ûndersyk dien. Sa folle mooglik spoaren en boarnen dy't de histoaryske persoanen neilitten hawwe, binne bestudearre. Dêrby wiene ek saken wichtich dy't gewoanwei bûten beskôging fan de histoarikus bliuwe. Sa binne net allinnich de ideeën fan de heechleraren oer ynstruminten bestudearre, mar ek de skiednis fan de fysike objekten dy't se meitsje lieten.

Wat wie in ynstrumint yn de santjinde ieu? Wêr waarden ynstruminten bewarre? Wa makke se en wêr binne se no? Soms smieten sokke syktochten hast neat op, mar meastal kaam der alderhanne nije ynformaasje boppe wetter oer de deistige praktyk yn de santjinde ieu en hoe’t de skiednis dy praktyk letter kleure hat. Brieven wiene net allinnich belangryk fanwege harren ynhâld, mar ek it hjoeddeistige plak koe ynformaasje besoargje.

In boek fertelt net allinnich eat oer de skriuwer fan dat wurk, mar ek oer de útjouwer en printer dy't it makken, de lêzer dy't syn spoaren deryn efterliet en de bibleteek dy't it yn syn kolleksje opnaam. Dat koe allegearre bestudearre wurde, om’t ek de boarnen in 'papieren spoar' foarmje hawwe: in pear oantekeningen, publikaasjes en oare foarmen fan skreaune ynformaasje oer de wei hoe’t kennis oan de ûndersiker oerlevere is. Soksoarte fan spoaren lieten yn publikaasjes fan histoarisy wer nije sporen nei, ek yn ynventarissen fan argiven en bygelyks yn persoanlike korrespondinsje oer ûndersyk nei it ferline. Yn dit proefskrift wurde ferskate fan dit soarte fan papieren spoaren útpluze.

Sa as boeken, ynstruminten en ûnderwiis inkeld begrepen wurde kinne troch breed te sjen nei produksje, gebrûk en betsjutting, jildt dat yn sterke mate ek foar 'wiskunde' en 'heechleraar'. Lokkich is it wol dúdlik wa yn de santjinde ieu de heechleraren yn de wiskunde wiene. Troch dy groep yn Frjentsjer sekuer yn kaart te bringen en te bestudearjen, kin in better en riker begryp fan dy histoaryske wurklikheid krigen wurde. Mei oare wurden: de histoaryske wiskunde en wiskundige krije pas harren gerak wannear't se begrepen wurde út harren eigen tiid wei.

It is sadwaande ûnmooglijk om yn dit proefskrift in dúdlike definysje fan wiskunde te jaan, want dat is ien fan de belangrykste tema's fan it ûndersyk. Dochs kin der wol wat sein wurde oer hoe’t yn dy tiid sels tsjin it begryp wiskunde oansjoen waard. Yn it earste plak wie it gesicht dêrfan twaliddich. It wie in fak dat op skoallen en universiteiten jûn waard, dêr't it as ûnderdiel fan de propedeutyske fase sjoen waard, as basiskennis. Dêrnjonken wie de astronomy – dy foar in grut part út berekkeningen bestie - in belangryk ûnderdiel fan de wiskunde op de universiteit. Tagelyk wie de wiskunde ek in fak dat krekt bûten it ûnderwiis in protte beoefene waard, bygelyks yn ’e hannel, mar ek troch lânmjitters, almanakskriuwers en militêre yngenieurs. Krekt oan de universiteit fan Frjentsjer kamen dy ferskate foarmen fan wiskunde byinoar. De universiteit wie yn de santjinde ieu in bolwurk fan geleardens dêr’t it Latyn de fiertaal wie. Yn Frjentsjer mochten lykwols ek minsken wiskunde studearje dy’t dy taal net yn ’e macht hiene. Troch de akademyske mienskip waarden se lytsachtsjend *idiotae* neamd – analfabeten. Krekt dêrom, sa is de ferûnderstelling, smyt Frjentsjer in ryk en kleure byld op fan wat de wiskunde yn de santjinde ieu krekt wie. De basis fan it ferhaal wurdt foarme troch de yndividuele Frjentsjerter heechleraren yn de wiskunde. De wiskunde dy't se beoefenen is yn kaart brocht oan de hân fan harren aktiviteiten.

Roggius: it begjin

De alderearste heechleraar yn de wiskunde yn Frjentsjer wie Johannes Roggius (1594-1596). Foar him wie syn stoel yn de wiskunde in middel yn politike en teologyske yntriges. De posysje koe brûkt wurde yn de turbulinte tiid dêr’t de Frjentsjerter universiteit him yn befûn. In tiid dêr't it belangryk yn wie dat de posysjes ynnommen waarden troch minsken mei de goeie geloofsoertsjûging. Yn it gefal fan Roggius betsjutte dit, dat immen fan in hiel ortodokse protestantske sinjatuer de ferantwurdilikens oer it oplieden fan de jongerein krige. Krekt de ferantwurdelikheid fan in heechleraar yn de wiskunde. Guon parten fan de wiskunde waarden as ûnderdiel fan it ûnderwiis yn it Hebrieusk jûn. Foarôfgeand oan de eigentlike stúdzje fan dy taal learden studinten it rekkenjen. It Hebrieusk wie op syn beurt wer wichtich foar de stúdzje fan de Bibel. Foar Roggius persoanlik wie it nei alle gedachten belangryk dat er heechleraar waard. Dêrneist hie er de ambysje heechleraar Hebrieusk te wurden. De stoel yn de wiskunde waard op dat stuit dus brûkt as in beskikbere en wichtige pion yn de universiteitspolityk. Lang om let mislearre er spektakulêr as heechleraar; oer syn wurk as wiskundige witte we likernôch neat.

Metius: de fûneminten

De twadde professor yn de wiskunde te Frjentsjer wie Adraan Metius (1598-1635). Hy wist de stoel op in oare wize te brûken en dêrmei definiearre er syn fakgebiet op in abslút oare manier. Foar Metius wie de universiteit in plak dêr't er wurkje koe oan de withoefolle edysjes fan syn lesboeken oer de astronomy, aritmetica (rekkenkunde) en geometry (mjitkunde). Metius wie ek in 'normale' heechleraar, sawol formeel as ynformeel. Formeel om’t er nei in oantal jierren de stap makke fan bûtengewoan nei ‘gewoan’. Ynformeel om’t er troch syn kollega's as folweardich beskôge waard en troch bûtensteanders úteinlik as ien fan de alderbelangrykste Frjentsjerter heechleraren.

Metius sette syn studinten oan it wurk mei syn boeken. Se fertaalden dy foar him út it Latyn yn de dominante lânstaal (it Nederlânsk) en dy boeken waarden dêrnei wer yn it Latyn oerset. Dêrneist probearre er syn wurk op de studinten en holpen sy him om materiaal te sammeljen foar de ferskate edysjes dy’t Metius útjoech. Dy boeken waarden faak printe op de parsen fan de universiteitsprinters en dêrnei binne se troch hiel Europe lêzen en brûkt. By dit alles brûkte Metius de universiteit foar syn eigen belangen (hy wist sels famylje yn de mienskip fan de universiteit te beheljen). Dêrmei behertige hy lykwols tagelyk de belangen fan de universiteit bûten har eigen muorre. Hij brûkte syn plak dus as in folweardich akademikus.

Metius socht noait nei de rânen fan besteande kennis en liet him nea echt út oer hiel moderne ideeën. Syn wurk wie tige betrouber, it wie goed te begripen en joech op ferskate manieren ynliedingen op alderlei foarmen dy't de wiskunde oannimme koe. Dêrneist wie it by de tiid (up-to-date) en wie syn styl fan presintearjen fernijend. Dat makke him ta ien fan de meast publisearre wiskundigen fan syn tiid: fan gjin inkele oare professor yn de wiskunde yn de earste helte fan de santjinde ieu ferskynden safolle edysjes as fan Metius. Hy brûkte syn studinten net allinnich foar syn boeken, hy liet se ek wurkje mei syn ynstruminten. Sa ûntwurp hy in ferneamde sekstant, in ynstrumint dat hy foar it earst presintearre yn in boek, mar dat er ek as in fysyk objekt fan izer en koper meitsje liet. Dat fysike objekt waard brûkt troch studinten en bleau yn it besit fan de universiteit, ek nei de dea fan Metius. Neist dizze sekstant brûkte Metius oare ynstruminten lykas papieren astrolabia, dy’t er ferkocht as goedkeape farianten op metalen ynstruminten. Metius makke fansels ek gebrûk fan de teleskoop. De útfining dêrfan waard troch de broer fan Metius claimd; sels brûkte er it nije ynstrumint om de himel mei te bestudearjen, yn gearwurking mei oare gelearden út Fryslân. Sy skreaunen oer dit wûnderlike ynstrumint en oer de resultaten fan harren observaasjes, dêr’t se de claim fan Metius syn broer mei fersterken. It wie foar Metius in manier om in grutte ynternasjonale reputaasje op te bouwen foar sawol himsels as syn famylje - dat wie de belangrykste manier dêr’t er de wiskunde foar brûkte.

Fullenius senior en Holwarda: in weardige opfolger en in fernijende bûtensteander

De tredde heechleraar yn de wiskunde wie Bernhardus Fullenius senior (1636-1656). Krekt as Roggius hie hy in eftergrûn as Herbaïcus. Yn tsjinstelling ta dy foargonger wie foar Fullenius de stoel yn de wiskunde it ferfolch op in karriêre yn de talen - wierskynlik wie it sels in stapke omheech. Fullenius wie de earste professor by wa in protte studinten in promoasje yn de wiskunde diene. Mei dy promoasje krigen se net it rjocht op in akademyske titel, mar wiene se klear om lânmjitter, wynroeier of pegelaar te wurden. Wynroeiers en pegelaars berekkenen de ynhâld fan wyn- en bierfetten, sadat it gesach de eksakte belesting heffe koe. Fullenius wie in wurdearre dosint, dy't der foar soarge dat de wiskunde in plak hold yn Frjentsjer. Dêrneist korrespondearre er mei ferskate astronomen troch hiel Europe hinne. Hoewol’t er oars as Metius wie, die bliken dat er in weardige opfolger wie.

Yn de tiid fan mear as in desennium hie Fullenius in kollega akademikus dy't him ek as wiskundige profilearre: Johannes Phocylides Holwarda. Dat wie in ambisjeuze ûndersiker mei mear as ien doel. Tegearre mei Fullenius soarge Holwarda derfoar dat net allinnich de opfolging fan Metius regele wie, de twa akademisi namen ek it erfskip fan harren foargonger foar harren rekken. Fullenius publisearre ferskillende fan Metius syn boeken. Holwarda bemachtige syn ynstruminten foar de universiteit en publisearre út Metius syn persoanlike oantekeningen. De ferdieling like derop dat Fullenius him op de ‘ierdske’ wiskunde rjochte (lykas lânmjitkunde en basis-astronomy), wylst Holwarda mear each hie foar de ‘himelske’en filosofyske wiskunde (lykas kosmology). Sa joegen beide oan dat se net allinnich op de winkel passe woene.

Holwarda (bûtengewoan) heechleraar logika en filosofy, die astronomyske observaasjes, skreau filosofyske learboeken, publisearre almanakken, in Nederlânsk hânboek oer de astronomy, in oersetting fan in ferneamde skiednis fan de wrâld en fansels syn ferneamde *Dissertatio Astronomica* dêr't er ûnder mear de ûntdekking fan in stjer yn oankundige. Mei al dy ferskillende aktiviteiten holp er by de transformaasje en it op'e nij definiearjen fan de wiskunde te Frjentsjer. Syn belangrykste bydrage dêroan wiene syn besykjen om wiskunde mei natoerfilosofy te kombinearjen. Hy seach wiskunde net inkeld as in tariedend fak foar in stúdzje filosofy, mar hy woe dat de wiskundige kennis brûkt waard om ta nije filosofyske ideeën te kommen. Dat wie in beweging dy't ek oare filosofen yn Europe foarstiene, sa as bygelyks Descartes. Yn Frjentsjer wie it in belangrike ûntjouwing om't it de wiskunde syn ûnskuld ûntnaam. Filosofen giene nije ideeën ferdigenjen op grûn fan wiskundige arguminten.

De Grau: filosoof en wiskundige

Fullenius senior waard opfolge troch Abraham de Grau (1656-1683) en dat wie daliks de belangrykste foarfjochter yn Frjentsjer om in permaninte brêge tusken wiskunde en filosofy te slaan. Foar De Grau wie de wiskunde sawol in middel as in wei, om úteinlik by de filosofy út te kommen. In middel om't er de wiskunde wichtich fûn foar de filosofy, in wei om't er syn learstoel seach as opstap nei in learstoel yn'e filosofy. Dat stribjen docht fansels tinken oan Roggius, mar de kontroverzes om De Grau hinne wiene hiel wat minder bedriigjend foar de universiteit yn syn gehiel as dat se ea wêst hiene. Dochs wie De Grau net in droege 'ier-moderne' heechleraar mei allinnich omtinken oan lesjaan. De Grau wist syn lessen te modernisearjen, hie in dúdlike oantrekkingskrêft op de Fryske lânadel en ûnder him waard it mooglik te promovearjen yn fortifikaasje (neist de wynroeiers en lânmjitters). Fieders wie er in bekende kometenjeier, dêr't er ek mei ferskillende ferneamde Europeeske gelearden oer korrespondearre. As wiskundige en filosoof besocht er de nelittenskip fan sawol Fullenius senior as Holwarda wer byinoar te bringen.

Fullenius junior: patrisiër en akademikus

De lêste heechleraar yn de wiskunde te Frjentsjer yn de santjinde ieu wie wer in Bernhardus Fullenius (1684-1707) – de âldste soan fan de eardere heechleraar. Foar him wie de wiskunde in persoanlike kar. Hy ruile in foaroansteande posysje as boargemaster fan Frjentsjer yn foar it akademysk kateder. Dat wie in útsprutsen opmerklike stap, seker om't de Frjentsjerter polityk Fullenius mei tsjinsin gean liet. De stap kin inkeld mar foar in part ferklearre wurde út it feit dat Fullenius in bejeftige wiskundige wie, dy op it stuit fan syn kar al aardich ynternasjonaal oansjen yn syn fakgebiet hie. Belangryk wie yn alle gefallen dat syn jongere broer klear stie om syn sosjale posysje oer te nimmen.

Fullenius wie de meast produktive heechleraar yn de wiskunde te Frjentsjer at dizze produksje metten wurdt yn promovearre wiskundigen. Dat hy in belangryk lid wie fan de ynternasjonale mienskip fan wiskundigen waard dúdlik doe't er de postume útjefte fan de wurken fan Christiaan Huygens fersoargje mocht. Tegearre mei de Leidske heechleraar Burchard de Volder soe hy dit kerwei ta in goed ein bringe. It redigearjen fan postuum wurk wie in foarname taak foar ditsoarte fan akademisi. Dêrneist wie Fullenius in persoanlike mentor fan Johan Willem Friso, de erfgenamt fan de famyljes Nassau en Oranje.

Pikant is dat Fullenius goed befreone wie mei Balthasar Bekker (dy't troud wie mei Fullenius syn suster), faaks wol de meast ferneamde dominy fan it lêste part fan de santjinde ieu. Bekker hie syn namme foaral te tankjen oan syn fermogen om op in radikale manier de Bibel te ynterpretearjen. De sweagers – dy't in simmerhûs yn Jelsum dielden – hiene nei alle gedachten ek in dield programma dêr't de wiskunde in hieltiten belangriker plak by ynnaam. It waard in model om net allinnich filosofyske mar ek teologyske fraachstikken mei op te lossen. Sa giene se noch in stapke fierder as Holwarda dien hie. Dêrmei hie Fullenius junior in manier fûn om de wiskunde yn te setten op in manier dy't Roggius al foar eagen stien hie. It wie in fak wurden dat belutsen wurde koe by drege fragen fan de tiid, by grutte teologyske problemen. Fullenius brocht it der lykwols folle better ôf om't er ticht by de wiskunde wist te bliuwen. Dat koe foar in part om't er it definityf om te foarmen wist. Yn de tiid fan Roggius wie it lykwols noch in fak foar jonge nije studinten. Fullenius joech dêrfoaroer kolleezjes oan studinten dy't al in graad behelle hienen. Hy ûnderwiisde it fak foar in part oan de oare kant fan it universitêre curriculum en dêrmei wie de wearde fan de wiskunde folslein feroare.

Idiotae

Yn de hiele santjinde ieu studearren sawol idiotae as gewoane studinten wiskunde. Foar de gewoane studinten wie wiskunde in fak dat oan it begjin fan in universitêre oplieding siet, foar de idiotae wie it eat 'bûten-universitêrs'. Dat betsjutte dat oan de iene kant eltse studint wat fan de wiskunde meikrige, wylst der tagelyk ferskate minsken troch oanlutsen waarden dy't gewoanwei hielendal net op de universiteit thúshearden. Foar de Frjentsjerter heechleraren smiet it druk op om twa draken fleane te litten, om oan twa ferskillende soarten fan 'studinten' les te jaan. Hieltiten slagge it har en sochten se nei nije mooglikheden. Mei de dea fan Fullenius junior yn 1707 kaam dêr in ein oan. Op dat stuit waarden de Frjentsjerter *idiotae* in apart ûnderdiel fan de universiteit, doe't Willem Loré beneamd waard as lektor yn de praktyske wiskunde neist in gewoane heechleraar yn dat fak. Loré, sels in akademikus sûnder oplieding yn it Latyn (dêr binne der mar in bytsje fan te finen yn it iermoderne Europe) soe yn 1743 sels in posysje as bûtengewoan heechleraar krije. Tagelyk wisten de measte studinten dy't wiskunde leard hiene yn Frjentsjer dat op ferskate manieren ta jild te meitsjen. Se skreaunen boeken en joegen les, se makken berekkeningen, se dienen opmjittingen, se kochten ynstruminten of lieten dy meitsje, se observeaerren de himel en navigearren oer de see. Dêrmei makken se de wrâld fan de santjinde-ieuske wiskunde hiel grut, mar it bleau tagelyk ek in wrâld dy't typysk Frysk wie. De wiskunde wie krekt in Europeesk fenomeen. Yn Frjentsjer wisten de wiskundige heechleraren de twa 'wrâlden' goed meiinoar te ferbinen.


De Pedellen.
De Heeren Professores van d'Academie tot FRANEKER.
De Heeren Gecommitteerde Professores van d'Academie tot GROENINGEN.
De Pedel.
De Predicanten der Stadt Leeuwarden.