ARJEN DIJKSTRA

BUILDER OF HEAVENS

How Eise Eisinga Created the Greatest Planetarium of His Time

Translated by Liz Waters

NOORDBOEK

Zijn is de ziel, is luisteren, is wijken,
is kind worden en naar de sterren kijken,
en daarheen langzaam worden opgelicht.

Being is the soul, is listening, is yielding,
is to become a child and, at the stars peering,
to be slowly lifted, light enough to meet them.

— ED HOORNIK

WHAT OTHERS SAY ABOUT *BUILDER OF HEAVENS*

'Rigorous, thoughtful and gently myth-busting, *Builder of Heavens* recounts the life and turbulent times of Eise Eisinga, creator of history's most awe-inspiring clockwork planetarium.'
– David Mitchell, author of *Cloud Atlas*, *Bone Clocks*, *Utopia Avenue* and more

'In the late 18th century, one man decided to take the cosmos into his own hands: to craft an elaborate working model of the Solar System and mount it in the ceiling of his home. This clockwork universe – the world's first large-scale planetarium – still operates today and remains a Netherlands tourist attraction. Its history is beautifully, colorfully, even lovingly explored by Arjen Dijkstra in *Builder of Heavens*.'
– Dava Sobel, author of books including *Longitude*, *The Planets* and *The Glass Universe*

'Read this book!'
– Ben Feringa, winner of the 2016 Nobel Prize in Chemistry

'A remarkable page-turner about an extraordinary man in an extraordinary time, who brought the stars a little bit closer by.' ****
– Govert Schilling, *De Volkskrant*

'Exceptionally accurate and insightful.' ****
– Bram van Duinen, *NRC Handelsblad*

'Delightfully written and magnificently illustrated.'
– Bart Funnekotter, OVT Radio 1

‘A masterful biography … the narrative is strong enough for the book to be reworked into a script for a historical adventure film.’
– Henk Bril, *Zenit Magazine*

‘A clear, enjoyable and beautifully illustrated biography.’
– *Historisch Nieuwsblad*

‘It is best described as a scholarly novel.’
– Marijn van Nijhuis, *NVOX*

‘This book is more than a biography. The image Dijkstra paints of the Enlightenment is a particular enrichment…’
– Wiebe Hoekstra, *Historisch Tijdschrift Fryslân*

‘Beautiful and lucid … a gripping story about genius and madness.’
– Martine van Poeteren, Biografieportaal

‘Exceptionally accessible.’
– Walter Smits, *Kunsttijdschrift Vlaanderen*

‘Highly recommended.’
– Michiel Dutrieue, *Stretto. Magazine voor kunst, geschiedenis, filosofie, literatuur en muziek*

‘Wonderful biography.’
– Marianne Visser, Cultuurblogger

‘A well-written depiction of the life of this versatile Frisian.’
– Rick Lindeman, *Managementboek Magazine*

‘Stripped of all myths, Dijkstra paints a more human picture of a socially engaged and politically active citizen of the small university town of Franeker.’
– Peter de Brock, *Het Parool*

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INTRODUCTION

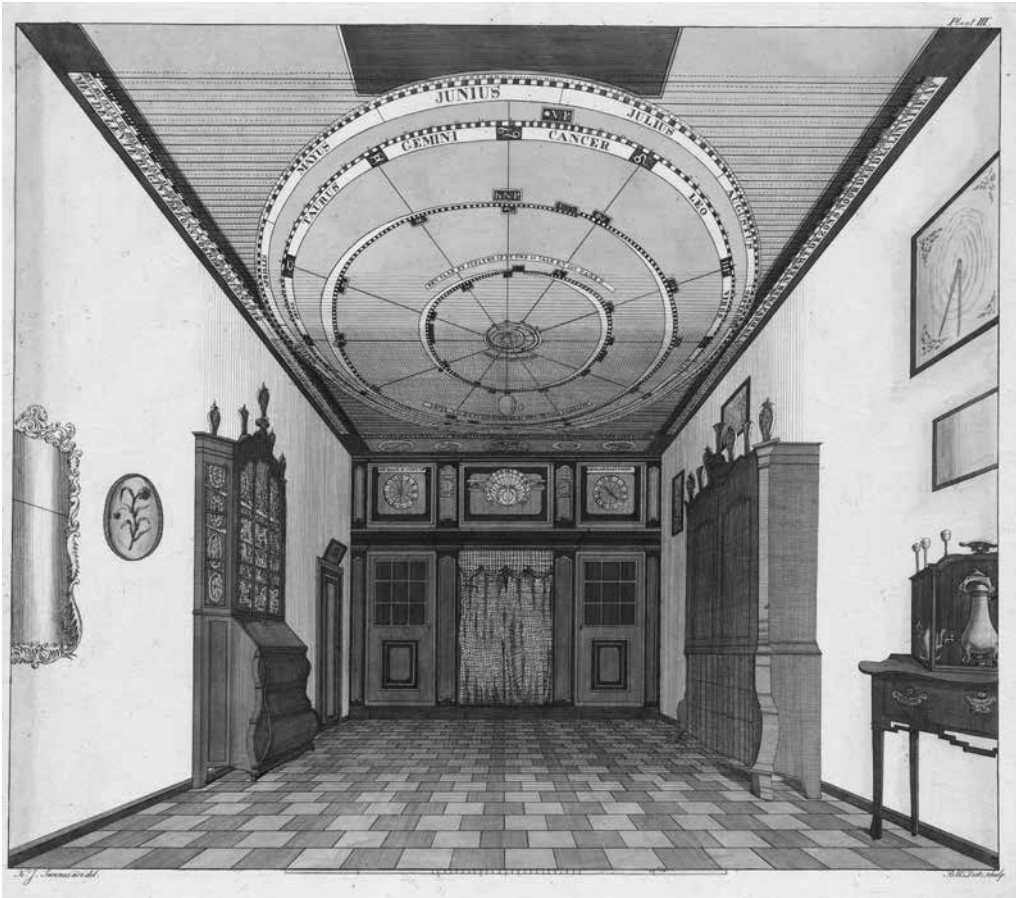
We all reach for the stars. We have an instinctive desire to get closer and sometimes even stretch out our hands as if we could touch them. But of course stars can never be touched.

Some people are not content to leave it at that. Eise Eisinga (1744-1828) reached for the stars and succeeded in bringing them a little closer. He lived in Franeker, in the north of the Republic of the United Netherlands, forerunner of the present-day Netherlands. There he constructed a clockwork device that showed how the planets move. On completion it was the most beautiful and accurate working model of the solar system ever built.

The Planetarium is a miraculous machine. In the living room of an elegant but far from spacious canalside house in what was once a university town, it is possible to gain an astonishing insight into the paths of the heavenly bodies. In the middle of the room hangs the sun, a big golden ball, around which our Earth, a second, smaller ball, slowly circles. The Earth takes exactly a year to complete its journey around the room in which it is suspended – the model operates in real time. Both balls hang from the ceiling, accompanied by the other planets: Mercury, closest to the sun, Venus, then the Earth with its moon, followed by Mars, Jupiter and Saturn.

Uranus is missing, since it was not discovered until 1781, the year in which Eisinga completed his Planetarium. As well as being found too late, it was too far away to have been added. Eisinga used a scale of 1:1,000,000,000,000, meaning that one millimetre in the model represents 1 million kilometres in reality. Had he wanted to add the latest discovery, he would have needed to start again and somehow build a mechanism half the size.

The Planetarium is sky blue in colour and adorned with golden lettering. The room presents all kinds of additional information about the night sky over Franeker, about the positions of the planets and especially the course of the moon. The entire system is driven by a single, straightforward pendulum clock, so for all its complexity this



Engraving showing a view of the room containing the Planetarium in 1824, made by Klaas Sannes in collaboration with Eisinga.

is essentially a simple machine. It started life as the most beautiful, the most accurate and also the largest planetarium, or orrery, in the world. It remains one of the most inspiring structures created in the Netherlands in the early modern period (1500-1800).

His clockwork model made Eisinga world famous, but his fame got him into deep trouble. After the world became familiar with his Planetarium, his opinions were taken extremely seriously. At the mercy of the great events of his day, he became involved in a major political revolt, was forced to flee, and suffered imprisonment and

banishment. But after years of adversity he was finally able to return to Franeker and to his Planetarium, where he stayed for the rest of his life. He found work suitable to his status as a prominent citizen and maintained his reputation as an accomplished astronomer. He used his orrery to teach people about planet Earth and the moon, the sun and the stars.

During Eisinga's lifetime, kings and princes came to Franeker to look at his Planetarium, as did others with great wealth, power or influence, including renowned scholars and famous writers. But visitors also included children, ordinary citizens (both men and women), craftsmen and tourists. They stared in awe at his heavenly timepiece. His brilliance and ingenuity won him admiration, although for a long time he was misunderstood – he may even have preferred it that way.

The myths

A simple man who was at the same time an eccentric genius – that is the image of Eisinga that has come down to us in books and articles. From a study of the sources, however, a different picture emerges, that of a well-educated citizen who lived between contrasting worlds. He was affluent and undeniably bursting with talent, and the circumstances in which he lived gave him opportunities unavailable to others, since he owned a successful business and his family supported him in good times and bad. If called upon, he was capable of turning almost any situation to his advantage. But although it was often said of him, he was no wunderkind.

Eisinga was known as a quiet and unassuming person. Jacob van Lennep, later to become one of the great Dutch writers of the nineteenth century, offers us a glimpse of the man's character in his description of a tour of the Planetarium given to him when he was young by Eisinga himself.

> Its creator showed me everything as if it were a fairground attraction, without appearing to know anything about it. We could not decide what to admire more, the magnificence of the undertaking, the outstanding accuracy of its execution or the inexplicable simplicity of its maker.[1]

There is no reason to think that Van Lennep had a completely different impression of Eisinga from that of his contemporaries. We do need to ask, however, whether this description represents an accurate evaluation of the Planetarium's builder. Eisinga may have seemed simple, but that was far from the truth. To understand him we have to look beyond superficial impressions.

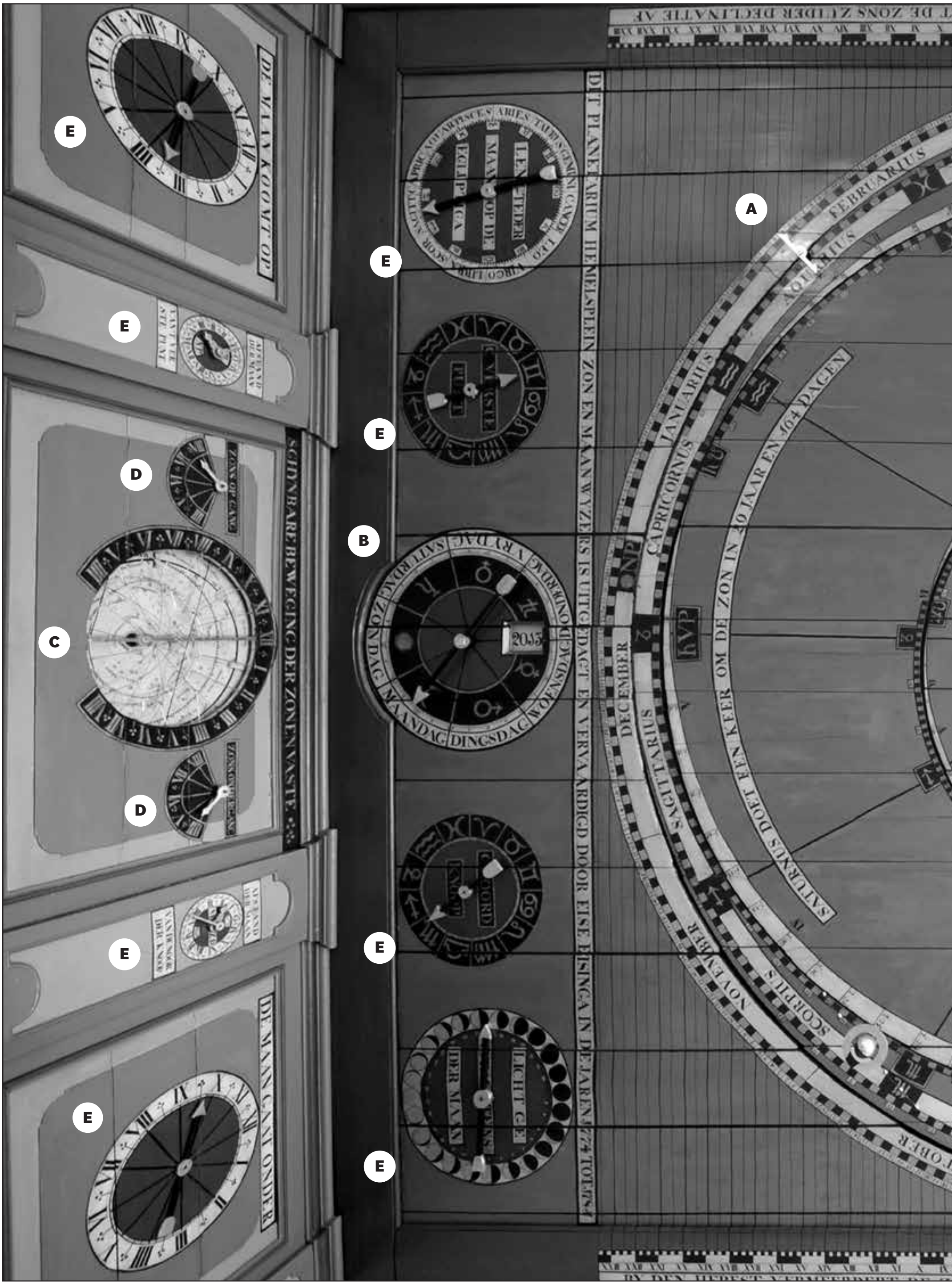
Three of the most persistent myths about Eisinga are that he had little schooling, built the Planetarium entirely on his own and was nothing more than a humble craftsman.

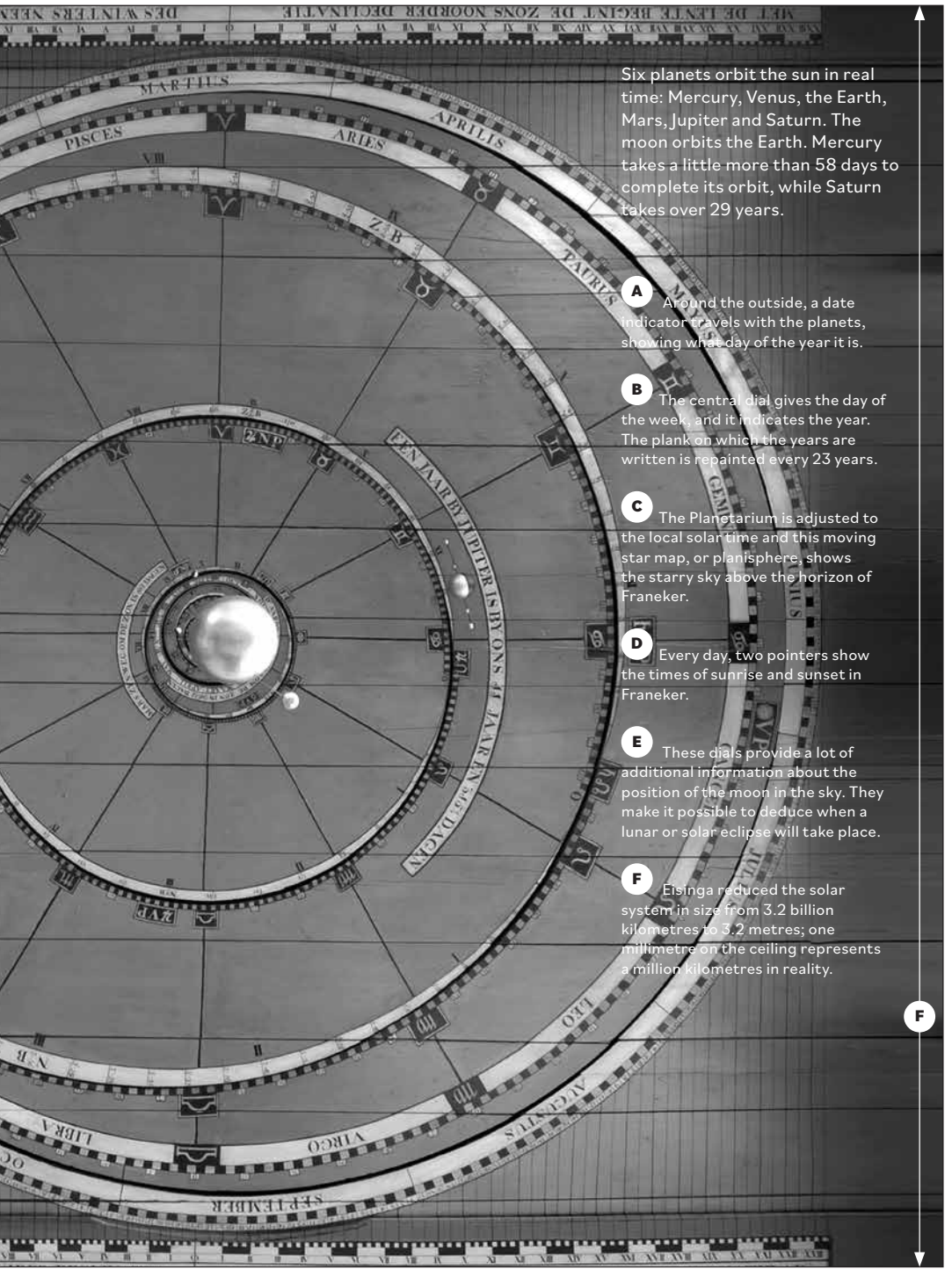
This book will correct the romanticised image of Eisinga on these points, all three of which have found their way into travel guides, blogs and YouTube videos. Based on dozens of previously unknown letters and other sources, we gain a quite different impression of the life of Eise Eisinga, his education, his financial position, his business and his political activities. They present surprising new insights into the life of this 'builder of heavens' and the creation of his Planetarium.

I will also show how, on the western edge of Europe, science penetrated society. Eisinga benefited from a scholarly environment. Although he did not attend university himself, he came into contact with university staff and students, and as a result, his Planetarium became part of an increasingly interconnected world. His story gives us an insight into the history of each one of us, whether we grew up in the same region as Eisinga or on a different continent. It shows how through tenacity and persistence, and indeed curiosity of mind and ingenuity, we can all enrich our lives a little.

Over the course of history, Eisinga's Planetarium has inspired famous planetariums large and small all over the world. The Adler Planetarium in Chicago, the Hayden Planetarium in New York, the Carl Zeiss Planetarium in Jena and Stuttgart, the Nagoya Planetarium in Japan – references to Eisinga's Planetarium are to be found everywhere. And every time Eisinga's story is told, the prevailing image of him is further refined. It pays to look beyond the myths to discover who Eisinga really was. What does the story of this builder of heavens tell us about the history of Europe and the ways people thought about astronomy?

The Planetarium built by Eise Eisinga between 1774 and 1781.





Six planets orbit the sun in real time: Mercury, Venus, the Earth, Mars, Jupiter and Saturn. The moon orbits the Earth. Mercury takes a little more than 58 days to complete its orbit, while Saturn takes over 29 years.

A Around the outside, a date indicator travels with the planets, showing what day of the year it is.

B The central dial gives the day of the week, and it indicates the year. The plank on which the years are written is repainted every 23 years.

C The Planetarium is adjusted to the local solar time and this moving star map, or planisphere, shows the starry sky above the horizon of Franeker.

D Every day, two pointers show the times of sunrise and sunset in Franeker.

E These dials provide a lot of additional information about the position of the moon in the sky. They make it possible to deduce when a lunar or solar eclipse will take place.

F Eisinga reduced the solar system in size from 3.2 billion kilometres to 3.2 metres; one millimetre on the ceiling represents a million kilometres in reality.

View of Dronryp 1745. Eisinga was born and raised in this small village in the mid-eighteenth century.

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Friesland and Franeker, farmers and science

Eisinga's Planetarium is in Franeker, in the north of the Netherlands and the west of Friesland, or as the province is known in the local language, Fryslân. To the Dutch, the province is famous for its many lakes, where sailing is popular in summer, and its people for sober-mindedness and a certain obstinacy. Most of all, Friesland is famous for the Elfstedentocht, a skating race that can be held only in the coldest of winters and that presents several good starting points for getting to know Eisinga's world.

In antiquity, long before the Netherlands existed, what is now Friesland was a region of clay soils bounded on all sides, with the exception of the south-east, by water. Seas with names like the Waddenzee, the Zuiderzee, the Lauwerszee and the Middelzee almost encircled it, and seawater found its way inland during storm surges. People lived here long before the creation of the region's first written records. To protect themselves against the sea, they built mounds known as *terpen*. Whenever the sea washed across the land, they took refuge on their *terpen*, and when the surrounding land dried out again, they farmed it. Those same man-made hillocks are still at the centre of most Frisian settlements.

Friesland was prosperous in the late Middle Ages, its farmers, merchants and craftspeople all earning good money. They were able to pay for the building of countless churches and fortified dwellings. As they grew steadily richer, they had more and more money to spare, so they began to prosecute wars, either against each other or together against outsiders, fighting over the legitimate ownership of their wealth. Dikes were built, and as a result the province, which was gradually assuming its present-day shape, did better than ever, so well in fact that a number of its villages became municipalities. Eventually this relatively small area had eleven towns. Its population density was remarkable for its day, as was its degree of urbanisation. Without such mediaeval prosperity, there would have been no eleven towns and thus no Elfstedentocht. The famous skating race relies, of course, on the region's many waterways, such as the Tjonger, the Linde and the Luts, economic arteries that ensured ease of transport for both people and goods.

Over the course of the sixteenth century, the province of Friesland became predominantly Protestant and the position of the old Catholic Church was increasingly challenged. Ultimately, along with the other Dutch provinces, Friesland cast off the power of the Catholic king of Spain, and with the Reformation came a new power structure. The provinces that had rebelled against Spain in the Dutch Revolt joined up to form the Republic of United Netherlands. It was governed by the States General, but at the very top, much of the time at least, was a stadholder, a member of the Nassau family, who accrued a great deal of power. The provinces were to a large extent autonomous, and within them local governments had a considerable say. Power was therefore fragmented, and this was sometimes the cause of unrest as people competed to acquire more of it.

The University of Franeker

One direct consequence of the struggle by regions of the Low Countries against the Catholic Church and the Spanish crown was the founding of the University of Franeker, not far from Eisinga's native village. The presence of this seat of learning enabled a regional culture to develop in which astronomy and mathematics were held in