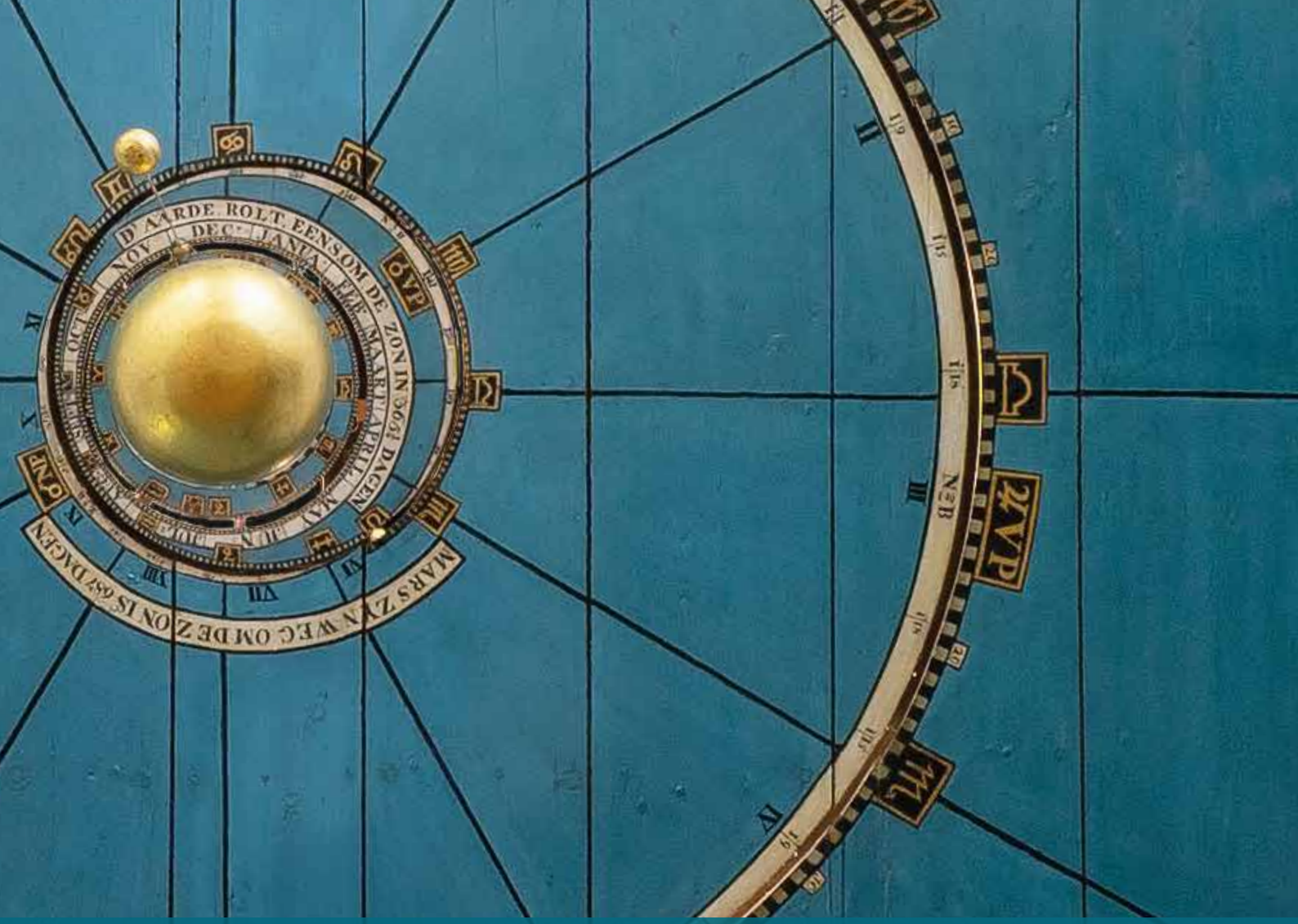
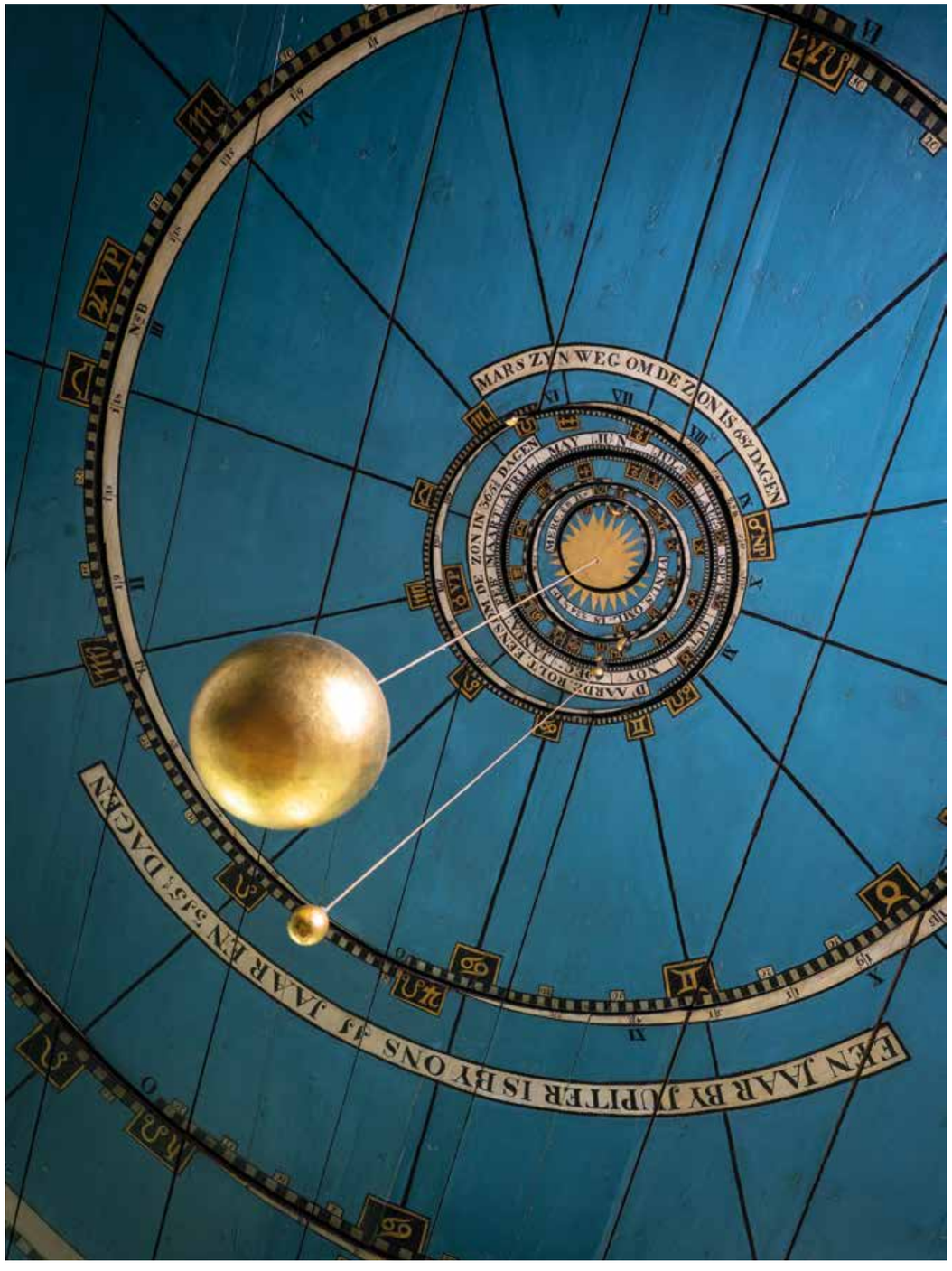


Moving heaven and earth

THE ROYAL EISE EISINGA PLANETARIUM

WORLD HERITAGE NOMINATION DOCUMENT



Kingdom of the Netherlands

The Royal Eise Eisinga Planetarium Franeker

NOMINATION BY THE KINGDOM OF THE NETHERLANDS
FOR INSCRIPTION ON THE
UNESCO WORLD HERITAGE LIST

World Heritage Nomination Document

December 2021

Kingdom of the Netherlands

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Published by Koninklijk Eise Eisinga PLANETARIUM

World Heritage List Nomination Form

CONVENTION CONCERNING THE
PROTECTION OF THE WORLD
CULTURAL AND NATURAL HERITAGE

Under the terms of the Convention concerning the Protection of the World Cultural and Natural Heritage, adopted by the General Conference of UNESCO in 1972, the Intergovernmental Committee for the Protection of the World Cultural and Natural Heritage, called 'the World Heritage Committee', shall establish, under the title of 'World Heritage List', a list of properties forming part of the cultural and natural heritage which it considers as having Outstanding Universal Value in terms of such criteria as it shall have established.

The purpose of this form is to enable States Parties to submit to the World Heritage Committee nominations of properties situated in their territory and suitable for inclusion in the World Heritage List.

This Nomination Document has been prepared in accordance with the 'Format for the nomination of cultural and natural properties for inscription on the World Heritage List' issued by UNESCO.

The form has been completed in English and is sent in duplicate to:
The Secretariat, World Heritage Centre UNESCO
7 Place de Fontenoy, 75352 Paris 07 SP, France

Disclaimer

We have endeavoured to collect the visual material in this document with the utmost care and to indicate the sources. However, if you nevertheless consider certain images to have been used unlawfully, please get in touch with the contact address provided in Chapter 8a. The Acknowledgements at the back include a list of photographers and museums, archives and private parties that have provided visual material.

Foreword

BY HER EXCELLENCY
INGRID K. VAN
ENGELSHOVEN
MINISTER OF EDUCATION, CULTURE AND SCIENCE

Step inside the Royal Eise Eisinga Planetarium in Franeker and the purpose of this remarkable building instantly becomes crystal clear. Look up and marvel at a magnificent scale model of our solar system, produced with pinpoint accuracy. This 18th-century depiction of the sun, moon and planets fills the entire ceiling of the room.

The planetarium was conceived, designed and realized by wool manufacturer Eise Eisinga. A man of science, he was inspired by the commotion caused in 1774 by the conjunction of four planets and the moon, and the wild theories that circulated about this event. Eisinga wanted to produce a fact-based instrument to give members of the public a realistic vision of the solar system and its workings.

Constructed in the 18th century to enlighten people about astronomy, Eise Eisinga's planetarium continues to fulfil that same purpose today. In its modern-day incarnation, it also tells the story of the scientific knowledge that led to the mechanism's design and implementation.
The Eise Eisinga Planetarium unites cultural heritage, science and education in one magnificent object and, in my role as Minister of Education, Culture and Science, this nomination is especially close to my heart.

This is the latest in a series of World Heritage nominations in the Netherlands that began in 2011. The nomination programme within the Dutch part of the Kingdom has now been completed; only two sites remain, both located in the Caribbean part of the Kingdom.

In the Netherlands we are aware of UNESCO's request – as part of its Global Strategy – that countries which are already rich in world heritage should refrain from future nominations. We will take this request into account as we shape the future of our World Heritage policy.

In light of the above, it gives me great pleasure to present to UNESCO the nomination dossier for the Royal Eise Eisinga Planetarium in Franeker.

Ingrid van Engelshoven,
Minister of Education, Culture and Science


2021
ZONDAG
MAANDAG
SATURDAG


D'AARDE ROLT EENSOM DE ZON IN 365 DAGEN
SATURNUS DOET EEN KEER OM DE ZON IN 29 JAAR EN
SCORPIUS
NOVEMBER
SAGITTARIUS
DECEMBER
CAPRICORNUS

Preface

BY HIS EXCELLENCY
ARNO A.M. BROK
KING'S COMMISSIONER IN FRYSLÂN

The Royal Eise Eisinga Planetarium is a twinkling star in the cultural heritage firmament of Fryslân, with an international appeal. The province of Fryslân and its inhabitants carry this unique piece of astronomical heritage in their hearts. They are proud of the oldest still functioning planetarium in the world, which rightfully bears the official title Royal. Eisinga's Planetarium is one of the highlights of the Canon of Dutch History, and is thus also part of the identity of this northern part of the Netherlands.
Every year, more than 60,000 visitors from home and abroad marvel at the handmade expanse that wool manufacturer Eise Eisinga created in his living room. Eisinga single-handedly built a dimension of which many at the time did not know it existed. After more than two hundred years, the enchanting effect of his creation has not lost any of its power. In fact, it seems to be gaining momentum as we learn more and more about the universe, and vehicles even drive around Mars. The Planetarium touches an existential chord somewhere.

The Planetarium is an icon and deserves to be a pearl in the chain of World Heritage Sites in the Netherlands. In Fryslân it forms a wonderful combination with the Wouda Steam Pumping Station, the most substantial still functioning steam pumping station in the world, and the unique Wadden Sea, the largest contiguous wilderness in western Europe.
When Eisinga built his mini-universe, Franeker was a university city of international allure. Together with the University of Leiden, Franeker was the only academic centre in the Netherlands, with leading professors and students. The university has disappeared, but the Planetarium is part of the academic tradition. As a knowledge centre, together with the current Franeker Academy and other institutions, it forms a constellation of study, knowledge and debate. This makes it much more than a relic from the distant past. It contributes to knowledge even today, and it is a modern source of energy and inspiration.

I regularly visit the Planetarium with guests. Time and again I am fascinated by the handcrafted timepiece, the celestial bodies that patiently revolve on the ceiling, and I get hypnotised by the ticking of the clock. But even more than that captivating spectacle, I am enchanted by seeing and hearing my guests' reactions. Young or old, all of them are instantly bewitched. That experience, that magic I would encourage everyone to enjoy. Raising the Planetarium to World Heritage Site provides an added guarantee for future generations to also be able to witness the miracle of Franeker. That is another reason why I want to dedicate myself with love as an ambassador for this wonderful cause.

His Excellency Arno Brok,
King's Commissioner in Fryslân

Charter UNESCO Werelderfgoednominatie

On 18 June 2020, the province of Fryslân, the municipality of Waadhoeke and the Royal Eise Eisinga Planetarium Foundation signed the Charter 'Moving Heaven and Earth', confirming their joint aim to have the Royal Eise Eisinga Planetarium inscribed on the UNESCO World Heritage List in 2023.
In doing so, the parties confirmed the joint pursuit of sustainable conservation and operation of the Planetarium, in accordance with the applicable instructions of founder Eise Eisinga [1744-1828].

Signing of the Charter 'Moving Heaven and Earth', on 18 June 2020. In the photograph from left to right Ms Jenny Schoute-Dirkx (Royal Eise Eisinga Planetarium Foundation), alderwoman Caroline de Pee (Municipality of Waadhoeke) and deputy Klaas Fokkinga (Province of Fryslân).

A voyage through space in a living room

PROF. KEES DE JAGER AT THE MERZ TELESCOPE IN 1953 **SONNENBORGH OBSERVATORY UTRECHT [NL]**

I first visited the Eisinga Planetarium in 1972, when Harke Terpstra was the curator there. Entering the living / bedroom of the Eisingas, I saw above me the planetary system, up to and including Saturn, as known from time immemorial until the 18th century. Moving around the sun through a ticking pendulum such as you hear in many houses with a Frisian longcase clock.

You can see the system as if from a large distance in space. A very different experience from seeing planets among the stars in the night sky, like in a projection planetarium. Nature on a large scale. Nowhere in the world you could see this on this scale. The current replicas did not yet exist.

For 42 years, Terpstra was the only staff member of the Planetarium. A unique, dedicated person, widely known as Harke 'Planet'. He did a good job in conserving the Planetarium and reached many generations with his explanations. His successors are continuing this.

I hope that the Planetarium will be preserved for many years to come for and by new generations. The universal importance of this exceptionally valuable and intact, living, astronomical monument justifies a positive World Heritage decision.

Cornelis (Kees) de Jager (1921-2021)

Emeritus Professor of Astronomy, Utrecht University and Free University of Brussels
Former Secretary General International Astronomical Union, IAU
Former President International Council of Scientific Unions, ICSU
(now International Science Council, ISC)
Former President Committee on Space Research, COSPAR

Den Burg (NL), 23 October 2020

Arnhem
27 August 2021

L.S.,

In 2006, Eise Eisinga was one of the fifty windows in the brand-new Canon of the Netherlands, composed and presented by a committee chaired by Prof. Frits van Oostrom.

Since then, the Canon is widely used in Dutch history education, and is also available at www.canonvannederland.nl and via other channels. In the Canon, Eise Eisinga and his impressive Planetarium constitute a low-threshold illustration of the impact of the Enlightenment in broad sections of the Dutch population.

In 2020, with a new committee, we have thoroughly evaluated and reassessed the first Canon of the Netherlands. As a result, we have replaced ten Canon windows by others, but the window Eise Eisinga we have kept. Consequently, his Planetarium is also part of the palette offered to history education in the Canon 2020-2030.

Therefore, our foundation – which manages the intellectual property around the Canon of the Netherlands – firmly supports the nomination of the Planetarium of Eise Eisinga as World Heritage Site.

On behalf of the entoen.nu foundation

Yours faithfully,

Prof. James Kennedy, Chairman
Dr Hubert Slings, Director

en toen nu
Canon van Nederland

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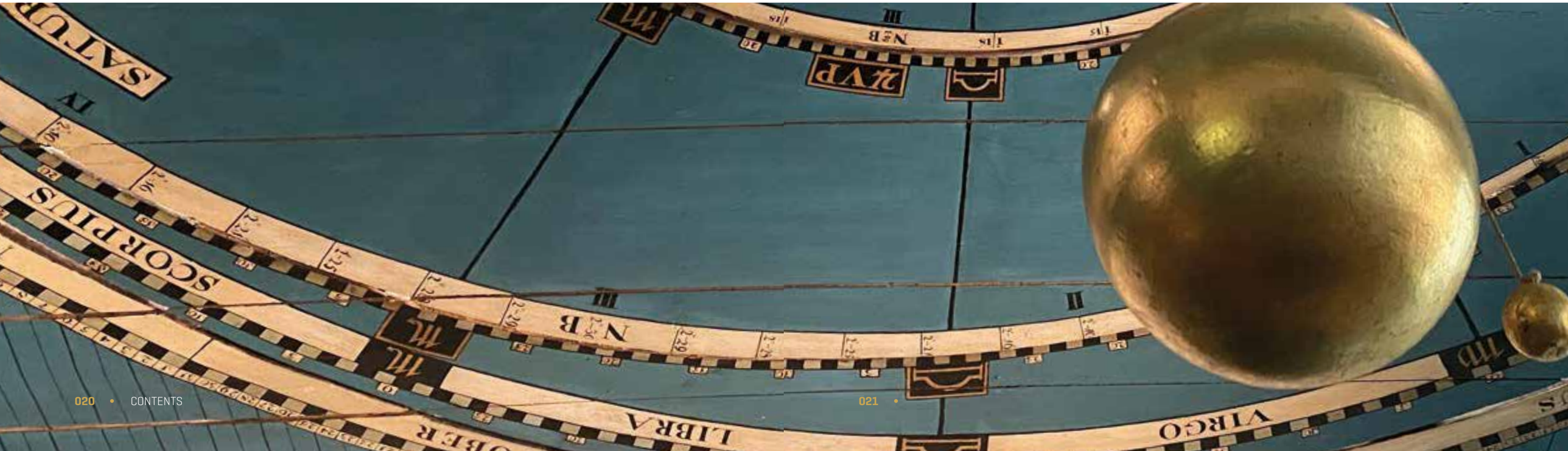

Executive summary


3,2 meters = 3,2 billion km
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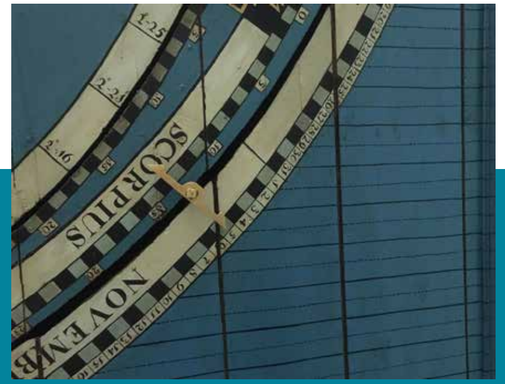
Around the sun the orbits of Mercury, Venus, Earth and Mars can be seen. The planets orbit the sun in 88, 224, 365 and 687 days respectively. Close to the earth there is another small sphere: the moon. Just like in reality, this moon rotates around the earth in 29.5 days. Outside the orbit of Mars, the planets Jupiter (11 years and 315 days) and Saturn (29 years and 164 days) orbit the sun. The largest moons of these planets are also shown. The other planets were only discovered after the Planetarium was built and are therefore missing. The spheres are half gilded and half painted black, indicating day and night sides. The distances of the planets are to scale, but the planet spheres are not: if they had been, the earth would have become invisibly small. In reality, the planetary orbits are not circles but ellipses, with the sun in one of the focal points. Consequently, the distance of a planet to the sun is not constant. This is approximated by eccentrically placing the circular orbits in the correct directions. The greatest distance is called the farthest point (VP) and the smallest distance the nearest point (NP). These points are also marked on the ceiling. Besides, the planetary orbits are not in the same plane as the earth's orbit around the sun – the so-called ecliptic plane. However, the inclination of the planetary orbits relative to the ecliptic is small: only a few degrees. The two points where the planets intersect the ecliptic plane are called 'nodes', with a distinction between the ascending (to the north) node and the descending (to the south) node. When a planet passes the ascending node, its distance to the ecliptic changes from negative to positive. The opposite happens when it passes the descending node. The numbers in the white circles around the planetary orbits indicate the position of the planet in relation to the nodes and how great the distance is. From this we can determine whether a planet is north or south of the ecliptic. In addition, the signs of the zodiac are painted along each planet's orbit, from which each planet's position in relation to the stars can be deduced. Outside Saturn's orbit a seventh slot has been added, through which the date hand moves. On the outside, the hand indicates the correct date (day and month) while on the inside the position of the sun in the zodiac is indicated. Parallel lines run from the date circle to the side plinths on the ceiling, on which a scale division has been applied. These lines indicate the declination of the sun throughout the year. The declination is the height of the sun in the sky, measured in relation to the celestial equator. Around 21 June, the sun reaches its highest point in the sky, while around 21 December it is at its lowest. Around 21 March and 21 September, the sun is exactly on the celestial equator. The date hand traverses the slot in one year. In the case of a leap year, the hand must be moved back one day. Eisinga made a special provision for this. The date wheel is disconnected from the central drive and set back one day. So it is 28 February twice.



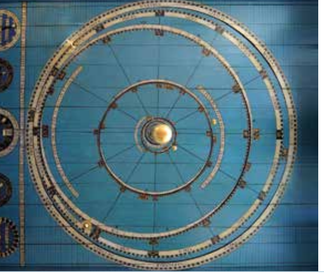
A seventh slot has been added outside Saturn's orbit, through which the date hand moves. On the outside, the hand indicates the correct date (day and month), while on the inside the position of the sun in the zodiac is indicated. This photograph shows the situation on 5 November, when the sun is at 14 degrees in the sign of Scorpius (Scorpio) and has a declination of almost -17 degrees.

The solar system in the living room

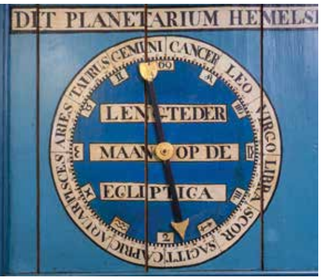
In order to accommodate the solar system in his living room, Eise Eisinga had to shrink reality by a factor of 1 trillion (thousand billion). This means that one millimetre on the ceiling in reality equals one million kilometres! On the ceiling he depicted the solar system with the sun in the centre and the planets that were known at the time around it. In addition to the solar system, all kinds of hands were installed on which the current data about our solar system can be read on a daily basis. In the centre, the sun is represented by a star. Around the sun several slots have been cut out, through which the planets move. The planets are suspended like spheres from metal rods that protrude through the slots in the ceiling.

The cog mechanism dissected

All the planets, hands and clocks of the Eisinga Planetarium are driven by an elaborate system of oak hoops and discs, fitted with thousands of hand-forged nails. This cog mechanism is powered by a pendulum clock with one weight. This clock only ensures the correct speed: the driving force is provided by eight weights connected to the main axes of the cog mechanism. The pendulum of the clock swings eighty times per minute. During the year, the pendulum length has to be slightly adjusted, due to temperature changes. Absolutely everything is powered by this clock: for example, the planets up to and including the hand indicating the ever-changing times of moonrise and moonset. To achieve this, Eisinga made use of eccentric wheels, on which nails (acting as 'teeth') are placed in such a way as to make the wheel rotate at varying speeds. Such an eccentric wheel engages with the pins of a so-called lantern pinion (two parallel discs connected with long pins), so that the engagement will continue to exist. The hoops that set the planets and also the date hand in motion are supported and held in place by wooden rollers. A hoop of this kind is located above every slot in the underlying ceiling.



01 • The planets in the Planetarium move clockwise, which means that we are looking at the solar system from the south side.



02 • The moon moves within a fixed path across the sky, just like the sun and the planets. This path also contains the constellations of the zodiac. These constellations can be seen as a band in the sky where we can always find the sun, the moon and the planets. This clock indicates which constellation the moon is in.

03 • The complex interplay of the movements of the earth, the moon and the sun causes the farthest point of the lunar orbit to shift over a period of 8 years and 311 days.

04 • Above the closet-bed there are five dials on the ceiling. The middle one indicates the correct day of the week. The correct (local) time can also be read. The days of the week are named after the seven celestial bodies that were known at the time: Sunday (the sun), Monday (the moon), Tuesday (Mardi – Mars), Wednesday (Mercredi – Mercury), Thursday (Jeudi – Jupiter), Friday (Vendredi – Venus) and Saturday (Saturn). The names of the days also correspond to the names of Germanic gods such as Wodan, Donar and Freyja. This dial also has a rectangular opening in which the correct year can be read. On 31 December, around four o'clock in the afternoon, the year indicated starts to shift and at midnight the new year appears. The board on which the years are painted must get a new series of years every 22 years.

05 • The complex interplay of the movements of the earth, the moon and the sun cause the lunar nodes in the sky to shift. They pass through the zodiac in a period of 18 years and 228 days.

06 • The moon is lit by the sun. Because the moon rotates around the earth, we will always see a different part of the moon being lit. This is how the lunar phases arise.

07 • Like the sun, the moon rises in the east and sets in the west. The times this takes place differ strongly. On average, the hands that indicate this are moving 48 minutes per 24 hours. The smallest time difference is 11 minutes, but it can also be an hour and a half! In order to reproduce this, Eisinga used eccentric cogwheels.

08 • The two small clocks next to the closet-bed provide information about the lunar orbit. Because the lunar orbit around the earth is elliptical, the distance from the moon to the earth is not always the same. The point where the distance is greatest is called the farthest point (VP). This point is reached when the hands of the clock indicating 'distance of the moon from the farthest point' are both at zero. That is when the distance between the earth and the moon is at its greatest. If the large hand is at zero and the small one at six, the moon is at the nearest point (NP). The moon is then nearest to the earth.

09 • Above the closet-bed is the 'square of heaven or planisphere'. Because the earth rotates on its axis in 24 hours, the sun and the stars appear to move from east to west. This disc shows the movement of the sun and the rotation of the starry sky, as seen from Franeker. The clocks next to the disc indicate the times of sunrise and sunset. As the earth rotates, it also moves around the sun. This makes the sun appear to move across the sky in a year. The disc is slotted to carry a sun figure moving through the zodiac, completing one cycle a year. The sun figure indicates the time of day on the 24 hours scale surrounding the planisphere.

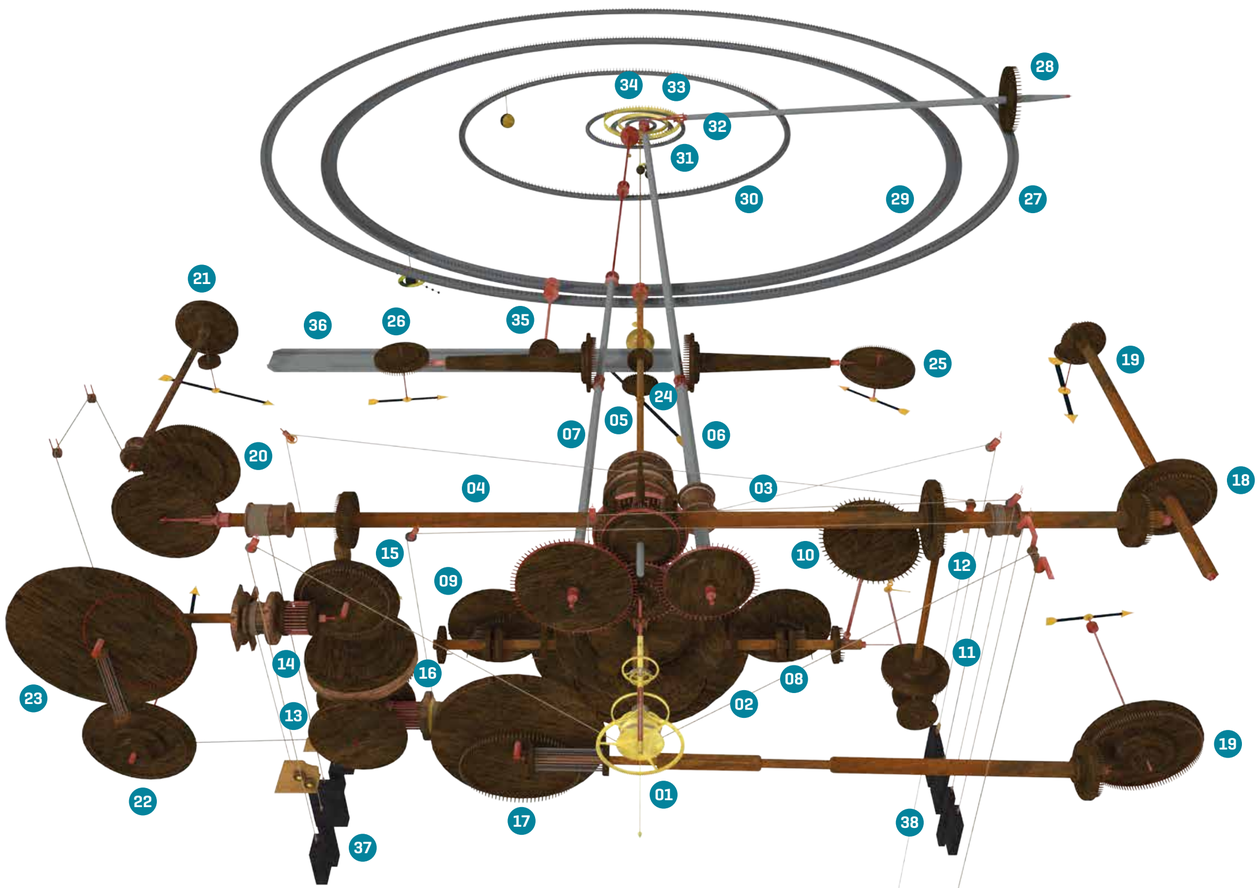
10 • The lunar orbit is somewhat at an angle in relation to the earth's orbit around the sun. As a result, one half of the lunar orbit is north of the earth's orbital plane and the other half south. Consequently, the moon intersects the earth's orbit twice during the lunar orbit around the earth. These points of intersection are called 'nodes'. One is called the ascending or north node, the other the descending or south node. When the moon is in one of the nodes, a solar or lunar eclipse can occur. If the hands of both clocks are at zero, and the hand of the moon phase is on new moon, there will be a solar eclipse somewhere in the world. In the case of full moon, there will be a lunar eclipse. Due to the complex interplay of the movements of the earth, the moon and the sun, the moon's nodes in the sky will shift. They pass through the zodiac in a period of 18 years and 228 days.

11 • This hand indicates the time the moon sets in the west.

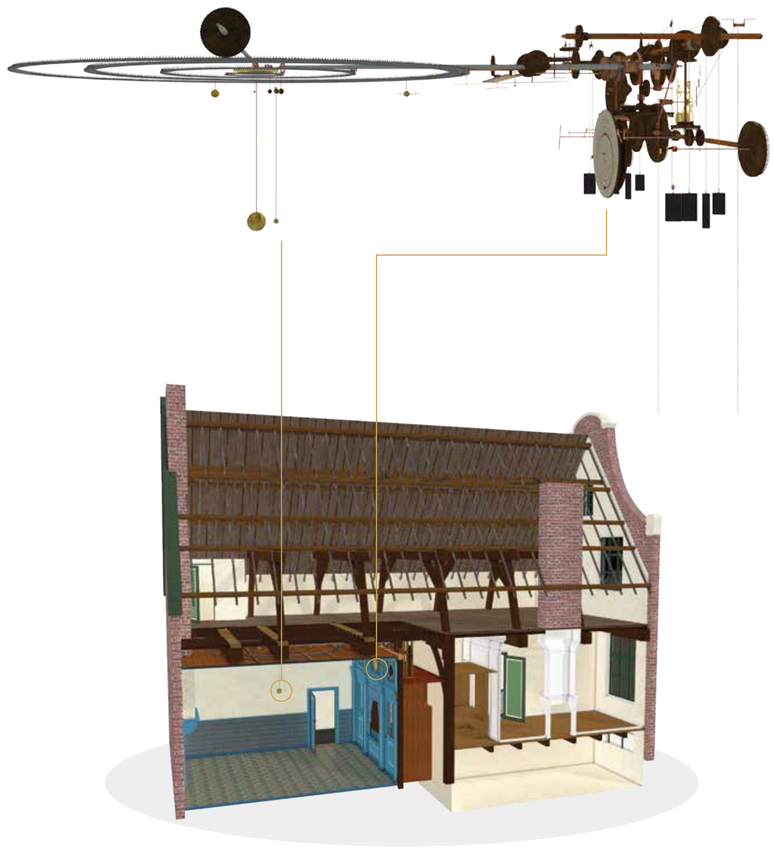
Listed below is an overview of the various components of the cog mechanism.
The numbers refer to the illustration on the right.

01 Pendulum clock
02 Square of heaven (four discs)
03 Farthest Point moon axis 1
04 Farthest Point moon axis 2
05 Drive date wheel and day hand
06 Drive planets Mercury and Venus and position Farthest Point moon (VP)
07 Drive planets Mars, Jupiter and Saturn and position Ascending Node moon (KK)
08 Sunrise
09 Sunset
10 Drive 'Sunrise' and 'Sunset'
11 Distance moon to farthest point
12 Drive moon to farthest point
13 Distance moon to north node
14 Transmission node wheels
15 Upper node moon wheel
16 Lower node moon wheel
17 Eccentric cog wheel, drive 'Moonrise'
18 Moonrise
19 Drive position moon in ecliptic
20 Eccentric transmission moon phases
21 Hand moon phases
22 Drive 'Moonset'
23 Transmission 'Moonset'
24 Drive day hand
25 Drive moon in VP
26 Drive moon in KK
27 Date wheel
28 Transmission drive Earth
29 Wheel Saturn
30 Wheel Jupiter
31 Wheel Mars
32 Wheel Earth and moon
33 Wheel Venus
34 Wheel Mercury
35 Drive yearboard
36 Yearboard
37 Five weights (for timepiece, date wheel, VP axis, node wheel, moon phases)
38 Four weights (axis drive of the planets Mercury, Venus, Mars, Jupiter and Saturn, and of lower node wheel and VP axis)

TOP VIEW



SIDE VIEW



STATE PARTY
Kingdom of the Netherlands

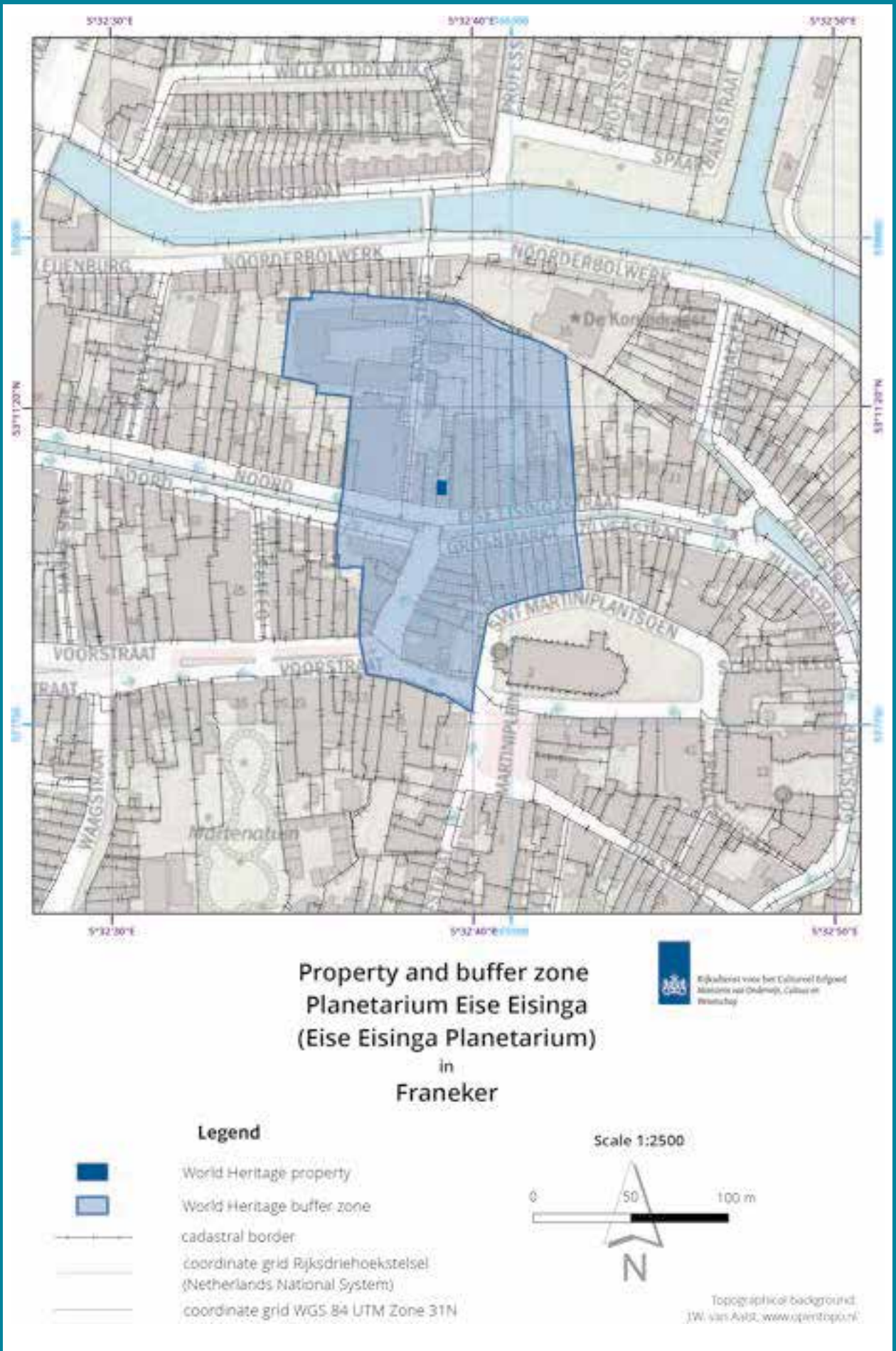
STATE, PROVINCE OR REGION
Municipality of Waadhoeke, Province of Fryslân (Friesland)

NAME OF THE PROPERTY
Koninklijk Eise Eisinga Planetarium (Royal Eise Eisinga Planetarium)

GEOGRAPHICAL COORDINATES
N 53°11'14.55"; E 5°32'37.51"

TEXTUAL DESCRIPTION OF THE BOUNDARIES OF THE NOMINATED PROPERTY
The boundary of the nominated property has been drawn in order to encompass all the attributes that are a direct and tangible expression of its Outstanding Universal Value.

The property measures 0.0027 hectare and encompasses the planetarium (i.e. orrery) in the former living room of the canal house Eise Eisingastraat 3 in the town of Franeker. It is fully owned by the municipality of Waadhoeke in the province of Fryslân (Friesland), in the northern part of the Netherlands. The buffer zone encompasses the immediate vicinity of the property and covers an area of 2.12539 hectares.



7. Nominated property with buffer zone. Cultural Heritage Agency of the Netherlands.

See maps enclosed in file.

CRITERIA UNDER WHICH INSCRIPTION IS PROPOSED
(i), (iii), (iv)

DRAFT STATEMENT OF OUTSTANDING UNIVERSAL VALUE

a. Brief synthesis
The Royal Eise Eisinga Planetarium is the oldest continuously operating planetarium (i.e. orrery) in the world. It is located in the historic centre of Franeker, one of the eleven historical cities in the province of Fryslân (Friesland), in the north of the Netherlands.

This accurately working model of our solar system was built between 1774 and 1781 by an ordinary citizen: the Frisian wool manufacturer Eise Eisinga. The mechanism consists of simple but robust components, such as wooden hoops and discs, and iron pins. It provides an up-to-date and realistic image of the positions of the sun, the moon, the earth and the five other planets that were known at the time.

The mechanism, ingeniously powered by one single pendulum clock, is built into the ceiling and at the top of the bed box of a living room. From the time that the planetarium instrument was completed, the room itself has continuously served as a reception and presentation area. To this day, it is open to the general public and used as an astronomical education centre.

The Eisinga Planetarium stems from a private initiative that was originally aimed at knowledgeable amateur astronomers, but soon took on a broader public function. It is characteristic of its time, in which science was increasingly being imbedded in society.

The combination of a permanent presentation, a great diversity of functions and the presence of a reception area is totally unique for a planetarium of that time. It makes the Eise Eisinga Planetarium an early predecessor of the many modern ceiling and projection planetariums. The excellently maintained instrument still functions as it did in 1781, and visitors are still given an explanation there about the functioning of our solar system – just as its maker intended.

b. Justification for criteria under which inscription is proposed

Criterion (i): Represents a masterpiece of human creative genius

The Royal Eise Eisinga Planetarium is an iconic example of an 18th-century orrery, representing exceptional creativity in both its extraordinary technical design and execution, and artistic expression. It is the world's oldest functioning planetarium where visitors can walk in to be informed about what is happening in the skies.

The Eisinga Planetarium is ingeniously built into the ceiling and the closet-bed wall of the living room of a former civilian home. That way it was possible to build a large orrery and use the underlying room as a reception and presentation area – just as in modern planetariums.

The orrery, which is in operation almost continuously since 1781, was designed and built by an ordinary citizen, with the use of ordinary materials. This opened the way for unprecedented design solutions that resulted in a very sophisticated instrument. It allows the beholder to see the current positions of the planets and the moon at one glance.

The fact that the Planetarium is still in working order, is largely due to the creative genius and foresight of its maker, the Frisian wool manufacturer Eise Eisinga, who left detailed instructions for the maintenance of his instrument.

Criterion (iii): Bears a unique testimony to a living cultural tradition
The Royal Eise Eisinga Planetarium bears a unique testimony to the cultural tradition of presenting and providing insight into celestial phenomena, using technology. This is a universal tradition, going back thousands of years, that lives on to this day.

It still functions exactly as it did when it came into operation in 1781 and, according to the consecutive series of guest books, all this time retained its inspiring educational function – receiving and educating visitors in a space where they can see the solar system and the starry sky portrayed above their heads.

Since its completion in 1781, the mechanism has been maintained according to its maker's instructions. Thanks in part to these extensive maintenance instructions, the Eisinga Planetarium continues to present the accurate positions of the sun, the moon and the planets of our solar system.

Criterion (iv): An outstanding example of a technological ensemble which illustrates a significant stage in human history

The Royal Eise Eisinga Planetarium illustrates a significant turning point in human history: the democratisation of science, which has permanently changed society. It is typical of the importance attached to the transfer of knowledge to a wider audience in 18th-century society. The intertwining of the instrument with the ceiling and the closet-bed of an existing living room symbolises, as it were, the increasing linkage of science and society.

The Planetarium was built by an ordinary citizen and was from the outset intended and used for educational purposes. Educated citizens could read the current celestial positions of the planets at a glance, and interested laymen were given insight into the 'functioning' of the solar system, based on the explanation provided at the instrument. This makes the Planetarium an object that bridges the gap between people of different educational levels and social classes.

As a technological ensemble, it continues to contribute to the dissemination of astronomical knowledge, and in particular the heliocentric worldview, in society.

c. Statement of Integrity
All the tangible elements and attributes required to express the Outstanding Universal Value of the candidate for nomination sit within its boundaries. The property is owned solely by the municipality of Waadhoeke, in the north of the Netherlands, and consists of six tangible attributes. Since the Royal Eise Eisinga Planetarium is still in full use, it is subject to wear and tear. But thanks to a very strict maintenance regime, almost all of the original parts have been preserved. The integrity of the property is therefore 100%.
The whole is inextricably linked to the building Eise Eisingastraat 3.

d. Statement of Authenticity
Although the Eise Eisinga Planetarium has been in operation just about continuously since 1781, the instrument has retained a high level of authenticity. Aside from necessary repairs, the various components of the planetarium instrument have remained unchanged since its completion. And the character of the room it is part of has been preserved. The authenticity of the Planetarium is confirmed, for example, by the first complete description of it, published in 1780 by Franeker University professor Jean Henri van Swinden, and by the description with maintenance instructions drawn up by Eise Eisinga in 1784. Its authenticity is also reflected in the almost complete series of guest books that have been kept from the very beginning. It proves that ever since the inauguration in 1781, the workings of our solar system have continuously been explained in the room below the Planetarium.

e. Requirements for protection and management

The former residence of Eise Eisinga, including the planetarium instrument, has been designated as a national monument by the State. A permit is required for changes to national monuments, in which respect it is carefully considered whether the plans are in accordance with the monumental values of the building.

In addition, the Planetarium building is entitled to bear the blue and white shield – the international distinguishing mark to indicate cultural heritage sites protected by the 1954 Hague Convention (a convention under the auspices of the UN and UNESCO for the Protection of Cultural Property in the Event of Armed Conflict).

Another important legal protection regime applies to the status of protected cityscape of the inner city of Franeker (now part of the municipality of Waadhoeke) since 1979. The protection is not aimed directly at individual buildings, but mainly at the historical characteristics, the urban planning structure and the layout of the public space. This protection of the area has been given a key position in the zoning plan for the inner city of Franeker. The entire buffer zone falls within the boundaries of one zoning plan, namely the 'Franeker – Inner City' zoning plan dating from 2016.

The municipality of Waadhoeke has a structural subsidy relationship with the Planetarium. On the basis of this relationship, an annual implementation agreement is drawn up in which the tasks of the Planetarium are stipulated. Since 15 June 2021, the Planetarium is also included in the subsidy structure of the province of Fryslân.

The municipality has committed itself to the sustainable maintenance and the conservation of the Planetarium. For the supervision of these management tasks, the Royal Eise Eisinga Planetarium Foundation was established in 2001. The board of this foundation consists of five representatives from scientific fields, the financial world and the local community. The day-to-day business is carried out by a managing director and nine employees.

Since it came into operation in 1781, maintenance of the planetarium instrument has taken place on the basis of the instructions of its maker, and is carried out by experienced staff and skilled external restorers.

Name and contact information of official local institution

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Mayor and Aldermen

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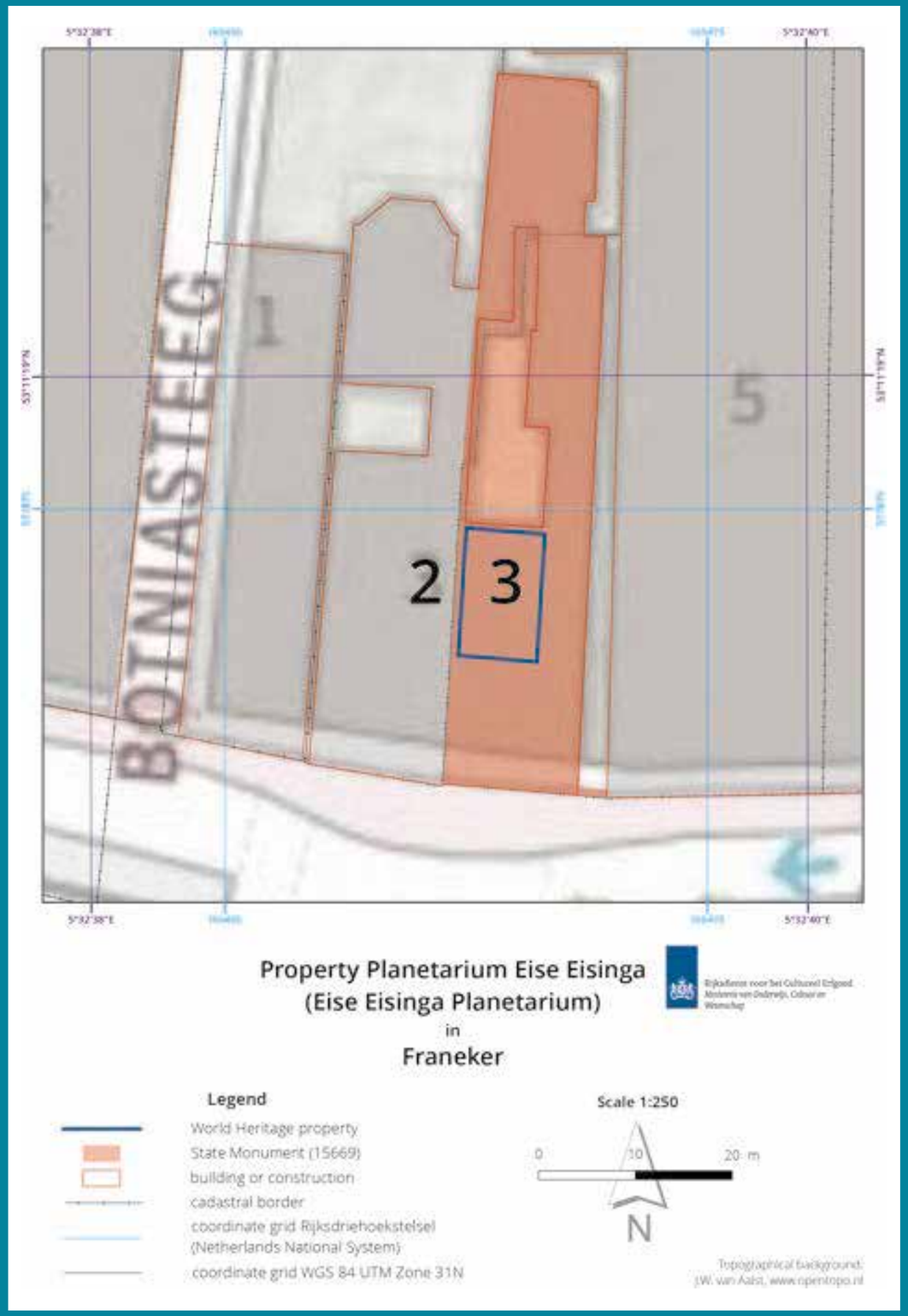
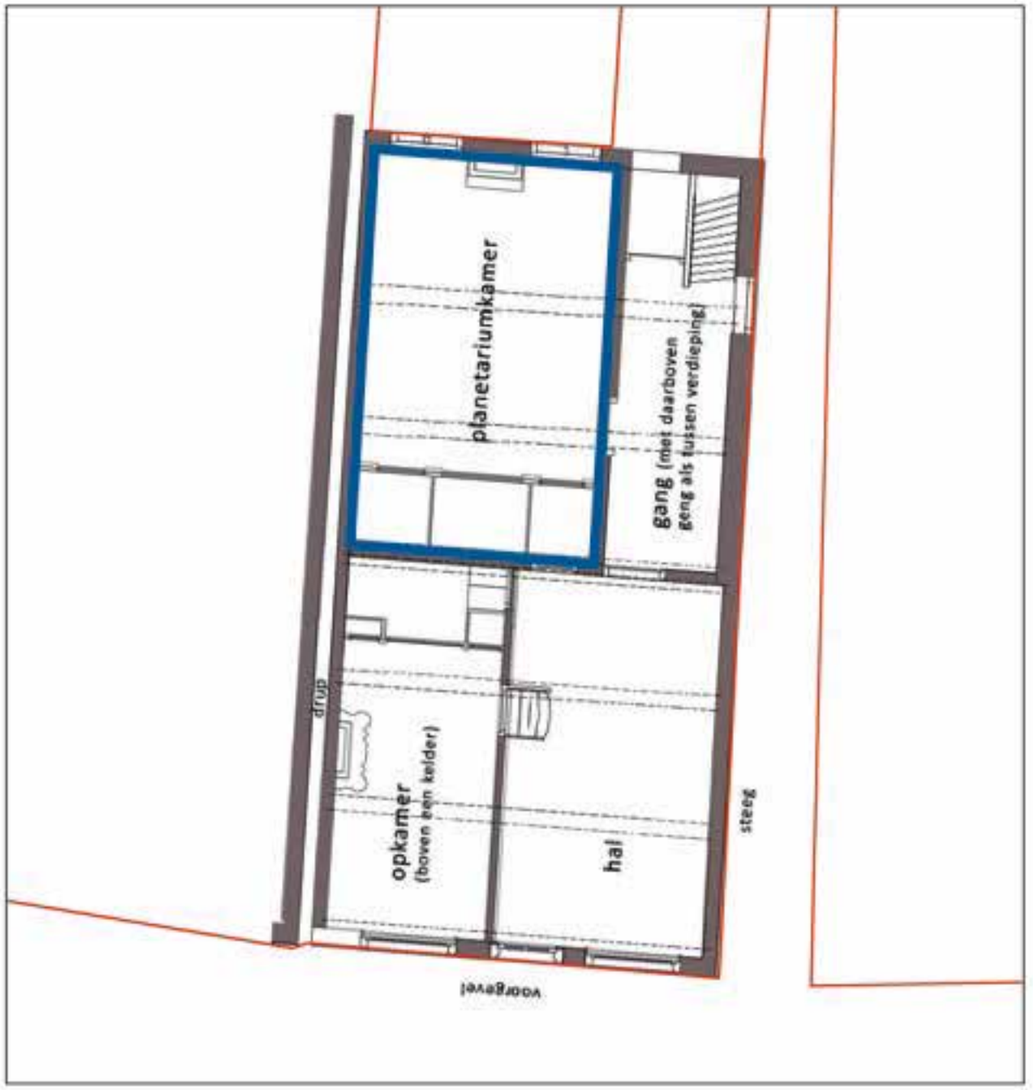
8800 AB Franeker

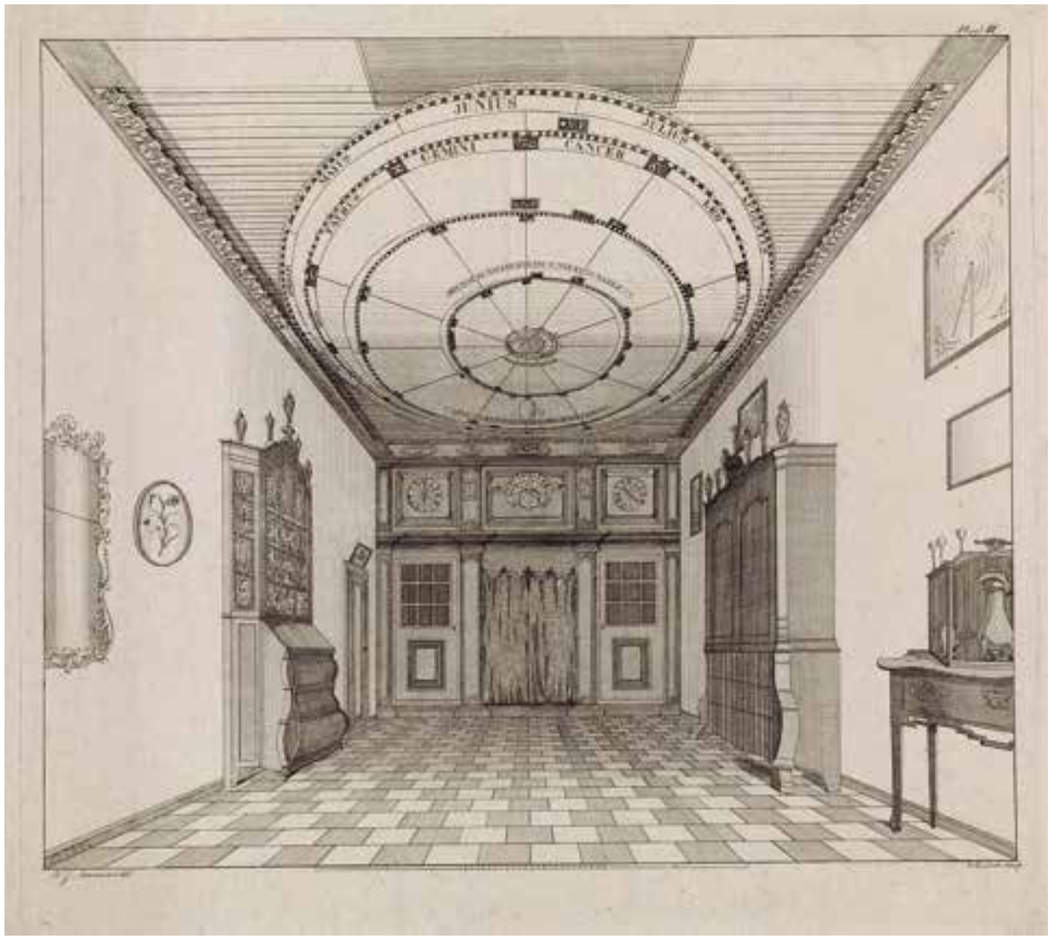
E-mail: m.visser@waadhoeke.nl
Web address: www.waadhoeke.nl



8. Map of the area of the nominated property.



9. Map of the nominated property. Cultural Heritage Agency of the Netherlands.



10. Planetarium room, engraving by Barentie Willem Dietz, after Claas Johannes Sannes, 1824.

1. Identification of the property

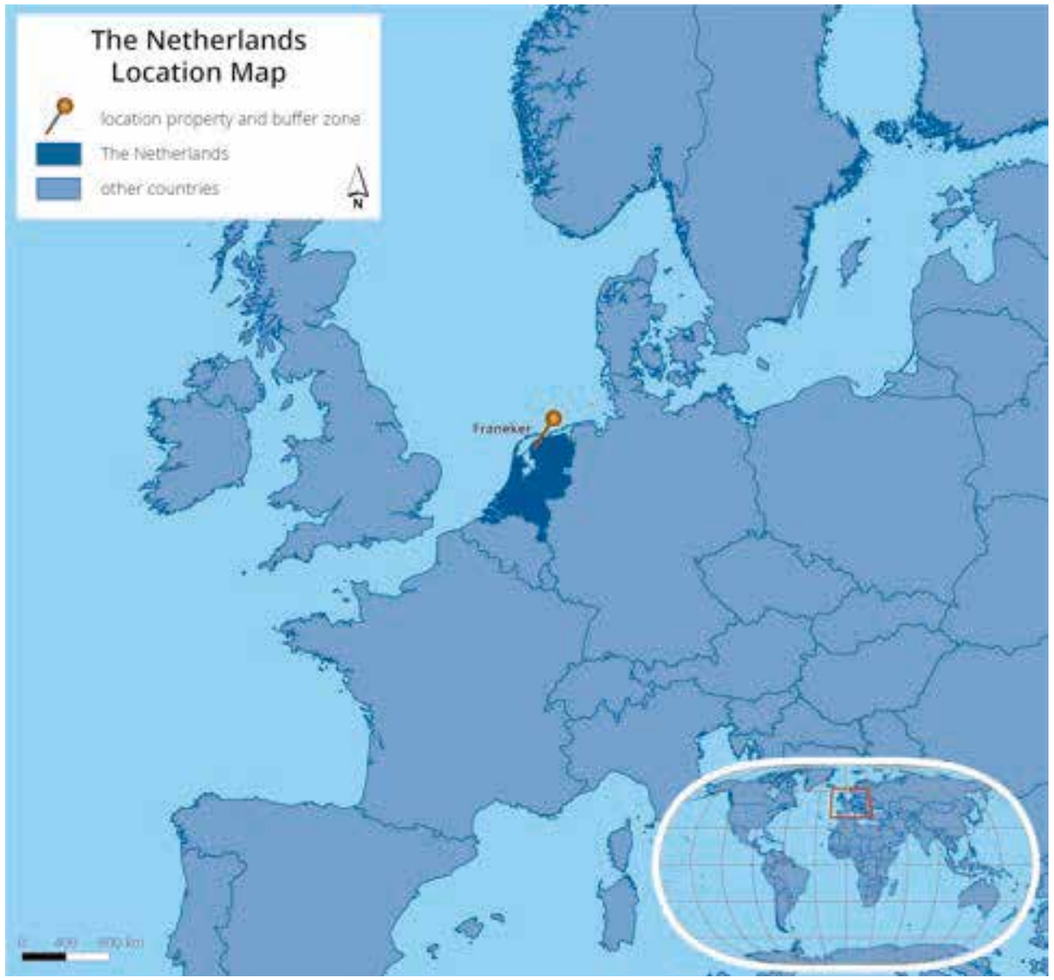
1.A STATE PARTY AND COUNTRY
Kingdom of the Netherlands

1.B STATE, PROVINCE OR REGION
Municipality of Waadhoeke, Province of Fryslân (Friesland)

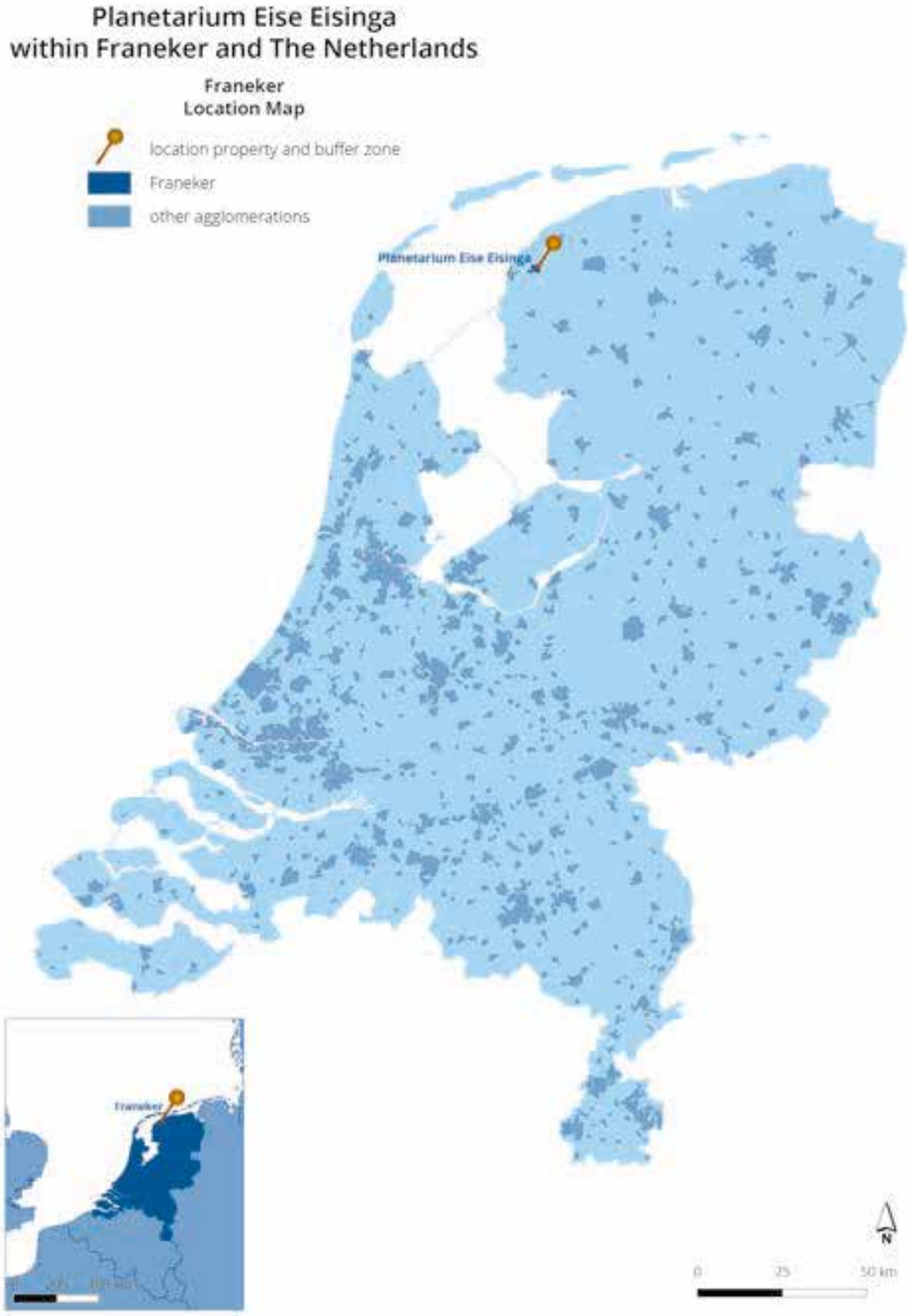
1.C NAME OF THE PROPERTY
Koninklijk Eise Eisinga Planetarium (Royal Eise Eisinga Planetarium)

1.D GEOGRAPHICAL COORDINATES
The centre of the nominated property is at:
N 53°11'14.55", E 5°32'37.51".

1.E MAPS SHOWING THE PROPERTY



11. Map showing Europe with the Netherlands.



12. Map showing the Netherlands with the city of Franeker.

13. Map showing the municipality of Waadhoeke and the city of Franeker.

List of maps showing the property

5. Fold-out map 1, planetarium instrument. Edition Royal Eise Eisinga Planetarium **[Executive summary]**

6. Fold-out map 2, cogwheels. Edition Royal Eise Eisinga Planetarium **[Executive summary].**

7. Nominated property with buffer zone. Cultural Heritage Agency of the Netherlands **[Executive summary].**

8. Map of the area of the nominated property **[Executive summary].**

9. Map of the nominated property. Cultural Heritage Agency of the Netherlands **[Executive summary].**

11. Map showing Europe with the Netherlands **[Section 1.e].**

12. Map showing the Netherlands with the city of Franeker **[Section 1.e].**

13. Map showing the municipality of Waadhoeke and the city of Franeker **[Section 1.e].**

14. Area of the nominated property, cadastral map. Cadastral designation (Planetarium, Eise Eisingastraat 3): Municipality of Franeker, Section A, Number 3320 **[Section 1.f].**

15. Location of the nominated property in Franeker **[Section 1.f].**

16. Area of the nominated property **[Section 1.f].**

17. Area of the nominated property **[Section 1.f].**

120. Cadastral floor plan Eise Eisingastraat 1, 2 and 3 **[Section 5.a].**

121. Buffer zone. Municipality of Waadhoeke **[Section 5.b].**

122. Map protected cityscape of Franeker, relating to the Designation Decree by the State Secretary for Culture, Recreation and Social Work and the Minister of Public Housing and Spatial Planning, 21 February 1979 **[Section 5.b].**

123. Planetarium, buffer zone (within blue outline) and protected cityscape (within red outline) **[Section 5.b].**

124. Planetarium, buffer zone (within purple outline) and protected cityscape (within blue outline) **[Section 5.b].**

125. Planetarium and buffer zone (within purple outline) **[Section 5.b].**

126. Property within the buffer zone **[Section 5.b].**

127. Franeker, parking space and rates. Source: Municipality of Waadhoeke, 2021 **[Section 5.c].**

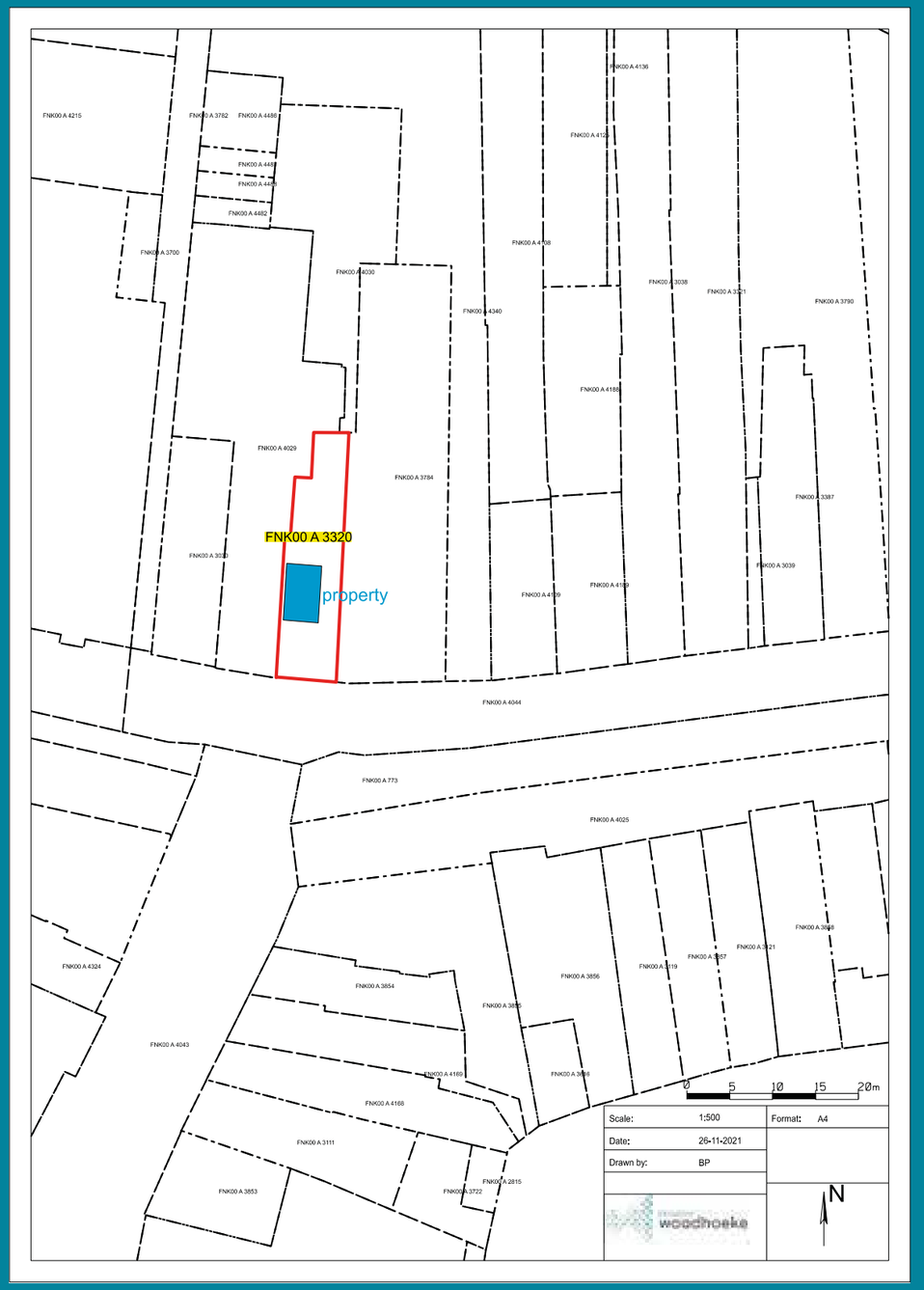
153. Planetarium, exhibition/floor plan. Edition Royal Eise Eisinga Planetarium **[Section 5.h].**

1.F MAPS SHOWING THE AREA OF THE PROPERTY

Area of nominated property:
0.00271 hectare

Area of buffer zone:
2.12539 hectares

Total area:
2.12810 hectares



14. Area of the nominated property, cadastral map. Cadastral designation (Planetarium, Eise Eisingastraat 3): Municipality of Franeker, Section A, Number 3320.

15. Location of the nominated property in Franeker. Buffer zone (within purple outline) and protected cityscape (within blue outline).

16. Area of the nominated property. Buffer zone (within purple outline).

17. Location of the nominated property.

2. Description of the property

2.A OVERVIEW OF THE PROPERTY

The World Heritage Site to be nominated is an accurately moving mechanical scale model of our solar system, built between 1774 and 1781. This planetarium – a citizen's initiative with a distinctly educational character – is in its authentic state and is inextricably linked to the ceiling and the south wall of the former living / bedroom of Eise Eisinga, which functions as a reception and presentation area.

The property, which is owned by the municipality of Waadhoeke, is located at Eise Eisingastraat 3, in the old centre of the city of Franeker, the capital of this municipality. Franeker is located in the province of Friesland, in the north of the Netherlands. The lively centre of the city, which has over 12,000 inhabitants, is characterised by a historically intricate structure with an average building height of four floors.

In the heart of Franeker there is a monumental Renaissance town hall, built between 1591 and 1594. Diagonally opposite of the town hall Eisinga's house can be found, which is a modest house with a simple 18th-century bell gable **<18, 19>.** To the left and right of it are higher buildings of much more recent date. Together they form a street wall that is located on a canal that cuts through the old city centre. (Detailed information about this canal house can be found in appendix 12.)

The fact that the Eisinga house is not an average residence is apparent from the sign with the text PLANETARIUM, installed in 1901 and mounted above the front door. Behind this door there is a space that used to serve as a wool shop, among other functions. The small 'raised room' to the left of it usually served as living space, but in the second half of the 19th century it was also used as a telegraph office, for example.

18. Franeker, town hall (right) and Eisinga house (third building from the left), 1788, source: Nic. Baur. View along the town hall and Noord in Franeker.

19. Planetarium building and immediate vicinity, from Groenmarkt.

Through a passage at the rear of the entrance area there is a narrow corridor, with a door on the left that gives access to the main room of the house. Between 1768 and 1826, this was the living / bedroom of Eise Eisinga, the maker of the Planetarium, and his family. Their closet-bed can be seen on the left from the doorway.

Above the closet-bed, several intriguing dials have been installed, but it is mainly the ceiling that attracts attention: here we see the actual Planetarium. Its main attraction is a room-sized, Prussian blue painted dial with black and gilt lettering, in which six circular slots have been sawn. The sun is painted in the middle and around it revolve – in real time – the six planets as they were known at the time of the Planetarium's construction: Mercury, Venus, Earth, Mars, Jupiter and Saturn.

The planets hang like wooden balls from metal rods, that protrude through the slots in the ceiling. The moon revolves around the earth – again at the actual pace. The balls are half gilded and half painted black, which indicates their day and night sides.

The distances between the planets are at scale (1 millimetre on the ceiling corresponds to 1 million kilometres), but the dimensions of the planet balls are not, because the earth model would then have been invisibly small. Larger versions of the sun (diameter 16 centimetres) and the earth (diameter 3.5 centimetres) hang from cords in the centre of the room. When you look at the sun along this earth, you can read on the ceiling what day it is, and in which constellations the other planets are as seen from the earth.

20. Planetarium building and immediate vicinity, from Raadhuisplein.

21. Franeker, Eisinga house (third building from the left), and Noord in Franeker.

22. Entrance area Eise Eisingastraat 3.

23. Raised room, ground floor, Eise Eisingastraat 3.

24. Planetarium room, ground floor, Eise Eisingastraat 3.

The scale model has a diameter of 3.2 metres – a size that is largely dictated by the width of the room (4.07 metres).

To the unsuspecting visitor, this massive astronomical timepiece seems to stand still, which is because the planets move very slowly: Mercury, the planet closest to the sun, goes around in 88 days; the outermost planet, Saturn, even takes more than 29 years. The fact that there is any movement at all is actually better to be heard than to be seen, because in quiet moments, the pendulum clock which controls the mechanism can be heard ticking. The clock is attached above the ceiling of the closet-bed, near the cogwheels of the Planetarium, which is hidden in the ceiling of the room.

The whole is driven by nine slowly lowering weights that must be raised at regular intervals. The weights hang in the cupboards on either side of the closet-bed. In addition to the six planets, the clock also controls twelve small dials, which are built into the top of the closet-bed and the adjacent part of the ceiling.

25. Stairs to the mezzanine with cogwheels, Eise Eisingastraat 3.

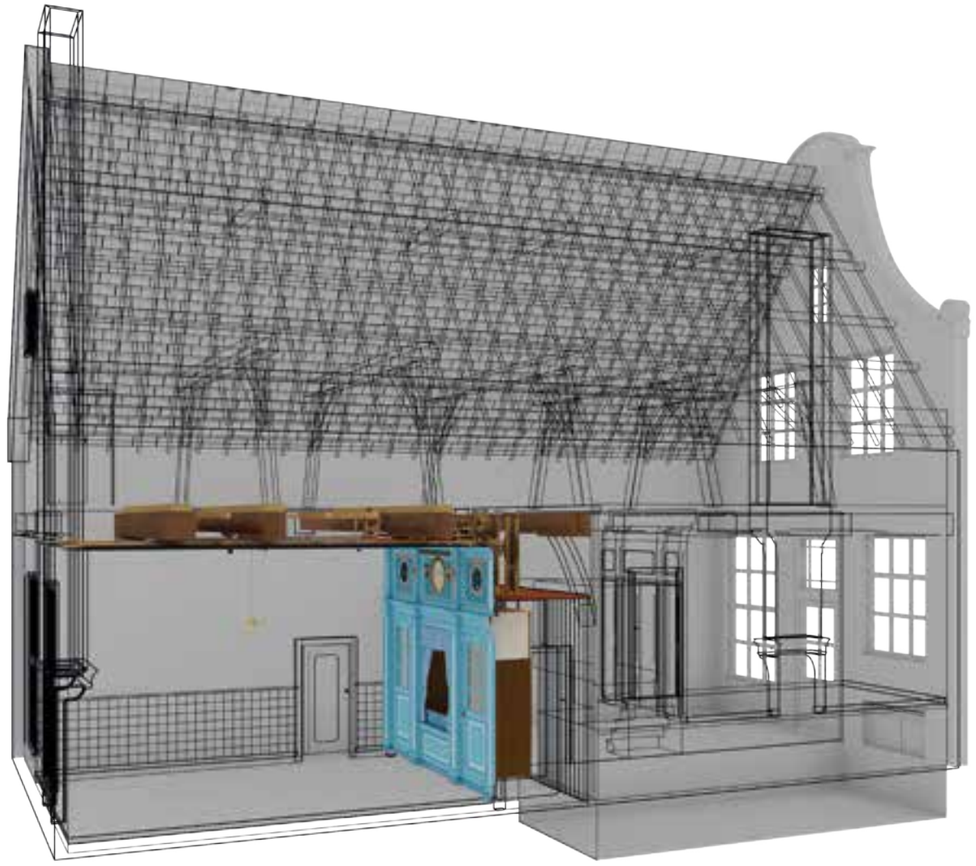
These show the local time, the date, the phases of the moon, the position of the stars, and more. (See the fold-out page for a detailed description.)

The planetarium instrument is ingeniously attached to the original beam construction of the house, which was specially adapted for this purpose. In this way, the cogwheels of the gear can be adjusted for the settling of the building. The cogwheels, accessible via the short staircase opposite the entrance door of the room, were largely constructed on site. They consist of approximately sixty oak hoops and discs of various sizes, with almost six thousand hand-forged iron pins, which interlock like pinions and cogwheels. In addition, the mechanism contains some forty other (small) parts. The whole is intertwined with the building to such an extent that it should be regarded as immovable property by its nature and circumstances (see appendix 11 for a detailed discussion of the technical aspects of the instrument).

26. 27. Mezzanine with cogwheels.

The main attributes of the property are:

- a mechanism of wooden hoops and discs, fitted with approximately six thousand iron pins that function as 'gears';
- a pendulum clock with nine weights that powers the mechanism;
- the Prussian blue and gold painted ceiling along which the planets move, including the spheres of the sun and the earth, attached to cords, and in which five dials are fitted;
- the closet-bed wall, painted in the same colours, in which seven dials are fitted and in which the weights of the pendulum clock are hanging;
- the space above the ceiling, housing the combination of pendulum clock and cogwheels, which functions as a drive; and
- the room under the planetarium instrument, which serves as a reception and presentation area.



28. The location of the Planetarium in the building Eise Eisingastraat 3.

2.B HISTORY AND DEVELOPMENT

The direct reason for the construction of the Eisinga Planetarium was the commotion that arose in 1774 about a conjunction of four planets (Mercury, Venus, Mars and Jupiter) and the moon, which took place on 8 May of that year. Prior to this, there had been rumours in Friesland that this conjunction could cause the earth and the other planets of our solar system to depart from their orbits and burn up in the sun.

This 'prediction' did not lead to great panic, partly because some professors from the then University of Franeker helped to disprove the rumours. But it had once again made it clear that celestial phenomena appeal to the imagination. In all layers of the population there was a need for a sound explanation of what was happening in the sky.

After Eise Eisinga had learned of the conjunction, he decided to check all the figures. On the basis of his calculations, he not only came to the conclusion that there was no cause for alarm, but he also got the idea that it would be useful to have an instrument that would render such calculations superfluous. By means of a planetarium it could be shown that such a conjunction of planets is in fact based on an optical illusion: the planets may appear to be close to each other, but in reality one planet is much further away than the other.

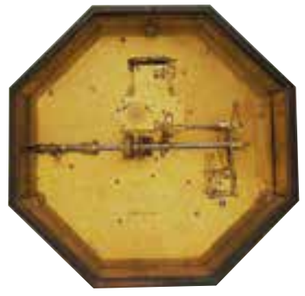
It is not clear what exactly the design of the Eisinga Planetarium was derived from. It is known that the Danish astronomer Ole Rømer (1644-1710) had installed a planetarium in the ceiling of the Round Tower in Copenhagen as early as 1697 **<29>.** However, the design of that planetarium was completely different. With its six eccentrically positioned circular slots, intended to approximate the variable heliocentric angular velocities of the planets, the Eisinga Planetarium is more like the planetarium designed around 1682 by the Dutch scholar Christiaan Huygens (1629-1695), which measured a mere sixty centimetres and was placed on a table **<30, 31>.** Such 'table planetariums' were widely used by the philosophical societies founded in the second half of the 17th century to disseminate the latest scientific insights beyond learned circles.

Be it as it may, Eisinga's way of translating his astronomical knowledge and mechanical expertise into a planetarium was unique. Most 18th-century planetariums employed fine-mechanical gear trains such as those current in horology. Eisinga's mechanism, however, uses mainly wooden disks with inserted iron pins.

The skill of inserting iron pins into wood was available to Eisinga, as the hand-held combs for wool combing had oak wood handles with dense rows of long iron spikes. These combs would be heated before the wool was worked. From everyday experience the rigidity and durability of that combination was obvious to him. He could conceive the planetarium gears as wooden disks, and the planetary wheels as wooden rings of oak with rows of iron pins, because he knew that this construction would be solid and lasting.

29. Copenhagen [DK], Round Tower, planetarium Ole Rømer.

30. Huygens planetarium, front.



31. Huygens planetarium, back.

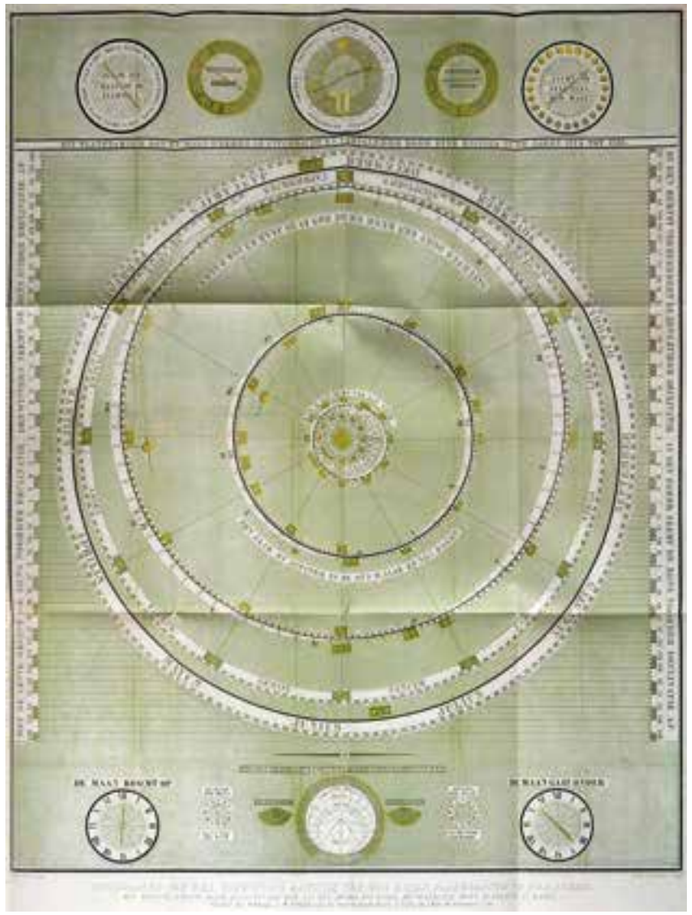
32. Jean Henri van Swinden, by Anonymous, oil paint.

International praise

Historical research has shown that as early as 1778 – less than four years after the work had started – the Planetarium was ready to such an extent that it could rotate. However, that does not mean that it was running permanently by that time. That probably wasn't the case until two years later, in 1780.

In February of that year, the nearly completed instrument was noticed by Jean Henri van Swinden (1746-1823). Van Swinden was a renowned professor of philosophy, logic, metaphysics and physics at the University of Franeker, who corresponded with a large, international network of scholars **<32>.**

Van Swinden was so impressed by what he found, that in the summer of 1780 he published a booklet in which he gave a complete and very favourable description of the instrument **<33>.** He also informed several well-known foreign scholars. Thanks to a letter from the French meteorologist Louis



33. Description of the Planetarium, by Jean Henri van Swinden, 1780, 'Description, by J.H. v. Swinden, Professor of Philosophy at the National College in Franeker, Member of various Societies, etc., of a Masterpiece, depicting a fully mobile Celestial Frame, devised and manufactured by Eise Eisinga, Also Member of the Council of the City of Franeker. At Franeker by D. v.d. Sluis and D. Romar 1780. With the exception of the headings, footnotes et cetera 124 pages in octavo.', in: Vaderlandsche letteroefeningen (National letter exercises), 1780.

Cotte (1740-1815), various magazines and newspapers in England, Germany and even North America mentioned the existence of the Planetarium.

At that time the Planetarium was still not fully completed: the painting of the ceiling was not applied until the summer of 1781, providing the planetary orbits with special lines of variable width, indicating when a planet is north or south of the plane of the orbit of the earth. These lines emphasise that the planetary orbits are in reality tilted relative to the earth's orbital plane (= plane of the ceiling) and give the model a certain depth.

A few years later, Eisinga made some further improvements, such as the addition of the sun and earth spheres hanging from wires. By looking at an object along the wire of the earth, the geocentric position of that object can be read on the circle of the zodiac. In the same way, the heliocentric position can be determined by means of the sun wire. In addition, Eisinga moved two dials and adjusted the orbital times of several planets.

In 1784, Eisinga drew up a detailed description of his Planetarium for his two sons. With this preserved instruction book, in which the operation of the instrument is described and which gives directions for maintenance and repairs, Eisinga wanted to secure the future of his life's work. The instruction book, which is kept in the municipal archives in Franeker and has also been digitised, has certainly played an important role in the continuity of care for the instrument.

Intermediate period

The Planetarium has been in operation continuously since 1781, with the exception of the period 1790-1797, when there was a troubled situation in the Republic of the Seven United Netherlands, of which Friesland was a part. Towards the end of the 18th century, citizens in the Republic revolted against stadtholder Prince of Orange, William V (1748-1806), which resulted in the so-called Patriot Revolution.

After the revolution had been contained at an early stage by the end of 1787, many insurgents – including Eisinga – had to flee abroad. Three years after his flight, Eisinga's house was evacuated. The timepiece above the closet-bed, and with it the Planetarium, came to a standstill at that time.

In the end it took until 1796 before Eisinga could move into his house again. Only from 1797 – seven years after it had come to a standstill – interested parties could return to the (by then restarted) Planetarium.

Guest books

From the beginning, guest books were kept in the Planetarium. These have largely been preserved **<34, 35>**. The three volumes up to and including August 1835 are kept in the municipal archives in Franeker and have also been digitised. The guest books for the period up to 15 September 1932 are also kept in the municipal archives. The later volumes are kept in the Planetarium itself.

The first registration is dated 26 August 1783, but the guest books of the initial period are not fully complete: a few dozen pages are missing. It is therefore no longer possible to determine exactly who came to Franeker to view the planetarium instrument in the very beginning.

An inventory of the guest books up to and including September 1828 shows that in the first 45 years there were at least five thousand visitors – mostly men, but also more than four hundred women. Families also came visiting, but it is unknown how many children were there: not every individual visitor signed the guest book.

Most of those interested came from the Netherlands, but there were also many visitors from Germany, England, France, Belgium, Switzerland, Scotland, Denmark and Russia. Most of them were students and professors, but many teachers, priests, vicars, seafarers and government officials also visited. The reactions they left show that they were impressed by the Planetarium.

34. Some of the Planetarium's guest books.

35. Guest book Planetarium, 1805-1806.

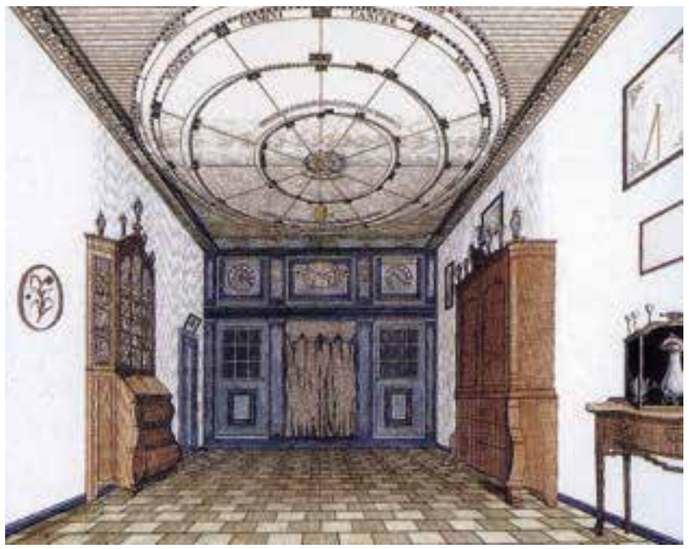
A new owner

On 28 December 1825, the Planetarium was taken over by the state by royal decree. It is unclear exactly how this special recognition had come about. The only thing that is certain is that the King of the Kingdom of the Netherlands at that time, William I (1772-1843), was very interested in science and had visited the Eisinga Planetarium as early as 1818. In addition, a reprint of the booklet by the recently deceased professor Van Swinden had been published in 1824, with an afterword urging the preservation of the instrument.

At the transfer, Eisinga received a sum of ten thousand guilders and the insurance of free lodging for him and his descendants. In addition, an annual allowance of two hundred guilders was made available for the person who was to keep the Planetarium in operation. In 1826, the state also took over the costs of maintaining the Planetarium building. This safeguarded the future of the planetarium instrument and the educational function of the Planetarium.

Minor adjustments

Two illustrations of the planetarium room have survived from the early 19th century. The oldest is the one by Claas Johannes Sannes from 1820, which four years later appeared in print **<36>.** The second image is to be seen on the portrait that Willem Bartel van der Kooi made of Eisinga in 1827. These pictures show, among other things, that the doors on either side of the closet-bed had originally been fitted with rod windows, while seven years later they were depicted as panel doors **<37>.**



36. Planetarium room, engraving 1820, by Barentie Willem Dietz (1798-1864), after Claas Joh. Sannes (1763-1830).

37. Portrait Eise Eisinga, 1827, by Willem Bartel van der Kooi (1768-1836).

Eise Eisinga died on 27 August 1828. He was succeeded by his son Jacobus. During Jacobus' management, the house underwent at least two architectural adjustments, of which some were indirectly related to the Planetarium. In 1838, the access to the mechanism was improved, sacrificing Eisinga senior's small study. And in 1848, larger windows were added in the northern facade to allow more light into the planetarium room. Also on that occasion, the floor above the mechanism was replaced by loose planks, in order to facilitate annual maintenance.

Last occupants

A year after Jacobus Eisinga's death in 1858, the state donated the Planetarium to the municipality of Franeker, under the obligation to maintain and conserve the planetarium instrument at all times. The management task was taken over by widow Feddigje Eisinga-Hoppers, who after her death in 1881 was succeeded by her daughter Jeltje Fogteloo-Eisinga. In 1908, the latter passed the baton to her daughter Hiltje Fogteloo – the last descendant of Eise Eisinga who lived in the Planetarium building.

The very last to move into the building was curator Klaas van der Valk, who stayed there from 1923 to 1930. Since then, the house has been uninhabited, but always open to visitors. For the later curators, the Planetarium building was and is an 'ordinary' workplace.

38. Eise Eisingastraat (left), situation 1908.

39. Situation Eise Eisingastraat 2, 3 and 4. Postcard around 1910.

40. Franeker, unveiling monument Eisinga, 27 August 1928.

National monument and designation 'Royal'

On 21 February 1967, the planetarium building was registered as a protected monument, as referred to in the Heritage Act (national monument). A blue and white shield adorns the front, as a sign that the building must be protected in times of war on account of its great cultural heritage value, as laid down in the Convention for the Protection of Cultural Property in the Event of Armed Conflict (1954).

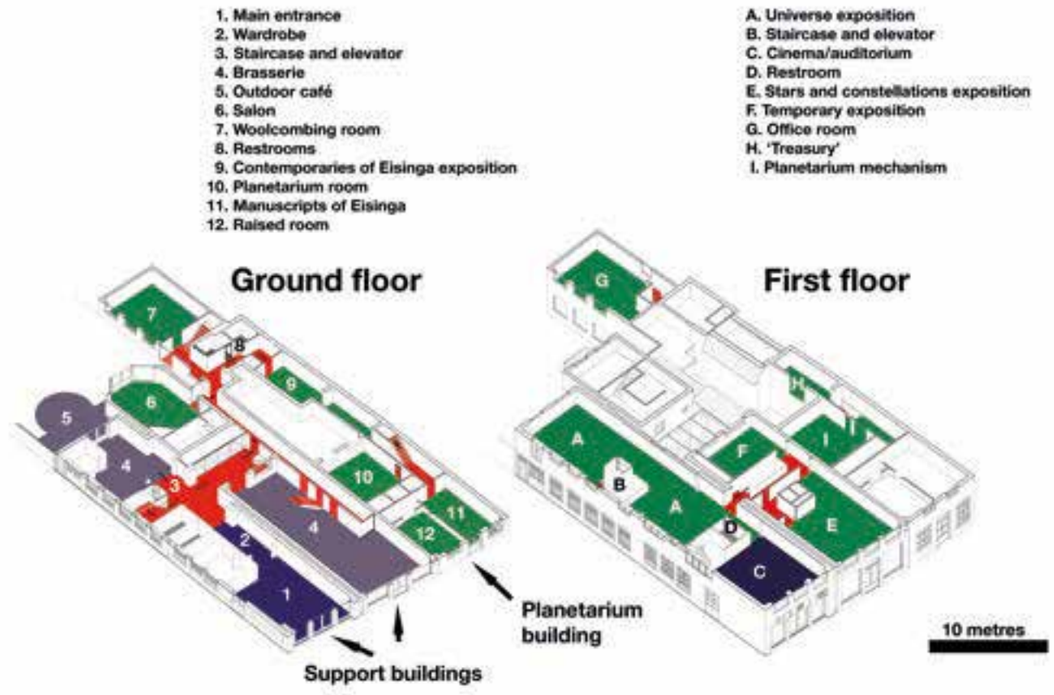
Another important milestone for the Planetarium was the celebration, in 2006, of its 225th anniversary. On that occasion, the Planetarium received the right to bear the designation 'Royal'. This designation has existed since 1807 and is only awarded to Dutch institutions that occupy a very important place in their field, are of national significance and have existed for at least a hundred years.

Support buildings

Since 2008 and 2016 respectively, two neighbouring buildings are playing a supporting role in the functioning of the Eisinga Planetarium **<41, 42>**. Neither of these buildings is indispensable, but they have significantly increased the reception capacity of the Planetarium. The building that houses the nominated property itself (Eise Eisingastraat 3) remained untouched.

The adjoining building 'De Tuinkamer' (Eise Eisingastraat 2) accommodates a brasserie and exhibition space. The building next to that (Eise Eisingastraat 1) functions as a visitors centre, exhibition space and a spacious auditorium/ cinema. A beautiful city garden has been opened up at the back, which is used as an outdoor café. From the visitors centre, one is led to the back entrance of the actual Planetarium building. The original entrance to this building has been closed to relieve the pressure on the nominated property.

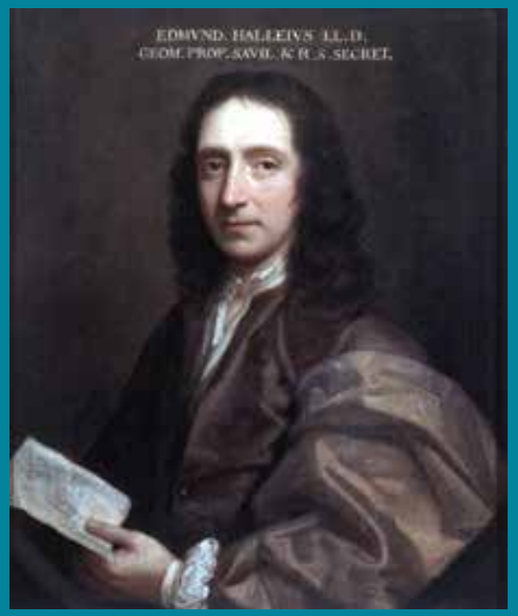
As early as 1992, a small building behind the Planetarium has also been put into use as a support building. In this room an exhibition on the processing of wool is set up **<165-167>.**



41. Planetarium, floor plan. Edition Royal Eise Eisinga Planetarium.

42. From left to right: the Visitor Centre, building 'de Tuinkamer' and the Planetarium building.

The universe of the 18th century



43. Sir Edmond Halley, oil on canvas painting (around 1690) by Thomas Murray (1663-1734).

44. Sir William Herschel, engraving.

In 1774, the year that Eisinga started building his Planetarium, the universe still seemed to be small and orderly. There was the sun, around which the six planets with their possible moons and – as the English astronomer Edmond Halley (1656-1742) had shown – also the comets moved **<43>.**

In addition, of course, there were the 'fixed' stars, some of which evidently changed their position or brightness. New stars (novae) had even appeared in the firmament, which later faded out again. In short: the ideal picture of the perfect, unchanging sphere of the stars had definitely become untenable.

How far away the stars were was uncertain, but they had to be much further away than the planets. Although the distances of the latter were not yet known very accurately either, it had been clear from the second half of the 17th century that the earth must be roughly 150 million kilometres from the sun. This meant that the distance of the at that time furthest known planet, Saturn, was almost 1500 million kilometres.

In this context, Eisinga started to build his Planetarium. Therefore, it includes only the sun, the moon, six planets and a revolving star chart. He should not have waited much longer, because in 1781 – the year in which Eisinga completed his life's work – the German-British astronomer William Herschel (1738-1822) discovered the seventh planet, Uranus **<44, 45>.**

If Eisinga had wanted to include this planet in his ceiling, the scale of his model would have needed to be almost twice as small, and the three inner planets – Mercury, Venus and Earth – would have been driven into a tight corner.

45. Telescope of William Herschel by which Uranus was discovered.

3. Justification for inscription

3.1 INTRODUCTION

The Eisinga Planetarium is proposed for inscription on the World Heritage List in recognition of the special position this historical instrument has occupied since 1781 in the dissemination of astronomical knowledge to a wide audience.

Because science-related properties are underrepresented on the World Heritage List, and the scientific value of cultural properties related to astronomy is not always recognised, UNESCO started a thematic initiative on astronomy and world heritage in 2003. Five years later, UNESCO and the International Astronomical Union (IAU) began collaborating on this initiative, resulting in the establishment of a Working Group on Astronomy and World Heritage.

ICOMOS, in collaboration with this working group, has produced the thematic study *Heritage Sites of Astronomy and Archaeoastronomy in the context of the UNESCO World Heritage Convention,* which was published in two volumes in 2010 and 2017. In 2019, this initiative resulted in the addition to the World Heritage List of the Jodrell Bank Observatory and the cultural landscape 'Risco Caído and the sacred mountains of Gran Canaria', which includes two archeoastronomy sites dedicated to the sun and the moon.

In the ICOMOS study, four categories of astronomical heritage are distinguished:

- Properties which by their concept and/or the environmental situation have significance in relation to celestial objects or events;
- Representations of the sky and/or celestial objects or events;
- Observatories and instruments;
- Properties with an important link to the history of astronomy.

Whilst mechanical planetariums and related objects, such as the Eise Eisinga Planetarium presented here, are not explicitly mentioned in the thematic studies, they fall within the second category: they are moving representations of the sky and/or celestial objects.

The Eisinga Planetarium is a completely unique expression of the age-old and universal fascination that human beings feel for the universe surrounding them. It is illustrative of the value attached to scientific knowledge in 18th-century society, and the transfer of this knowledge to a wider audience. From the beginning, the Planetarium was a place where ordinary citizens were involved in astronomical science in an understandable way.

The Planetarium has served as a model for various (electro)mechanical planetariums of the 20th century, among which the orrery in the visitor centre of the Jodrell Bank Observatory. This makes the Eisinga Planetarium an exceptional educational heritage – a small heritage in size that relates to the very big one: the universe!

The preparations for this nomination file have in 2010 resulted in the addition of the Eisinga Planetarium to the Tentative List of UNESCO World Heritage Sites of the Kingdom of the Netherlands. This relatively long start-up period has been used to explore in depth the planetarium instrument and the building to which it is inextricably linked. The knowledge gained in this process not only emphasises the authenticity, integrity and uniqueness of the property, but will also serve as a guideline for its future management and preservation.

3.1.A BRIEF SYNTHESIS

The Royal Eise Eisinga Planetarium is the oldest continuously operating planetarium in the world. This accurate working model of our solar system, built between 1774 and 1781, presents a combination of technology, precision and craftsmanship that was very special in the 18th century – particularly because it consists of simple but robust components, such as wooden hoops and discs, and iron pins. The instrument was built by a mathematically skilled citizen.

The Planetarium is in its original state and consistently provides an up-to-date and realistic image of the positions of the sun, the moon, the earth and the five other planets that were known at the time. The mechanism, which is powered by a single clock, is built into the ceiling and at the top of the closet-bed of a civilian living/bedroom. The room itself has served as a reception and presentation area from the very beginning.

The planets hang like wooden balls from metal rods, that protrude through the slots in the ceiling. The ceiling itself has a painting which is both functional and beautiful. Against a Prussian blue background, the planetary orbits are indicated by white lines of variable width, with black lettering and gold symbols. Around these, in a similar manner, the circles of the zodiac and the twelve months are painted. The smaller dials on the ceiling and above the closet-bed show the same aesthetic colour schemes.

The Eisinga Planetarium stems from a citizen's initiative, aimed at educating a broad public about the movements of the planets around the sun and relative to each other – an educational function which it has maintained to this day. In addition, the instrument provides extensive information about the mutual positions of the sun, the moon and the stars – functions lacking in most other planetariums from the early modern period.

The combination of the permanent presentation, the diversity of functions and the presence of a reception and presentation area is totally unique for a planetarium dating from a time when the vast majority of planetariums were 'mobile'. It makes the Eisinga Planetarium a very early predecessor of the ceiling and projection planetariums of the 20th and 21st centuries.

Although more than two centuries have passed since its completion, the Eisinga Planetarium has not lost any of its eloquence, functionality and accuracy. The well-maintained instrument still functions as it did in 1781, and visitors are still given an explanation there about the functioning of our solar system – just as its maker intended. Provided that it is properly maintained, the instrument will continue to present an accurate picture of the solar system for many years to come.

The Outstanding Universal Value of the Eisinga Planetarium is reflected in the following tangible attributes:

- the mechanism of wooden hoops and discs, fitted with approximately six thousand iron pins that function as cogwheels;
- the pendulum clock with nine weights that powers the mechanism;
- the Prussian blue and gold painted ceiling along which the planets move, including the spheres of the sun and the earth, attached to cords, and in which five dials are fitted;
- the closet-bed wall, painted in the same colours, in which seven dials are fitted and in which the weights of the pendulum clock are hanging;
- the space above the ceiling, housing the combination of pendulum clock and cogwheels, which functions as a gear; and
- the room under the planetarium instrument, which serves as reception and presentation area.

In addition, the following movable attributes are not part of the property but also important in relation to the OUV of the Eisinga Planetarium:

- The description of the Planetarium, drawn up by Eise Eisinga in 1784 for his sons. This handwritten document, which is kept in the Franeker municipal archives, contains a complete description of the functioning of the planetarium instrument and detailed instructions for its maintenance. It has played a key role in the survival of the instrument.

- The guest books, kept since 1783. They are proof that the planetarium room has been used for educational purposes from the very beginning and has attracted (for its time) large numbers of visitors.

3.1.B CRITERIA UNDER WHICH INSCRIPTION IS PROPOSED AND JUSTIFICATION FOR INSCRIPTION UNDER THESE CRITERIA

It is proposed to inscribe the Eisinga Planetarium under criteria (i), (iii) and (iv).

Criterion (i): Represents a masterpiece of human creative genius

The Royal Eise Eisinga Planetarium is an iconic example of an 18th-century orrery, representing exceptional creativity in both its extraordinary technical design and execution, and artistic expression. It is the world's oldest functioning planetarium where visitors can walk in to be informed about what is happening in the skies.

The Eisinga Planetarium is ingeniously built into the ceiling and the closet-bed wall of the living room of a former civilian home. That way it was possible to build a large orrery and use the underlying room as a reception and presentation area – just as in modern planetariums.

The orrery, which is in operation almost continuously since 1781, was designed and built by an ordinary citizen, with the use of ordinary materials. This opened the way for unprecedented design solutions that resulted in a very sophisticated instrument. It allows the beholder to see the current positions of the planets and the moon at one glance.

The fact that the Planetarium is still in working order, is largely due to the creative genius and foresight of its maker, the Frisian wool manufacturer Eise Eisinga, who left detailed instructions for the maintenance of his instrument.

The orreries of the 18th-century were usually portable, small-scale representations of the solar system, built by professional clockmakers using precious materials. They were used for demonstrative purposes in academic settings or as prestigious collector's items for the select upper class of society.

The maker of the Eisinga Planetarium, however, was not a professional clock maker or a scientist: he was a wool manufacturer with a knack for mathematics and mechanics, and a special interest in astronomy. Although he was well-off, he did not have the financial means to commission a professional clockmaker to buid him a large orrery. He therefore decided to make one himself.

In order to build a planetarium that would be large enough to show the planetary orbits in their correct proportions, Eisinga needed a large surface area, and that meant there was just one spot where he could put his orrery: the ceiling of his living room. It wasn't the first time someone thought of placing an orrery overhead – Ole Rømer had done that a century earlier – but it almost certainly was the first time that someone built a ceiling-mounted orrery this size.

Eisinga's way of translating his astronomical knowledge and mechanical expertise into an orrery was unique. Most 18th-century orreries employed fine-mechanical gear trains like those used in horology. Eisinga's mechanism, however,

mainly consists of wooden hoops with inserted iron pins. These pins form the 'teeth' of crown wheels, spur wheels, or the staffs of lantern wheels, fixed on wooden or metal shafts. This mechanism is regulated by a pendulum clock, made of brass cog wheels and an iron anchor – the only part acquired from a professional clockmaker.

The gear trains of wooden wheels with pins show some similarity with those in traditional tower clocks and wind or water mills. But no evidence exists about Eisinga's familiarity with these particular technologies. And besides: in these mechanisms the pins were usually the same material as the wheels. The combination of wooden wheels with iron pins inserted does however bear some similarity to the few surviving mechanical theatres of the 18th century.

The skill of inserting iron pins into wood was certainly available to Eisinga, as the hand-held combs for wool combing had oak wood handles with dense rows of long iron spikes. The resistance and durability of that combination were obvious to him from every day experience. The tools for drilling holes, inserting and cutting pins must have been at hand. He could conceive the gears of his orrery as wooden disks, and the planetary wheels as wooden rings of oak with rows of iron pins inserted along the peripheries, because he knew that this assemblage would be solid and lasting.

This technique opened the way for unprecedented design solutions. For instance: to produce the variation in angular velocity Eisinga wanted to obtain for the lunar motion and the dials of sunrise/sunset, he could vary the radial distance of the pins in his crown wheels. This way he could speed up or down the motion of the model moon, exactly as the velocity of the real moon varies during its orbit around the earth.

Another remarkable fact is that the planetary motions of the Eisinga Planetarium go clockwise, and hence are modelling a south view on the ecliptic plane (the plane of earth's orbit around the sun). This distinguishes it from all other orreries of its time and emphasizes the Planetarium's spatial realism. Spatial realism is also enhanced by the mean planetary distances being (approximately) in proportion to each other as they are in the real solar system. In this, the Eisinga Planetarium is also unique: the many table orreries of his time were simply too small to use proportionally correct planetary orbits.

And last but not least, the six circular slots through which the model planets move are not exactly centred on the sun. In reality, the planets of our solar system travel in elliptic orbits, but an appropriately chosen circular orbit is a good approximation of that. In this way, one can mimic the varying velocities with which the planets move around the sun. In very few orreries of the 17th and 18th century this 'trick' is used to address the movements of the planets.

Thanks to the eccentric positions of the planetary orbits, the angular velocities of the planets as seen from the sun approach those in nature. This configuration allows the beholder to see the current positions of the planets at one glance. All this makes Eisinga's Planetarium an outstanding astronomical mechanism.

Criterion (iii): Bears a unique testimony to a living cultural tradition

The Royal Eise Eisinga Planetarium bears a unique testimony to the cultural tradition of presenting and providing insight into celestial phenomena, using technology. This is a universal tradition, going back thousands of years, that lives on to this day.

It still functions exactly as it did when it came into operation in 1781 and, according to the consecutive series of guest books, all this time retained its inspiring educational function – receiving and educating visitors in a space where they can see the solar system and the starry sky portrayed above their heads.

Since its completion in 1781, the mechanism has been maintained according to its maker's instructions. Thanks in part to these extensive maintenance instructions, the Eisinga Planetarium continues to present the accurate positions of the sun, the moon and the planets of our solar system.

> *"Every theory requires some kind of model to help explain it to others and convince them of its truth. This model might take a variety of forms – a wall painting, a machine, a painted dome, a projection system, a computer animation – according to the requirements of the theory and the custom of the time." – William Firebrace, Star Theatre, The Story of the Planetarium (2017).*

With the advent of the heliocentric world view, from the second half of the 16th century onwards, the possibility of imitating the movements of the planets by using small mechanisms arose. Such a mechanism could be driven by a hand crank, but also by a clock. This fitted in well with the emerging idea that the universe was an enormous cosmic clock that had been wound in the distant past and would continue to run until the end of time.

This development gave rise to the (almost literally) universal cultural tradition of building planetariums – at first very small, but with time growing into colossal domed or spherical buildings.

The 18th-century Eisinga Planetarium occupies a special position in this tradition. Together with the planetariums built by Jacob and Hüttig at Bolesławiec (Poland) that are lost today, it is among the earliest room-filling planetariums outside a courtly or university setting. That makes it a typical product of its time and culture. It brought the solar system to a very ordinary Frisian living room, and thus to ordinary citizens.

The elaborate large-scale model of our solar system quickly attracted international attention. That in itself is already proof that the Eisinga Planetarium bears an exceptional testimony to a living cultural tradition, but that is not the whole story.

Eisinga already realised that, in order to reach a wider audience, he would have to build an even more impressive planetarium – if only to make room for the planet Uranus, discovered in 1781. For one of his designs he even envisioned a dome, not unlike the domes used in modern projection planetariums, in which his new large orrery would be placed. Via a staircase, visitors would get an overwhelming impression of the universe.

His beautiful plans came to nothing because of the high costs involved, but the idea of making celestial phenomena understandable with the help of a planetarium persisted. Some of the planetariums that were built in the 19th and 20th century, such as Perini's Planetarium and the Copernican Planetarium of the Deutsches Museum, show some remarkable similarities with the Eisinga Planetarium, although so far a direct link could not be established.

However, this does not alter the fact that the Eisinga Planetarium is the oldest of its kind: a planetarium that, due to its design, is inextricably linked to a building, which functions as a permanent reception area where people are informed about what is going on in the universe – a principle that lives on in all modern planetariums.

Criterion (iv): An outstanding example of a technological ensemble which illustrates a significant stage in human history

The Royal Eise Eisinga Planetarium illustrates a significant turning point in human history: the democratisation of science, which has permanently changed society. It is typical of the importance attached to the transfer of knowledge to a wider audience in 18th-century society. The intertwining of the instrument with the ceiling and the closet-bed of an existing living room symbolises, as it were, the increasing linkage of science and society.

The Planetarium was built by an ordinary citizen and was from the outset intended and used for educational purposes. Educated citizens could read the current celestial positions of the planets at a glance, and interested laymen were given insight into the 'functioning' of the solar system, based on the explanation provided at the instrument. This makes the Planetarium an object that bridges the gap between people of different educational levels and social classes.

As a technological ensemble, it continues to contribute to the dissemination of astronomical knowledge, and in particular the heliocentric worldview, in society.

It is clear that Eise Eisinga originally didn't intend his planetarium for a general audience. Many elements of the instrument could only be appreciated by a public that was already well informed about the modern ideas about the movements of the moon and the planets – well-educated amateur astronomers. But it soon turned out that it very much appealed to the wider public too.

A substantial part of the first guest book that Eisinga kept is missing, but he himself estimated that until the summer of 1787, the Planetarium already drew more than a thousand visitors. More precise figures are available for the period from 1783 onwards, because from that year the series of guest books is complete.

An inventory of the guest books up to and including September 1828 has shown that in the first 45 years there had been at least five thousand visitors – mostly men, but also more than four hundred women. Even families came visiting, but it is unknown how many children came along: not every individual visitor signed the guest book. However, it is clear that even during this early period, people from all walks of life visited the Eisinga Planetarium. Most of them were students and professors, but many teachers, priests, vicars, seafarers and government officials also rang the doorbell. And they came not only from the Netherlands, but also from Germany, England, France, Belgium, Switzerland, Scotland, Denmark and Russia.

There are no first-hand accounts available of exactly what explanation visitors to the Planetarium received. The earliest written account can be found in a letter from the Frisian student Marten Martens, who visited Eisinga in 1794 during his exile in Visvliet, in the neighbouring province of Groningen:

> *"He manufactured a Planetarium in a room suitable for it in Franeker, where the viewer, sitting at a table sipping tea or coffee, smoking a pipe of tobacco, may observe the manifold movements of the heavenly bodies in their correct time, with one glance of the eye."*

Eisinga himself has not written down what he told his visitors. However, we can deduce from Martens' description that it must have been a rather homey affair (and in a sense it still is!). Because up to 1923 direct descendants of Eise Eisinga kept the Planetarium running, it seems likely that the type of information they gave their visitors did not change much from generation to generation. The same oral tradition was maintained by their later successors, who presumably adapted the content of their presentations to the current state of knowledge.

All in all, it is clear that Eisinga, intentionally or unintentionally, fulfilled a great need when he installed a planetarium in his living room and started using it – illustrative for his time – as an astronomical visitor centre. This has allowed many generations to become acquainted with the wonders of our solar system in an accessible way.

46. The building Eise Eisingastraat 3 is the load-bearing structure for the planetarium instrument.

3.1.C STATEMENT OF INTEGRITY

All the tangible elements and attributes required to express the Outstanding Universal Value of the candidate for nomination sit within its boundaries. The property is owned solely by the municipality of Waadhoeke, in the north of the Netherlands, and consists of six tangible attributes. Since the Royal Eise Eisinga Planetarium is still in full use, it is subject to wear and tear. But thanks to a very strict maintenance regime, almost all of the original parts have been preserved. The integrity of the property is therefore 100%.
The whole is inextricably linked to the building Eise Eisingastraat 3.

The mechanism
The mechanism of the Royal Eise Eisinga Planetarium, hidden in the ceiling of the Planetarium chamber, consists of sixty wooden hoops, shafts and pinions and is driven bij a single pendulum clock **<48>.**
Major damage has rarely occured, but during a bombing raid in World War II, on the night of 25 April 1942, a bomb fell into the canal about 150 metres from the Planetarium. The vibrations brought the cogwheel mechanism to a standstill and the Mercury wheel broke in two. It was replaced by an identical one, after which the mechanism was put back into operation.
The cog mechanism is checked annually by a watchmaker. Where necessary, small parts, such as the bushings in which the shafts rotate, are replaced 'like-for-like'. In the course of the centuries, some pins have been replaced and the planet wheels were reinforced in some places.
In spite of these adjustments, the mechanism is still complete and continues to work according to its original design.

47. Overview photograph Planetarium.

48. The mechanism of wooden hoops and discs, fitted with approximately six thousand iron pins that functions as a gear.

The pendulum clock

The pendulum clock was made by a local clockmaker and consists of four cogwheels with an escapement and a pendulum with a length of 70 centimetres. The cogwheel mechanism is driven by the pendulum clock and nine lead weights with a total weight of almost 60 kilograms. These weights have to be raised manually, at intervals of five days to six months **<49-51>.**

The pendulum clock and the nine lead weights are still original. However, the ropes from which the weights hang are regularly replaced. Other than that, the clock and weights are in their original state and function as intended.

49. 50. 51. The pendulum clock with nine weights that powers the mechanism.

52. 53. 54. The Prussian blue and gold painted ceiling along which the planets move, including the spheres of the sun and the earth, attached to cords, and in which five dials are fitted.

The painted ceiling

On the Prussian blue and gold painted ceiling, the sun and the then known planets are shown: Mercury, Venus, the Earth with its moon, Mars, Jupiter and Saturn. From the small dials various astronomical data can be read. All planets still move in their correct orbital periods around the sun **<52-54>.**
During major maintenance, possible minor wear spots are touched up, to keep the expressiveness of the ceiling intact. This does not affect the operation of the Planetarium.
Ceiling and dials are still fully intact and show the correct information.

The closet-bed

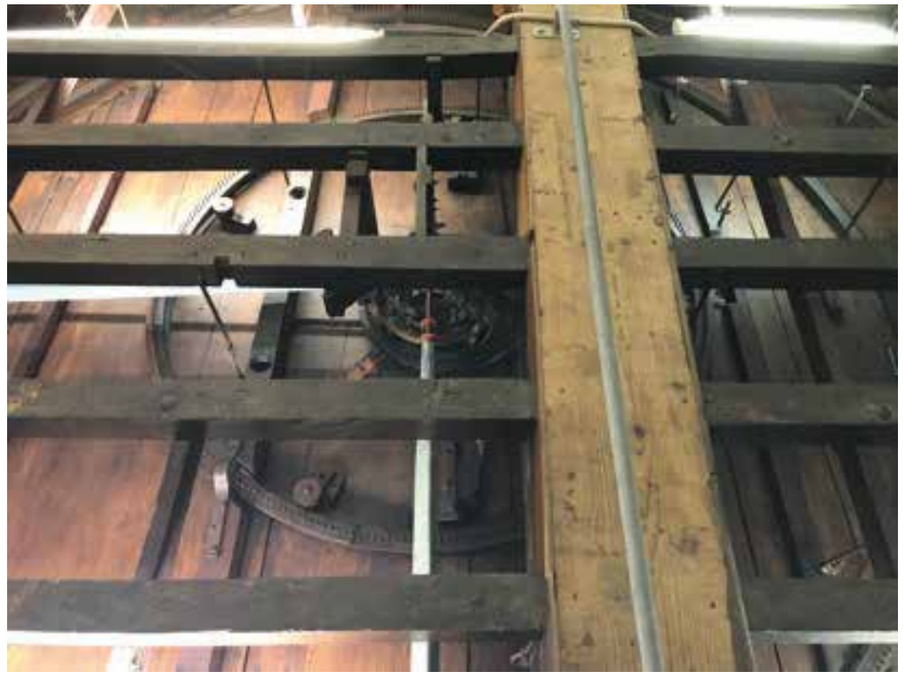
In the closet-bed wall, which is also painted in Prussian blue, seven small dials can be seen. The two cabinets on either side of the closet-bed hide the weights of the pendulum clock from sight. The left-hand cabinet contains four weights, with two counterweights next to them, and in the right-hand cabinet five weights are hanging **<55>.**
The dials are still fully intact and show the correct information. During major maintenance, possible minor wear spots in the paintwork are touched up, in order to preserve the appearance of the bedstead. This does not affect the Planetarium's operation.

55. The closet-bed wall, painted in the same colours, in which seven dials are fitted and in which the weights of the pendulum clock are hanging.

The mezzanine

The mezzanine above the ceiling houses the pendulum clock and the cogwheels. The ceiling itself is suspended from the beams of the house **<56, 57>.** The difference in height between the original beam structure and the suspended ceiling is 50 centimetres. For maintenance purposes, the cogwheels can be reached from the attic above.

At the end of the 20th century, windows were installed on the corridor side of the cogwheel mechanism. This was partly to prevent visitors from touching the cogwheels and partly to optimise the operation of the gas extinguishing system. This addition hasn't affected the mezzanine itself.



56. 57. The space above the ceiling (mezzanine), housing the combination of pendulum clock and cogwheels, which functions as a gear.

The Planetarium room

The room measures 4.05 by 5.40 metres – exactly the same as the ceiling showing the current position of the planets. On the south side of the room is the bed box, with a cabinet on either side. On the north side there is a modest kitchen arrangement.

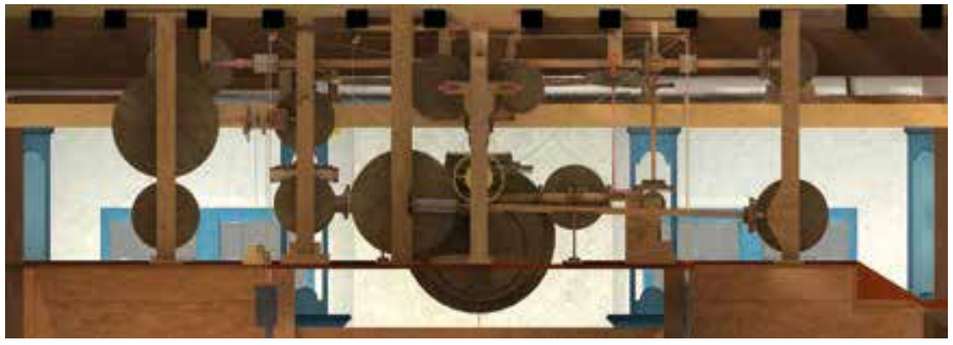
In 1890-1891 the room has undergone some changes: the original wooden floor was replaced by a tiled floor, the windows on the north side were enlarged (to let in more daylight) and the walls have been panelled with tiles.

These alterations haven't affected the planetarium instrument, nor the room's function as a reception and presentation area **<58>.**

58. The room under the planetarium instrument, which serves as reception and presentation area.

Table A. Diagram of attributes, their integrity, completeness and state of conservation.

ATTRIBUTES	INTEGRITY	COMPLETENESS	STATE OF CONSERVATION
The mechanism of wooden hoops and discs, fitted with approximately six thousand iron pins that function as a gear.	100%	100%	100%
The pendulum clock with nine weights that powers the mechanism.	100%	100%	100%
The ceiling, painted in Prussian blue and gold, along which the planets move, including the spheres of the sun and the earth, attached to cords, and in which five dials are fitted.	100%	100%	100%
The closet-bed wall, painted in the same colours, in which seven dials are fitted and in which the weights of the pendulum clock are hanging.	100%	100%	100%
The mezzanine above the ceiling, housing the combination of pendulum clock and cogwheels.	100%	100%	100%
The Planetarium room which serves as a reception and presentation area.	100%	100%	100%



59. 60. Cross section at the level of the mezzanine with the cogwheels.

3.1.D STATEMENT OF AUTHENTICITY

Use and Function

The Eisinga Planetarium has been in operation just about continuously since 1781, and can be viewed at close quarters almost daily. In the planetarium room, small groups of visitors are given an explanation about the functioning of the instrument and of our solar system. This functional continuity is a crucial part of the OUV of the site. Its authenticity is reflected in the almost complete series of guest books that have been kept from the very beginning.

Form and Design

The planetarium instrument, with its various components, has remained unchanged since its completion in 1781. Its authenticity is confirmed, for example, by the first complete description of it, published in 1780 by Franeker professor Jean Henri van Swinden, and by the description with maintenance instructions drawn up by Eise Eisinga in 1784.

Other documents that substantiate the authenticity of the property are the engravings by Claas Johannes Sannes dating from 1820, and the portrait painted by Willem Bartel van der Kooi of Eisinga and his Planetarium in 1827. The earliest known photographic depiction of the Planetarium dates from the period 1891-1895.

The fact that the visitor views the model of the solar system from below emphasises the spatial realism. This effect is enhanced by the correct proportions in which the distances of the planets from the sun are shown. In this respect, the Eisinga Planetarium is very special.

The Planetarium has proved to be a source of inspiration for later ceiling planetariums. The setup of the Copernican Planetarium (destroyed in 1944), built in 1923 in the Deutsches Museum in Munich, for example, bears clear similarities to the Eisinga Planetarium – including the use of a pointer **<61>.** The same setup was used in two American planetariums (Hayden and Morehead; both demolished at the end of the 20th century) **<62>.**

61. Munich [G], Deutsches Museum, planetarium.

62. New York [USA], Hayden Planetarium, Copernican Hall, 1944

The much more modern ceiling planetarium in the visitor centre of the Jodrell Bank Observatory is also known to have been inspired by the Eisinga Planetarium **<63>.** In addition, several simplified versions of the Eisinga Planetarium have been produced in the Netherlands: the Achterhoeks Planetarium in Toldijk (1988) and the Planetarium Zuylenburgh in Oud-Zuilen (2009) **<64, 65>.**
The replica of the Eisinga Planetarium in the exhibition space of the Nagoya City (Japan) planetarium deserves a special mention. The 'ceiling' of this replica shows a projection of the ceiling painting of the Eisinga Planetarium **<66>.**

63. Macclesfield [UK], Jodrell Bank Orrery.

64. Toldijk [NL], planetarium after Eisinga, 1988.

66. Nagoya [JAP], planetarium after Eisinga.

65. Oud-Zuilen [NL], planetarium after Eisinga, 2009.

Material and Substance

The planetarium instrument consists mainly of wooden parts. The only metal components are the clock that drives the instrument, the pins that act as the 'teeth' of the crown wheels and cogwheels or as the bars of pinions, and the 'hour lines' of the 'Square of Heaven' (the revolving star chart).

As noted in the Integrity section, the property has remained entirely complete, albeit that in the period since 1781, when the Planetarium came into operation, some parts had to be replaced or reinforced. For example, after World War II the wheel of the planet Mercury was replaced, because it had been damaged during a bombing raid on the city of Franeker.

During the 1997 restoration, non-authentic additions were removed and the instrument was returned to its original state, with Eisinga's handwritten maintenance instruction – which is kept in the Franeker municipal archives and which has also been digitised – serving as a guideline. Wherever possible, authentic materials have been used and parts have been manufactured in accordance with the original version. This restoration has been excellently documented: the report is to be found in the planetarium library.

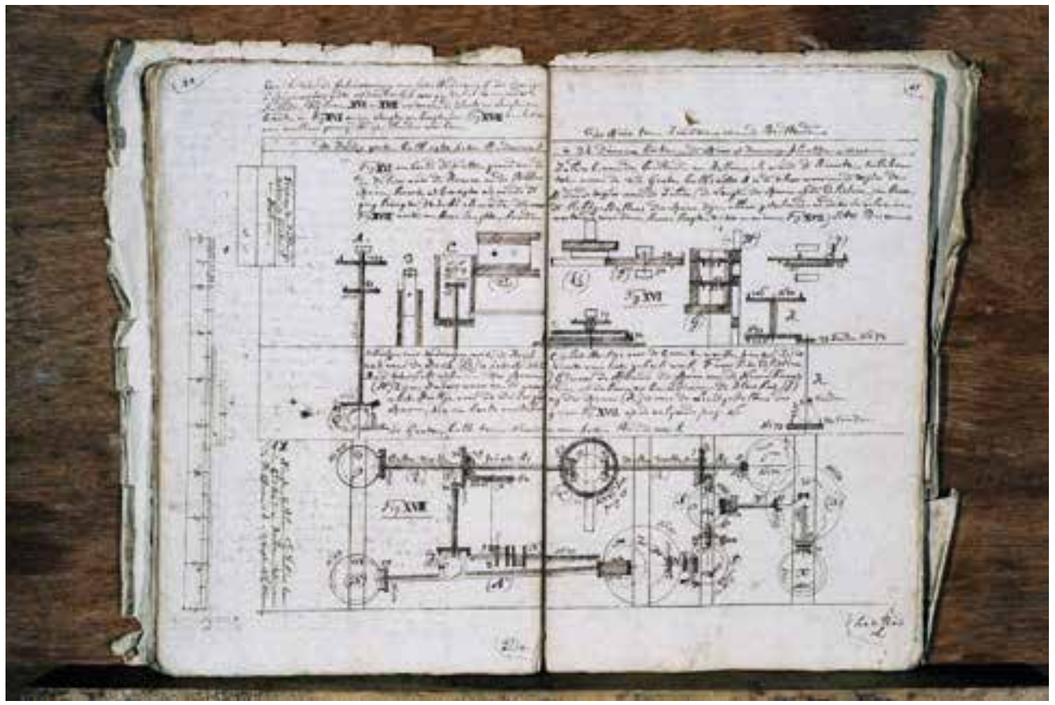
The ceiling has also been repainted and retouched a number of times. During the restoration work in 1997, a layer of wrongly composed Prussian blue, which turned greener over time, was removed.

Every twelve to fifteen years, the planetarium instrument undergoes major maintenance. In addition, the cogwheels are cleaned, lubricated and waxed annually. All this work is carried out by regional professionals, under the supervision of the curator. Because the property consists mainly of wooden parts, these are checked every two years for the presence of woodworm and longhorn beetle.

Traditions, techniques and management systems

For nearly a quarter of a century from December 1825, the Planetarium was owned by the state, which saw to it that it remained open to the public and was well maintained. In 1859, the Planetarium was transferred to the then municipality of Franeker, which on 1 January 2018 merged to form the municipality of Waadhoeke. Since then, the latter municipality has guaranteed the opening and the maintenance of this outstanding cultural heritage.

The continuity of maintenance is based on the handwritten maintenance instruction compiled by Eise Eisinga in 1784 **<67>.** A specific part of this is the repainting of the so-called yearboard of the Planetarium, which shows the actual year and must be given a new series of dates once every 22 years – a task passed on from one curator to the next.



67. Instruction manual maintenance Planetarium, by Eise Eisinga, 1784.

68. Explanation in the planetarium room with the aid of a pointer.

Ever since the inauguration in 1781 (with the exception of the period 1790-1797), the workings of our solar system have continuously been explained, with the aid of a simple pointer, in the room below the Planetarium. Until 1922, this educational task was assigned to the descendants of Eise Eisinga, who also lived in the Planetarium building. Since then, an external managing director has been responsible for the presentation. Because the number of visitors has gradually increased significantly since Eisinga's time, the explanation can no longer be taken care of by the managing director alone. These days, he is assisted in this task by a staff of co-workers **<68>.**

Location and Setting

The Royal Eise Eisinga Planetarium is located at
N 53°11'14.55"; E 5°32'37.51".

Since the inauguration of the Eisinga Planetarium in 1781, the nature of the property and its immediate setting have not changed substantially. The most important part of this setting is the former residence at Eise Eisingastraat 3. The planetarium instrument is inextricably linked to this building, which has consequently become an exemplary place for the democratisation of science.

The house is located in a 15th-century expansion of the city of Franeker. It is situated on the north side of a canal, immediately to the east of a bridge that used to be much wider. On the other side of this bridge, Franeker town hall is situated.

The house had its own quay by the water – an ideal place for a future wool manufacturer. Eise Eisinga moved into this building in 1768, which was also the year in which the current bell gable was built. In the rear annex he established a woolcombery; between 1774 and 1781, the Planetarium was accommodated in the back room of the front house. Since then, the house has served as the setting for the Planetarium.

69. Franeker Protected Cityscape.

3.1.E PROTECTION AND MANAGEMENT REQUIREMENTS

The property has been maintained in accordance with the handwritten maintenance instruction drawn up by Eise Eisinga in 1784. In this instruction, it is described in detail how the planetarium instrument works, and also how certain parts can be removed and put back. It also explains how the instrument can be adjusted if parts are out of alignment.

In 1967, the canal house of which the property is part was designated as a national monument by the state. A permit is required for changes to monuments, in which respect it is carefully considered whether the plans are in accordance with the monumental values.

Another important protection regime applies to the buffer zone of the property: the status of protected cityscape. Since 1979, the entire inner city of Franeker has been subject to this regime. A protected cityscape, townscape or villagescape is an area in a city, a town or a village with a special cultural heritage character. This protection is aimed at the historical characteristics, the urban planning structure and the layout of the public space.

The protection of the buffer zone has been given an important place in the zoning plan for the inner city of Franeker. The entire buffer zone falls within the boundaries of one zoning plan, namely the 'Franeker – Inner City' zoning plan dating from 2016. The starting point of this zoning plan is to consolidate the characteristics of the historic inner city.

The care for the preservation of cultural heritage in the physical living environment and for world heritage will be transferred to the Environment and Planning Act, which is expected to enter into force on 1 July 2022. At that time, both the granting of permits for national monuments and the protection of protected cityscapes, townscapes and villagescapes will also be transferred to the Environment and Planning Act. In respect of the latter, municipalities must provide adequate protection in the (municipal) environmental plan.

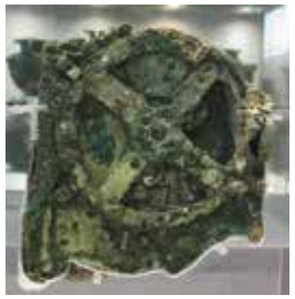
World Heritage occupies a special, state-controlled position in the Environment and Planning Act. The state provides mandatory instruction rules for provinces and municipalities in order to regulate matters in their environmental ordinance or environmental plan. All the rules relating to the physical living environment are included in the environmental plan. This concerns a balanced allocation of functions to locations (comparable to the current designations), as well as rules in respect of activities with consequences for the physical living environment.

Since 1859, the Eisinga Planetarium, including the building of which it is a part, has been owned by the municipality. Nowadays, this is the municipality of Waadhoeke, which was created by the merger of the former municipalities of Franekeradeel, Het Bildt and Menameradiel, and four villages of the former municipality of Littenseradiel.

Since 2001, the management of the Planetarium has been in the hands of the Royal Eise Eisinga Planetarium Foundation. The day-to-day business is carried out by a managing director and nine co-workers. Subsidy agreements are in force between the municipality of Waadhoeke and the Planetarium, and between the province of Fryslân and the Planetarium, on the basis of which the Planetarium's targets are realised.

3.2 COMPARATIVE ANALYSIS

This section compares the nominated property with similar properties, regardless of whether these are on the World Heritage List or not. It opens with a discussion of astronomy in a world heritage context and of planetariums in a historical context. Based on this, the list of comparison features and criteria is drawn up. The various objects are then compared on the basis of these criteria, indicating in what aspect(s) the nominated property distinguishes itself nationally and internationally.



70. Mechanism of Antikythera [GR].

3.2.A ASTRONOMY AND WORLD HERITAGE

In order to arrive at a list of possibly comparable properties, it is important to place planetariums in the broader context of astronomical world heritage.

Comparable properties on the World Heritage List and the Tentative Lists
In the context of the two-part thematic study *Heritage Sites of Astronomy and Archaeoastronomy in the context of the UNESCO World Heritage Convention,* a list has been drawn up of World Heritage Sites that are possibly astronomy-related (https://www3.astronomicalheritage.net/index.php/world-heritage-list). It should be noted that the vast majority of the sites on this list are not related to modern scientific astronomy or its history.

Not much has changed in that respect since the publication of the second part of the thematic study in 2017, although in 2019 the modern Jodrell Bank Observatory was added to the World Heritage List. Also on the national Tentative Lists there are some modern candidates: the Astronomical Observatories of Ukraine (AOU; nominated in 2008), the Helwan Observatory in Egypt (2010) and the Astronomical Observatories of Kazan Federal University in the Russian Federation (KFU; 2020).

The aforementioned observatories have a modern projection planetarium for educational purposes. However, planetariums as stand-alone entities are not explicitly mentioned in the thematic study. There are no planetariums on the World Heritage List either. The only planetarium that is to be found on the Tentative Lists is the Eise Eisinga Planetarium.

Planetariums in a historical context
Since the beginning of the 20th century, and especially during the past decades, interdisciplinary research has provided strong indications that man even in prehistoric times observed certain celestial phenomena, and thought about his place in space and time. There is also little doubt that astronomy played an important role in the early cognitive development of humankind. As early as the Upper Palaeolithic, images were produced of the sun, the moon, bright planets and stars.

When contemplating the firmament, it was evidently noticed at an early stage that the celestial bodies show cyclic movements. The observed regularity led to the devising of different types of calendars and – from ancient times – the manufacture of astronomical mechanisms.

A famous example is the mechanism of Antikythera, an 'astronomical calculator' dating from around 100 B.C., which was found in 1901 in a Roman shipwreck off the coast of the Greek island of that name **<70>.** It could be used to 'predict' the dates of solar eclipses and the times of rising and setting of the sun, the moon, the planets and the brightest stars.

In China, from as early as the 4th century B.C. a very different kind of mechanism was used to simulate the movements in the starry sky: the armillary sphere –

71. Beijing [CN], replica of Ming Dynasty's Armillary in the courtyard of Beijing Ancient Observatory.

an openwork celestial sphere, made up of a number of rings, used mainly for observations. From 52 B.C. there also existed fixed versions of this, followed not much later by specimens powered by a water clock or a timepiece. These played about the same role as the European astronomical clocks of the 14th-century, which not only indicated the time, but also the relative positions of the sun, the moon, the signs of the zodiac and sometimes also the planets **<71>.**

The mechanism of Antikythera, the Chinese armillary spheres and the astronomical clocks in Europe are in a certain sense early predecessors of the later mechanical planetariums. They were expressions of the wish to make what is happening in the sky comprehensible and, if possible, predictable. For a long time, the geocentric worldview was assumed: the idea that the earth occupies a central position, and that the sun, the moon, the planets and the stars revolve around it.

From a geocentric to a heliocentric worldview
Since the 4th century B.C., there had been doubts about the geocentric worldview among some scholars. However, it took a very long time before it was finally replaced by the heliocentric model, which states that the earth is a planet that, along with the other planets, revolves around the sun **<72>.** This shift was preceded by a long period of discussions, which fall outside the scope of this nomination document. But by the mid 17th century, the new worldview was generally accepted – in scholarly circles at least. (For a further elaboration we refer to chapter 12 of part 1 of the thematic study *Heritage Sites of Astronomy and Archaeoastronomy in the context of the UNESCO World Heritage Convention* [2010].)

The planetarium – in English-speaking nations also known as 'orrery' – was a popular visual aid in making the apparently much less obvious heliocentric

72. Copernicus, heliocentric model, around 1543, from the book 'On the Revolutions of the Celestial Spheres'.

worldview accessible to the general public. Aesthetic aspects also played a role to this: an attractive design enhances the effect of a visual aid. The instrument should not only be functional, but also please the eye and in that way stimulate interest.

As early as the 17th century, numerous mechanisms were built that showed the movements of planets, and sometimes of their moons as well. They were expensive devices, regarded in wealthy circles as symbols of scientific knowledge and material prestige.

These moving models of our solar system did not really come into vogue until the 18th century. They were used as demonstration models in public 'philosophical lectures' aimed at disseminating scientific knowledge beyond scholarly circles. Subsequently, also ordinary citizens such as Eise Eisinga also started to build planetariums.

With its civilian setting, its inextricable link with the ceiling of a living room and its large size, the Eisinga Planetarium stands out from other planetariums up to and including the 19th century. Other mechanical planetariums from this period are (or were) movable table models or cabinet models in an aristocratic, academic or ecclesiastical setting.

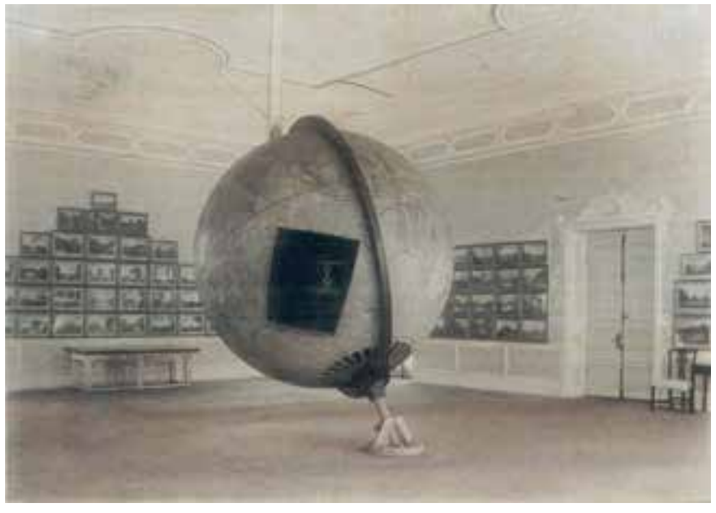
Another distinguishing element is that the mechanism consists of robust components of wood and iron, and not of refined features such as brass, gold and silver, like many other 'planetary clocks'. This was not only a cost issue: it also opened the way to unorthodox design solutions intended, among other things, to realise variations in angular speed, for example in respect of the movement of the moon and the dials of sunrise and sunset.

The third key element of the Eisinga Planetarium is that from the outset it was intended and used for educational purposes. Educated citizens could read the ongoing positions of the planets at a glance, and interested laymen were given insight into the 'functioning' of the solar system on the basis of the explanation provided at the beautifully designed and painted instrument. This makes the Planetarium an object that bridges the gap between people of different educational levels and social classes.

Spherical planetariums

Parallel to the development of the mechanical planetarium, another type of educational astronomical mechanism was introduced: the spherical planetarium. This was a hollow, rotating sphere measuring several metres, that primarily showed the apparent rotational movement of the starry sky instead of the planetary movements.

An early example of this is the famous Gottorp Globe, which was made between 1650 and 1654 by the German scholar Adam Olearius (1599-1671) and gunsmith Andreas Bösch **<73>.** Visitors could enter through a small opening at the bottom, and take a seat at a round table mounted on a stationery platform. The globe was then made to spin on hydropower, after which the starry sky – lit



73. St. Petersburg [RUS], Kunstkamera Museum. Since around 1713 the Gottorp Globe is to be found in the tower of the Kunstkamera Museum. Photo late 1940s.

by a lamp – was seen slowly passing by. This principle lives on in the modern optical planetariums, in which the starry sky is projected onto the inside of a domed roof.

In the end, the classical mechanical planetariums were largely superseded by these projection planetariums, although the former are still considered to be the best tool for providing insight into the movements of the planets around the sun and relative to each other. This was largely due to the complexity of these mechanisms, and the associated high construction and maintenance costs. For this reason, various initiatives between 1783 and 1818 for the construction of a larger version of the Eisinga Planetarium failed.

Nevertheless, mechanical planetariums are still being manufactured, now powered by electric motors that are controlled digitally.

Table B. Types of planetariums and their predecessors.

PERIOD	CATEGORY	TYPE	EXAMPLE
Ancient History - Middle Ages	Predecessors	Astronomical calculators	Antikythera mechanism
		Armillary spheres	Su Song's Astronomical Clock Tower, Santucci's Armillary Sphere
		Astronomical clocks	Town Hall Prague Strasbourg Cathedral, Besançon Cathedral, Messina Cathedral
Renaissance and early modern period	Classical planetariums (orreries)	Spherical planetariums	Globe of Gottorf, Roger Long's Great Sphere
		Mechanical planetariums	Huygens Planetarium, Round Tower Planetarium, Eisinga Planetarium
Modern period	Star Theatres	Optical and digital projectors	Bauersfeld Star Theatre, Zeiss-Planetarium Jena

3.2.B VALUES FOR COMPARISON

In order to select the most relevant categories for the final comparison, it has been investigated which mechanical planetariums exhibit or have exhibited the most important characteristics, as formulated in the Outstanding Universal Value. The following aspects were examined, and how these manifest themselves in the other planetariums:

- it continuously and accurately provides a realistic picture of the position of the planets and/or the starry sky;
- it was primarily built for educational purposes;
- the instrument has its own reception and presentation area;
- it is (or was) accessible to a wide audience, and not just to a select group;
- regular explanations are (or were) given about the functioning or our solar system;
- it is still functioning and has been preserved in its original state on the location where it was built.

3.2.C THE SITE COMPARED

In order to estimate the OUV of the Eisinga Planetarium, an obvious step is to compare this instrument with other astronomical mechanisms. That is not quite so simple as it seems: there is no standard yardstick against which mechanical planetariums can be measured.

In the 18th century, interest in representations of the (heliocentric) solar system reached a historic peak. This interest extended to all layers of society, but by no means everyone had the financial means to purchase or build a planetarium themselves. Consequently, the makers of these instruments had very different backgrounds and objectives. They were often specialised clockmakers or instrument makers who, whether or not in collaboration with a scholar, built luxurious models for a select audience. Others aimed at the growing public lecture market and produced large numbers of demonstration models.

An extensive overview of the various mechanisms that this astronomical 'craze' has produced can be found in the standard work Geared to the Stars by King and Millburn (1978). The authors of this book divide the wide variety of instruments into two main categories:

1. **Planetary machines,** i.e. three-dimensional models that show the mutual movements of the planets. These are driven by a crank, a spring, a timepiece with weights or (from the 20th century onwards) electric motors.

2. **Astronomical clocks,** i.e. clocks with hands that provide specific astronomical information, such as the phases of the moon, the times of sunrise and sunset, the positions of the sun and the moon in the zodiac, upcoming solar and lunar eclipses, and the equation of time (the difference between local mean time and solar time).

A pre-selection has been made from this colourful collection of mechanisms, based on a report by science historian dr Samuel Gessner (2020), which has been added to this file as appendix 11. This pre-selection consists of the following categories:

1. **Traditional relations of the Eisinga Planetarium.** This historical selection is based on the early comparative publications by Van Swinden (1780) and Van Wijk (1928). In these publications, various mechanisms and clocks are viewed primarily from an astronomical perspective.

2. **Configurational relations.** The Eisinga Planetarium is one of the few early planetariums with its own reception and presentation area, and was remarkably large for its time. For that reason, other large, permanently installed mechanisms are also looked at, including several astronomical clocks in cathedrals.

Traditional relations

In their publications Van Swinden (1780) and Van Wijk (1928) provide an overview of known planetariums **<Table C>.** In discussing these instruments, the authors seem to assume that a planetarium must meet a number of requirements related to the features on display and the accuracy with which the positions of the planets are presented. They also indicate on which points the Eisinga Planetarium scores 'better' or 'worse'.

Both lists are interesting, because they place the Eisinga Planetarium in a national and international context. The comparison material consists almost exclusively of movable stand-alone planetariums, which were mostly used for educational purposes.

Only two of the planetariums on both lists were truly immovable: the ceiling planetarium of the Danish astronomer Ole Rømer in the Round Tower in Copenhagen (1680, destroyed in 1728) and the Copernican Planetarium of the Deutsches Museum in Munich (1923, destroyed in 1944). The astronomical clock of Dasypodius (1574, replaced in 1838), in Strasbourg Cathedral, may also be considered immovable because of its colossal size and position as part of the cathedral's interior.

Table C. List of astronomical clocks and planetariums after 1550.

YEAR	NAME/KIND	MAKER/DESIGNER	LOCATION
1574 (replaced in 1838)	Astronomical clock; floor standing model; **immovable**	Dasypodius	Strasbourg
1645	Astronomical clock; table model; **movable**	Antonius de Rheita	Rheita
c. 1670	Leyden Sphaera; floor standing orrery; **movable**	Nicolas Stampioen	Rotterdam, Leiden
1672-1681 (destr. 1728)	Jovilabium; table model; **movable**	Ole Rømer	Copenhagen
c. 1680 (destr. 1728)	Ceiling planetarium; **immovable**	Ole Rømer	Copenhagen
1682	Table planetarium; **movable**	Christiaan Huygens	The Hague
1700	Table planetarium; **movable**	Thomas Graham	London
1707	Table planetarium; **movable**	Jean Pigeon	Paris
c. 1730	Table planetarium; **movable**	John Th. Desaguliers	London
after 1734	Table planetarium; **movable**	Abbé Nollet	Paris
before 1738	Table planetarium; **movable**	Thomas Wright	London
1737	Table planetarium; **movable**	Pieter Eysenbroek	Haarlem
1756	Floor standing planetarium; **movable**	Jan van den Dam	Amsterdam
after 1756	Table planetarium; **movable**	Benjamin Martin	London
c. 1763	Floor standing planetarium; **movable**	Jacques-Thomas Castel	Paris
before 1788	Zeeland planetarium; floor standing model; **movable**	Joseph van den Eeckhout	Middelburg
after 1792	Table planetarium; **movable**	Hartog van Laun	Amsterdam
before 1810	?	Lambertus Nieuwenhuis	Enschede
1817-1824	Jovilabium; table model; **movable**	Coenraad ter Kuile	Enschede
1835-1842	Floor standing planetarium; **movable**	Cornelis Jacobs van der Meulen	Sneek
1843	Table planetarium; **movable**	Alle Jans Bokma	Workum
1854	Mundomotorium; table model; **movable**	Willem Gleuns	Groningen
before 1868	Table planetarium; **movable**	Wildrik Botjes	Nieuwe Pekela
after 1895	Table planetarium; **movable**	Petrus Verhaar	The Hague (?)
before 1901	?	Jan Mekken	Wieringen
1919	Floor standing planetarium; **movable**	Lolke Siderius	Franeker
1923 (destr. 1944)	Copernican Planetarium; ceiling planetarium, **immovable**	Deutsches Museum	Munich

Configurational relations

In the wealth of literature about the Eisinga Planetarium, it is rarely emphasised that it is one of the few room-filling ceiling planetariums, and the only one that has survived from the 18th century. Yet this is precisely the aspect that makes the instrument so special. Eisinga was certainly not the only one to build a planetarium of this type, but all the other examples have either disappeared or still exist only as replicas.

Little is known about the oldest planetary mechanisms that visitors fitted into. The earliest known example is the Domus Aurea (Golden House) of the Roman emperor Nero, who was famous for his revolving dining hall, the Coenatio Rotunda (64-68 A.D.). Unfortunately, the available literature and archaeological finds are not detailed enough to be able to state with certainty that this was a moving planetarium.

More than a thousand years later, in 1232, the then Sultan of Egypt, Al-Kamil (about 1177-1238) sent a gift to emperor Frederick II (1194-1250) in the shape of a tent in which 'artificially powered' effigies of the sun and the moon, and perhaps also the five planets, moved, thus indicating the hours of day and night.

What exactly these two mechanisms looked like is unknown, but they were in any case exclusively intended for persons of high standing.

Displays of celestial movements that were more 'public' were offered by the European monumental astronomical clocks in churches and cathedrals, although these were sometimes placed close to the apse and not always visible to a lay public. The timepieces usually consist of altar-like constructions with astronomy-related and calendar-related elements. In addition, at certain times they show a spectacle with automatically moving figures (automata).

In addition to the time, the oldest astronomical clocks usually only show the positions of the sun and the moon in the zodiac, and the phases of the moon. Besides, impending solar and lunar eclipses can be read from them. Some of these monumental clocks also had planet hands. The best known are (or rather were) those in Strasbourg (second clock, Dasypodius, 1540-1574), Lübeck (St. Mary's Church, 1561-1566), Münster (Cathedral, 1540-1542) and Osnabrück (1587, destroyed shortly afterwards).

The Strasbourg clock was replaced between 1838 and 1842 by a more elaborate version, which also includes a vertically positioned heliocentric planetarium (https://www3.astronomicalheritage.net/index.php/show-entity?idunescowhc=495). Comparable to a certain extent are the later planetariums in the cathedrals of Besançon (1867) and Messina (1933). However, all these instruments consist of precision mechanical parts and in that respect they differ greatly from the Eisinga Planetarium.

'Room planetariums' in a secular context only appeared several centuries after the first monumental ecclesiastical timepieces. In addition to the Eisinga Planetarium, at least seven of these constructions are known from the seventeenth up to and including the 19th century:

- the Gottorp Globe (around 1654);
- the spherical planetarium of Erhard Weigel (1661);
- the ceiling planetarium of Ole Rømer (1697);
- the spherical planetarium of Roger Long (around 1758);
- two astronomical mechanisms, built into the houses of two craftsmen in Bolesławiec (Bunzlau) (around 1770);
- the planetarium of Perini in London (around 1879).

Afterwards, the following large (electro)mechanical planetariums were built:

- the Atwood Sphere (1913);
- the Copernican Planetarium (1923) in the Deutsches Museum in Munich;

- the Copernican planetariums in the Hayden Planetarium (1933) in New York and the Morehead Planetarium (1949) in Chapel Hill (USA);
- the Planétaire de Gresswiller in Gresswiller, France (1999);
- the Jodrell Bank Orrery in Lower Withington, England (2013).

In addition, since 1924, thousands of so-called projection planetariums have arisen all over the world. These are halls in which the entire firmament is projected onto the inside of a large dome-shaped screen using a moving optical or digital projector. The same screen is also often used to show IMAX films.
These modern planetariums are disregarded in the comparative analysis because they do not provide a comprehensible, uninterrupted actual picture of the position of the planets as some classical mechanical planetariums do, and are largely intended for entertainment.

Based on the values of the Eisinga Planetarium as formulated above, the following comparison objects remain – in chronological order:

1. **Gottorp Globe (1654)**
2. **Weigel Sphere (1661)**
3. **Round Tower Planetarium (1697)**
4. **Great Sphere (1758)**
5. **The astronomical mechanisms of Jakob and Hüttig (around 1770)**
6. **Strasbourg Astronomical Clock/Planetarium (1843)**
7. **Besançon Astronomical Clock/Planetarium (1867)**
8. **Perini's Planetarium (1879)**
9. **Atwood Sphere (1913)**
10. **Copernican Planetarium (1923)**
11. **Messina Astronomical Clock/Planetarium (1933)**
12. **Copernican Hall and Morehead Planetarium (1935)**
13. **Horloge mère et Planétaire de Gresswiller (1999)**
14. **Jodrell Bank Orrery (2013)**

Explanation of the characters:
√ = Good
O = Poor
X = None
? = Unknown

1. Gottorp Globe, Germany/Russia (largely destroyed and replicated)

The Gottorp (or Gottorf) Globe was a spherical planetarium with a diameter of 3.1 metres, which could accommodate about ten visitors. These were seated side by side at a permanently fixed round table and saw, by candlelight, a baroque painting of the night sky, with gilded nails as stars, slowly passing by. Glass balls represented the sun and the moon. The planets were not represented.

The Gottorp Globe was conceived between 1650 and 1654 by the German scholar Adam Olearius (1599-1671) and manufactured by gunsmith Andreas Bösch. It was made of copper and wood, covered with canvas, and ran on hydropower. If desired, this 'artificial starry sky', which on the outside was painted like a globe, could also rotate faster.

The spherical planetarium was set up in the main hall of a villa specially built for this purpose. Adjoining rooms housed a cabinet of curiosities and a scientific library. The first floor of the villa was used as a guest house by the principal, Duke Frederick II of Holstein-Gottorp. His planetarium was not accessible to everyone, unlike Eisinga's planetarium.

Around 1713, the Globe was given to Tsar Peter the Great of Russia, who had it transferred to St Petersburg. In 1747, the special object was largely destroyed by fire, but some years later a replica was made, which can still be seen in the Kunstkamera Museum. After having been seriously damaged during the Second World War, this replica has also been restored several times – most recently in 2003.

Comparative values and characteristics
X The Gottorp Globe simulates/simulated the apparent rotation of the starry sky, but did this not very accurately and not continuously. It did not show the actual positions of the planets.
√ The Globe has an educational setup, but the painting of the night sky was not very realistic and rather of an ornamental nature.
O The Globe has always been accessible to visitors, but initially not to a wide audience. These days, the instrument is accessible to everyone, but only accompanied by a guide.
√ The Globe was its own reception and presentation area.
? It is not known whether explanations about the functioning of the solar system were always given in the Globe.

75. St Petersburg [RUS], Kunstkamera Museum, Gottorp Globe.

74. St Petersburg [RUS], Kunstkamera Museum, home of the Gottorp Globe.

2. Weigel Sphere, Germany (demolished)

In 1661, inspired by the reports about the Gottorp Globe, Erhard Weigel (1625-1699), professor of mathematics at the University of Jena, had a smaller spherical planetarium annex observatory built on the roof of his house. This sphere had a circumference of 5.4 metres and the outside was painted with the zodiac. It was pierced with holes of various sizes, allowing daylight to enter. In this way, those who were inside the sphere got to see a realistic representation of the starry sky.

The Weigel Sphere was made of sheet iron, which made it possible to attach easily movable magnetic models of the planets to the outside. This spherical planetarium, which was demolished in 1692, also seems to have served mainly as entertainment.

Comparative values and characteristics

X The Weigel Sphere simulated the apparent rotation of the starry sky, but did this not very accurately and not continuously. The planets could only be put in their place manually.

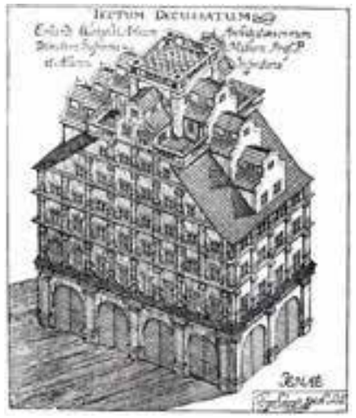
√ The Sphere had an educational setup, although it seems to have served mainly as entertainment.

X Although the Sphere was accessible to visitors, it was not open to a wide audience.

√ The Sphere was its own reception and presentation area.

? It is not known whether explanations about the functioning of the solar system were regularly given, but this seems unlikely.

76. Jena [G], Iron globe 'Pancosmos' on the residential building of Erhard Weigel, 1661.



77. Jena [G], Weigel's mansion, etching or print by Benedictus Georgi, 1669.

78. Erhard Weigel (1625-1699), etching (1688) by Elias Nessenthaler (1674-1714).

82. Ole Rømer (1644-1710).

3. Round Tower Planetarium, Denmark (damaged by fire and reconstructed)

In 1697, the Danish astronomer Ole Rømer (1644-1710) installed a planetarium measuring nearly two metres in the ceiling at the top of the Round Tower in Copenhagen. This educational instrument, which was driven by a crank mechanism, showed the planetary movements according to the modified heliocentric system of another Danish astronomer, Tycho Brahe (1546-1601). That was a compromise between the old geocentric worldview and the heliocentric worldview, in which the moon and the sun revolved around the earth and the other planets in turn revolved around the sun.

Not much later, Rømer himself adapted his planetarium in such a way that it showed both Brahe's system and the heliocentric system. However, this mechanism was seriously damaged in the great fire that struck the city of Copenhagen in 1728. It was reconstructed fourteen years later by instrument maker Johan Jacob Lincke, but omitting Brahe's system.

During a restoration in 1822, the Lincke version was placed in its current vertical position. And in 1928, a clock mechanism was added and the dial was replaced by a copy of a 17th-century star chart.

The dial has six concentric slots in which the planets revolve around the sun. Underneath there is a small hemisphere on which the day, the month and the year can be read.
The whole is driven by precision mechanical metal gears.

79. Copenhagen [DK], Round Tower.

Comparative values and characteristics

- O Ole Rømer's planetarium initially had to be made to rotate manually, and therefore did not always show the actual positions of the planets, but only their mutual movements. A timepiece was not added until 1928.
- √ The instrument was built for educational purposes.
- √ It is accessible to a wide audience.
- O It is located in a publicly accessible space. However, the Round Tower is mainly climbed for the view and the rooftop observatory, not for the planetarium.
- O There is no specific explanation given at the instrument about the functioning of the solar system, although guided tours are conducted in the tower, with the emphasis on the history of the building and the city of Copenhagen. On request, astronomical themes are also covered in this context.

80. Copenhagen [DK], Round Tower, planetarium Ole Rømer.

81. Copenhagen [DK], Round Tower planetarium.

4. Great Sphere, England (demolished)

Around 1758, the English astronomer Roger Long (1680-1770) also had a spherical planetarium built, which was installed in Pembroke Hall (now Pembroke College) in Cambridge. The hollow globe had a diameter of 5.4 metres, weighed more than 450 kilograms and, according to its creator, could accommodate at least thirty people, who could enter by means of a small six-step staircase via the 'South Pole'.

Roger Long's Great Sphere consisted of thin sheets of tin attached to curved iron ribs. The whole was anchored to a round plate of oak with a diameter of 3.9 metres. The latter rested on bearings made of tropical hardwood (lignum vitae), such as are also used in mills. Despite the considerable weight, the sphere could be made to rotate by one person with a simple crank.

The inside of the sphere was painted with stars, the zodiac and the ecliptic, but visitors had to bring their own lamp to see it. Some time after 1764, holes were pierced in the sphere, so that the stars could also be seen during the day without a lamp. The maintenance of the instrument, which was probably used mainly for educational purposes, was in the hands of a student.

Although the Great Sphere was accessible to visitors, it was little known outside of academic circles. After Long's death, the Great Sphere fell into oblivion. In 1871, it was dismantled and sold for scrap.

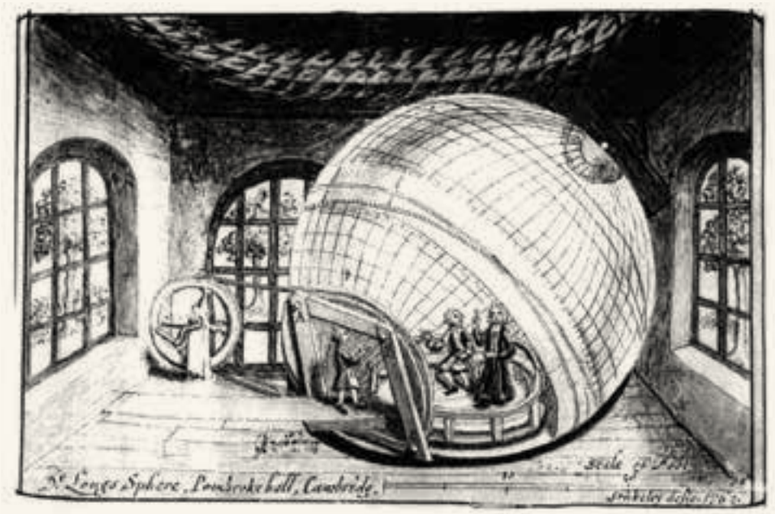


Fig. 3 *'Dr. Long's* Sphere, *Pembroke hall, Cambridge': sketch by William Stukeley dated 1762. Presumably we see Roger Long, in his academic robes, at stage centre. The sphere is put into motion by a rope, friction-drive, mechanism set around the entrance doorway. The students sit on a platform that projects into the sphere's interior. A scale bar (showing 10, 20 and 30 feet) is just visible to the lower right in the sketch. Image courtesy of the Gough Collection, the Bodleian Library, Oxford.*

84. Cambridge [UK], Pembroke Hall, Roger Long Sphere, sketch (1762) by William Stukeley (1687-1765). Gough Collection, Bodleian Library, Oxford [UK].

Roger Long's Great Sphere

An early version of a planetarium, perhaps at the time the largest ever constructed. It was a hollow sphere, 18 feet in diameter and made of copper. Turned by a winch, it represented on its inner surface the apparent movements of the heavenly bodies. Thirty people could sit in it. The Sphere was originally housed in a building on the site of Pitt Buildings (M staircase). It was moved into the garden when the Old Master's Lodge (now N staircase) was built and the site was wanted for stables. The Sphere survived for over a century before being broken up. In this photograph, taken in 1871, John Power, Master, stands at the left.

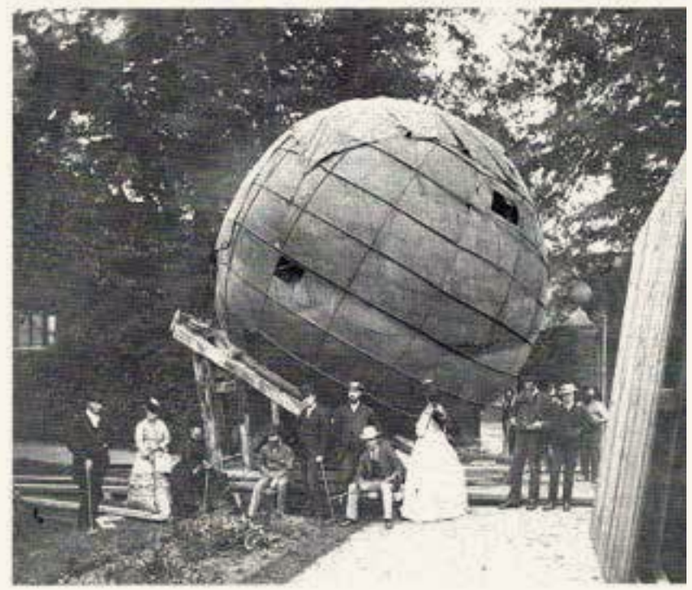


Figure 66

85. Cambridge [UK], Pembroke Hall, Globe Roger Long. Photo 1871, published in the Bulletin of the Scientific Instrument Society No. 134 (2017) p. 8.

86. Roger Long (1680-1770), oil on canvas (1769) by Benjamin Wilson (1721-1788).

83. Cambridge [UK], Pembroke Hall, steel engraving. Artist: Richard Bankes Harraden (1778-1862), engraver: R.W. Smart, publisher: W.P. Grant, Cambridge.

Comparative values and characteristics

X The Great Sphere simulated the apparent rotation of the starry sky, but did this not very accurately and not continuously. It did not show the actual positions of the planets.
√ The Sphere was built for educational purposes.
O The Sphere was accessible to visitors, but not for a wide audience: most Visitors were Pembroke Hall students.
√ The Sphere was its own reception and presentation area.
? It seems plausible that explanations were given in the Sphere about the functioning of the solar system, but it is not known whether this happened on a regular basis.

5. The astronomical mechanisms of Jakob and Hüttig, Prussia (lost, destroyed)

Towards the end of the 18th century, two exceptional astronomical mechanisms were manufactured in Bolesławiec (Bunzlau), in what was then Prussia. The first was an altar-shaped timepiece, built by furniture maker Hermann (or Gottfried) Jakob, which included a planisphere with the positions of the sun, the moon and the planets. The instrument was about six metres high, 2.5 metres wide and was driven by running gear that, in addition to brass gear wheels, also contained numerous wooden parts. The mechanism was eventually bought by a trader and transported to Russia. After that it disappeared without a trace.

The second mechanism was manufactured by linen weaver Johann Hüttig, who transformed several rooms of his house into a geographical, an astronomical and a mechanical room respectively. The astronomical room housed a timepiece that, in addition to the heliocentric worldview, also showed the orbits of a number of comets. A rotating image of the starry sky showed the rise and setting of the stars. In the mechanical room, there was another timepiece that showed occurrences such as the movements and phases of the moon. After Hüttig's death in 1802, attempts were made to transfer the various timepieces to a nearby orphanage. However, that turned out to be impossible: they were fully intertwined with his house. Ten years later, this house was destroyed by fire.

No depiction is known of either of the two instruments.

Comparative values and characteristics

? What exactly the timepieces of Jakob and Hüttig looked like, and whether they continuously showed the actual positions of the planets, is unknown.
√ It seems plausible that they had an educational function.
O It is certain that they were accessible to visitors, but it is unclear what the target group was.
√ It is also certain that both instruments were manufactured by autodidacts in a civilian setting (residential house), which functioned as a reception and presentation area.
? It is not known whether explanations about the functioning of the solar system were regularly given.

6. The astronomical clock with planetarium in Strasbourg, France (extant)

The current astronomical clock of the Cathédrale Notre-Dame in Strasbourg was manufactured between 1838 and 1842 by the autodidactic clockmaker Jean-Baptiste Schwilgué (1776-1856). It is the third clock there.

The history of the eighteen metres high timepiece shows a striking resemblance to that of the Eisinga Planetarium. Schwilgué was born in Strasbourg, but his family had to flee the city for some time for political reasons. Just ten years old, Schwilgué was fascinated by the astronomical clock of his native city's cathedral, which had been standing still since 1788. That is why he decided to explore astronomy, mathematics, physics and mechanics.

88. Strasbourg [F], Cathédrale Notre-Dame, Astronomical Clock/ Planetarium. Photo 1870.

In the end, at an advanced age, Schwilgué was actually authorised to build a new astronomical clock for the cathedral. It developed into a theatrical design with extra hands and automatically moving figures, based on different religions. Every day at 12 o'clock solar time, a procession of 46 centimetres high figures of Christ and the Apostles is staged, with a life-size rooster crowing three times.

In addition to these 'automata', the timepiece includes a perpetual calendar and a planetarium that, like the Eisinga Planetarium, shows the positions of the planets Mercury, Venus, Earth, Mars, Jupiter and Saturn. The actual positions of the sun and the moon are also shown, as are the local times of Rome and sixteen French cities. Another striking feature is a copper star globe measuring 84 centimetres, on which all the stars visible to the naked eye are depicted. This globe rotates around its axis in the same time as the earth.

The planetarium has a diameter of 2.5 metres. The individual planets are attached to the ends of hands that revolve around the central sun. The instrument is located slightly below the centre of the timepiece and is positioned

87. Strasbourg [F], Cathédrale Notre-Dame. Postcard 1925.

89. Strasbourg [F], Cathédrale Notre-Dame, Astronomical Clock/Planetarium.

vertically. The gear of the planetarium in Strasbourg does not consist of wooden parts, but of precision metal cogwheels.

Comparative values and characteristics

O The planetarium of Strasbourg Cathedral continuously presents the actual positions of the planets of our solar system, but due to its vertical positioning and the use of hands, the result is not very realistic.

√ The planetarium was included for educational purposes.

√ It is accessible to a wide audience.

X The instrument does not have its own reception and presentation area, but is part of an extensive astronomical clock, which is largely made up of religious and liturgical elements.

X There is no specific explanation given at the planetarium about the functioning of the solar system.

90. Besançon [F], Cathédrale de St. Jean. Postcard 1930.

7. The astronomical clock with planetarium in Besançon, France (extant)

The astronomical clock in the Cathédrale Saint-Jean in Besançon was completed in 1867, but was not installed in the church until 1873. It is 2.5 metres wide, 5.8 metres high and 1 metre deep, and features no fewer than 65 hands.

The many hands show the time, the date, the day of the week, the month, the season, the year, the position of the sun in the zodiac, the times of sunrise and sunset, the length of day and night, the expected number of solar and lunar eclipses for the current year, the phases of the moon, the tides for different French harbours, and more.

In the lower part of the clock there is a round recess in which a lit planetarium measuring approximately 80 centimetres is housed. The positions of the planets are indicated with hands – just like in Strasbourg Cathedral. There is also a small rotating moon globe.

91. Besançon [F], Cathédrale de St. Jean, Horloge astronomique.

92. Besançon [F], Horloge astronomique. 93. Besançon [F], Horloge astronomique, mechanism.

The upper part of the clock is ornamental in nature. Here there are four recesses, each housing three statues of Apostles. These images automatically alternate every hour.
The whole is driven by a gear consisting of precision mechanical cogwheels.

Comparative values and characteristics

O The planetarium of the Cathedral of Besançon continuously shows the actual positions of the planets of our solar system, but due to its vertical positioning, small size and the use of hands, the result is not very realistic.
√ The planetarium was included for educational purposes.
√ It is accessible to a wide audience.
X The instrument does not have its own reception and presentation area, but is part of an extensive astronomical clock, which is largely made up of religious and liturgical elements.
X There is no specific explanation given at the planetarium about the functioning of the solar system.

8. Perini's Planetarium, England (lost)

At the end of the 19th century, there was a mechanical planetarium in London that at first sight presents strong similarities with the Eisinga Planetarium. It had been conceived by Napoleone Perini (1837-1903), professor of Italian Language and Literature at King's College, and was accommodated in his house. It was open to the public.

The instrument consisted of a hemisphere, with a height and a width of more than four metres, which rested on twelve wooden columns. The bottom of this dome was painted with a starry sky, with the Milky Way and the constellations in the right places. Hanging from a thin hollow rod was an opal glass sphere, lit by gas or electricity. The planets Mercury to Uranus hung on thin threads around this artificial sun.

When the whole was set in motion, the planets revolved around the sun at the correct mutual speeds. Saturn had its rings, and the other planets their moons. The earth – about the size of a walnut – rotated on its axis at the right speed, and the same mechanism ensured that the moon – a small pearl – rotated around the earth in its proper orbit.

In 1879, Perini's planetarium was extensively described in the British scientific journal Nature and in various daily newspapers. Not long afterwards, the instrument was put up for sale. What became of it is unknown.

94. London [UK], Garrick Chambers, Napoleone Perini's Planetarium. Source: Nature, Vol. 21, p. 111 [4 December 1979] and p. 568 [15 April 1880].

Comparative values and characteristics

? It is unknown whether Perini's planetarium showed the current positions of the planets or just simulated their mutual movements.
√ The instrument was educational in nature and was placed above the heads of the spectators.
√ For a time, at any rate, it was accessible to the public.
√ It was installed in a private house, which served as a reception and presentation area.
O Available pictures suggest that visitors were actually given an explanation about the functioning of the solar system, but it is not clear whether this took place on a regular basis.

9. Atwood Sphere, USA (extant, but modified)

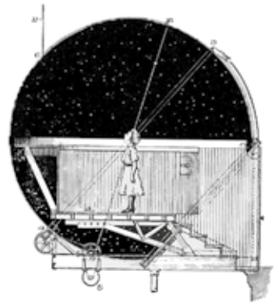
The Atwood Sphere is the most recent example of a spherical planetarium. The sphere, weighing 227 kilograms, has a diameter of 5.1 metres and consists of pieces of sheet steel only 0.4 millimetres thick, in which 692 holes are pierced.

97. Chicago [USA], Adler Planetarium, Atwood Sphere.

96. Chicago [USA], Adler Planetarium, Atwood Sphere.

The holes are lit from the outside and in that way function as stars.

The sphere, which rests on three wheels, accommodates ten spectators, who are brought into position by means of a mechanical platform. The two lower wheels are driven by an electric motor, to make the sphere rotate just like the earth.



95. Chicago [USA], Atwood Sphere. Source: The Popular Science Monthly, Volume 84, p. 103. New York, Popular Science Pub. Co., January 1914.

In order to show the planets, the Atwood Sphere is equipped with a number of extra openings, which indicate the positions for each planet at different times of the year. The various openings can be easily sealed so that from the inside the planets are shown in their current positions.

Manufactured in 1913 for the Chicago Academy of Sciences, the Atwood Sphere fell into disrepair from 1930 with the advent of the modern projection planetarium. During the Second World War, it was used to train US Navy reservists in astronomical navigation.

In 1959, the sphere was painted as a large terrestrial globe, to make it more attractive for the public. However, that did not prevent it from being unused for decades. In 1997, the Atwood Sphere was transferred to the Adler Planetarium in Chicago (USA), where it has been fully restored and is once again being used for educational purposes.

The design of the Atwood Sphere is based on the much older Gottorp Globe (around 1654) and the spherical planetarium of Erhard Weigel (1661). However, the latter two have not survived the test of time, which is why the Atwood Sphere is described as the oldest 'sky simulator' in the world.

Comparative values and characteristics

O The Atwood Sphere simulates the apparent rotation of the starry sky, but not continuously. The positions of the planets relative to the stars are also shown, but not how the planets are spatially positioned.

√ The Sphere was built for educational purposes.
√ It is accessible to a wide audience.
√ The Sphere is its own reception and presentation area.
√ In the Sphere explanations are given on a regular basis about the functioning of the solar system.

10. Copernican Planetarium, Germany (almost completely destroyed)

In 1924, visitors to the Deutsches Museum in Munich, Germany, were introduced to the largest ceiling planetarium ever built. However, its existence was relatively short-lived: along with other parts of the museum, it was badly damaged during the Second World War. All that remains of it is a collection of globes that once represented the planets.

The planetarium consisted of six elliptical rails attached to the ceiling, along which the planets from Mercury to Saturn moved. This distinguished the Copernican Planetarium from all the other comparison objects, in which the planets traverse circular orbits. The 'earth rail' was horizontal, those of the other planets were placed at their proper angles to it. Each rail was fitted with an electrically powered 'cart', from which the planet in question (including its moons, if any) was suspended by means of a thin rod. The planets were driven independently of each other by two electric motors, which had the disadvantage that they tended to get out of step with each other, because they were not controlled from one source.

The different planets revolved around the sun at an accelerated pace: one 'planetarium year' lasted only twelve minutes. To observe the apparent movements of the planets relative to the earth, the visitor could stand on a mobile platform positioned below the model of the earth, and have a look around through a wide-angle periscope.

Only the orbits of Mercury to Mars were more or less to scale, but those of Jupiter and Saturn were not. The orbital diameter of the outermost planet, Saturn, was 11.25 metres, that of the earth 4.45 metres. In reality, Saturn's orbit is nearly ten times larger than the earth's orbit.

Comparative values and characteristics

X The Copernican Planetarium did not continuously show the actual positions of the planets, but simulated their mutual movements at an accelerated pace. Other negative aspects were that the planetary orbits were not to scale and that the planets were not driven from one source.
√ The Copernican Planetarium was built primarily for educational purposes.
√ It was accessible to the public.
√ The planetarium was installed in its own space within the Deutsches Museum.
√ Regular explanations were given about the phenomena occurring within our solar system.

98. Munich [G], Deutsches Museum. Postcard 1952.

99. Munich [G], Deutsches Museum, Copernican Planetarium. Postcard 1930.

11. The astronomical clock with planetarium in Messina, Italy (extant)

Unlike the astronomical clocks of Strasbourg and Besançon, that of the Cathedral of Messina can be seen from the outside. It is housed in the cathedral's 65-metre-high bell tower.

Some parts of the clock show clear similarities with the one in Strasbourg. Four illuminated hands at the top of the tower show the time. A slowly rotating sphere shows the actual moon phase. Below it a planetarium and a perpetual calendar can be seen. However, by far the largest part of the tower is taken up by an automated imagery that performs local legends and biblical scenes at noon.

With a diameter of five metres, the planetarium in Messina is one of the largest in the world. It bears a strong resemblance to the smaller planetarium in Strasbourg. The most interesting difference is that it includes not only the six inner planets of our solar system, but also the subsequently discovered outer planets Uranus, Neptune and Pluto.

Comparative values and characteristics

O The planetarium of the Cathedral of Messina continuously shows the actual positions of the planets of our solar system, but due to its vertical positioning, coarse scaling and the use of hands the result is not very realistic.
X The planetarium has a mainly ornamental character; its educational value is limited.
√ It is 'accessible' to a wide audience.
X The instrument does not have its own reception and presentation area, but is visible from the street.
X There is no specific explanation given at the planetarium about the functioning of our solar system.

100. Messina [IT], Il Duomo. Postcard 1957.

101. Messina [IT], Il Duomo, Bell tower with planetarium.

102. Messina [IT], Il Duomo, Bell tower with planetarium. Prospectus 1933.

12. Copernican Hall and Morehead Planetarium, USA (demolished)

Between 1930 and 1949, seven projection planetariums were built in the United States. Due to the high costs, only two of these were also equipped with a mechanical heliocentric planetarium. The first was the Hayden Planetarium in New York, which acquired a simplified version of the Copernican Planetarium in Munich. It was housed in the Copernican Hall, below the projection hall. In 1949, a comparable combination was installed in the Morehead Planetarium in Chapel Hill, North Carolina.

Combinations of this type conformed to the philosophy of Oskar von Miller, founder of the Deutsches Museum, who was of the opinion that for pedagogical reasons, the representations in the projection dome should be supplemented with physical models of our solar system. In that way it could be better explained how the planetary apparitions in the sky relate to the heliocentric movements of the planets relative to each other.

In 1970, Hayden's electromechanical planetarium had to make way for an exhibition about the modern history of astronomy, and in 1997 the entire Planetarium building was demolished. The electromechanical planetarium in Morehead closed its doors in 1999.

103. New York [USA], Hayden Planetarium, 1957.

104. New York [USA], Hayden Planetarium, Solar Room, 1960.

Comparative values and characteristics

O The two American ceiling planetariums continuously showed the actual positions of the six longest known planets, but the planetary orbits shown were not to scale.
√ They were built for educational purposes.
√ Both planetariums were accessible to the public.
√ They were installed in their own space, in the same building that also housed a modern projection planetarium.
√ Regular explanations were given about the phenomena occurring within our solar system.

13. Horloge mère et Planétaire de Gresswiller, France (1999) (extant, but not operational)

Perhaps the most impressive modern mechanical planetarium is – or rather: was – the one in Gresswiller, France. It was installed in 1999 and showed the movements of the six inner planets of our solar system in real time, as did the Eisinga Planetarium. The planets Uranus, Neptune and Pluto are also part of the model, but these had to be moved manually.

Like the Eisinga Planetarium, the Horloge mère et Planétaire de Gresswiller is attached to the ceiling. However, the model is not driven by a pendulum clock with weights, but by a three-metre-high water clock. Unfortunately, this large instrument, with a diameter of nine metres, was shut down in 2015.

Comparative values and characteristics

O The Gresswiller planetarium continuously showed the actual positions of the six longest known planets, but the planetary orbits shown were not at scale.
√ It was built for educational purposes.
√ The planetarium was accessible to everyone free of charge.
√ It was installed in its own reception and presentation area.
? It is not clear whether visitors were given a personal explanation at the instrument, or if the information was limited to text boards.

105. Gresswiller [F], planetarium, 1999.

106. Gresswiller [F], planetarium.

14. The Jodrell Bank Orrery, England (2013) (extant)

The five-metre planetarium in the Jodrell Bank Discovery Centre, which was installed in 2013, is currently the largest (electro)mechanical planetarium in the world. It is a ceiling planetarium, inspired by the Eisinga Planetarium, which shows not only the positions and movements of the six inner planets of our solar system, but also those of the outer planets Uranus and Neptune.

The gear of the planetarium consists of 52 brass cogwheels, which ensure that the planets revolve around the (luminous) sun at the correct mutual speeds. The background of the mechanism is a giant dial, on which the constellations are depicted.

The Jodrell Bank Orrery runs at an accelerated pace, but can also be made to revolve manually, using a large crank. The Discovery Centre is located near the monumental Jodrell Bank Radio Observatory.

Comparative values and characteristics

O The Jodrell Bank Orrery is positioned horizontally, high above the visitor. However, the model is not very realistic: the dimensions of the planets and their distances from the sun are not at scale. Moreover, the planets move at an accelerated pace: one planetarium minute equals one earth year.
√ It was built primarily for educational purposes.
√ It is accessible to a wide audience.
O The instrument is not installed in its own reception and presentation area, but is located in an astronomical visitor centre.
O The planetarium is part of a large interactive exhibition with informative text boards. Only for group tours a personal explanation is given at the instrument.

107. Macclesfield [UK], Jodrell Bank Discovery Centre.

108. Macclesfield [UK], Jodrell Bank Discovery Centre, planetarium.

109. Macclesfield [UK], Jodrell Bank Discovery Centre, planetarium.

3.2.D CONCLUSION

The Royal Eise Eisinga Planetarium differs in many ways from the comparison objects **<Table D>**:

- The Eisinga Planetarium is the oldest permanently functioning mechanical planetarium in the world that is still in its original state. Of the comparable objects from the 17th and 18th centuries, not one has withstood the test of time unscathed. The Eisinga Planetarium has only become rarer over the years.

- It has shown the actual positions of the six longest known planets of our solar system almost continuously since its completion in 1781. No other mechanical planetarium has been in permanent operation for such a long time.

- In addition, the Eisinga Planetarium is the oldest fully intact example of a 'ceiling planetarium' – a planetarium positioned horizontally above visitors' heads. The fact that the visitor looks at the model of the solar system from below, emphasises the spatial realism of the model.

- It is still proving its value as a powerful didactic/educational tool. In the reception and presentation area explanations are given almost daily at the instrument about the functioning of our solar system.

Table D. Summary of values for properties worldwide that might compare to the nominated property

Explanation of characters in the table
√ = Good
O = Poor
X = None
? = Unknown

PROPERTY	COUNTRY	YEAR OF CONSTRUCTION	CONTINUOUS / REALISTIC	EDUCATIONAL	WIDE AUDIENCE	RECEPTION ROOM	PERSONAL EXPLANATION	STATE OF PRESERVATION
Gottorp Globe	Germany / Russia	1654	X	√	O	√	?	O
Weigel Sphere	Germany	1661	X	√	X	√	?	X
Round Tower Planetarium	Denmark	1697	O	√	√	√	O	O
Great Sphere	England	1758	X	√	O	√	?	X
Mechanisms of Jakob and Hüttig	Prussia / Poland	c. 1770	?	√	O	√	?	X
Eisinga Planetarium	The Netherlands	1781	√	√	√	√	√	√
Strasbourg Astronomical Clock/ Planetarium	France	1843	O	√	√	X	X	√
Besançon Astronomical Clock/ Planetarium	France	1867	O	√	√	X	X	√
Perini's Planetarium	England	c. 1879	?	√	√	√	O	X
Atwood Sphere	USA	1913	O	√	√	√	√	√
Copernican Planetarium	Germany	1923	X	√	√	√	√	X
Messina Astronomical Clock/ Planetarium	Italy	1933	O	X	√	X	X	√
Copernican Hall	USA	1935	O	√	√	√	√	X
Horloge mère et Planétaire de Gresswiller	France	1999	O	√	√	√	?	?
Jodrell Bank Orrery	England	2013	O	√	√	O	O	√

Of the sites compared, the Round Tower Planetarium, Perini's Planetarium, the Copernican Planetarium and the Copernican Hall show a number of similarities (3 or 4) with the Eisinga Planetarium. However, these sites have not been preserved and/or do not function as originally built. The Atwood Sphere is still intact, but it has been out of use for forty years, has not always had a public function, is no longer to be found on its original location, and does not show a clear picture of the solar system. Moreover, the Sphere is more than a century younger than the Eisinga Planetarium.

This makes the Royal Eise Eisinga Planetarium the only fully intact planetarium in the world that since 1781 provides an actual picture of the position of the six longest known planets of our solar system, serves an educational purpose, is accessible to a wide audience, and where almost daily personal explanations are given about the functioning of the solar system and the place the earth occupies in it.

3.3 PROPOSED STATEMENT OF OUTSTANDING UNIVERSAL VALUE

3.3.A BRIEF SYNTHESIS

The Royal Eise Eisinga Planetarium is the oldest continuously operating planetarium (i.e. orrery) in the world. It is located in the historic centre of Franeker, one of the eleven historical cities in the province of Fryslân (Friesland), in the north of the Netherlands.

110. Planetarium around 1828.

This accurately working model of our solar system was built between 1774 and 1781 by an ordinary citizen: the Frisian wool manufacturer Eise Eisinga. The mechanism consists of simple but robust components, such as wooden hoops and discs, and iron pins. It provides an up-to-date and realistic image of the positions of the sun, the moon, the earth and the five other planets that were known at the time.

The mechanism, ingeniously powered by one single pendulum clock, is built into the ceiling and at the top of the bed box of a living room. From the time that the planetarium instrument was completed, the room itself has continuously served as a reception and presentation area. To this day, it is open to the general public and used as an astronomical education centre.

The Eisinga Planetarium stems from a private initiative that was originally aimed at knowledgeable amateur astronomers, but soon took on a broader public function. It is characteristic of its time, in which science was increasingly being imbedded in society.

The combination of a permanent presentation, a great diversity of functions and the presence of a reception area is totally unique for a planetarium of that time. It makes the Eise Eisinga Planetarium an early predecessor of the many modern ceiling and projection planetariums. The excellently maintained instrument still functions as it did in 1781, and visitors are still given an explanation there about the functioning of our solar system – just as its maker intended.

3.3.B JUSTIFICATION OF CRITERIA UNDER WHICH INSCRIPTION IS PROPOSED

Criterion (i): Represents a masterpiece of human creative genius

The Royal Eise Eisinga Planetarium is an iconic example of an 18th-century orrery, representing exceptional creativity in both its extraordinary technical design and execution, and artistic expression. It is the world's oldest functioning planetarium where visitors can walk in to be informed about what is happening in the skies.

The Eisinga Planetarium is ingeniously built into the ceiling and the closet-bed wall of the living room of a former civilian home. That way it was possible to build a large orrery and use the underlying room as a reception and presentation area – just as in modern planetariums.

The orrery, which is in operation almost continuously since 1781, was designed and built by an ordinary citizen, with the use of ordinary materials. This opened the way for unprecedented design solutions that resulted in a very sophisticated instrument. It allows the beholder to see the current positions of the planets and the moon at one glance.

The fact that the Planetarium is still in working order, is largely due to the creative genius and foresight of its maker, the Frisian wool manufacturer Eise Eisinga, who left detailed instructions for the maintenance of his instrument.

Criterion (iii): Bears a unique testimony to a living cultural tradition

The Royal Eise Eisinga Planetarium bears a unique testimony to the cultural tradition of presenting and providing insight into celestial phenomena, using technology. This is a universal tradition, going back thousands of years, that lives on to this day.

It still functions exactly as it did when it came into operation in 1781 and, according to the consecutive series of guest books, all this time retained its inspiring educational function – receiving and educating visitors in a space where they can see the solar system and the starry sky portrayed above their heads.

Since its completion in 1781, the mechanism has been maintained according to its maker's instructions. Thanks in part to these extensive maintenance instructions, the Eisinga Planetarium continues to present the accurate positions of the sun, the moon and the planets of our solar system.

Criterion (iv): An outstanding example of a technological ensemble which illustrates a significant stage in human history

The Royal Eise Eisinga Planetarium illustrates a significant turning point in human history: the democratisation of science, which has permanently changed society. It is typical of the importance attached to the transfer of knowledge to a wider audience in 18th-century society. The intertwining of the instrument with the ceiling and the closet-bed of an existing living room symbolises, as it were, the increasing linkage of science and society.

The Planetarium was built by an ordinary citizen and was from the outset intended and used for educational purposes. Educated citizens could read the current celestial positions of the planets at a glance, and interested laymen were given insight into the 'functioning' of the solar system, based on the explanation provided at the instrument. This makes the Planetarium an object that bridges the gap between people of different educational levels and social classes.

As a technological ensemble, it continues to contribute to the dissemination of astronomical knowledge, and in particular the heliocentric worldview, in society.

3.3.C STATEMENT OF INTEGRITY

All the tangible elements and attributes required to express the Outstanding Universal Value of the candidate for nomination sit within its boundaries. The property is owned solely by the municipality of Waadhoeke, in the north of the Netherlands, and consists of six tangible attributes. Since the Royal Eise Eisinga Planetarium is still in full use, it is subject to wear and tear. But thanks to a very strict maintenance regime, almost all of the original parts have been preserved. The integrity of the property is therefore 100%.
The whole is inextricably linked to the building Eise Eisingastraat 3.

3.3.D STATEMENT OF AUTHENTICITY

Although the Eise Eisinga Planetarium has been in operation just about continuously since 1781, the instrument has retained a high level of authenticity. Aside from necessary repairs, the various components of the planetarium instrument have remained unchanged since its completion. And the character of the room it is part of has been preserved. The authenticity of the Planetarium is confirmed, for example, by the first complete description of it, published in 1780 by Franeker University professor Jean Henri van Swinden, and by the description with maintenance instructions drawn up by Eise Eisinga in 1784. Its authenticity is also reflected in the almost complete series of guest books that have been kept from the very beginning. It proves that ever since the inauguration in 1781, the workings of our solar system have continuously been explained in the room below the Planetarium.

3.3.E REQUIREMENTS FOR PROTECTION AND MANAGEMENT

The former residence of Eise Eisinga, including the planetarium instrument, has been designated a national monument by the state. A permit is required for changes to national monuments, in which respect it is carefully considered whether the plans are in accordance with the monumental values of the building.

In addition, the Planetarium building is entitled to bear the blue and white shield – the international distinguishing mark to indicate cultural heritage sites protected by the 1954 Hague Convention (a convention under the auspices of the UN and UNESCO for the Protection of Cultural Property in the Event of Armed Conflict).

Another important legal protection regime applies to the status of protected cityscape of the inner city of Franeker since 1979. A protected cityscape, townscape or villagescape is an area in a city, a town or a village with a special cultural heritage character. The protection is not aimed directly at individual buildings, but mainly at the historical characteristics, the urban planning structure and the layout of the public space. As a result of this protection, the cultural heritage character remains preserved. The intention of the designation is to preserve the uniqueness of the area and give it an explicit place in any spatial developments.

This protection of the area has been given a key position in the zoning plan for the inner city of Franeker. The entire buffer zone falls within the boundaries of one zoning plan, namely the 'Franeker – Inner City' zoning plan dating from 2016. The starting point of this zoning plan is to consolidate the characteristics of the historic inner city. This means that spatial plans in the planning area are assessed and must meet criteria that guarantee the preservation of the historical characteristics. In order to do this as effectively as possible, a so-called area-protecting designation, namely the designation 'Value – Protected Cityscape' applies to the entire planning area. In this designation it is indicated that all the grounds in the city are intended for the preservation, restoration and expansion of the existing cultural heritage and spatial values referred to in the 1979 Designation Decree.

The care for the preservation of cultural heritage in the physical living environment and for world heritage will be transferred to the Environment and Planning Act which is expected to enter into force on 1 July 2022. At that time, both the granting of permits for national monuments and the protection of protected cityscapes, townscapes and villagescapes will be transferred to the Environment and Planning Act. Municipalities must provide adequate protection in respect of cityscapes, townscapes and villagescapes in the (municipal) environmental plan. The transition from the current Spatial Planning Act to the Environment and Planning Act will be seamlessly synchronised – both Acts will smoothly merge into each other.

World Heritage occupies a special, state-controlled position in the Environment and Planning Act. The state provides mandatory instruction rules for provinces and municipalities in order to regulate matters in their environmental ordinance or environmental plan. All the rules relating to the physical living environment are included in the environmental plan. This concerns a balanced allocation of functions to locations (comparable to the current designations), as well as rules in respect of activities with consequences for the physical living environment.

Within the system of the Environment and Planning Act, all government bodies - state, provinces and municipalities – establish an environmental vision (policy vision). Municipal zoning plans will become part of the environmental plan. For World Heritage, sites on the World Heritage List or the Tentative List are designated as nationally important in the National Environmental Vision (NOVI) of the national government. All future environmental visions and environmental plans must take this into account. Furthermore, the Decree on quality of the living environment – a general order in council under the Environment and Planning Act – includes the instruction rule that municipalities take into account the importance of preserving the Outstanding Universal Value of World Heritage when establishing the environmental plan.

On 25 February 1859, the Eisinga Planetarium was transferred by the state to the then municipality of Franeker (from 1984 municipality of Franekeradeel). On 1 January 2018, this municipality was merged into the municipality of Waadhoeke, the current owner. The mayor and aldermen of this municipality are very much committed to the Planetarium and the nomination process. They have made a strong case for structurally increasing the subsidy, so as to enable the Planetarium to reinforce its staff formation. The mayor of the municipality of Waadhoeke is also a member of the Nomination Team.

Since 2001, the management of the Planetarium has been in the hands of the Royal Eise Eisinga Planetarium Foundation. The board of the foundation consists of five members from scientific fields (University of Groningen and scientific journalism), the financial world (accountancy) and local representatives. The day-to-day business is carried out by a managing director and nine employees. The municipality of Waadhoeke has a structural subsidy relationship with the Planetarium. On the basis of this relationship, an annual implementation agreement is drawn up in which the tasks of the Planetarium are stipulated. On 15 June 2021, the Planetarium has also been included in the subsidy structure of the province of Fryslân.

4. State of conservation and factors affecting the property

4.A PRESENT STATE OF CONSERVATION

For the Baseline Condition, the legal protection provided by the national government, the solid municipal site holder, the effective administration, and the traditional and expertly executed management are of unconditional importance for the conservation of the property. This powerful coalition of allies structurally constitutes a literal guarantee for the propulsion of the Planetarium.

In chapter 4.1 of the Management Plan, extensive attention is paid to the conservation of the property.
The regular maintenance of the Planetarium consists of the following activities:

- cleaning of the building (six times per week during the busy summer; three times per week during the winter period);
- monthly maintenance of the windows;
- monthly maintenance and inspection of fire and intrusion security system;
- annual maintenance of cogwheels (cleaning and waxing);
- annual maintenance and check of extinguishing agents;
- annual cleaning interior showcases and collection;
- annual maintenance paintwork;
- two-yearly inspection by Monument Watch (as regards the condition of the building as well as the presence of woodworm and longhorn beetle);
- every twelve to fifteen years major maintenance.

The implementation of the above measures guarantees a high-quality and sustainable conservation of the property. As a result, the present state of conservation of the Planetarium, the OUV and the attributes can be regarded as excellent.

4.B FACTORS AFFECTING THE PROPERTY

Although many risk-mitigating measures have been organised and implemented, negative influence or threats can never be ruled out completely, both in terms of property-related factors and environmental factors.

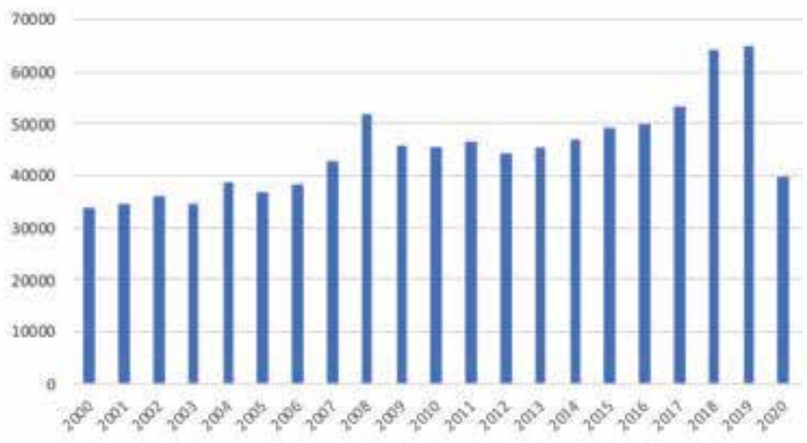
The property may be affected or threatened by property-related factors such as:

- Spatial pressure on the Planetarium due to an unexpectedly steep increase of visitor numbers. Provisions have been made for this, such as proper maintenance, a sound security system and an already existing visitor management system for limiting the number of visitors and, if necessary, registration via the website.

- Fire: the Planetarium has an automatic detection and extinguishing system, to which the fire brigade is very alert. It has a well-equipped station in Franeker, and in the event of a fire alarm two fire engines can reach the location of the fire within eight minutes. Keeping emergency routes clear is a top priority for the municipality, the police and the fire brigade, so that the Planetarium is easily accessible for emergency services at all times.

- Other environmental factors, such as spatial developments, ecological circumstances and natural disasters are already covered by existing instruments, including the status of protected cityscape. This is discussed in detail in the Management Plan, chapter 4.2. The chance is very small that one or more of these environmental factors will occur. Nevertheless, it will be examined to what extent further risk-mitigating measures are possible.

Table E. Visitor numbers Royal Eise Eisinga Planetarium.



[Decline visitor numbers in 2020 due to COVID pandemic]

Security Regions Act

In 2020, the Security Regions Act (Wvr) came into effect. The Act arose from a need to organise disaster relief and crisis management on a more extensive scale than the municipal scale. In addition, it was felt that the effectiveness and the professionalism of the emergency services had to be increased. The Act consequently aims at an efficient and high-quality organisation of firefighting, medical assistance and crisis management under one regional administrative direction.

Currently, there are 25 security regions in the Netherlands. Under the Wvr the board of the security region, consisting of all the mayors of the participating municipalities, has been given various tasks, such as:

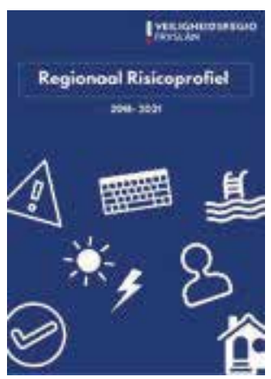
- identifying the risks of fires, disasters and crises;
- advising the competent authority on the risks of fires, disasters and crises in the cases designated by or pursuant to the law, as well as in the cases determined in the policy plan;
- preparing for combatting fires and major accidents, and organising disaster relief and crisis management; and
- providing the control room function.

Security Region Fryslân

In the province of Fryslân, all Frisian municipalities are represented within the Security Region Fryslân (VRF). The VRF has laid down the preparation in a so-called Regional Crisis Plan and various sub-plans. As a result, emergency services such as the police, the fire brigade, medical assistance and the municipalities know how to deal with incidents.

In 2020, in addition to the general structure for the approach to disaster relief and crisis management, the VRF has started a project 'High water and evacuation'. The aim of this project is to develop a structural approach to promote adequate crisis management in case of flooding. This approach includes drawing up an impact analysis and an evacuation strategy.

111. Security Region Fryslân, logo.



112. Regional Crisis Plan Fryslân, Security Region Fryslân.

Municipality of Waadhoeke

Pursuant to article 172 of the Municipalities Act, the mayor is charged with maintaining public order in the municipality. To support and advise the mayor 24/7 in this respect, the municipality of Waadhoeke has a Public Order and Safety team (OOV). To this end, mainly in collaboration with the VRF, an annual training plan is drawn up for the various crisis officers. By repeatedly practicing in different crisis situations, the officers learn to anticipate possible dilemmas in the organisation.

The OOV team is also responsible for the coordination and support of the 'Officer in Charge of Population Care' (OvD-Bz) picket group. The OvD-Bz is the first officer to be called up in the event of an incident. Within 30 minutes after the call, the OvD-Bz will start his work. He will visit the scene of the incident and will take care of the handling of the processes for which the municipality is responsible. He does this in consultation with the other emergency services, that will also be present at the scene of the incident. This officer is also available 24/7 for the municipality of Waadhoeke.

Risk map

In order to gain insight into the risks in a certain area, we use the so-called risk map in the Netherlands. Anyone can get an overview of these risks via the website www.risicokaart.nl. The relevant data are supplied by provinces, municipalities, water boards and other authorities. The use of this risk map follows from a legal obligation (Security Regions Act and Environmental Management Act).

113. Risk map, logo.

4.B.(I) DEVELOPMENT PRESSURES

Environmental risks

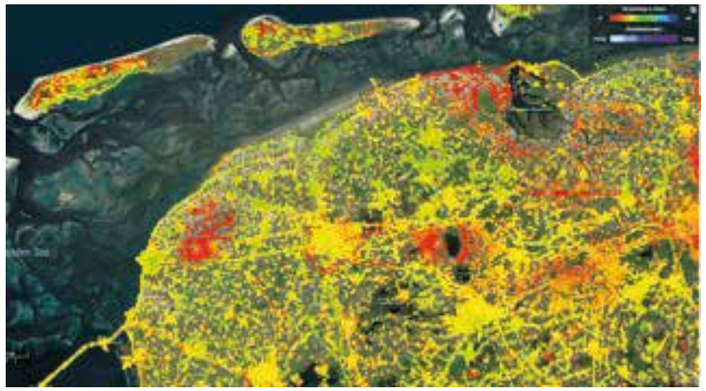
The Planetarium is located in the centre of Franeker and is legally protected. The layout and management of the Planetarium do not entail any special risks. It is an institution without the use of hazardous substances or equipment. There are no companies located in the immediate vicinity of the Planetarium where activities take place that involve special substances or materials that could pose a danger to the environment.
There is no danger for the OUV and attributes.

The Planetarium is located within the protected cityscape of Franeker, together with almost 150 other buildings that are protected as national monuments. The buffer zone of the Planetarium is located fully within the protected cityscape and comprises mainly national monuments – a total of eighteen.
There is no risk here of disruptive high-rise buildings in the vicinity of the OUV and attributes.

4.B.(II) ENVIRONMENTAL PRESSURES

Soil movement

The soil in the Netherlands, the north of the Netherlands included, is subject to all kinds of processes and factors taking place on or in the soil. As a result, the soil is slowly descending. On the one hand, this is the result of natural processes, such as the subsidence of the shallow subsoil. On the other hand, there are anthropogenic causes, such as surface load/settlement or decline of the groundwater level. Together, natural processes and human interventions cause this autonomous subsidence of the surface level. In the north-west of Friesland, the autonomous subsidence varies



114. Soil subsidence in the north of Fryslân. Source: bodemdalingskaart.nl.

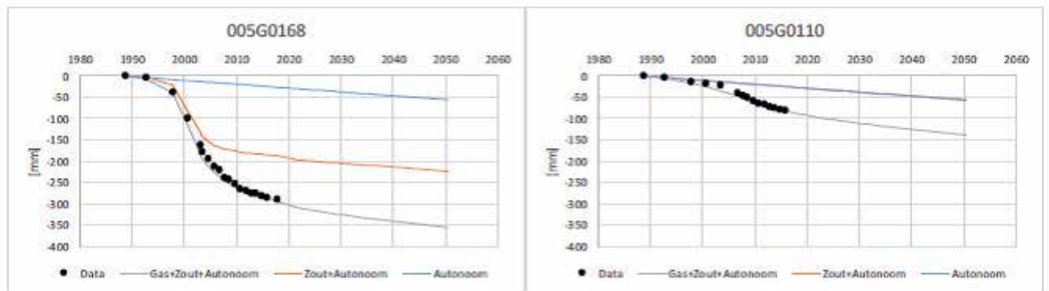
on average from less than 1 millimetre to several millimetres per year. This subsidence is spread fairly evenly over a large area and the consequences of this have so far been barely noticeable.

Soil subsidence map

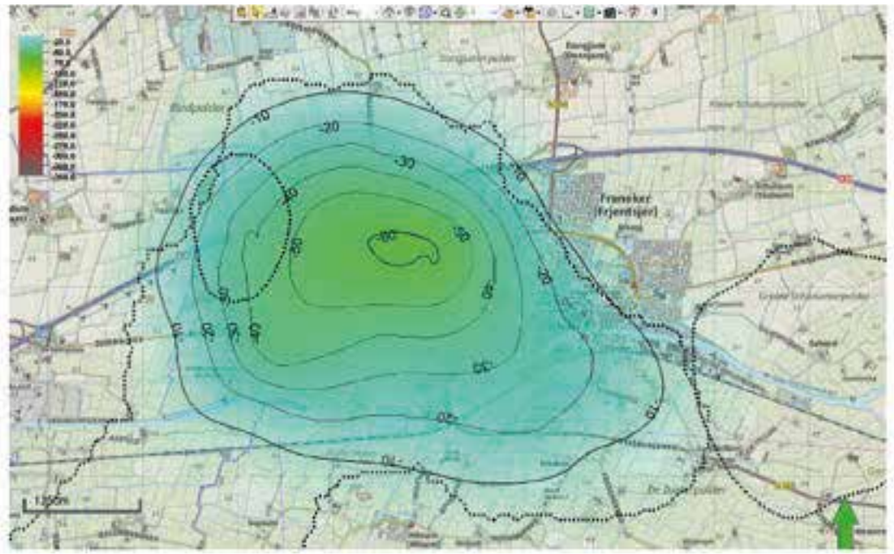
The soil subsidence map literally shows the dynamic of the Netherlands. The soil subsidence map 2.0 is an interactive map which can be zoomed in on to object level, and which shows the movement of measuring points in time. It can be consulted via the website https://bodemdalingskaart.nl/nl/.

Soil subsidence due to mineral extraction

Since the soil subsidence has been occurring evenly for a longer period of time over a larger area, and the mineral extraction in the area has ended or is in its final phase, it is in the current circumstances not in line with the expectations that soil subsidence could have an effect on the existing buildings in the inner city of Franeker.
Because the Planetarium has not experienced any harmful effects from the soil subsidence to date, future subsidence will probably have no effect either.
There is no danger for the OUV and attributes.



115. Soil subsidence prospects. Left in Herbaijum, right near Franeker. The future soil subsidence is estimated to be negligible at these locations.



116. Soil subsidence in and around Franeker. Gas decrease 2018-2050, in mm. At the deepest point, about 6 cm of gas drop is expected. Contour interval 10 mm. Source: Vermilion Energy, 2019.

4.B.(III) NATURAL DISASTERS AND RISK PREPAREDNESS

Natural disasters

The Netherlands is well prepared for natural disasters. Natural disasters remain a risk for everyone. In the Netherlands, the chance of severe autumn storms (wind force 11 or more) is currently not very great yet (once every fifteen years), but could increase sharply due to global warming (once every two to three years). However, because these storms come from the (south-)west, they are not expected to be accompanied by storm tides. On the other hand, the chance of severe winter storms is expected to decrease. (https://www.knmi.nl/kennis-en-datacentrum/achtergrond/zware-herfststormen-in-europa-door-orkanen-in-een-warmer-klimaat)

The chance of earthquakes and wildfires in the Netherlands is real, but not in the north of the province of Fryslân or the city of Franeker.

There is no risk of damage to the Planetarium caused by winter storms, earthquakes and wildfires.
Tsunamis are not expected here either, although there is a risk of flooding. However, very detailed provisions and plans exist to prevent possible threats of flooding.
There is no danger for the OUV and attributes.

Flooding in the Netherlands

Another type of natural disaster is flooding. The risk of flooding and excess water will increase due to a number of causes, such as rising sea levels, soil subsidence and urbanisation. In the Netherlands, flood defences such as dykes, dunes and dams provide protection against these floods.

All kinds of measures are taken In the Netherlands in order to prevent flooding. These measures are laid down by law. For example, there is a Delta Act that makes it mandatory to draw up a Delta programme that ensures that the Netherlands is well protected against flooding, is well adapted to extreme climate effects and has an adequate freshwater supply. Another example is the Water Act, in combination with provincial ordinances that specify the safety that the flood defences must provide.

117. Delta programme.

For the province of Fryslân, Wetterskip Fryslân is one of the important players when it comes to the construction and maintenance of dykes and the monitoring of rising water levels. Wetterskip Fryslân regularly checks whether flood defences meet the set standards. If they do not comply, it will implement the necessary measures.

Consequently, the Planetarium is safe and well protected against flooding.
There is no danger for the OUV and attributes.

118. Wetterskip Fryslân.

Flooding and Franeker

The city of Franeker is located at a distance of approximately seven kilometres from the coast of Fryslân. The risk map, as described in the Friesland Climate Atlas (www.frieseklimaatatlas.nl), is based on three different levels of flooding; high probability (1/10 per year), medium probability (1/100 per year) and low probability (1/1000 per year).

This yields the following result:

- High probability (1/10 per year) In the province of Fryslân, a high probability of flooding applies mainly to an area close to the coast, at a considerable distance from Franeker.

- Medium probability of flooding (1/100 per year) The medium probability of flooding applies to a much larger area in the province of Fryslân, but the centre of the city of Franeker does not run this risk.

- Low probability of flooding The probability of flooding from which the city of Franeker – and thus the Planetarium at ground level – will experience problems from excess water is estimated at 0.1% (1/1000) per year.

In addition to the aforementioned care of Wetterskip Fryslân for the provincial water management, the risk of flooding in Franeker is minimal. In the unlikely event of water nuisance, measures will be taken in good time to prevent the water from entering the Planetarium building by closing the entrances, possibly combined with supporting the facades. Wetterskip Fryslân regularly checks whether flood defences (sea walls and drainage ditches) meet the standards which have been set. If they do not comply, the necessary measures are implemented, such as the current plan for reinforcement of the sea wall on the Koehool-Lauwersmeer route. Along this route, some parts of the sea wall were found to be unsatisfactory; this concerns, for example, the grass surface, the height of the sea wall or its stone revetment. At the moment a plan is being drawn up to strengthen the sea wall. From 2023 to 2027 implementation of the reinforcement of this wall will take place, after which the Wadden Sea flood defence will be up to par for the next fifty years.
In this context it should be noted that it is improbable that any level of flooding will get as high as the planetarium instrument (ceiling) and the cogwheels (mezzanine).
Consequently, the Planetarium is considered to be sufficiently protected against water nuisance.
The OUV and attributes are not at risk.

119. Small risk of flooding in Franeker and surroundings. Source: risicokaart.nl.

Deployment of emergency services

The Eisinga Planetarium is located right in the middle of the inner city of Franeker, but is nevertheless easily accessible for emergency services. A major threat to the preservation of the Planetarium is a fire. The fire brigade has a well-equipped station in Franeker and defines a fire in the Planetarium as a medium fire scenario. This means that in the event of a fire alarm, it will immediately drive towards the fire location with two fire engines. It employs a standard time of eight minutes for this. The fire brigade exercises various scenarios every week, which enables them to act competently and professionally in real-life situations.

During events in the inner city, Eise Eisingastraat is kept free of obstacles, with the exception of the annual 'Agricultural Days' market (September) and the street market on the King's birthday (27 April). The organisers of these markets are required to place stalls and rugs in such a way that sufficient driving space remains for emergency transports, such as fire engines. This is included as a condition for the granting of event permits, and there check on compliance takes place.

Keeping emergency routes clear is top priority for the municipality, the police, the fire brigade and the event organisations, to ensure that the Planetarium is easily accessible for emergency services at all times, also during events. In order to properly secure the safety theme and to ensure that all those involved clearly keep it in mind, the municipality has been setting its stakes high for many years when it comes to integrated collaboration. All large-scale events are integrally prepared and evaluated, so that the scenarios can be optimised every year.

Fire brigade and Planetarium
The Planetarium has a so-called reporting system, by means of which a starting fire is reported within a minute. This speeds up the time between the detection of the fire and the arrival of the fire brigade on site, which increases the chance of extinguishing a fire in time.

In the building, a so-called gas extinguishing system has been installed near the mechanism. This installation ensures that in the event of a fire, a gas mixture is blown into the room, which mixes with the air present, extinguishing the fire without water.

The fire brigade has a so-called accessibility map of the Planetarium building. On this map, all kinds of details of the building are marked with icons. This makes it easy to trace, for example, where the entrance to the building is situated and how the building is laid out. This map has been processed in a digital information system and is available to every fire-fighting corps.
Thanks to clear procedures in the event of calamities, and to extensive measures to prevent and fight fires, the lowest possible fire risk applies to the Planetarium.
There is no danger for the OUV and attributes.

4.B.(IV) RESPONSIBLE VISITOR ACCESS AND EDUCATION

Risk factors in relation to visitors
In the run-up to a UNESCO World Heritage nomination, the Cultural Heritage Agency of the Netherlands (RCE) was asked to map the risks resulting from large visitor flows. This analysis was drawn up on the basis of ten damage factors such as physical forces, dirt and indoor climate. The analysis was carried out by the National Heritage Laboratory, which is part of the RCE. A number of visitor-related scenarios were selected from the risk analysis.

The Planetarium frequently receives groups (schools and travel organisations), all during regular opening hours. Approximately once or twice a week groups are received outside opening hours.

Typical groups are:
- Travel organisations: 40 people divided into two groups of 20 people. These groups visit several dozen times per year.
- School classes: 10-30 people in a group. The Planetarium receives approximately 2800 students per year.

During the European Heritage Days, everyone is welcome as a regular visitor and buying a ticket is mandatory. Events are exclusively organised in the catering area. Sometimes there are theme evenings. The small groups of mostly experts do not pose a great risk. On the basis of practical experience and managing the building and the collection, the scenarios have been discussed and evaluated.

Individual visitors and visitors in groups are received in the planetarium room only under the supervision of

Planetarium employees. When visiting the attic, people do not come into direct contact with the cogwheels, which are only visible behind a transparent framework. The Planetarium runs no risk in relation to visitors.
There is no danger for the OUV and attributes.

Physical forces
Accident during maintenance work causing damage to the building, such as bumping and scraping. Frequency of maintenance increases with an increase in visitor numbers.
Only experienced staff members and restorers carry out maintenance. Once a year the cogwheels are cleaned (dust removed), followed by waxing of the wood. Once a year the clockmaker comes to inspect the rotating parts. Whenever external maintenance workers are present, for example to replace the fire detectors, staff is always in attendance. This risk is estimated to be very small.

Accident whereby a visitor bumps or scrapes the surface, resulting in damage.
Every year a few visitors faint. Bags must be stored in a locker. Given the nature of the collection, the risk of damage resulting from bumping is very small.

Wear as a result of cleaning activities, for example wear caused by a vacuum cleaner and/or scuffs from dusting. Frequency of cleaning increases with an increase in visitor numbers.
Cleaning takes place six days per week from 1 April to 31 October and three days per week in the six winter months. There are only hard floors (tiles in the planetarium room, the rest marmoleum). Damp mop on tiles. Cleaning by professional company. Always the same person. Always instruction and transfer. Chance of bumping damage is estimated as small.

Vibration caused by visitors resulting in damage to floors/ceiling and/or layer of paint on ceiling.
Does not apply.

Bumping damage as a result of regularly moving large objects for maintenance.
Only staff members carry out these movements. Therefore, the risk of damage is estimated as very small.

Because of too many visitors, people bump into surfaces.
The surfaces accessible to visitors are, except for the closet-bed, less sensitive and valuable. When visitors look into the closet-bed to admire the gear of the instrument, they are cautious. Damage to the closet-bed has so far remained limited to wear, and there has not been any direct bumping damage, partly due to the positioning of two chairs in front of the closet-bed.

The Planetarium is protected against physical forces through active supervision, expert management and the availability of a maintenance team of experts who can perform any necessary repairs promptly.
There is no danger for the OUV and attributes.

Theft & Vandalism
Vandalism by visitors, such as the scratching of surfaces. Theft does not apply, because the Planetarium consists of permanent fixtures.
The museum offers children the opportunity of a quest. Answers to questions are filled in by pencil. Very sporadically a small pencil mark is found in the visitor centre, but never in the planetarium room, where there is supervision of visitors. The risk of vandalism is therefore estimated as very small, and in the planetarium room as nil.
There is no danger for the OUV and attributes.

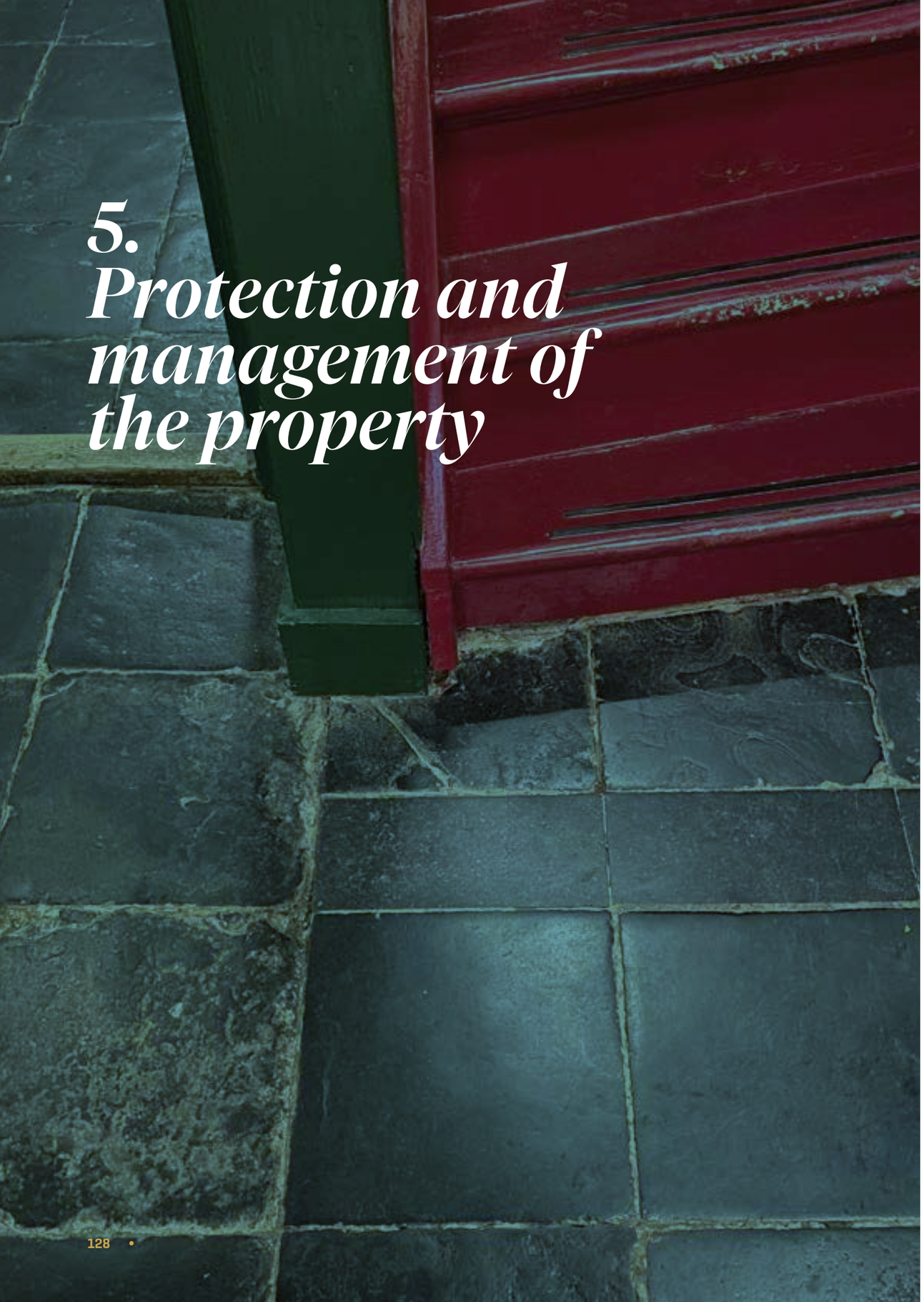
Dirt
Coarse and fine dust settles on horizontal surfaces and gives a dirty impression. Dust becomes difficult to remove over time. Dustiness increases with an increase in the number of visitors.

In the planetarium room there are no vulnerable horizontal surfaces. The walls, the floors and the fireplace can easily be cleaned without damage.
There is no danger for the OUV and attributes.

Pandemic
In addition to known and expected risks, a pandemic can occur as a complete surprise, as has become apparent with the arrival of the Covid-19 virus in 2020. As a result of government measures, the Planetarium abruptly had to close its doors and prepare for a reopening under strict conditions. The temporary closure raised the question of how to ensure the propagation of the message and keeping it at the disposal of the 'visitor' through the availability of high-quality and accessible digital information. The necessary steps have been taken to this end. Furthermore, the management has immediately taken measures to start an online ticketing system and has adapted the website in this respect. In addition, partition walls have been placed at the entrance, and a one-way route has been set up to make it possible for the public to view the exhibitions in a safe way. Disinfection columns have also been installed. The measures have proved to be effective to such an extent that the visits to the Planetarium got off to a smooth start again after reopening.
The experience gained can be put to good use by the organisation in the event of a possible recurrence of a pandemic.
A pandemic does not pose any risk to the condition of the Planetarium.
There is no danger for the OUV and attributes.

4.B.(V) NUMBER OF INHABITANTS WITHIN THE PROPERTY AND THE BUFFER ZONE

The estimated population (2020) located within the area of the property: none
The estimated population (2020) located within the buffer zone: 78
Total population located within the property and the buffer zone: 78



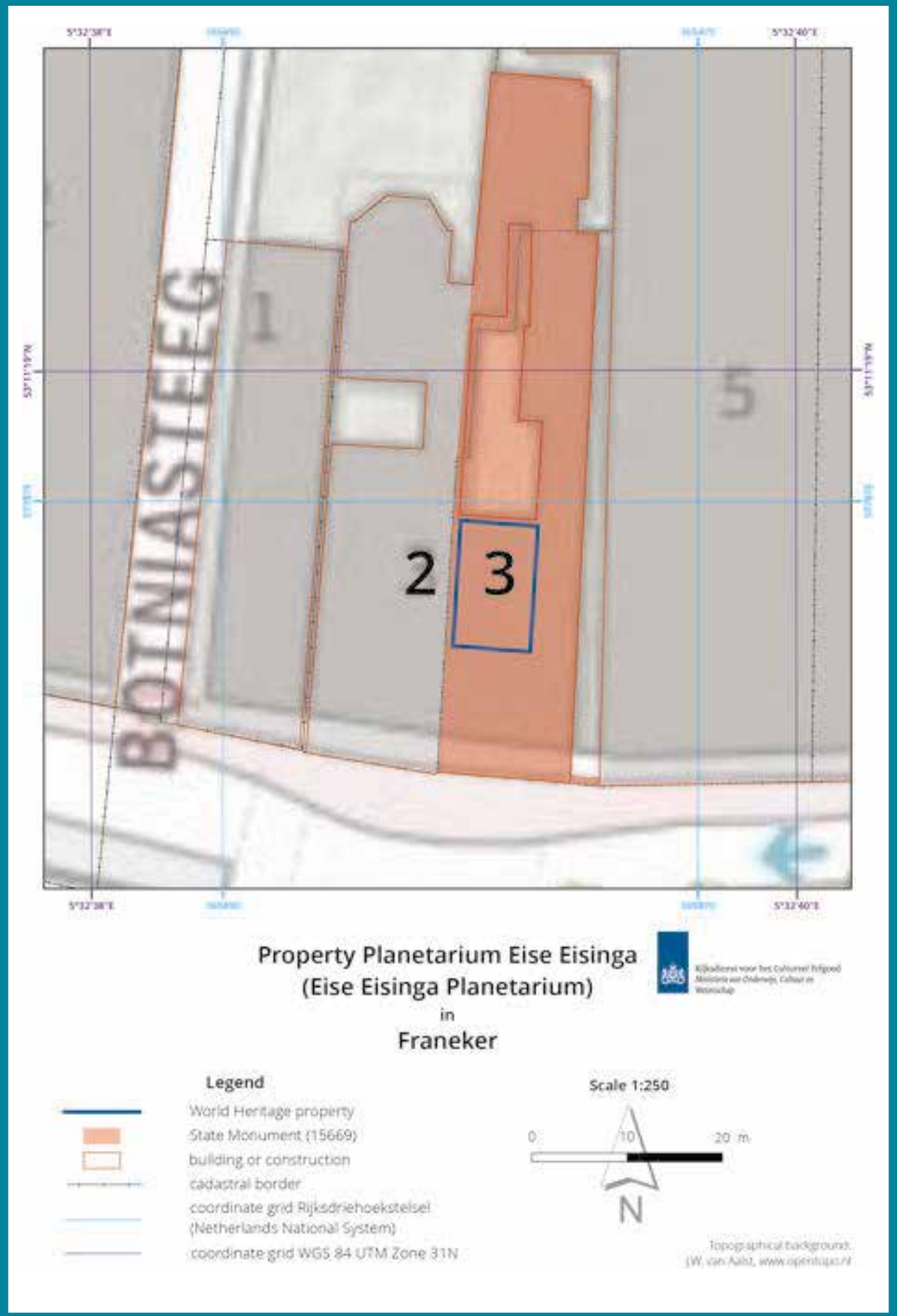
5. *Protection and management of the property*

5.A OWNERSHIP

Until 1825, the Planetarium was owned by Eise Eisinga. In that year, it was purchased by King William I, as a result of which it came into government hands, with a view to the conservation of the building, which was recognised as an important monument, for many years to come. Until 1922 the management of the Planetarium remained in the hands of Eisinga and his descendants.

In 1859, ownership was transferred to the municipality of Franeker (from 1984 Franekeradeel), which from 1922 also appointed the curator. Since gaining independence in 2002, the management has been placed with the Royal Eise Eisinga Planetarium Foundation. On 1 January 2018, as a result of a municipal reorganisation, the municipality of Waadhoeke came into being, of which the city of Franeker is a part. Since then, Waadhoeke has been the owner of the Royal Eise Eisinga Planetarium.

The consistent practice of management and maintenance since 1781 has proven to be extremely sustainable. With the gaining of independence in 2002, it was stipulated that the Planetarium building, including the planetarium room and the mechanism, will remain the property of the municipality. This was established mainly in order to safeguard continuity: not a foundation board but the community, or the municipality, is the owner, to perpetuate the sustainability over the years.



120. Cadastral floor plan Eise Eisingastraat 1, 2 and 3.

5.B PROTECTIVE DESIGNATION

The protection and designation of World Heritage Sites in the Netherlands is guaranteed by existing legislation: on the one hand trough national heritage legislation under the Heritage Act and on the other hand through urban planning legislation such as the Spatial Planning Act, as well as on the basis of regulations at provincial or local level.
The Spatial Planning Act will become part of the new Environment and Planning Act, in which from 2022 a total of 26 existing acts with respect to monuments, archaeology, environment, infrastructure, mobility, water control and housing will be integrated.

Heritage Act
Since 1 July 2016, there has been one integral act relating to our museum objects, museums, monuments and archaeology on land and under water. Together with the new Environment and Planning Act, the Heritage Act forms the foundation for the protection of national monuments. In conjunction with the new Environment and Planning Act, the Heritage Act ensures the integral protection of our cultural heritage.
The division between the Heritage Act and the new Environment and Planning Act is as follows:

- movable cultural heritage and designation of national monuments are incorporated in the Heritage Act
- designation of spatial cultural heritage (cityscapes, townscapes and villagescapes and cultural landscapes) and the approach to cultural heritage in the physical living environment are part of the Environment and Planning Act.

In the Heritage Act the approach to our heritage is laid down: who has which responsibilities in that respect and how it is supervised. Some relevant articles of law for the national monument Royal Eise Eisinga Planetarium concern the National Register of Monuments and the conservation of monuments.

Article 3.3. National Register of Monuments

1 Our minister keeps a register of the national monuments.
2 The National Register of Monuments can be consulted by anyone.
3 The minister enters the monuments and archaeological monuments in the Register, insofar no appeal has been lodged against the Designation Decree or an appeal has been rejected.
4 The National Register of Monuments contains information about the registration and for the identification of the national monuments.
5 Our minister sends a copy of the entry in the Register to the executive board of the municipality where the national monument is located or, if the national monument is not located on the territory of a municipality, to the competent authority for an environmental permit as referred to in article 2.1, first paragraph, under f, of the General Provisions Act.

Article 7.3. Conservation of monuments

1 On request, our minister may grant a multi-year subsidy for the normal maintenance of national monuments.
2 On request, our minister may grant a subsidy for the restoration of national monuments.
3 On request, our minister may grant a subsidy in connection with the adaptive re-use of monuments.

Heritage and Environment and Planning Act
The primary focus of the Environment and Planning Act is the balance between protection and use, and its significance for World Heritage. The heritage is included in various aspects of the Environment and Planning Act.

World Heritage occupies a special, state-controlled position in the Environment and Planning Act (art. 4.29, in which paragraph 1 concerns '*protection*', and paragraph 2 concerns '*use*').
The state provides mandatory instruction rules for other government authorities in order to regulate matters.

Article 4.29 Environment and Planning Act (government rules World Heritage)

1 The rules referred to in article 4.3 regarding activities relating to World Heritage are established with a view to preservation of the Outstanding Universal Value of the World Heritage.
2 The rules at all times aim to prevent damage or destruction of World Heritage.

Environmental plan
All the rules relating to the physical living environment are included in the environmental plan. This concerns a balanced allocation of functions to locations (comparable to the current designations), as well as rules in respect of activities with consequences for the physical living environment. Through the Environment and Planning Act, the national government intends to leave more matters to municipalities, based on the motto 'decentralised, unless'. The many rules that have their effect at all levels must be incorporated in one environmental plan. Municipal zoning plans will be integrated in the environmental plan.

Decree on Quality of the Living Environment
An important basis for the environmental plan is the Decree on Quality of the Living Environment (BKL).
The BKL sets the substantive standards for municipalities, provinces, water boards and the state with a view to achieving national objectives and complying with international obligations. The rules in this Decree are arranged per instrument and per chapter: all the rules for programmes, for environmental plans, and so on, are grouped together. Instruction rules are the standards and associated rules that apply to administrative bodies when establishing programmes, environmental plans, environmental ordinances, water board ordinances and project decisions. These are arranged per chapter. The chapter on the environmental plan, for example, contains the standards and rules that apply to the environmental plan. These include standards and rules for noise and odour from activities, external safety and heritage.
Article 5.131 of the Decree on Quality of the Living Environment regulates the preservation of World Heritage in relation to the environmental plan.

Article 5.131 BKL (preservation World Heritage)

The environmental plan takes into account the importance of the preservation of the Outstanding Universal Value of World Heritage.

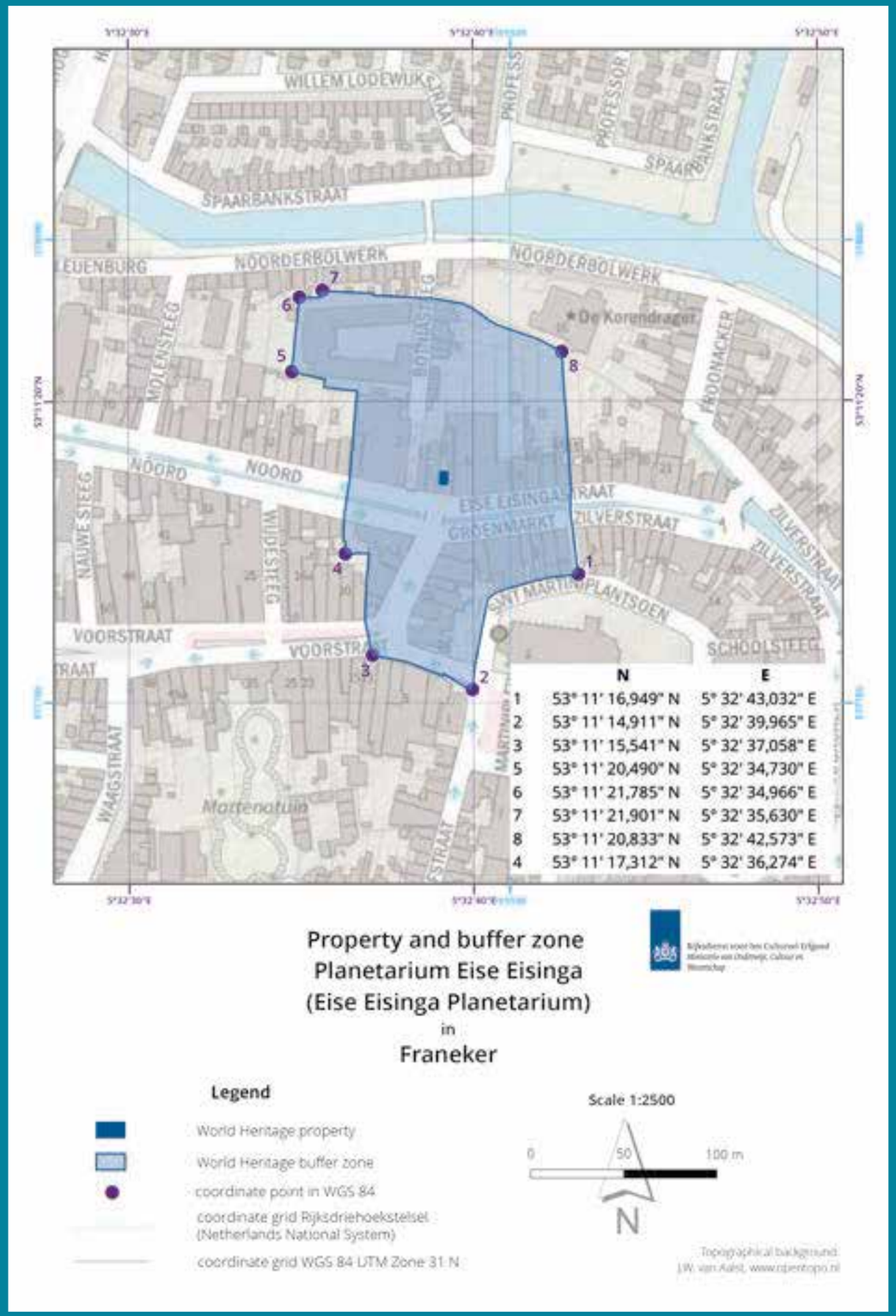
Loosely translated, this means that after the Planetarium has been designated as a World Heritage Site, the environmental plan should be adapted to do justice to the designation and the associated protection of this World Heritage Site.

Buffer zone
The canal house, with which the Eisinga Planetarium is inextricably linked, is located in a 15th-century expansion of Franeker, and is part of the historic inner city.

The proposed buffer zone around the Planetarium encompasses the immediate vicinity of the building and enjoys protection at municipal and state level.

The zone covers an area of 2.12539 hectares and runs, starting from Noord, as follows:

- in northerly direction along the western plot boundary of De Koornbeurs;
- then along the southern, western and northern plot boundaries of the Botnia House (Patyna);
- then along the southern plot boundary of Christian Primary School De Korendrager, after which the plot boundary between the buildings Eise Eisingastraat 14 and 15 is maintained in a southerly direction;
- further south, the canal is crossed and the boundary winds up in Kerksteeg, running up to Sint Martiniplantsoen, where the boundary is placed on the northern and western facades;
- up to Voorstraat, where the boundary is drawn on the southern facade up to and including the north western corner building Raadhuisplein/Voorstraat;
- after which the boundary runs in a northerly direction on the west side of the buildings on Raadhuisplein, and around the old town hall direction Noord.
- on the other side of Noord, the boundary winds up again at the western plot boundary of De Koornbeurs.

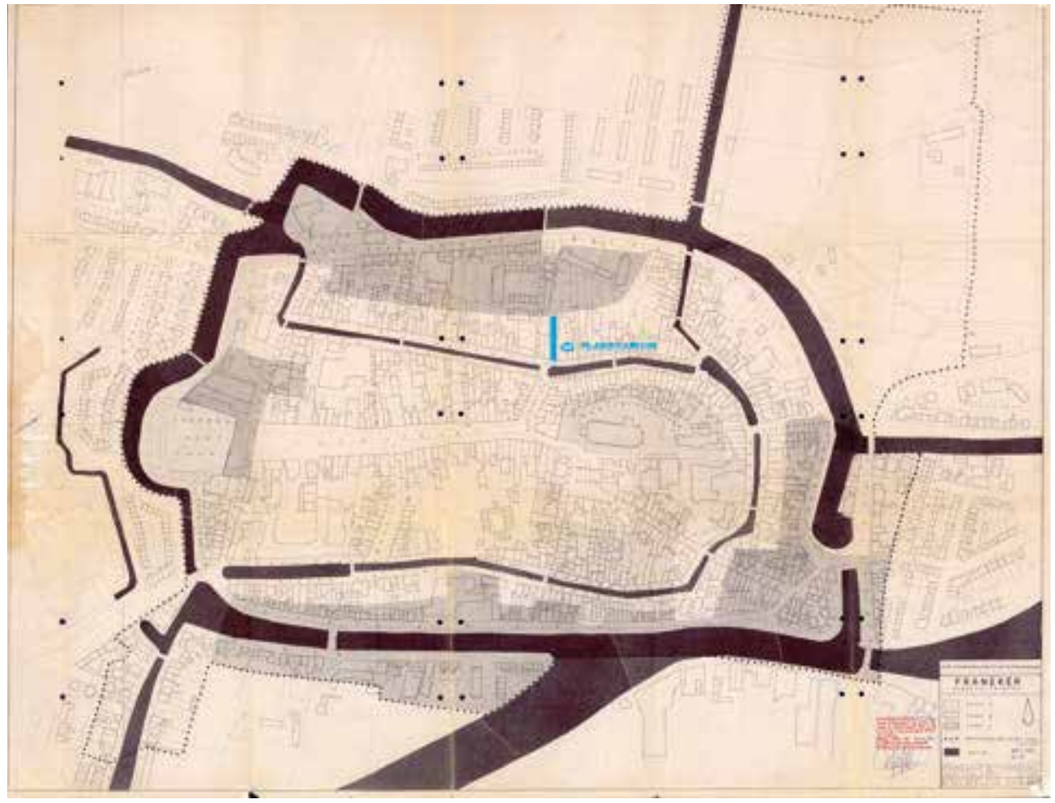


121. Property and buffer zone.

Property, attributes and the Heritage Act

The Planetarium building, including all the attributes, and more than a hundred other buildings in the historic inner city of Franeker have been designated as national monuments by the national government. On behalf of the Minister of Education, Culture and Science (OCW), the Cultural Heritage Agency of the Netherlands designates immovable property that is unique and valuable for our country. A permit is required for changes to monuments, in which respect it is carefully considered whether the plans are in accordance with the monumental values of the building. This consideration is made by the municipality, which is at all times advised in this process by the (independent) municipal advisory committee. In addition, the Cultural Heritage Agency of the Netherlands provides advice in the event of major changes, adaptive re-use, reconstruction, relocation or demolition.

The monumental Planetarium building is indicated on the map of the protected cityscape **<122>.**



122. Map protected cityscape of Franeker, relating to the Designation Decree by the State Secretary for Culture, Recreation and Social Work and the Minister of Public Housing and Spatial Planning, 21 February 1979.

Buffer zone and protected cityscape

Since 1979, the inner city of Franeker – including the Bloemketerp area outside the buffer zone and an area south of the city canal – has enjoyed the status of protected cityscape. The property and the buffer zone are part of the protected cityscape.

The Heritage Act contains the following description of a protected cityscape, townscape or villagescape:
'Groups of immovable property that is of general interest on account of its beauty, its mutual spatial or structural cohesion or its scientific or cultural heritage value, and in which groups one or more monuments are located.'

The designation is aimed at preserving the uniqueness of the area must be given an explicit place in spatial planning and development. At the request of the municipality, the Cultural Heritage Agency of the Netherlands can provide advice in this respect, as well as Hûs & Hiem (Frisian for House and Yard), the organisation for building aesthetics advice and monument care in the province of Fryslân. The protection is not aimed directly at individual buildings, but mainly at the historical characteristics, the urban planning structure and the layout of the public space. This protection of the area has been given a key position in the zoning plan for the inner city of Franeker and will have a similar position – after the Environment and Planning Act has entered into effect – in the environmental plan.

As described above, the national monuments and the protected cityscape are well protected legally and planologically. This protection extends to the buffer zone, which covers the immediate vicinity of the Planetarium building and is aimed at the preservation of both the spatial and the visual aspects of the property, as well as anticipating on new developments that could potentially affect the World Heritage Site.

Description buffer zone

The buffer zone concerns the immediate vicinity of the Planetarium, where the boundaries on the west and the east side coincide with the (farthest) sight lines of the Planetarium building. This also applies to the south side, where Voorstraat forms the boundary of the buffer zone. The northern part of the buffer zone contains the buildings and plots directly adjacent to the Planetarium up to the site of primary school 'De Korendrager'.

The entire buffer zone falls within the boundaries of one zoning plan, namely the 'Franeker – Inner City' zoning plan dating from 2016. This zoning plan was adopted by the city council on 27 October 2016.

The starting point of this zoning plan is to consolidate the characteristics of the historic inner city. This means that spatial plans in the planning area are assessed and must meet criteria that guarantee the preservation of the historic characteristics. In order to do this as effectively as possible, a so-called area-protecting designation, namely the designation 'Value – Protected Cityscape', applies to the entire planning area. In this designation, it is indicated that all the grounds in the inner city are intended for the preservation, restoration and expansion of the existing cultural heritage and spatial values referred to in the 1979 Designation Decree. This Designation Decree forms an integral part of the zoning plan and is also summarised in the elaboration of the zoning plan.

The designation 'Value – Protected Cityscape' also contains a legal translation of the intention of the Designation Decree for the protected cityscape, for example building in facade lines, the corresponding desired directions of the roof ridges, facade widths and requirements for roof pitches. Another important element is the ban on total or partial demolition of buildings in facade lines (insofar as a permit is not already required under the Heritage Act). Finally, attention is also paid to the way in which the grounds in the inner city where no buildings are present, such as roads, streets, paths, parks, etc. are dealt with. For activities relating to the construction or removal of such works a permit is required, in which respect assessment must again take place on the basis of the cultural heritage and spatial values present, as referred to in the 1979 Designation Decree.
The zoning plan for the inner city provides an elaboration of the instruction in the Designation Decree, to ensure appropriate protection of the protected cityscape.

The Environment and Planning Act is expected to enter into force as from 2022. Through this Act the government means to simplify, and where possible merge, rules for the physical living environment. The Planetarium will also be well protected within the regime of the Environment and Planning Act, comparable to the current provisions in the zoning plan. More about this below.

Building Aesthetics

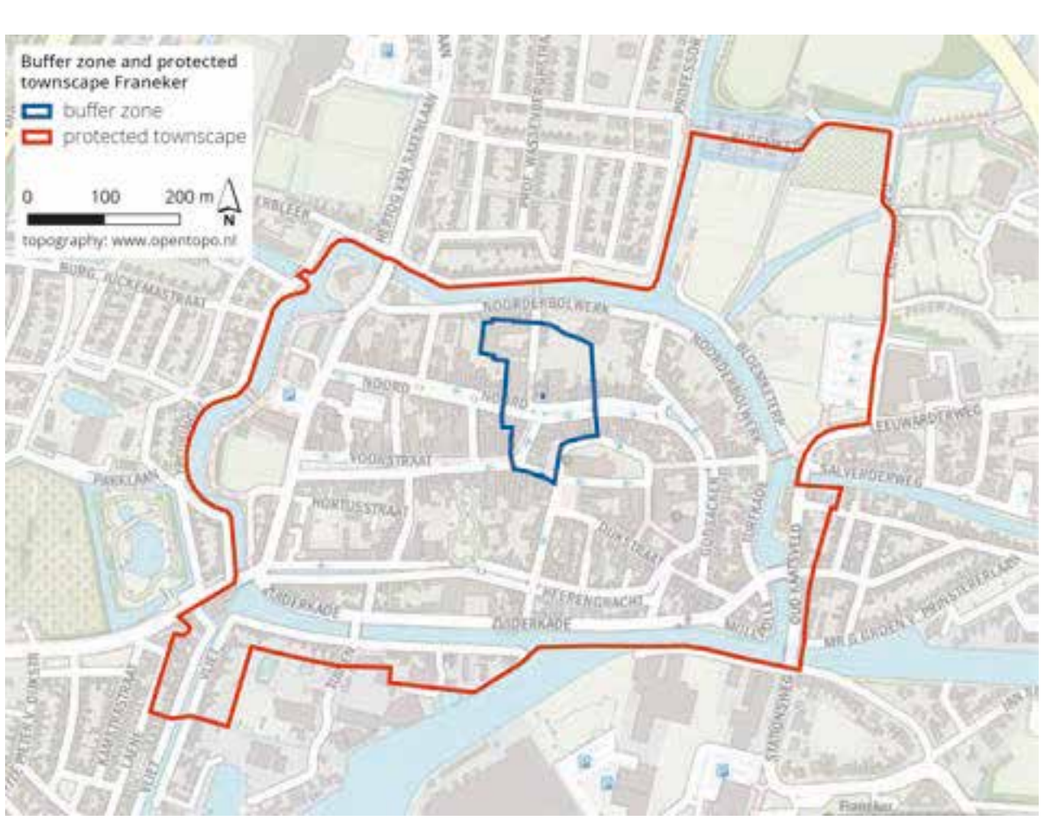
Within the municipality of Waadhoeke, the Advisory Committee on Spatial Quality (included in the joint arrangement Hûs en Hiem) is responsible for building aesthetics advice. All environmental permits for the construction or renovation of a structure are submitted to this committee for assessment. This also applies to changes to national monuments.

The Advisory Committee on Spatial Quality is an independent advisory committee, that assesses building plans against the building aesthetics criteria established by the municipal council, as included in the Building Aesthetics Policy Document. In view of the protected status and the valuable character of the inner city of Franeker, it is obvious that stricter criteria apply to the area within the boundaries of the protected cityscape.

It is evident from the Building Aesthetics Policy Document that plans should not only be assessed as separate entities, but also in conjunction with the environment. In this way, the characteristic street and building image of the historic inner city is safeguarded. For the protected cityscape, this means that the preservation or the reinforcement of the unique character of the historic inner city will always primarily be the starting point. It is worth mentioning that the Building Aesthetics Policy Document, too, will eventually become part of the environmental plan, obviously based on the framework of the Environment and Planning Act.

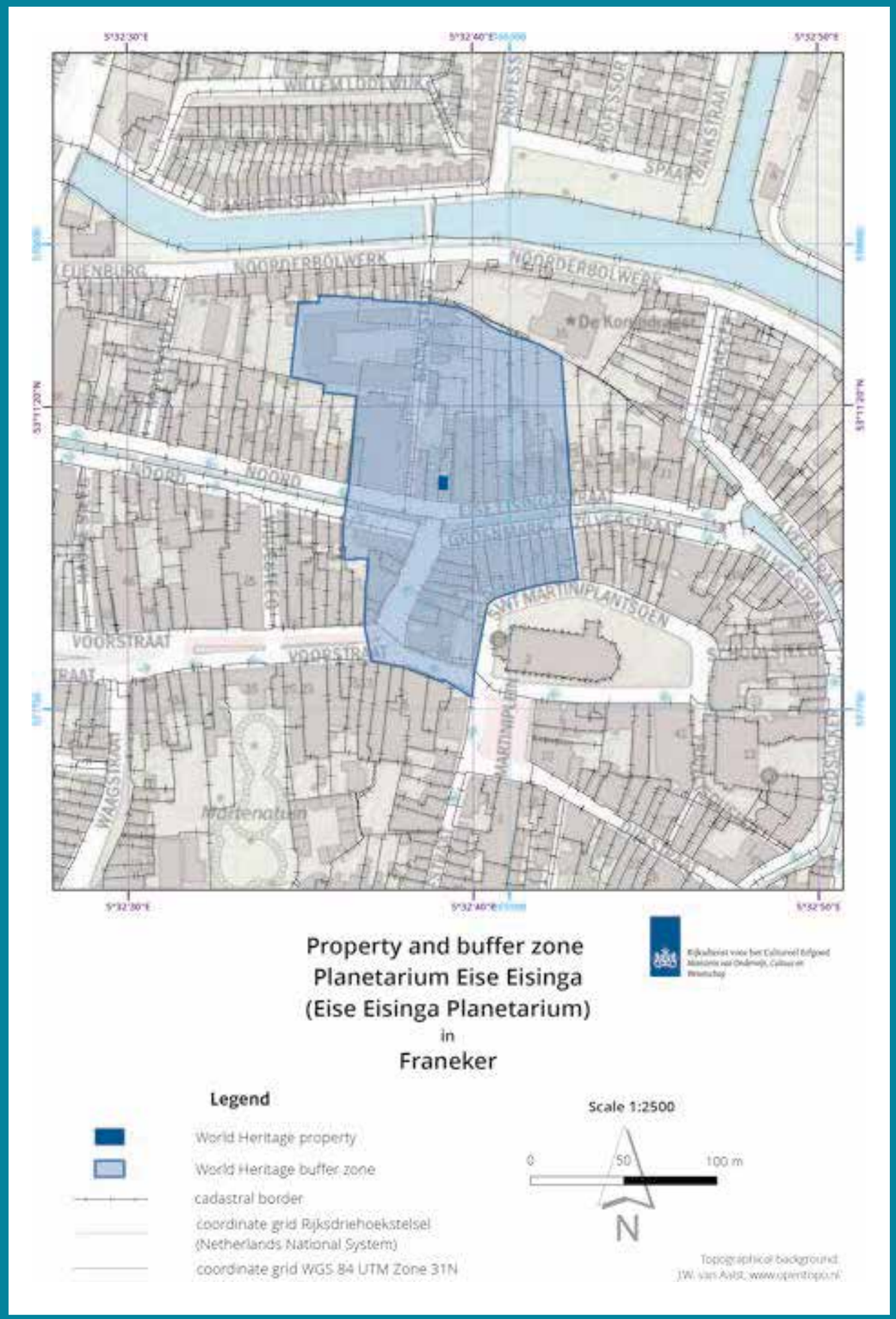
Adequate regulations

The inscription of the Eisinga Planetarium on the UNESCO World Heritage List does not entail any new rules. The wide range of existing regulations, primarily aimed to preserve and where possible reinforce the unique appearance of the historic inner city of Franeker, ensures that no undesirable spatial developments are to be expected for the Planetarium building and the surrounding buffer zone. In addition to this, a so-called duty of care will apply under the Environment and Planning Act. Those who carry out activities that concern the World Heritage Site and who know or can reasonably suspect that such activities may lead to damage or destruction of the World Heritage Site or a part thereof, are obliged, insofar as this affects the Outstanding Universal Value, to take any measures that can reasonably be requested from them in order to prevent such damage or destruction.



123. Planetarium, buffer zone (within blue outline) and protected cityscape (within red outline).

124. Planetarium, buffer zone (within purple outline) and protected cityscape (within blue outline).
125. Planetarium and buffer zone (within purple outline).



126. Property within the buffer zone.

Protection

The Royal Eise Eisinga Planetarium enjoys the status of protected national monument, pursuant to article 3.3 of the Heritage Act, by ministerial decree of 21 February 1967. The monument number of the national monument is 15669.

The Planetarium is part of an exceptionally well-preserved historic inner city ensemble with the designation 'Protected Cityscape'. Since 1979, the inner city of Franeker has enjoyed the status of protected cityscape.

Permits

In many cases a permit is required for the renovation or restoration of a built national monument – including the Royal Eise Eisinga Planetarium. A permit is also required for certain work on buildings within protected cityscapes, townscapes and villagescapes. The environmental permit is a permit for many activities in the physical living environment.
Articles 4.3 and 4.28 of the Environment and Planning Act apply.

Article 4.3 Environment and Planning Act partially (based on government rules)

1 Rules are laid down by order in council regarding the following activities that have or may have consequences for the physical living environment:
a. construction activities, demolition activities and the use of and conservation of buildings;
b. environmentally harmful activities;
h. activities relating to cultural heritage;
i. activities relating to World Heritage.

Article 4.28 Environment and Planning Act (government rules cultural heritage)

1 The rules referred to in article 4.3 regarding activities relating to cultural heritage, are laid down with a view to the preservation of cultural heritage.
2 The rules are in any case intended to prevent damage or destruction of cultural heritage and to conserve it, where monuments are concerned.

Advice on permit applications

The applicant of a request for the granting of a permit for restoration or modification of a national monument addresses his application to the relevant municipality.
The municipality considers whether or not to issue a permit (Article 5.22 Environment and Planning Act).
The Cultural Heritage Agency of the Netherlands provides advice in the event of adaptive re-use, reconstruction or demolition, and provides know-how in the event of conservation tasks. In all cases, the municipal building aesthetics and monument committee (Hûs en Hiem) plays an advisory role.

Article 5.22 Environment and Planning Act (assessment rules application national monument activity)

For a national monument activity, the rules (...) are laid down with a view to the preservation of cultural heritage, and in that context to:
a. the prevention of impairment, damage, demolition or relocation of national monuments and archaeological monuments;
b. the promotion of the use of national monuments, if necessary by modifying such monuments, taking into account the monumental values;
c. the conservation and maintenance of archaeological monuments, preferably in situ.

An initiator is prohibited from implementing measures without a permit when modifying a national monument. This prohibition is regulated in article 5.1 of the Environment and Planning Act.

Article 5.1 Environment and Planning Act partially (environmental activities decree)

1 It is prohibited to carry out the following activities without an environmental permit:
c. a national monument activity.

An initiator is prohibited from implementing measures in derogation from the permit when modifying a national monument. This prohibition is regulated in article 5.5 of the Environment and Planning Act.

Article 5.5 Environment and Planning Act partially (prohibition of acting in violation of environmental permit regulations)

1 It is prohibited to act in violation of a regulation of an environmental permit for
a. an environmental plan activity, insofar as that regulation has been laid down with a view to:
1°. ensuring safety, protecting health and protecting the environment;
4°. protecting monuments or archaeological monuments;
b. a national monument activity.

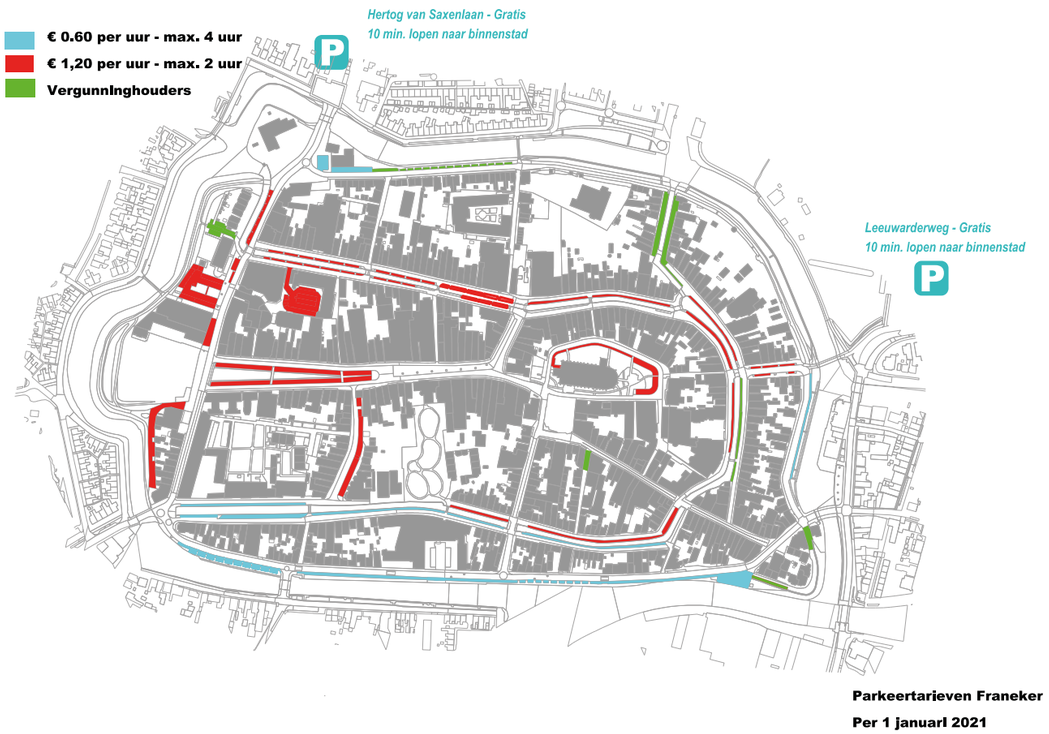
5.D EXISTING PLANS RELATED TO MUNICIPALITY AND REGION IN WHICH THE PROPERTY IS LOCATED

Analysis parking requirement

The Planetarium currently attracts approximately 60,000 to 65,000 annual visitors. The Parking Vision for the inner city of Franeker, adopted by the city council in 2019, shows that the parking capacity in and around the centre is sufficient. To enable developments (with a view to parking demand at peak times) the council has made money available to create additional parking capacity within a walking distance of approximately 10 minutes from the Planetarium.

With the acquisition of the designation 'UNESCO World Heritage Site', the number of visitors is expected to grow. Commissioned by the municipality of Waadhoeke, research was carried out in the second half of 2020 into the consequences if the number of visitors were to increase to 80,000, 100,000 or 125,000 per year respectively.

The location of the various parking options, the parking capacity and the different access and walking routes to and from the Planetarium are adequate to accommodate a substantially growing number of visitors to the Planetarium without public nuisance. The parking requirement is monitored annually to ensure a timely response to developments whenever necessary.



127. Franeker, parking space and rates. Source: Municipality of Waadhoeke, 2021.

Inner city management

The municipality of Waadhoeke collaborates with entrepreneurs in the city on the inner city management Franeker. The ambition of the inner city management is to position the city of Franeker as a powerful regional centre and a future-proof vital city.

Municipality and entrepreneurs intend to achieve the following with the inner city management:

- attract more visitors to the city (focusing on tourists, shoppers and visitors to activities and events);
- make the inner city even more attractive (by adjusting the infrastructure and the physical street scene, focusing on atmosphere and experience);
- improve the entrepreneurial climate (focusing on the establishment of more small and medium sized businesses, paying attention to the tourism sector).

Tourist information provision Franeker

In 2020 the municipality of Waadhoeke, together with various stakeholders from Franeker, produced the 'Implementation Plan Tourist Information Provision Franeker'. The plan is intended to renew the tourist signage in the city of Franeker. Implementation is to take place mid-2021. The Implementation Plan has been drawn up on the basis of the theme Franeker Historic Academy City, and from that Unique Selling Point (USP) intends to inform visitors to the city as well and completely as possible about what to do, and where to see and experience things.

Summarised

By means of the physical signage, but also by providing map material, visitors are guided from several 'reception areas' and from the city centre to the various points of interest (POIs). At some of these buildings, locations and objects, the visitor is further informed via a QR code sign. The QR code leads to text fragments on the website of 'The Star of the Eleven Cities' and refers to the academy city. Visitors can also listen to audio files: spoken word by historical 'folk' from the time of the academy city about their relationship with the POI in question. For the stinses (former Frisian strongholds) and city castles, this is combined with hard stone plaques displaying concise information. These plaques are incorporated into the road surface. In addition to the characteristic and specific POIs, more general matters will also be included in the physical signage relating to, for example, parking locations, the railway station or the public toilets.

Reception

On the various approach roads, signs will indicate the historic academy city of Franeker, and regular signage will direct car traffic as much as possible to the free parking areas around the inner city. In addition to the signage (signposts, QR code signs and plaques), there will be reception areas to welcome visitors coming from the parking areas (car), by foot or by bicycle, as well as from the station. These reception areas are intended to enable visitors to orientate themselves prior to a visit to the inner city, and to allow themselves a moment of rest. At these locations visitors will be informed about Franeker and its surroundings via information panels and signage. In collaboration with the catering industry and selected shops, analogue (paper) city maps will be offered. The other walking and cycling routes in, around and through the city also converge at these points. The locations will (in a next development phase) be organised in a user-friendly way, and be equipped with bicycle parking facilities, benches, signage and other street furniture. An information panel will also be installed in the centre of the city.

Welcome signs

It is the intention to place welcome signs on all the approach roads. The signs represent the city's USPs, whereby various logos have been chosen, including that of the Planetarium. Signs along the A31 (permission Department of Waterways and Public Works) will not be possible until after the Planetarium has been designated as a World Heritage Site. Then, from both directions on the A31, signs with the text 'Planetarium Franeker World Heritage Site' can be placed.

128. Oort Cloud Fountain (Oortwolkfontein).

The Planetarium plays an important part in the Implementation Plan and its realisation. The Planetarium is unique and valuable to Franeker. Historically, thematically and through the person of Eise Eisinga it connects with the USP Franeker Historic Academy City. Eise Eisinga, as an amateur astronomer as well as a curator, is inextricably linked to the former Franeker Academy. The astronomer relationship with Franeker is further strengthened by the presence of the house where professor astronomer Jan Hendrik Oort (1900-1992) was born as well as the 'Oort Cloud Fountain' (Oortwolkfontein), part of 'The 11 Fountains' **<128>**. Both are included as POI in the Implementation Plan, as is the Planetarium itself of course.

5.E PROPERTY MANAGEMENT PLAN

5.E.1 VISION

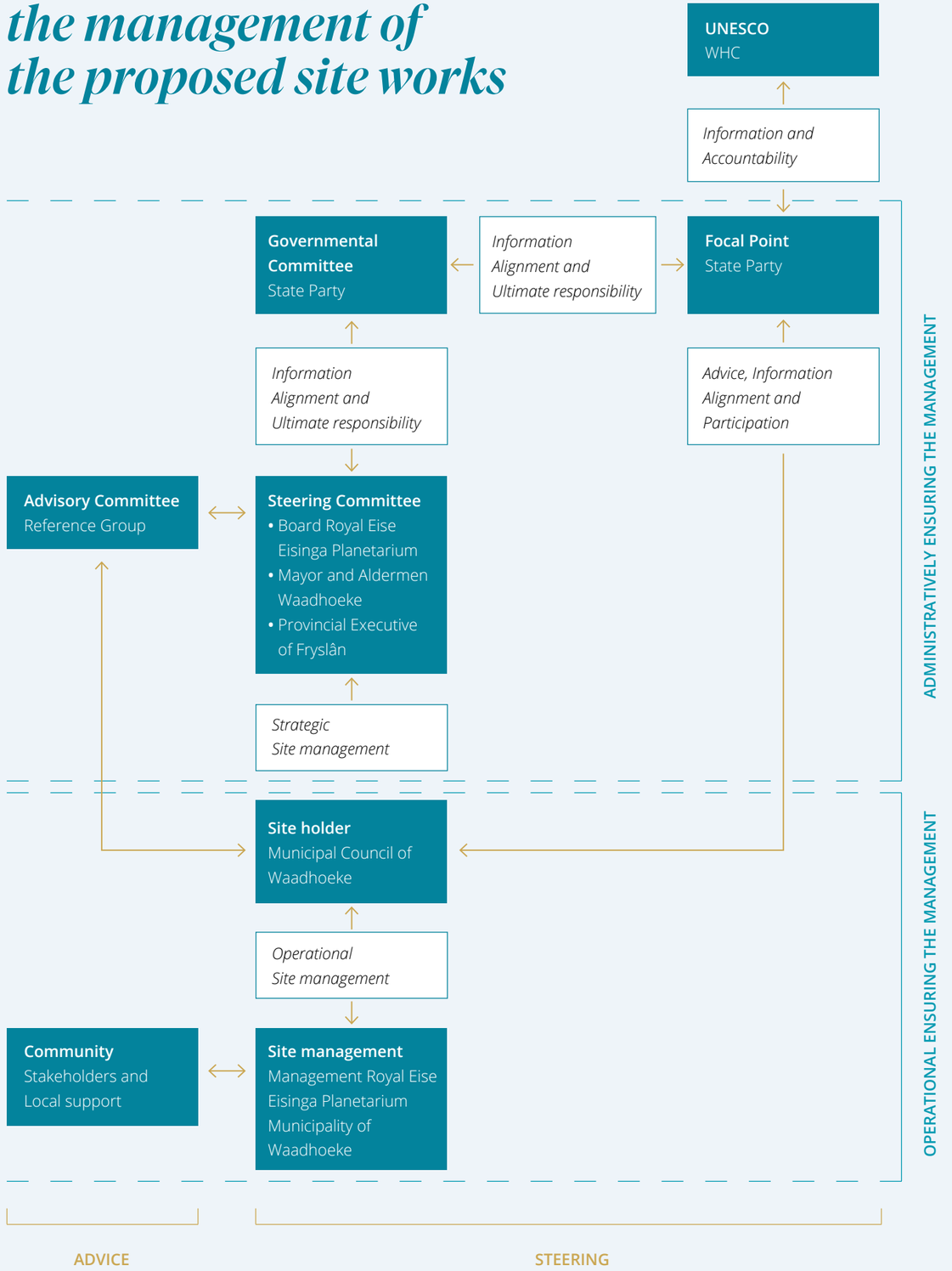
Part of the World Heritage Nomination is a Management Plan. Underlying this is the vision that the Royal Eise Eisinga Planetarium will be a World Heritage Site that makes a positive contribution to human existence and pays tribute to humanity's ongoing exploration of its position in the universe.

To this end, the Planetarium brings together stakeholders in order to continue protecting and developing the planetarium heritage. A historic site, where people from regional, national and global communities are provided with a warm welcome and a world-class experience. Visitors will perpetuate tourism to the local community, which will improve the quality of local life and positively impact the region's profile as a place to live, work and invest.

The World Heritage status reinforces the valuable inspiration to continue the connection of astronomical science and humanity through the ages, thereby transmitting Eise Eisinga's genius work with integrity and authenticity to future generations.

In conjunction with site management, every effort will be made to prevent or limit developments and changes that could negatively affect the World Heritage Site.

Chart showing how the management of the proposed site works



5.E.2 ROYAL PLANETARIUM BOARD

Since 2001, the Royal Eise Eisinga Planetarium has been managed and operated by the board and management of the Royal Eise Eisinga Planetarium Foundation. The board of the foundation consists of five members from scientific fields (University of Groningen and scientific journalism), the financial world (accountancy) and local representatives.

The board of the Royal Eise Eisinga Planetarium Foundation bears administrative responsibility for aspects such as:

- Conservation, management and operation of the Planetarium.
- Reviewing the World Heritage Site Management Plan on the basis of a 5-year cycle, including updates on the needs of stakeholders and others where relevant.
- Reviewing and sharing information on the obligations of the World Heritage Convention.
- Coordinating the implementation of the Management Plan.
- Ensuring adequate resources are available for the implementation of the Management Plan.
- Identifying fundraising opportunities for specific conservation, maintenance and engagement projects and secure funding for these.
- Seeking funding to support staffing initiatives where appropriate.
- Developing full Monitoring Programme and Plan for the World Heritage Site, including timetable and budgets, etc.
- Preparing biennial monitoring report on implementation of planned actions.
- Reviewing priorities and progress on planned actions at regular board meetings of the Royal Eise Eisinga Planetarium Foundation.
- Reviewing and updating planned actions on a 5-year basis.

5.E.3 ROYAL PLANETARIUM MANAGING DIRECTOR

The day-to-day business is carried out by a managing director and nine employees. Each of the employees has a specific task in the organisation, such as preservation and management, preparing exhibitions, and education. Within the organisation, great importance is attached to the explanation in the planetarium room **<129>**. Each of the employees plays a part in this explanation, and every visitor is given professional and educationally sound information.

129. Planetarium, every visitor is given an explanation in the planetarium room.

Due to the various expansions of the Planetarium building and the increase in the number of visitors, it has been necessary to reinforce the existing team through the addition of a curator and a part-time educational employee. With the daily presence of at least three employees, the Planetarium can be managed in a responsible manner.

The Managing Director bears operational responsibility for aspects such as:

- A strong workforce, in the interest of a professional organisation in which qualified people are available in areas such as management, hospitality, education, finance, preservation and administration.
- The availability of training and educational opportunities for employees.
- A rolling multi-year programme which includes the planning of exhibitions (both permanent and temporary) and educational programmes.
- Effective transfer of knowledge about the functioning and the necessary daily and periodic maintenance of the planetarium instrument, as described by Eise Eisinga in his 1784 manual. The associated and necessary knowledge is transmitted from one curator to the next.
- Availability of particular expertise, to be brought in from outside the organisation, for the preservation of the specific planetarium instrument.
- Up-to-date maintenance planning for the regular maintenance of the Planetarium, which also involves keeping track of the availability of specialists for the long term.

5.E.4 ROYAL PLANETARIUM NOMINATION GROUP AND STEERING GROUP

Nomination Group

The process leading to the UNESCO World Heritage status of the Royal Eise Eisinga Planetarium is supervised by the World Heritage Nomination Team. This team includes a delegation from the board of the Royal Eise Eisinga Planetarium Foundation, as well as the managing director of the Planetarium, the mayor of the municipality of Waadhoeke, an official of the municipality of Waadhoeke and the external World Heritage Nomination Project Manager. The Nomination Team has regular consultations with the official advisors of the Cultural Heritage Agency of the Netherlands.

Steering Group

The Steering Group UNESCO World Heritage Nomination Royal Eise Eisinga Planetarium includes the parties that have signed the UNESCO World Heritage Nomination Charter. The responsibilities of the municipality of Waadhoeke, the province of Fryslân and the Royal Eise Eisinga Planetarium Foundation are laid down in the UNESCO World Heritage Nomination Royal Eise Eisinga Planetarium Charter. Each Charter Party can be represented both administratively and officially. This means that each Charter Party has two seats on the Steering Group. The province of Fryslân is represented by a member of the executive committee and an official delegate. The municipality of Waadhoeke is represented by a member of the executive committee and an official delegate, who is also a member of the Nomination Team. The Royal Eise Eisinga Planetarium Foundation is represented by a foundation board member and officially by the managing director of the Royal Eise Eisinga Planetarium, who is also a member of the Nomination Team. In addition, the Steering Group has two delegated assessors. The first delegated assessor acts on behalf of the national government, in particular the Cultural Heritage Agency of the Netherlands. The second delegated assessor is the World Heritage Nomination Project Manager, who is responsible for advice and the effective preparation, reporting and (seeing tot he) activation of what has been decided by the Steering Group. Consequently, the Steering Group has a total of eight seats.

5.E.5 ROYAL PLANETARIUM PARTNERSHIPS

Authorities

The Royal Eise Eisinga Planetarium is privileged to have been publicly owned since 1825. Initially by the national government, through the purchase of the Planetarium by King William I, later by a municipal government: first the municipality of Franeker, from 1984 the municipality of Franekeradeel, and since 1 January 2018 the municipality of

Waadhoeke. Records and archives are held in the Municipal Archives of Waadhoeke (Franeker), at the Cultural Heritage Agency of the Netherlands (Amersfoort) and at Tresoar Friesland Historical and Literary Centre (Leeuwarden). This means that the government has been responsible for the conservation of all the parts of the Planetarium for almost two hundred years. As a result, all the attributes as the basis for the OUV of the property are under government management and are therefore continuously monitored.

University of Groningen

The Eise Eisinga Planetarium ensures that the scientific level of the presentation in the Planetarium is sufficiently guaranteed through various forms of collaboration with the University of Groningen (RUG). The RUG is the nearest university and one of the four universities in the Netherlands where astronomy is taught. The RUG also has a University Museum. The collaboration with this institute enhances the regional appeal of the Planetarium.

The RUG is represented in the board of the Royal Eise Eisinga Planetarium Foundation and also in the Reference Group for the nomination of the Planetarium for the World Heritage List.

The RUG has also been consulted in respect of the scientific historical research into Eise Eisinga and his Planetarium for the World Heritage File. On a daily basis, the University Museum of the RUG and the Planetarium share a curator. The curator maintans contact with the University Museum of Groningen. In October 2021 a biography of Eise Eisinga, written by the director of the University Museum, was published.

To further increase support, a partnership could be sought with the Royal Netherlands Astronomical Society, a professional association of astronomers with members in the Netherlands and Flanders. This association aims to promote the study of astronomy in the Netherlands and Belgium.

The Royal Eise Eisinga Planetarium is also affiliated with a number of organisations and branch associations, including:
- Star of the Eleven Cities Foundation, a promotion organisation in the municipality of Waadhoeke;
- Association of Dutch-language Planetariums in the Netherlands and Belgium (PLANed);
- International Planetarium Society, Inc. (IPS);
- The Netherlands World Heritage Foundation;
- Entoen.nu Foundation (Canon of the Netherlands).

In addition, the Planetarium participates in a number of national activities:
- National Stargazing Days, under the auspices of the Royal Netherlands Association for Meteorology and Astronomy;
- National Heritage Days, under the auspices of the Netherlands Monument Land Foundation;
- Night of the Night, under the auspices of the Foundation Nature and Environment Federations.

5.E.6 MANAGEMENT PLAN

The main objective of the Management Plan is the protection and conservation of the Royal Eise Eisinga Planetarium. It indicates the structure for decision-making and managing changes in the context of the World Heritage Site. Attention is paid to management goals, objectives and daily or periodic actions required to protect the World Heritage Site, to sustainably conserve it and to present it to the public. The municipality of Waadhoeke, as the owner, and the board of the Royal Eise Eisinga Planetarium Foundation, composed of representative delegates, are the parties responsible for the formulation and implementation of this Management Plan, which has been drawn up in close collaboration and coordination with the Cultural Heritage Agency of the Netherlands.

The Management Plan:
- describes the Planetarium, with details of the boundaries of the World Heritage Site;
- sets out how to manage and maintain the Outstanding Universal Value, including the attributes, authenticity and integrity of the site;

- provides information on the current condition of the property and factors that can positively or negatively affect attributes, authenticity and integrity;
- states a shared vision for the long-term management of the property, and the policies, objectives and actions for the next six years;
- explains matters that may affect the preservation and use of the World Heritage Site, such as spatial developments, sustainability, tourism, education and transport;
- formulates a strategy for implementation, with monitoring and review as important aspects.

5.E.6.1 Protection

The Planetarium building and more than a hundred other buildings in the historic inner city of Franeker have been designated as national monuments by the national government. On behalf of the Minister of Education, Culture and Science (OCW), the Cultural Heritage Agency of the Netherlands designates immovable property that is unique and of great value to our country. A permit is required for changes to monuments, in which respect it is carefully considered whether the plans are in accordance with the monumental values of the building. This consideration is made by the municipality. The Cultural Heritage Agency of the Netherlands provides advice in the event of adaptive re-use, reconstruction or demolition.

130. Planetarium, blue and white shield.

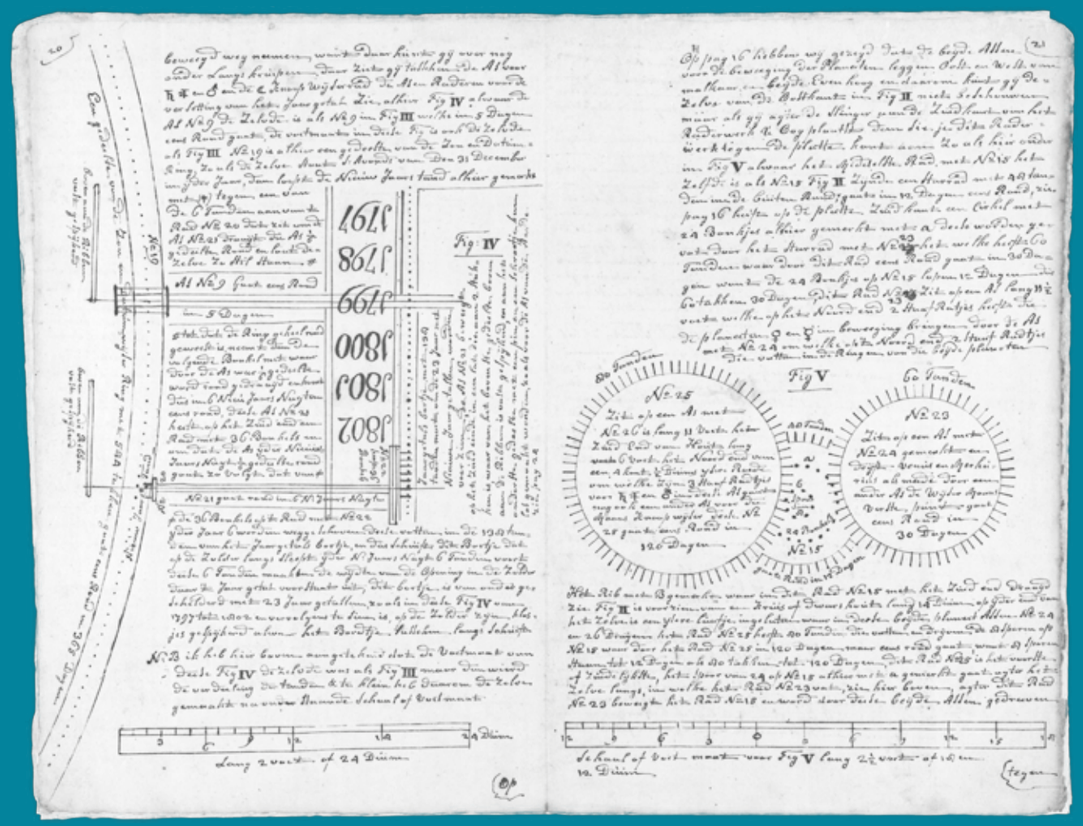
In addition, the Planetarium building is entitled to bear the blue and white shield - the international distinguishing mark to indicate cultural heritage sites protected by the 1954 Hague Convention (a convention under the auspices of the UN and UNESCO for the Protection of Cultural Property in the Event of Armed Conflict) **<130>.**

5.E.6.2 Conservation

Every two years, the building that houses the Planetarium is technically inspected by Monument Watch. The Planetarium itself (ceiling and mechanism) is also regularly checked and maintained. The basis for this was laid in 1784 in a manual written by Eise Eisinga for his sons **<131>**. The knowledge gained during this work is passed on from one curator to the next. After Eisinga's death in 1828, curators have always been responsible for the conservation and the

maintenance of the Planetarium. Once a year the cogwheels are cleaned and waxed, and also checked by a clockmaker and the managing director. The work carried out is recorded in restoration reports. In the past, various clockmakers have performed maintenance (as evidenced, for example, by the texts found on the cogwheels).

Every ten to fifteen years, the Planetarium undergoes extensive maintenance. This involves cleaning the ceiling and, if necessary, touching up bad spots. The mechanism is taken apart, cleaned and readjusted. The most recent extensive maintenance took place in January 2013. The reports of this maintenance and also of the 1998 maintenance are kept in the planetarium library.



131. Planetarium, instruction manual Eisinga (1784) about replacing the yearboard.

132. Planetarium, instalment updated yearboard.

5.E.6.3 Presentation

The main objective of presentation is the continued use of the Planetarium for receiving visitors and applying an extensive programme for presentation and education.

Extensive scientific research has taken place into the various facets of the 'planetarium' phenomenon. The literature review includes a selection of relevant publications in which the Eisinga Planetarium is discussed, directly or indirectly. The unpublished research reports commissioned by the Royal Eise Eisinga Planetarium Foundation are included as appendices. Dijkstra (2019) and Gessner (2020) also contain extensive literature references.

Various media regularly pay attention to the Royal Eise Eisinga Planetarium, always in a positive way. This includes articles, both on paper and on the internet, and television recordings. The aim is to generate more or less constant media coverage.

133. Planetarium, recording Japanese television, 2013.

The Royal Eise Eisinga Planetarium offers an extensive range of education for both primary and secondary schools. Attention in this respect is paid not only to the location of the Planetarium, but also to the city of Franeker and Eisinga's native village Dronrijp. In addition, the international Universe Awareness teaching box *'Universe in a Box'* is offered. The Planetarium's educational activities are extensive and diverse, and constitute a valuable component in the transfer of knowledge related to the future World Heritage Site.

The board and the management of the Royal Eise Eisinga Planetarium are affiliated with organisations in the field of astronomy and planetariums, in particular the following:

- Association of Dutch-language Planetariums in the Netherlands and Belgium (PLANed) – PLANed is the association in which a number of the Dutch-language planetariums in Belgium and the Netherlands work together. The relatively small Dutch-language area has only a limited number of planetariums. This cooperation arose from the desire to be able to offer a varied range of Dutch-language programmes.

134. PLANed, logo.

135. International Planetarium Society, logo.

136. International Astronomical Union, logo.

- International Planetarium Society, Inc. (IPS) – More than six hundred planetariums from forty-six countries, including the Royal Eise Eisinga Planetarium, have united in the International Planetarium Society. The IPS is an international association of planetarium professionals involved in a wide range of planetariums: from historical planetariums to the most modern projection planetariums. Every two years a conference is organised with presentations and workshops, where knowledge, experiences and new ideas are exchanged.

- International Astronomical Union (IAU) – UNESCO, supported by the International Working Group on Astronomy and World Heritage and by the International Astronomical Union (IAU), has an online portal that facilitates international discussion and preparation of nomination files of astronomical heritage: https://www3.astronomicalheritage.net.

5.E.6.4 Community Benefit

In the context of community benefit, the Royal Eise Eisinga Planetarium, in collaboration with the Cultural Heritage Agency of the Netherlands, focuses on the European Faro Convention. Heritage brings people together and ensures that the environment, which changes quickly, remains familiar. The Faro Convention emphasises this social and connecting value of heritage, and the importance of participation by society. The Faro Convention identifies a movement in the heritage sector that is getting ever stronger: cultural heritage as a means to achieve social goals.

The main objective of community benefit is to make a social contribution to the local society and economy through sustainable conservation and use of the Royal Eise Eisinga Planetarium. In this context particular attention is paid to public events and workshops. Examples of public events are chamber music series, lectures, literature readings, Franeker Historic Evenings, topical subjects, information sessions and special meetings. For more extensive public events, the adjacent theatre De Koornbeurs is available as an alternative location. When the number of visitors increases, the theatre can also play a role in the reception and information of visitors. On the basis of an introductory memorandum with perspective, further elaboration of the 'workshop' aspect will be initiated, in conjunction with one or more pilot projects. It is the intention to employ external expert organisations in this connection.

137. Planetarium, Feel the Night 2015.

Due to its unique character, the Royal Eise Eisinga Planetarium's appeal goes beyond just Franeker or Friesland. National and international media attention is paid to the Planetarium every year. The economic value of this attention is considerable. Also, the direct visitors to the Planetarium and their stay in the region provide a financial injection for the municipality and the province. On average, around € 20 is spent per visitor outside the Planetarium. This means that the Planetarium is currently stimulating local economy by approximately € 1,300,000 per year.

138. Planetarium, two millionth visitor, 2015.

5.E.6.5 Inspiration to Future Generations

Education is the most important instrument for the transmission of inspiration to future generations. The Royal Eise Eisinga Planetarium offers an extensive range of education for both primary and secondary schools. Attention in this respect is paid not only to the location of the Planetarium, but also to the city of Franeker and Eisinga's native village Dronrijp. In addition, the international Universe Awareness teaching box *'Universe in a Box'* is offered. The Planetarium's educational activities are extensive and versatile, and constitute a valuable component in the transfer of knowledge related to the future World Heritage Site.

In the municipality of Waadhoeke, primary education and the arts and culture field work closely together in the sphere of cultural education. Every year, under the name 'Waadzinnig', they offer a varied programme in which different arts and culture disciplines receive attention in a continuous learning line. All of Waadhoeke's primary schools, including special education, participate in this joint programme (reaching about 3700 children). The Planetarium is a permanent feature of this programme.

5.E.7 COMMUNITY INVOLVEMENT

Recognition and social support are essential for a sustainable and sunny future of the Eisinga Planetarium. To this end, raising awareness is one of the central activities of the Planetarium. Both the Planaterium's educational projects and the programme aimed at the involvement of adults from the region serve this purpose. This is in line with an (inter) national movement to increase public involvement and participation in heritage. (Faro Convention).

The name of Eise Eisinga and the Planetarium are inextricably linked to Franeker. Those who live, work or are educated in Franeker will come across Eise Eisinga and his Planetarium. Eise Eisinga, his ideas and the Planetarium live on in various ways. The city has two works of art that refer to Eisinga. Those who want to have a rest in the inner city can take a seat on so-called star seats, and to visit the Planetarium one will of course have to pass through Eise Eisingastraat. Another Eise Eisinga work of art is to be found on the bridge in front of the Planetarium. This work of art will be part of the 'Denkbeeldenpad' (Ideas Path), a project of the Franeker Art Foundation, which is intended to form an educational arts route through Franeker. The works of art refer to the ideas of four 'thinkers' from the history of the city, namely Anna Maria van Schurman (first female university student), René Descartes (French philosopher and mathematician), Balthasar Bekker (theologian and preacher) and Eise Eisinga. The 'Denkbeeldenpad' is expected to be completed by the end of 2022.

The city of Franeker is the 'Star of the Eleven Cities'. With its historic inner city, Franeker serves as a shopping centre for a large catchment area. Entrepreneurial associations have united in an umbrella foundation called 'Star of the Eleven Cities'. 'Star' refers to the Planetarium and stands for quality. This club of entrepreneurs promotes the Franeker inner city and organises activities there, seasonal markets and more, all year round.
Social support is strong: people from Franeker are proud of their Planetarium. The influx of more than 60,000 visitors per year is also important for local businesses. There are no reports or indications that local residents are inconvenienced by the large numbers of visitors to the Planetarium.

139. Planetarium, 60.000th visitor of 2018.

The award of the 'Royal' designation in 2006 is considered to be the national recognition of the exceptional status of the Planetarium. Some highlights are the 2008 Queen's Day, with a central role for Eise Eisinga, and the visit to the Planetarium by King Willem Alexander and Queen Maxima on 13 June 2016 **<140>**. The Planetarium was nominated to be proclaimed 'Het moaiste fan Fryslân' (The finest of Fryslân). On 16 November 2017, during the final, the gratifying message was received that the Planetarium had won the election, which confirms the wide support among the Frisian population.

140. Planetarium, Royal visit, 2016.

5.F SOURCES AND LEVELS OF FINANCE

Sources of finance

The Royal Eise Eisinga Planetarium is supported by various public authorities, and it also regularly calls upon regional and national funds. In addition, the Planetarium generates income from entrance fees and the sale of items in the planetarium shop.

The Royal Eise Eisinga Planetarium has a subsidy agreement with the municipality of Waadhoeke, under which the operating subsidy for the Planetarium is sustainably organised. In this subsidy agreement, the required best effort obligations are specified. The board of the Royal Eise Eisinga Planetarium Foundation annually submits a substantive and financial report to the municipality of Waadhoeke, in which the activities realised are described. With effect from 2021, the Royal Eise Eisinga Planetarium has also been included in the Provincial Subsidy Structure, in addition to the subsidy agreement with the municipality of Waadhoeke.

The national government intends to encourage the care of protected monuments, giving priority to the World Heritage Sites in the Netherlands. It does this, for example, by granting owners subsidies for maintenance and restoration or to enable adaptive re-use in the event of imminent vacancy.
Current schemes which are important to the Planetarium are:

- Subsidy scheme Monument Preservation (SIM) – Owners of national monuments that are not residential buildings can apply for this subsidy scheme. The SIM is intended for regular maintenance costs, based on a six-year maintenance plan. Applications can be submitted from 1 February to 31 March.
- In addition to a state subsidy, monument owners can apply for a loan from the Restoration Fund or make use of one of the provincial restoration schemes. There are also funds such as the Culture Fund, that can financially support restoration of special objects, interiors and monuments.

In addition, the Friends of the Royal Eise Eisinga Planetarium Foundation was established in 1996, with a core of more than 300 donors. The board of the Friends Foundation manages the funds of the donors. The Planetarium management can call upon these funds for the support of, for example, purchases, restorations and special projects. Besides the structural support from the various public authorities as described above, the Royal Eise Eisinga Planetarium regularly calls upon regional and national funds. Applications are made in case of special projects, such as educational programmes, expansions and purchases.

Levels of finance

The Royal Eise Eisinga Planetarium has structural operation subsidy agreements with the municipality of Waadhoeke and the province of Fryslân. For the period 2022-2025, this will be € 210,000 and € 80,000 per year respectively. This means that the annual operation is guaranteed. With the Planetarium's own income (approximately € 300,000 per year) added to this, it can be concluded that management is sound, and that there is room for reservations for the required maintenance and management to be able to pass on the OUV to future generations.

For one-off investments with regard to special projects – such as the two expansions that have been realised – regional, national and international funds are called upon **<141>.**

141. Planetarium, cheque BankGiro Lottery, 2015.

5.G SOURCES OF EXPERTISE AND TRAINING IN CONSERVATION AND MANAGEMENT TECHNIQUES

The main objective for the principle protection & conservation is to provide a future guarantee for adequate and effective protection, preservation and sustainable maintenance of the Outstanding Universal Value, Integrity and Authenticity of the Planetarium, including any measures in favour thereof.

Unconditional continuation of the historical function of the Planetarium is essential, by (seeing to the) implementation of all the relevant policy and preservation measures, so that the authenticity of location, material and function remains preserved. Training of current and future generations of experts is an additional task in order to be able to apply and implement everything necessary in the context of the World Heritage Status of the property over the years. In addition, the board and management of the Royal Eise Eisinga Planetarium have the ambition to provide continuous briefings and training for all staff and stakeholders on the OUV, Integrity and Authenticity of the World Heritage Site, on the Management Plan and on the Action Plan. Related to this is the instrument of heritage impact assessment, and to implement the protocol for undertaking heritage impact assessments, compliant with the ICOMOS process. Part of the training is also the establishing process for annual review of the condition of the attributes of the OUV (part of the Monitoring Programme and Plan). The experience built up over centuries in conservation and management techniques forms the solid basis for sustainable conservation of authenticity and integrity of the Planetarium.

The main objective for preservation and management of the OUV is effective governance, adequate resources and appropriate supervision to support the implementation of the Management Plan, with attention to the transfer of management knowledge as laid down by Eise Eisinga, the founder of the Planetarium, including the required aspects of planning, realisation, evaluation and feedback. The board of the Royal Eise Eisinga Planetarium ensures the structural availability of effective management and staff in order to perpetuate high-quality conservation, sustainable management and dynamic operation at a functional level. Continuous training and educational opportunities will be made available to employees.

142. Planetarium, maintenance work cogwheels.

143. Planetarium, maintenance work planetarium ceiling.

The correct transfer of knowledge about the functioning and the necessary daily and periodic maintenance of the planetarium instrument will be ensured. The functioning is primarily described by Eise Eisinga in his 1784 manual. The associated and necessary knowledge is transmitted from one curator to the next. Team members regularly attend courses to responsibly ensure preservation and management. Suitable materials are present to carry out the required maintenance work in a responsible way. In order to preserve the specific planetarium instrument, expertise from outside the organisation is called in for advice and support, to supplement the knowledge present within the planetarium team. There is an external team consisting of a clockmaker, a restoration painter and an artisan woodworker. A schedule for the regular maintenance of the Planetarium is progressively updated, which also involves keeping track of the availability of specialists for the long term.

5.H VISITOR FACILITIES AND INFRASTRUCTURE

In 2008 and 2016 respectively, the Eisinga Planetarium was expanded with two adjacent buildings. This has considerably increased the reception capacity. In the adjacent building 'De Tuinkamer' houses a brasserie **<144>** and a spacious auditorium annex cinema **<145>.** The main entrance has been moved to the building next to 'De Tuinkamer', which functions as Visitor Centre **<147, 154>.** It also accommodates an interactive exhibition. A beautiful city garden, which is used as an outdoor terrace, is accessible at the rear **<146>.**

144. Brasserie 'De Stadstuin', front house, ground floor, Eise Eisingastraat 2.

145. Auditorium annex cinema, first floor, Eise Eisingastraat 1.

146. City garden behind the buildings Eise Eisingastraat 1 and 2.

147. Entrance of the Planetarium Visitor Centre, ground floor, Eise Eisingastraat 1.

These expansions have significantly reduced the pressure on the planetarium room. The length of stay in the other rooms has increased considerably – from fifteen minutes in the old situation of one building to more than sixty minutes now. This has created much more time to receive visitors in the planetarium room.

Should the potential World Heritage status lead to (much) higher visitor numbers, as yet unused visitor management tools can be deployed, such as an extension of opening hours (more hours during the day, Sunday morning opening hours), and the introduction of time slots. The current Visitor Centre will be renamed World Heritage Visitor Centre. In the event of a significant increase in visitor numbers, collaboration is being prepared with the adjacent theatre De Koornbeurs.

For visitors, the aspect of accessibility is relevant. Franeker is located on the Leeuwarden-Harlingen railway line, through which it is connected to the national rail network **<148>.** The train station is within walking distance from the city centre. In addition, Franeker is very easy to reach via multiple bus connections. There are several bus stops throughout the city. A number of these have been made accessible to the disabled. Tourist signposting marks the route from the station (as the main public transport hub) to the Planetarium **<149>.**

Franeker is conveniently located on the A31, the motorway between Leeuwarden and the end of Afsluitdijk where it connects to the A7, which provides a fast and direct link with Amsterdam **<150>.** The city is easily accessible from all directions. A ring road ensures orderly traffic around the city, which reduces the strain of considerable and heavy traffic on the centre and the residential areas. The ring road leads visitors to parking areas with free parking spaces at the edge of the compact city centre, within walking distance from the Planetarium **<151, 152>.** In addition, in the immediate vicinity of the Planetarium paid parking is available and there are special parking spaces for disabled visitors.

148. Connection to the railway network. 149. Tourist signposting.

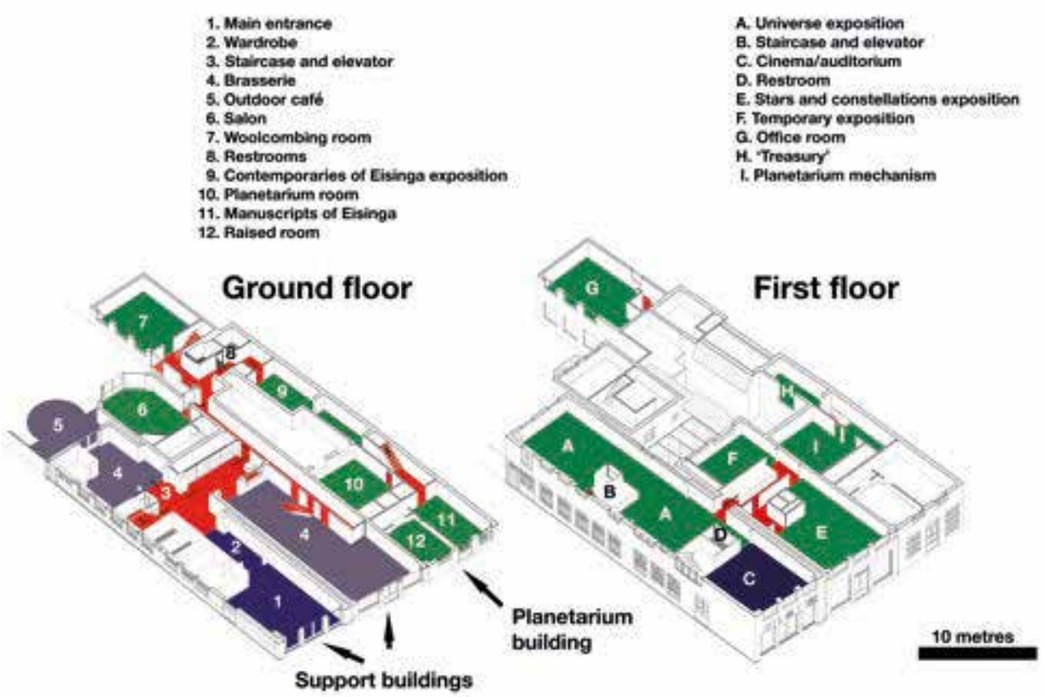
150. Motorway A31.

151. Franeker, Hertog van Saksenlaan, long-term parking close to the city centre.

152. Franeker, Leeuwarderweg, long-term parking close to the city centre.

Visitor facilities

The Eise Eisinga Planetarium has a wide audience, in terms of age as well as background and origin. It consists mainly of day trippers, with about fifteen per cent coming from abroad. Group visits and schools each account for between five and ten per cent of the number of visitors. Every visitor attends the explanation in the planetarium room. In order to properly regulate audience flows, visitors are guided in advance through informative exhibitions, with a focus on astronomical instruments from Eisinga's time.



153. Planetarium, exhibition/floor plan. Edition Royal Eise Eisinga Planetarium.

154. Information desk and planetarium shop, ground floor, Eise Eisingastraat 1.

155. Interactive exhibition 'Space', welcome by Eise Eisinga, first floor, Eise Eisingastraat 1.

156. Interactive exhibition 'Space'.

157. Interactive exhibition 'Space'.

158. Interactive exhibition 'Space'.

159. Interactive exhibition 'Space', explanation about the cogwheels of the Planetarium.

160. Interactive exhibition 'Stars and constellations', front room, first floor, Eise Eisingastraat 2.

162. Temporary exhibitions, back room, first floor, Eise Eisingastraat 2.

161. Interactive exhibition 'Stars and constellations'

With the route described below, the visitor is optimally prepared for a visit to the 18th-century Planetarium of Eise Eisinga.

Guests are welcomed at the entrance, where there is an information desk and a planetarium shop **<154>.** Visitors take the stairs or the elevator to the interactive exhibition 'Space' where they are welcomed by Eise Eisinga, who comes to life from his painted portrait **<155-162>.** After a projection of the 'Powers of Ten', about the size and structure of the universe, the functioning of a number of astronomical instruments and of the cogwheels of the Planetarium is explained by means of touchscreens and models. In the cinema, a documentary about the life and work of Eise Eisinga can be viewed in various languages. The route continues via an exhibition space dedicated to stars and constellations, and a space for temporary exhibitions.

Top: 163. Exhibition in the salon, rear annex, ground floor, Eise Eisingastraat 2. Bottom: 164. Exhibition in the salon.

167. Woolcombery, tile tableau.

165. Woolcombery, rear annex, ground floor, Eise Eisingastraat 3.

166. Woolcombery

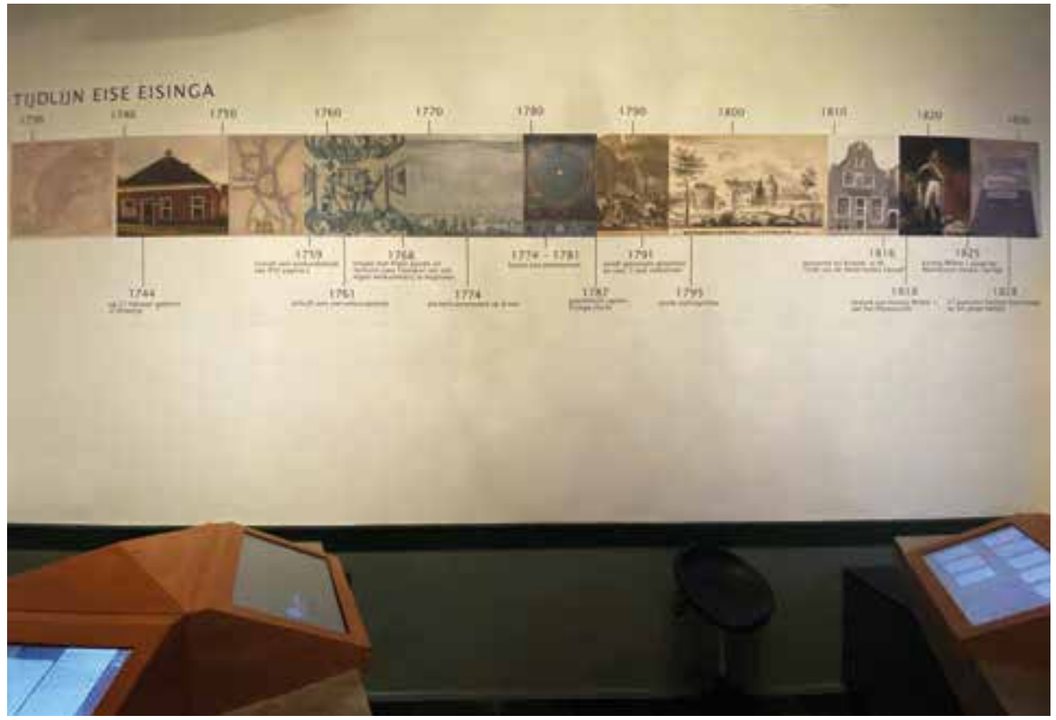
Via a beautiful salon with a rich collection of planetariums and telluriums, the visitor reaches the workplace and residence of Eisinga **<163-164>.** On the north side Eise Eisinga's woolcombery is to be found. Here, based on Eisinga's manuscripts, a reconstruction of a woolcombing company and an 18th-century tile tableau depicting a woolcombery are shown **<165-167>.**

168. 169. Long corridor to the front house of Eise Eisingastraat 1, with exhibition about contemporaries of Eise Eisinga.

171. Permanent exhibition 'Treasury' on the mezzanine near the mechanism.

170. Permanent exhibition 'Treasury' on the mezzanine near the mechanism of the Planetarium, Eise Eisingastraat 3.

In the long corridor to the front house, an exhibition has been set up about Eise Eisinga's contemporaries: people, like Eise, without specific training, who made observations and built astronomical instruments **<168, 169>.** A well-known example is Jan van der Bildt (1709-1791), a carpenter's son who taught himself the clockmaker's and lens grinder's crafts. He built several hundred telescopes that were used all over Europe. A permanent exhibition, 'Treasury', has been set up on the mezzanine near the mechanism of the Planetarium **<170, 171>.** In the hall of the front house, Eisinga's life is depicted in a timeline **<172>.** Eisinga's manuscripts can also be viewed via touchscreens **<173>.**



Top: 172. Timeline Eise Eisinga, ground floor, hall, Eise Eisingastraat 3. Bottom: 173. Touchscreens with Eise Eisinga's manuscripts, ground floor, hall, Eise Eisingastraat 3.

174. Former living room, now planetarium room with planetarium.

175. Route to the planetarium room.

176. Cogwheels above the planetarium room.

The route ends at the former living room of Eise Eisinga, where in the 18th century he made an accurate working scale model of the solar system **<174, 175>.** Every visitor is given an explanation here. Above the living room the mechanism is situated, a system of dozens of wooden hoops and discs, fitted with thousands of nails, driven by a pendulum clock with nine weights **<176>.** All the aspects of Eise Eisinga's life and work are highlighted in this way.

Increase of visitor numbers

The Planetarium is preparing for an increasing number of visitors, both as regards the reception of visitors in the Planetarium and the logistics in the city (see also the description in the Management Plan, chapter 3.1). The proximity of two other World Heritage Sites – the Steam Pumping Station in Lemmer and the Wadden Sea – makes it extra attractive for tourists to visit Fryslân and the Planetarium. In addition, the other World Heritage Sites in the Netherlands can also be reached within a maximum of two hours. A collaboration, for example via Werelderfgoed.nl, will attract potential visitors.

5.I POLICIES AND PROGRAMMES RELATED TO THE PRESENTATION AND PROMOTION OF THE PROPERTY

The theme of public events is diverse and does not have to correspond with the substantive objectives of the Planetarium. The main thing is to generate attention for the location, to rent out the location as intensively as possible, and to show that the Planetarium is at the heart of society, which is another asset in relation to the support for the World Heritage status.

The use of the Royal Eise Eisinga Planetarium will be further intensified through renting and hospitality, with the side effect of further increasing prominence of the property. Related to the historical craftsmanship that can be observed in the Royal Eise Eisinga Planetarium, the aim is to organise workshops for (small) groups of participants, who during a certain period work, for example, on the construction of their own planetarium, or the processing of wool into an artistic product, all this under the guidance of external, expert teachers. Workshops which focus on specific research assignments can also be envisaged. Such workshops contribute to the positive image of social diversity.

The main objective for the principle of presentation & transmission to future generations is to continue using the Planetarium for receiving visitors and applying an extensive programme for presentation and education, with particular attention to sharing values, accessibility of the Planetarium, the information desk, the planetarium room, exhibitions, education and special activities.

It is relevant to share the World Heritage values of the Royal Eise Eisinga Planetarium with all conceivable stakeholders in relation to the development and implementation of the Management Plan, and for the promotion of the fulfilment of the obligations under the World Heritage Convention.

The Planetarium is accessible to everyone, regardless of knowledge level or age. During opening hours of the Planetarium, an information desk is available to answer questions, provide information and draw attention to matters via the website, brochures, telephone answering service and social media.

The explanation in the planetarium room is provided in Dutch, German and English. An explanation in French and Frisian is also possible on request. If these languages are not appropriate for visitors, the explanation will be given by an accompanying guide from the group, who will see to the translation.

The story of Eise Eisinga and his contemporaries is told in a permanent exhibition. In temporary exhibitions, attention is paid to current astronomical topics or subjects specifically related to the Planetarium. There is a continuous orientation on new issues and loan options in respect of objects to be exhibited. The accompanying texts in the exhibition rooms are standardly displayed in English and Dutch. In order to reach the largest possible international audience here, too, information cards are available for each exhibition room in German, French, Spanish, Portuguese, Arabic, Russian, Italian and Frisian. More languages are under preparation.

The Royal Eise Eisinga Planetarium offers an extensive range of education for both primary and secondary schools. This, too, is a valuable part of the transfer of knowledge related to the future World Heritage Site. This also applies to the Canon of the Netherlands, of which the Planetarium is part. The Canon is a core objective for education related to the cultural history of the Netherlands.

An annual lecture programme is provided in the auditorium of the Planetarium. Active participation of the planetarium organisation in special activities, such as the National Stargazing Days, Night of the Night, National Heritage Days and Story Nights, draws attention to the Planetarium. The object of constant attention is the search, together with other parties, for opportunities to deepen and broaden the range offered.

5.J STAFFING LEVELS AND EXPERTISE (PROFESSIONAL, TECHNICAL, MAINTENANCE)

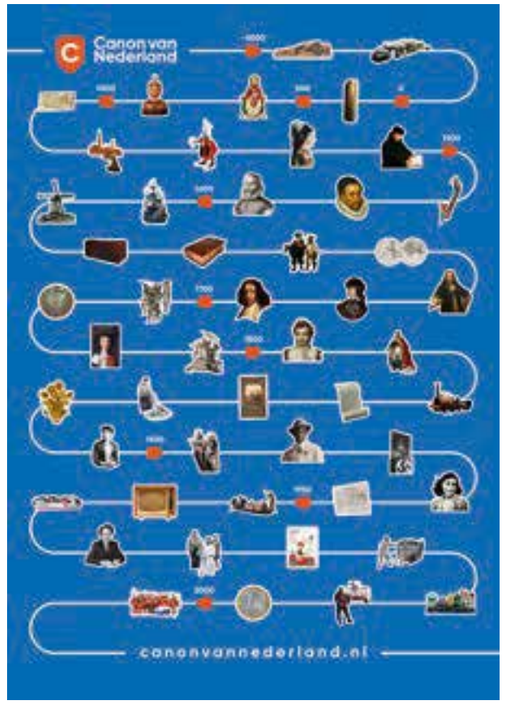
The municipality of Waadhoeke as owner of the Royal Eise Eisinga Planetarium and the Royal Eise Eisinga Planetarium Foundation as manager are aware of the great value represented by the Planetarium and the specific expertise that is vital for the sustainable conservation of the heritage. The Planetarium's management and staff are adequately equipped for high-quality daily management and maintenance.
External experts of the Planetarium Maintenance Team, who can be called upon immediately if necessary to carry out inspections and repairs, are available for aspects of periodic maintenance and any emergency repairs to the Planetarium. These are experts such as a clockmaker, a restoration painter and an artisan woodworker. In addition, experts from the municipality of Waadhoeke and the Cultural Heritage Agency of the Netherlands can be called upon to effectively advise the board and management of the Planetarium.
Briefings and training are offered for all the staff, the Planetarium Maintenance Team and stakeholders on the OUV, Integrity and Authenticity of the World Heritage Site, and on the Management Plan and the Action Plan. Apart from the contribution of in-house knowledge and experience, there is a collaboration with the Cultural Heritage Agency of the Netherlands.

Knowledge exchange

The Eisinga Planetarium was built with the aim of showing the instrument to everyone *'in order to obtain more detailed and extensive knowledge of the great gloriously and wonderfully created Universe'*. This tradition is maintained to this day: everyone who enters the planetarium room is given an explanation on the (functioning of the) solar system. This continuity in knowledge exchange makes the Planetarium an exemplary and outstanding model of the universal wish of man to understand the solar system. It makes it the oldest planetarium that has retained its original function(s) to this day.

178. Planetarium, knowledge exchange youths.

177. Planetarium, knowledge exchange adults.



179. Canon of the Netherlands with Eisinga Planetarium.

180. Attention to the Canon of the Netherlands in the Eisinga Planetarium.

The way the Planetarium is built makes it a powerful educational model and, because explanations are still given, a strong example of a living tradition. Consequently, schools are an important target group for the Planetarium. Not only because children are the future visitors, but also because the Planetarium provides insight into complex astronomical matters in a very accessible, low-threshold way.

The Planetarium has a wide range of teaching material for schools – for primary, secondary as well as special education. In this connection a collaboration has also been entered into with the Martena Museum in Franeker which, together with the Planetarium, portrays the history of the city.

With the teaching material, the Planetarium also links up with municipal cultural education. Within the municipality of Waadhoeke, the cultural offer is now coordinated by Seewyn Cultural Education Centre, under the programme name 'Waadzinnig'. This is a collaboration between primary education, the arts and culture field and the municipality of Waadhoeke. They offer a varied annual programme in which the different arts and culture disciplines receive attention in a continuous learning line. All of Waadhoeke's primary schools, including special education, participate in this joint programme (approximately 3700 children).
The Planetarium is a permanent feature of this programme, which means that every child in the municipality of Waadhoeke visits the Planetarium and learns about Eise Eisinga, the Planetarium and the solar system at least once during their school period. The Planetarium could not wish for better – future – ambassadors.

Canon of the Netherlands
In 2006 and 2020, on behalf of the Dutch government a list was drawn up of people and events in history that every Dutch person should know. Eise Eisinga occupies a central position in this 'Canon of the Netherlands'.
The Canon is one of the core objectives for education, so that every student in the Netherlands is introduced to Eisinga and his Planetarium. Text material is available for both upper primary and lower secondary education. The Canon is also distributed to every eighteen-year-old and to people who acquire Dutch citizenship.
The Canon has proven to be an important source of inspiration for museums, heritage institutions and a wide audience interested in history. A Canon network of museums displays the major works from the fifty Canon windows. It goes without saying that the Eisinga Planetarium is also part of this network.

Educational programme

Teaching box 'I spy ... stars!' for group 1-2 (age 4-6)
The activities in this teaching box comply with the core objectives for primary education and the elaboration thereof by the Curriculum Development Foundation (project Interim objectives & learning lines – TULE) in respect of the orientation on astronomical subjects such as light, time, sun, moon and stars. The teaching box contains a teacher's guide with a description of the following activities: round-table discussion, activities for a circuit or corners, and a spelling lesson. Most of the things needed are contained in the box. The teacher only needs to provide some consumables.

181. Universe Awareness.

182. Dronrijp [NL], Tsjerkebuorren 13, house where Eise Eisinga was born.

183. Dronrijp [NL], detail of the house where Eisinga was born.

184. Dronrijp [NL], memorial plaque 100th birthday Eisinga, 1844.

UNAWE teaching box 'Universe in a box' for group 1-8 (age 4-12)

Universe Awareness (UNAWE) is an international project that has won several awards for educational material. The teaching box contains a manual that consists of five modules: Moon, Earth, Sun, Planets and Constellations. Each module contains an introduction, followed by activities that can be carried out independently. Materials which are in general not available at schools are included in the box. The manual specifies what the teachers themselves should take care of. Those are always simple materials. The box is complemented by a website full of extra information and activities: www.unawe.nl.

Find the stars

Before or after a visit to the Planetarium, a class can take part in a treasure hunt through the centre of Franeker. In various places there are seats with constellations, and there is an enormous sun dial on which the children themselves can be the hand that tells the time. At each stop there is an assignment for children aged 4-6, 7-9 and 10+.

Searching for Eise Eisinga in Dronrijp

Eise was born in Dronrijp, seven kilometres from Franeker. Much of him can still be found In Dronrijp, such as the house where he was born, the school he went to as well as his grave:

- Eise Eisinga was born at Tjserkebuorren 13 on 21 February 1744. A commemorative plaque on the facade recalls this.
- Opposite the house where he was born there is a bust made by G.J. Adema on the occasion of the 200th anniversary of the Eise Eisinga Planetarium in 1981. G.J. Adema is also the artist who made a plaque of Eisinga in 1928.
- Eisinga is buried at the foot of the Salvius Church. He died on 28 August 1828, and according to his wish he was buried in his parents' grave. After the death of his father, Eisinga placed an epitaph with an arithmetic riddle on the stone. The outcome of the riddle represents the date of his father's death.
- On the wall of the church, near the grave, there is a plaque presented in 1844 by the Frisian Society on the occasion of the 100th birthday of Eise Eisinga.
- At the age of five, Eise Eisinga moved to a house at Brêgebuorren 14. His father's woolcombery was located in the rear annex.

On request, a free treasure hunt through Dronrijp is provided at the desk of the Planetarium. In about 45 minutes, the children will discover all the places that have a connection with Eise Eisinga.

Sailing on the stars

'Navigation, sailing on the stars' is the theme within which students of classes 1 and 2 of secondary education can visit the Planetarium. Beforehand, the school receives a 'historic' edition of the regional newspaper Leeuwarder Courant from 1802, which raises the question of what the two men on the front page have to do with each other. With that

185. Exhibition 'Space', Visitor Centre Royal Eise Eisinga Planetarium.

question, the students come to the Planetarium and get to work with the assignments in the newspaper. Research and action are central to this. With the answers, the students reconstruct a journey made by John Maurice of Nassau (1604-1679), the prince who once fell through the bridge in Franeker and almost died. A manual will be issued in advance. This manual offers points of departure for extending the visit to a cross curricular project.

Franeker, city of science in the 18th century

This is the title of a fascinating group visit to the Eisinga Planetarium and the Martena Museum for the second year of VMBO (Pre-Vocational Secondary Education) and HAVO/VWO (Senior General Secondary Education/Pre-University Education). The students get to work with science in Franeker. The programme is implemented partly at school and partly on location. The students are encouraged to work independently. They get to work in small groups. Each group is given its own theme with accompanying assignment sheet that the students are to fill in on the spot. It concerns themes such as learning materials, women at university, the life of Eise Eisinga or astronomy. The answers are then at home or at school, with information from the internet, made into a short presentation in front of the class. This way, all the subjects are studied in further detail and the students can make connections between each other's themes.
The programme takes approximately 180 teaching minutes, of which 90 minutes for the visit. In addition, the students have to prepare their presentations in their own time.

Apart from the above teaching packages, educational treasure hunts are also available for various age categories.

Another collaboration is in the field of the institutions associated with the Canon of the Netherlands, which together show the major works in the history of the Netherlands. After the expansion of the Planetarium with a Visitor Centre in 2016, an interactive educational exhibition could be set up. Here information on the functioning of the astronomical instruments in the collection is provided, such as navigation instruments, telescopes and planetariums. With simple models, phenomena such as the origin of day and night, the seasons, the phases of the moon and the eclipses of the sun and the moon are explained. The cogwheels of the Planetarium are also dealt with. Using a simplified model, the principle of gear transmissions is made clear and visitors and students see the influence of this on the movements of the planets. By first working with such instruments in an interactive way, visitors and students will better understand how the instruments and planetariums function.

6. *Monitoring*

6.A KEY INDICATORS FOR MEASURING STATE OF CONSERVATION

The Statement of Outstanding Universal Value is the reference point for the monitoring of the Royal Eise Eisinga Planetarium by the State Party, the municipality/owner and the board of the Royal Eise Eisinga Planetarium Foundation.

Table F. Diagram of attributes, their integrity, completeness and state of conservation.

ATTRIBUTES	INTEGRITY	COMPLETENESS	STATE OF CONSERVATION
The mechanism of wooden hoops and discs, fitted with approximately six thousand iron pins that function as a gear.	100%	100%	100%
The pendulum clock with nine weights that powers the mechanism.	100%	100%	100%
The ceiling, painted in Prussian blue and gold, along which the planets move, including the spheres of the sun and the earth, attached to cords, and in which five dials are fitted.	100%	100%	100%
The closet-bed wall, painted in the same colours, in which seven dials are fitted and in which the weights of the pendulum clock are hanging.	100%	100%	100%
The mezzanine above the ceiling, housing the combination of pendulum clock and cogwheels.	100%	100%	100%
The Planetarium room, which serves as a reception and presentation area.	100%	100%	100%

Key indicators have been provided for monitoring in order to ensure future preservation of the monument and to guarantee that structural maintenance and renovation tasks are carried out according to the monument preservation principles and criteria. During regular monitoring processes, the state of conservation will be specified and relevant data will be recorded with the help of questionnaires. The data acquisition for the key indicators has been initiated by the owner, the municipality of Waadhoeke, and the Cultural Heritage Agency of the Netherlands.

The municipality of Waadhoeke, as owner since 2001, has delegated the implementation of maintenance and management to the Royal Eise Eisinga Planetarium Foundation. The board of the foundation charges the managing director of the Planetarium with the daily and periodic management of a group of experts consisting of a permanent core of a clockmaker, a restoration painter and an artisan woodworker, hereinafter referred to as the ‘Planetarium Maintenance Expert Team’ **<186, 187>.**

186. Planetarium Maintenance Expert Team, clockmaker.

187. Planetarium Maintenance Expert Team, restoration painter.

188. Monument Watch Fryslân Foundation.

On behalf of the management, monitoring of the monumental building is carried out every two years by experts of the Monument Watch Fryslân Foundation **<188>.** For any necessary substantiation of maintenance and conservation measures, there is a collaboration with experts of the University Museum Groningen and the Cultural Heritage Agency of the Netherlands.

Internal expertise is available for any emergency repairs to the Planetarium; measures considered desirable can be taken instantly. In the event of unforeseen structural problems, the managing director of the Planetarium commissions external experts from the relationship network of the Royal Eise Eisinga Planetarium to carry out research and repairs without delay, if necessary in close consultation with experts from the municipality of Waadhoeke and the Cultural Heritage Agency of the Netherlands.

For all the measures taken with regard to the Planetarium, the management acts as supervisor and rapporteur to the foundation board and the owner of the property.

The planetarium instrument is subject to daily management and maintenance by the staff of the Royal Eise Eisinga Planetarium.

Table G. Subject, Indicators, Periodicity and Location of Records.

SUBJECT	INDICATOR	PERIODICITY	LOCATION OF RECORDS
Condition of the property	Description of maintenance tasks undertaken, including: • Engineering specification if relevant • Budget • Time taken • Illustrated by photographs as appropriate • Comments from conservation officer and Cultural Heritage Agency of the Netherlands as appropriate	Annually	RCE Site holders
Conservation projects	Report on conservation projects underway, to include: • Description of work and engineering specifications • Heritage Impact Assessment • Comments from conservation officer and Cultural Heritage Agency of the Netherlands as appropriate • Period of work • Required budget • Illustrated by photographs as appropriate Reports on any major conservation projects likely to be required in future, to include: • Description of work including extent of structure concerned, engineering specifications • Comments from conservation officer and Cultural Heritage Agency of the Netherlands as appropriate • Period of work from start • Required budget	Annually	RCE Site holders

Repairs and maintenance	• General update on use of building • Description of any works carried out, including budget, estimate of time taken, illustrated by photographs as appropriate • Relevant Heritage Impact Assessments • Report from conservation officer on any works to listed building • Description of any future work identified to be required, including estimated budget and time required, illustrated by photographs as appropriate • Photographs of the property from several specified external and internal locations, for comparison to previous years	Annually	RCE Site holders
Aspects of visitation	• Visitor numbers • Evaluation of visitor satisfaction • Education programme numbers • Evaluation of education programme • Assessment of level of impact on property	Annually	Site holders
Safety and evacuation	Safety and Evacuation Plan, to include: • Description of maintenance of the property • Continuous, or at least annual update • Once or twice a year the procedures are run through with all the employees • Every two years this plan is evaluated with the Fire Brigade Fryslân • During this evaluation, the procedures are run through with the fire service team	Annually	Municipality Site holders
Comprehensive inspection of the building, condition survey of the National Monument	Monument Watch Fryslân Foundation, to include: • Inspection structural condition • Monument Watch inspection report • Implementation recommendations Monument Watch	Every two years	Monument Watch Site holders
Comprehensive inspection planetarium instrument, condition survey	Planetarium Maintenance Expert Team, to include: • Inspection physical and technical condition • Inspection report Planetarium Maintenance Expert Team • Implementation recommendations Planetarium Maintenance Expert Team	Every two years	Site holders
Condition survey of the property	Condition survey report to collate the annual reporting and provide update to the Conservation Management Plan	Every five years	Site holders
Conservation	Updated version of Conservation Management Plan	Every five years	Site holders
Area adjacent to the property	• Development pressures • Environmental pressures • Natural disasters and risk preparedness • Traffic pressures • Event pressures • Crime pressures	Every five years	Municipality Site holders

6.B ADMINISTRATIVE ARRANGEMENTS FOR MONITORING THE PROPERTY

Koninklijk Eise Eisinga Planetarium (Royal Eise Eisinga Planetarium)
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6.C RESULTS OF PREVIOUS REPORTING EXERCISES

Since Eise Eisinga's time, the Planetarium has been maintained as described in Eisinga's 1784 manual.

A Restoration Report has been drawn up about the most recent restoration in 1997, including information about the restoration planning.

In 2013, major maintenance took place, as described in a Maintenance Report.

The information referred to is available in the Royal Eise Eisinga Planetarium.

7. Documentation

7.A PHOTOGRAPHS, AUDIO-VISUAL IMAGE INVENTORY AND AUTHORISATION TABLE

Film material

Unveiling monument for Eise Eisinga in Franeker (27 August 1928)
https://zoeken.beeldengeluid.nl/program/urn:vme:default:program:2101608040030604331
Images of the unveiling of the monument in Franeker in honour of Eise Eisinga, with the laying of a wreath. The Planetarium, a house with a neck gable, is also shown

The Planetarium (1 March 1944)
https://zoeken.beeldengeluid.nl/program/urn:vme:default:program:2101608140120105531/asset/urn:vme:default:asset:2101610180604068121/segment/urn:vme:default:logtrackitem:2101703040125354724
Two girls visit Eise Eisinga's Planetarium in Franeker.

189. Planetarium, film 1 March 1944.

Franeker 750 Years (30 August 1949)
https://zoeken.beeldengeluid.nl/program/urn:vme:default:program:2101608140120128631/asset/urn:vme:default:asset:2101609220330612721/segment/urn:vme:default:logtrackitem:2101703040126132724
Franeker celebrates its 750th anniversary.

Spiegel van Nederland No. 10 (1959) (Newsreel)
https://archive.org/details/62728_1411104912_s01_Spiegel_van_Nederland_No_10_62728
A Dutch newsreel with sound, including an item about the Planetarium of Eise Eisinga in Franeker.

Van gewest tot gewest (12 December 1968) (TV news background series)
https://www.npostart.nl/WO_NTR_9794970
Curator Harke Terpstra explains the functioning of the Planetarium.

Franeker 2008 Queen's Day
https://www.youtube.com/watch?v=bYl1IHQJ6mE

190. Eise Eisingastraat around 1910.

Old photographs

https://historischcentrumfraneker.nl/panden/a198-eise-eisingastraat-3-2/

https://www.tresoar.nl/Pages/OnderZoeken.aspx#/?q=eisinga

https://historischcentrumleeuwarden.nl/onderzoek/beeldmateriaal/beeldbank/?mode=gallery&view=horizontal&q=planetarium&page=1&reverse=0

https://beeldbank.cultureelerfgoed.nl/rce-mediabank/?fq%5B%5D=search_s_entity_name:%22Foto%27s%20en%20dia%27s%22&q=planetarium%20franeker&mode=gallery&view=horizontal&page=1

https://www.nationalebeeldbank.nl/search.pp?multikeyword=planetarium+franeker&ObjectType=0&ObjectType=1&MetadataField4=on&MetadataField5=on&flush=1

Photo and image credits

1 Ministry of Education, Culture and Science, The Hague [NL]
2 Province of Fryslân, Leeuwarden [NL]
3 Joachim de Ruijter
4 Sonnenborgh Observatory, Utrecht [NL]
5-6 de Bey communicatie & vormgeving b.v., Franeker [NL]
7-9 Cultural Heritage Agency of the Netherlands, Amersfoort [NL]
10 Rijksmuseum Amsterdam [NL]
11-12 Cultural Heritage Agency of the Netherlands, Amersfoort [NL]
13-17 Municipality of Waadhoeke, Franeker [NL]
18 Martena Museum, Franeker [NL]
19-21 Hildebrand P.G. de Boer
22 Frank J. van der Waard
23-27 Hildebrand P.G. de Boer
28 Paul Becx
29 Jorge Láscar from Melbourne, Australia, 29 October 2014. This file is licensed under the Creative Commons Attribution 2.0 Generic license
30 Tom Haartsen, National Museum Boerhaave Leiden [NL]
31 Maarten van de Velde, National Museum Boerhaave Leiden [NL]
32 University Museum Amsterdam [NL]
34 35 Royal Eise Eisinga Planetarium, Franeker [NL]
36 Fries Museum Leeuwarden [NL]
37 Municipality of Waadhoeke, Franeker [NL]
38 Historische Kring Franeker (social grouping) [NL]
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42 Hildebrand P.G. de Boer
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59-60 Paul Becx
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62 Lee Boltin, 1944, The Photographic Collection at the Research Library of the American Museum of Natural History New York [USA]
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66 Nagoya City Science Museum, Nagoya [JAP]
67-68 Royal Eise Eisinga Planetarium, Franeker [NL]
69 Hildebrand P.G. de Boer
71 Kallgan, 2006, Wikimedia Commons
72 British Library, copyright The British Library Board, London [UK]
74-75 Kunstkamera Museum St. Petersburg [RUS]
77 Städtische Museen Jena, graphic collection, Jena [D]
79 Rundetårn Samling Copenhagen [DK]
80 Per Meistrup, 21 May 2018, Wikimedia Commons
81-82 Rundetårn Samling Copenhagen [DK]

86 Pembroke College, Cambridge [UK]
89 Didier B, 7 October 2005, Wikimedia Commons
91 Arnaud 25, 3 August 2006, Wikimedia Commons
92 Philippe Couton, 3 April 2020, Wikimedia Commons
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96-97 Adler Planetarium Chicago [USA]
101 Abxbay, 13 September 2010, Wikimedia Commons
103 Lee Boltin, 1944, The Photographic Collection at the Research Library of the American Museum of Natural History New York [USA]
104 Alex J. Rota, 1960, The Photographic Collection at the Research Library of the American Museum of Natural History New York [USA]
105-106 Commune de Gresswiller [F]
107-109 Amy Bishop, Jodrell Bank, University of Manchester [UK]
110 Fries Museum Leeuwarden [NL]
116 Vermilion Energy, 2019, Harlingen [NL]
120 Cultural Heritage Agency of the Netherlands, Amersfoort [NL]
121-123 Cultural Heritage Agency of the Netherlands, Amersfoort [NL]
124-125 Municipality of Waadhoeke, Franeker [NL]
126 Cultural Heritage Agency of the Netherlands, Amersfoort [NL]
127 Municipality of Waadhoeke, Franeker [NL]
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130 Hildebrand P.G. de Boer
131-133 Royal Eise Eisinga Planetarium, Franeker [NL]
137 Ruben van Vliet
138-143 Royal Eise Eisinga Planetarium, Franeker [NL]
144-152 Hildebrand P.G. de Boer
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154-155 Hildebrand P.G. de Boer
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165 Royal Eise Eisinga Planetarium, Franeker [NL]
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167 Royal Eise Eisinga Planetarium, Franeker [NL]
168-173 Hildebrand P.G. de Boer
174 Royal Eise Eisinga Planetarium, Franeker [NL]
175-176 Hildebrand P.G. de Boer
177-178 Royal Eise Eisinga Planetarium, Franeker [NL]
180 Hildebrand P.G. de Boer
182-184 Adrie Warmenhoven
185 de Bey communicatie & vormgeving b.v., Franeker [NL]
186-187 Royal Eise Eisinga Planetarium, Franeker [NL]
188 Paul David van Vliet, Monument Watch Fryslân, Leeuwarden [NL]
190 Historisch Centrum Franeker (digital access portal) [NL]
199 Fries Museum Leeuwarden [NL]
Cover photos, photos transition to new sections: Hildebrand P.G. de Boer and de Bey communicatie & vormgeving b.v., Franeker [NL]

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NOMINATION DOCUMENT CAPTION AND FORMAT	DATE OF PHOTO (MO/YR)	PHOTOGRAPHER	COPYRIGHT OWNER (IF DIFFERENT THAN PHOTOGRAPHER)	NON EXCLUSIVE CESSION OF RIGHTS
19. Planetarium building and immediate vicinity, from Groenmarkt. JPEG	09/2016	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
20. Planetarium building and immediate vicinity, from Raadhuisplein. JPEG	08/2021	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
21. Franeker, Eisinga house (third building from the left), and Noord in Franeker. JPEG	08/2021	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
23. Raised room, ground floor, Eise Eisingastraat 3. JPEG	02/2021	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
24. Planetarium room, ground floor, Eise Eisingastraat 3. JPEG	01/2020	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
25. Stairs to the mezzanine with cogwheels, Eise Eisingastraat 3. JPEG	01/2020	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
26. Mezzanine with cogwheels. JPEG	02/2021	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
27. Mezzanine with cogwheels. JPEG	02/2021	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
34. Some of the Planetarium's guest books. JPEG	05/2020	Paul Terpstra	Royal Eise Eisinga Planetarium	Yes
35. Guest book Planetarium, 1805-1806. JPEG	05/2020	Paul Terpstra	Royal Eise Eisinga Planetarium	Yes
42. From left to right: the Visitor Centre, building 'de Tuinkamer' and the Planetarium building. JPEG	04/2019	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
46. The building Eise Eisingastraat 3 is the load-bearing structure for the planetarium instrument. JPEG	04/2019		Royal Eise Eisinga Planetarium	Yes
47. Overview photograph Planetarium. JPEG	02/2013	Paul Terpstra	Royal Eise Eisinga Planetarium	Yes
48. The mechanism of wooden hoops and discs, fitted with approximately six thousand iron pins that functions as a gear. JPEG	01/2020	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes

49. The pendulum clock with nine weights that powers the mechanism. JPEG	03/2019	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
50. The pendulum clock with nine weights that powers the mechanism. JPEG	03/2019	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
51. The pendulum clock with nine weights that powers the mechanism. JPEG	01/2020	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
52. The Prussian blue and gold painted ceiling along which the planets move, including the spheres of the sun and the earth, attached to cords, and in which five dials are fitted. JPEG	12/2021	Jeroen Adema	de Bey communicatie & vormgeving b.v.	Yes
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55. The closet-bed wall, painted in the same colours, in which seven dials are fitted and in which the weights of the pendulum clock are hanging. JPEG	12/2021	Jeroen Adema	de Bey communicatie & vormgeving b.v.	Yes
56. The space above the ceiling (mezzanine), housing the combination of pendulum clock and cogwheels, which functions as a gear. JPEG	03/2019	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
57. The space above the ceiling (mezzanine), housing the combination of pendulum clock and cogwheels, which functions as a gear. JPEG	01/2020	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
58. The room under the planetarium instrument, which serves as reception and presentation area. JPEG	03/2019	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
67. Instruction manual maintenance Planetarium, by Eise Eisinga, 1784. JPEG	01/2018	Minne Velstra	Royal Eise Eisinga Planetarium	Yes
68. Explanation in the planetarium room with the aid of a pointer. JPEG	04/2014		Royal Eise Eisinga Planetarium	Yes
69. Franeker Protected Cityscape. JPEG	08/2021	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
129. Planetarium, every visitor is given an explanation in the planetarium room. JPEG	03/2019		Royal Eise Eisinga Planetarium	Yes

130. Planetarium, blue and white shield. JPEG	02/2021	Hildebrand P.G. de Boer		Yes
131. Planetarium, instruction manual Eisinga (1784) about replacing the yearboard. JPEG	03/2008		Royal Eise Eisinga Planetarium	Yes
132. Planetarium, instalment updated yearboard. JPEG	12/2017	Paul Terpstra	Royal Eise Eisinga Planetarium	Yes
142. Planetarium, maintenance work cogwheels. JPEG	06/2016	Paul Terpstra	Royal Eise Eisinga Planetarium	Yes
143. Planetarium, maintenance work planetarium ceiling. JPEG	06/2016	Paul Terpstra	Royal Eise Eisinga Planetarium	Yes
144. Brasserie 'De Stadstuin', front house, ground floor, Eise Eisingastraat 2. JPEG	09/2018	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
145. Auditorium annex cinema, first floor, Eise Eisingastraat 1. JPEG	08/2021	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
146. City garden behind the buildings Eise Eisingastraat 1 and 2. JPEG	09/2020	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
147. Entrance of the Planetarium Visitor Centre, ground floor, Eise Eisingastraat 1. JPEG	08/2021	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
154. Information desk and planetarium shop, ground floor, Eise Eisingastraat 1. JPEG	12/2021	Jeroen Adema	de Bey communicatie & vormgeving b.v.	Yes
155. Interactive exhibition 'Space', welcome by Eise Eisinga, first floor, Eise Eisingastraat 1. JPEG	12/2021	Jeroen Adema	de Bey communicatie & vormgeving b.v.	Yes
156. Interactive exhibition 'Space'. JPEG	12/2021	Jeroen Adema	de Bey communicatie & vormgeving b.v.	Yes
157. Interactive exhibition 'Space'. JPEG	12/2021	Jeroen Adema	de Bey communicatie & vormgeving b.v.	Yes
158. Interactive exhibition 'Space'. JPEG	12/2021	Jeroen Adema	de Bey communicatie & vormgeving b.v.	Yes
159. Interactive exhibition 'Space', explanation about the cogwheels of the Planetarium. JPEG	12/2021	Jeroen Adema	de Bey communicatie & vormgeving b.v.	Yes
160. Interactive exhibition 'Stars and constellations', front room, first floor, Eise Eisingastraat 2. JPEG	08/2021	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
161. Interactive exhibition 'Stars and constellations'. JPEG	06/2015		Royal Eise Eisinga Planetarium	Yes
162. Temporary exhibitions, back room, first floor, Eise Eisingastraat 2. JPEG	08/2021	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
163. Exhibition in the salon, rear annex, ground floor, Eise Eisingastraat 2. JPEG	08/2021	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
164. Exhibition in the salon. JPEG	03/2019	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes

165. Woolcombery, rear annex, ground floor, Eise Eisingastraat 3. JPEG	04/2012	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
166. Woolcombery. JPEG	08/2021	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
167. Woolcombery, tile tableau. JPEG	04/2016	Adrie Warmenhoven	Royal Eise Eisinga Planetarium	Yes
168. Long corridor to the front house of Eise Eisingastraat 1, with exhibition about contemporaries of Eise Eisinga. JPEG	08/2021	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
169. Long corridor to the front house of Eise Eisingastraat 1, with exhibition about contemporaries of Eise Eisinga. JPEG	08/2021	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
170. Permanent exhibition 'Treasury' on the mezzanine near the mechanism of the Planetarium, Eise Eisingastraat 3. JPEG	08/2021	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
171. Permanent exhibition 'Treasury' on the mezzanine near the mechanism. JPEG	02/2021	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
172. Timeline Eise Eisinga, ground floor, hall, Eise Eisingastraat 3. JPEG	01/2020	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
173. Touchscreens with Eise Eisinga's manuscripts, ground floor, hall, Eise Eisingastraat 3. JPEG	08/2021	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
174. Former living room, now planetarium room with planetarium. JPEG	07/2015		Royal Eise Eisinga Planetarium	Yes
175. Route to the planetarium room. JPEG	08/2021	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
176. Cogwheels above the planetarium room. JPEG	01/2020	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
177. Planetarium, knowledge exchange adults. JPEG	10/2014		Royal Eise Eisinga Planetarium	Yes
178. Planetarium, knowledge exchange youths. JPEG	04/2014		Royal Eise Eisinga Planetarium	Yes
180. Attention to the Canon of the Netherlands in the Eisinga Planetarium. JPEG	01/2020	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
182. Dronrijp [NL], Tsjerkebuorren 13, house where Eise Eisinga was born. JPEG	06/2019	Adrie Warmenhoven	Royal Eise Eisinga Planetarium	Yes
183. Dronrijp [NL], detail of the house where Eisinga was born. JPEG	06/2019	Adrie Warmenhoven	Royal Eise Eisinga Planetarium	Yes
184. Dronrijp [NL], memorial plaque 100th birthday Eisinga, 1844. JPEG	06/2019	Adrie Warmenhoven	Royal Eise Eisinga Planetarium	Yes
185. Exhibition 'Space', Visitor Centre Royal Eise Eisinga Planetarium. JPEG	12/2021	Jeroen Adema	de Bey communicatie & vormgeving b.v.	Yes

186. Planetarium Maintenance Expert Team, clockmaker. JPEG	10/2015	Paul Terpstra	Royal Eise Eisinga Planetarium	Yes
187. Planetarium Maintenance Expert Team, restoration painter. JPEG	10/2015	Paul Terpstra	Royal Eise Eisinga Planetarium	Yes

MANAGEMENT PLAN CAPTION AND FORMAT	DATE OF PHOTO (MO/YR)	PHOTOGRAPHER	COPYRIGHT OWNER (IF DIFFERENT THAN PHOTOGRAPHER)	NON EXCLUSIVE CESSION OF RIGHTS
6. Canal houses Eise Eisingastraat. JPEG	09/2016	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
7. Planetarium room, closet-bed wall. JPEG	12/2021	Jeroen Adema	de Bey communicatie & vormgeving b.v.	Yes
8. Planetarium room. JPEG	01/2020	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
10. Ceiling and closet-bed wall. JPEG	12/2021	Jeroen Adema	de Bey communicatie & vormgeving b.v.	Yes
11. Pendulum clock on the mezzanine. JPEG	12/2021	Jeroen Adema	de Bey communicatie & vormgeving b.v.	Yes
12. Pendulum clock on the mezzanine. JPEG	12/2021	Jeroen Adema	de Bey communicatie & vormgeving b.v.	Yes
13 Cords with weights in the closet-bed wall	03/2019	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
16. Mathematics book Eisinga, 1759. JPEG	03/2008	Paul Terpstra	Royal Eise Eisinga Planetarium	Yes
17. Description solar eclipse, 23 March 1773. JPEG	03/2008	Paul Terpstra	Royal Eise Eisinga Planetarium	Yes
18. Manual Planetarium, 1784. JPEG	03/2008	Paul Terpstra	Royal Eise Eisinga Planetarium	Yes
19. Eisinga's manuscripts can be consulted digitally. JPEG	02/2021	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
20. Eisinga's manuscripts can be consulted digitally. JPEG	08/2021	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
21. Explanation in the planetarium room. JPEG	04/2014		Royal Eise Eisinga Planetarium	Yes
22. The building Eise Eisingastraat 3 is the load-bearing structure for the planetarium instrument. JPEG	04/2019		Royal Eise Eisinga Planetarium	Yes
23. Overview photograph Planetarium. JPEG	02/2013	Paul Terpstra	Royal Eise Eisinga Planetarium	Yes
24. The mechanism of wooden hoops and discs, fitted with approximately six thousand iron pins that functions as a gear. JPEG	01/2020	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
25. The pendulum clock with nine weights that powers the mechanism. JPEG	03/2019	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
26. The pendulum clock with nine weights that powers the mechanism. JPEG	03/2019	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes

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31. The closet-bed wall, painted in the same colours, in which seven dials are fitted and in which the weights of the pendulum clock are hanging. JPEG	12/2021	Jeroen Adema	de Bey communicatie & vormgeving b.v.	Yes
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33. The space above the ceiling (mezzanine), housing the combination of pendulum clock and cogwheels, which functions as a gear. JPEG	01/2020	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
34. The room under the planetarium instrument, which serves as reception and presentation area. JPEG	03/2019	Hildebrand P.G. de Boer	Royal Eise Eisinga Planetarium	Yes
40. Extensive maintenance. JPEG	06/2016	Paul Terpstra	Royal Eise Eisinga Planetarium	Yes
41. Extensive maintenance. JPEG	06/2016	Paul Terpstra	Royal Eise Eisinga Planetarium	Yes
42. Restoration 1998, project manager Hans Noordmans, saying "That must be the most difficult bit...". JPEG	04/1998		Royal Eise Eisinga Planetarium	Yes
43. Maintenance paintwork. JPEG	06/2016	Paul Terpstra	Royal Eise Eisinga Planetarium	Yes
46. Brasserie De Stadstuin in former coffee roasting facility. JPEG	12/2021	Jeroen Adema	de Bey communicatie & vormgeving b.v.	Yes
47. Visitor Centre in former confectionery. JPEG	12/2021	Jeroen Adema	de Bey communicatie & vormgeving b.v.	Yes
56. Planetarium, Canon of the Netherlands. JPEG	12/2021	Jeroen Adema	de Bey communicatie & vormgeving b.v.	Yes
58. Planetarium, The finest of Friesland.	11/2017	Adrie Warmenhoven	Royal Eise Eisinga Planetarium	Yes

7.B TEXTS RELATING TO PROTECTIVE DESIGNATION, COPIES OF PROPERTY MANAGEMENT PLANS OR DOCUMENTED MANAGEMENT SYSTEMS AND EXTRACTS OF OTHER PLANS RELEVANT TO THE PROPERTY

Designation of the Royal Eise Eisinga Planetarium as National Monument
The written designations (1967) of the Royal Eise Eisinga Planetarium are held by the Cultural Heritage Agency of the Netherlands.

Zoning Plan Franeker Inner City (2016)
The Zoning Plan Franeker Inner City (2016) is held by the municipality of Waadhoeke.

Masterplan Tourist Signposting
The Masterplan Tourist Signposting is held by the municipality of Waadhoeke.

Analysis Parking Requirement
The Analysis Parking Requirement is held by the municipality of Waadhoeke.

Regional Crisis Plan Security Region Fryslân
The Regional Crisis Plan Security Region Fryslân is held by the Provincial Administration of Fryslân.

Inner City Management
The Inner City Management is held by the municipality of Waadhoeke.

7.C FORM AND DATE OF MOST RECENT RECORDS OR INVENTORY OF THE PROPERTY

The paper designations (1967) of the Royal Eise Eisinga Planetarium as National Monument reside at the Cultural Heritage Agency of the Netherlands.

Information about the state of conservation and the activities of the board of the Royal Eise Eisinga Planetarium Foundation reside at the Royal Eise Eisinga Planetarium.

Information about the permits issued over the years reside at the Royal Eise Eisinga Planetarium and the municipality of Waadhoeke.

7.D ADDRESS WHERE INVENTORY, RECORDS AND ARCHIVES ARE HELD

Koninklijk Eise Eisinga Planetarium
(Royal Eise Eisinga Planetarium)
Eise Eisingastraat 3
8801 KE Franeker
The Netherlands

Rijksdienst voor het Cultureel Erfgoed
(Cultural Heritage Agency of the Netherlands)
PO Box 1600
3800 BP Amersfoort
The Netherlands

Gemeente Waadhoeke
(Municipality of Waadhoeke)
PO Box 58
8800 AB Franeker
The Netherlands

Tresoar, Frysk Histoarysk en Letterkundich Sintrum
(Tresoar, Friesland Historical and Literary Centre)
PO Box 2637
8901 AC Leeuwarden
The Netherlands

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Pag. 9

PHILOSOPHISCHE EN GODGELEERDE

VERHANDELING

OVER DE AANSTAANDE

CONJUNCTIE DER PLANETEN,

EN DE

MOGELYKE GEVOLGEN DESZELFS.

DAt deeze Aarde zoo wel als alle dingen op dezelve vergankelyk is en vergaan zal, is van oude tyden en byna van alle Volkeren algemeen geloofd, zelf die geene gelegentheid gehad hebben om de Goddelyke Schriften (waarin zulks duidelyk geopenbaard is) te leezen, en veele derzelven hebben vaſtgeſteld, dat de Aarde zou verbranden, waarom *Theophilus* aan *Antolycus* ſchreef," Wat de verbranding der Wae-„ reld betreft, de wyze Heidenen ſtemmen of-„ ze willen of niet, daarin met onze Propheten „ overeen.

Dog ik zal thans dit Stuk geheel daar laten, en miſſchien eens in't vervolg breedvoerig uit de Schriften der Ouden en in het byzonder uit

A 5 de

191. Alta, 1774, page 9.

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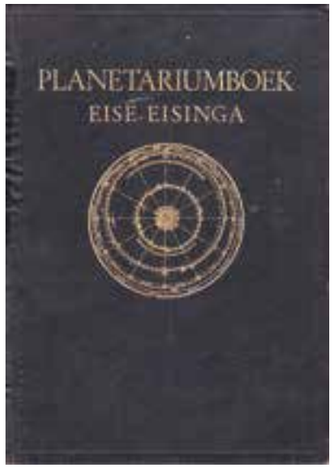

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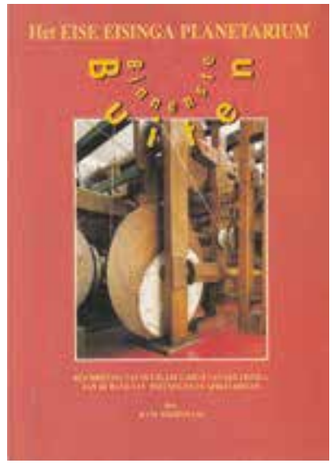

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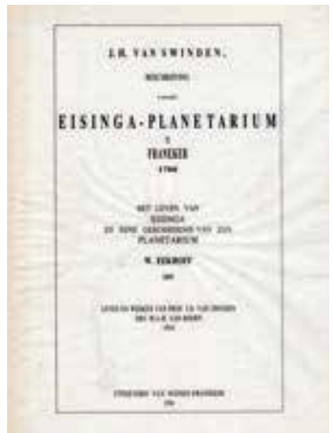

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Province of Friesland
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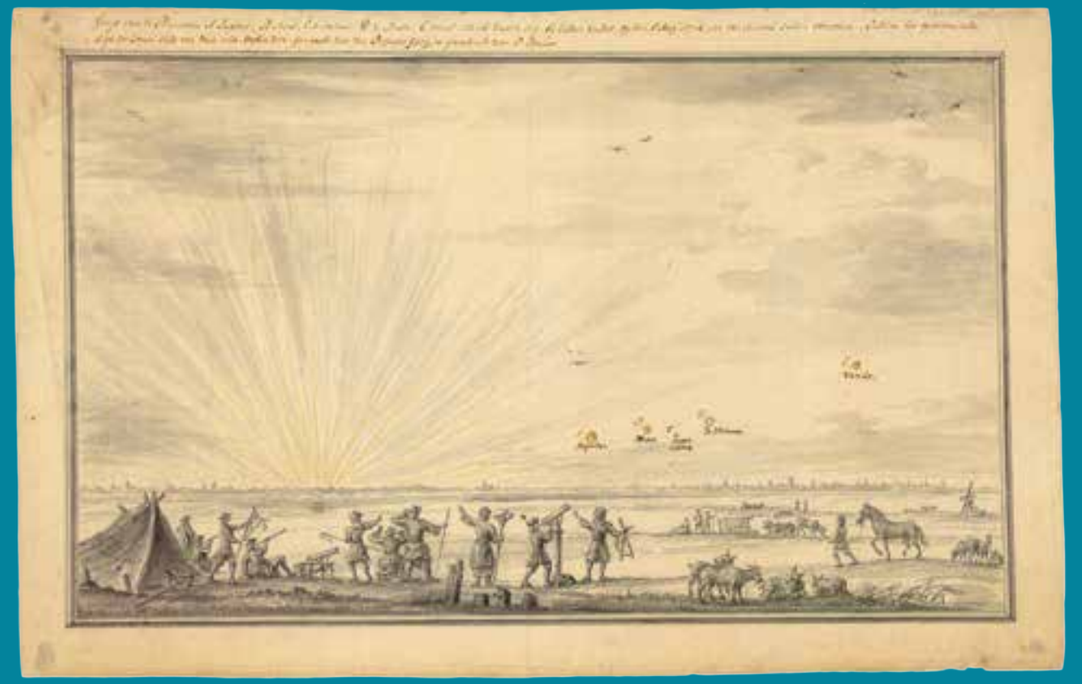
Epilogue — A dream come true

Visiting the Frisian city of Franeker is a pleasantly relaxing activity. The outward journey by train from the provincial capital Leeuwarden or by car from Holland over the Afsluitdijk, right across the water of the IJsselmeer and the UNESCO World Heritage Site Wadden Sea, provides stunning views. The green meadow landscape surrounding Franeker could be called 'bare' by the superficial viewer. However, this qualification falls short. The subtle observer speaks of an 'open' landscape in which – depending on the weather – you can orientate yourself over a distance of almost twenty kilometres on the scattered old church towers. Crisscross there are canals, ditches and dykes. Small clumps of trees, skewed by the sea breeze, protect and highlight lonely farmsteads. If you climb one of the countless medieval dykes, the slightly higher vantage point provides additional insights into the depth of the landscape.

As soon as the daylight world is alternated with the heavy darkness of the night, the landscape seems to come to a complete standstill. Due to the low level of artificial surrounding light in these regions, you now find yourself in a black hole that seems to stretch to infinity. You have no idea, any orientation to land is engulfed in darkness. All that is left to you is a practiced look up from the black hole, where an unimaginably rich astronomical concert is now taking place, and where the moon has taken over the leading role from the sun. Not only do the classical and prominent constellations offer every opportunity to clarify your own actual position within the world. As a matter of course you tend to go over to optical observation, whereby closer inspection always yields new insights into infinity. Many have done this before us, for centuries, and not just anybody. From these Frisian dykes, Eise Eisinga also made his observations, and his many fellow amateur astronomers who, since the mid 18th century, have been manufacturing optical tools to broaden their astronomical field of view and to support their observations.



199. Conjunction of planets: 'The actual position of the Planets will be seen just before sunrise on 8 May Anno 1774 and also several days before the rising of the sun, which seldom happens', drawing 1774.

It is an exciting realisation to be able to follow in the footsteps of old generations of Frisian astronomers, under a rich starry sky, looking upwards. Looking upwards like that, the heavenly realm is united with the Planetarium located a few kilometres away, which Eise Eisinga diligently built in seven years, and opened to all the world's citizens from 1781. His hospitality seemed to be limitless when you consider that the Planetarium was constructed in the ceiling of the parental living / bedroom. There, visitors were and are enjoying with increasing amazement an ingenious masterpiece which, moreover, is a thing of great beauty. You move in metaphorical form from that dark dyke looking upwards, from the heavenly realm to Eise Eisinga's planetarium room, still looking upwards.

The road through the open Frisian landscape to the Planetarium as an astronomical marvel results in an organic transition to an unimaginable climax. The old town of Franeker lies between landscape and Planetarium. Walking through the historic and monumental streets, along canals and across squares, tranquility – prior to the upcoming planetarium visit – definitely sets in. Here, too, we are walking in the footsteps of Eisinga, who lived in the city in similar circumstances. It is this wonderful trinity of landscape, city, planetarium that results in almost every visitor being (even) happier on the return journey than before arrival. You can only conclude that this day has brought something complete, where the sea breeze, the flat greenery, the intact historic city and the overwhelming astronomical miracle merge together into a beautiful dream come true.

Koninklijk
Eise Eisinga
PLANETARIUM

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Ministerie van Onderwijs, Cultuur en Wetenschap

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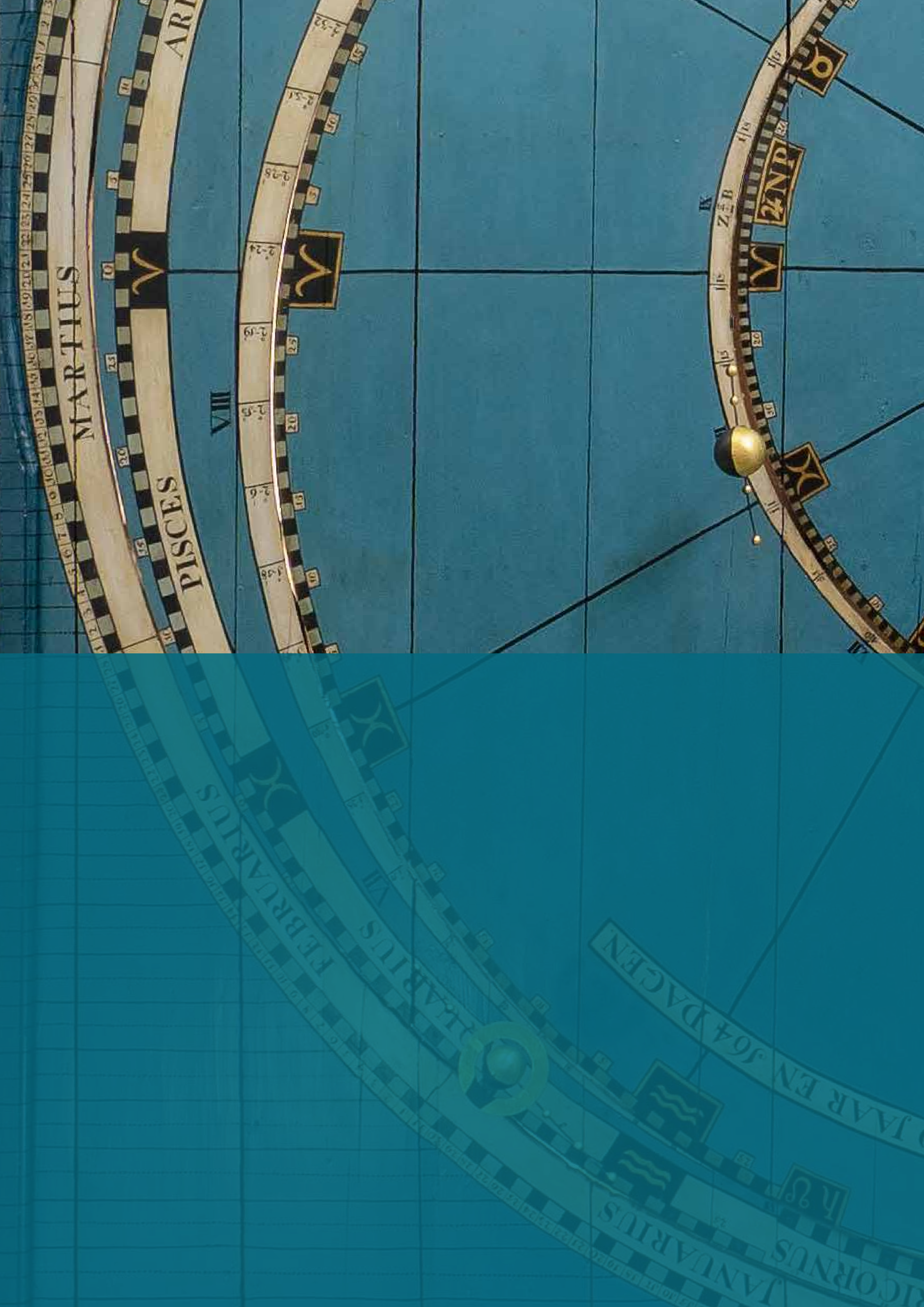
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