

Eise Eisinga and his planetarium

A man driven by dynamics



*In honour of Henk Broer
his 60th birthday*



George Huitema
Leiden, December 2009

Thanks to Adri Warmenhoven, conservator Koninklijke Eise Eisinga Planetarium

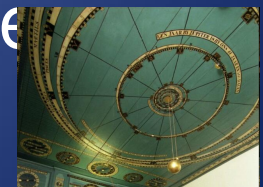
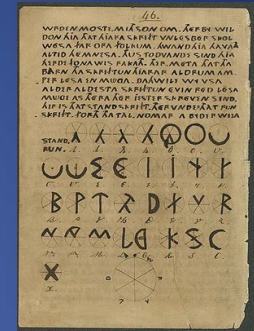
Eise Jeltes Eisinga

- Eisinga was a Dutch amateur astronomer (1744 – 1828) who built a planetarium (orrey) in his house in Franeker
- The planetarium still exists and is the oldest functioning one in the world.



Why Henk and Eise Eisinga?

- Last days of December 1983 we drove to Friesland
 - discussed *The Oera Linda Bok* (1867)
 - visited the *mummies of Wieuwert* (1765)
 - listened in Franeker to one of the last tours of Harke Planeet (Terpstra), conservator of the Planetarium (1941-1983): ‘denkt u om uw hoofd’, and bought a signed copy of his beautiful book “Friesche Sterreconst”
- Up to today Henk is fascinated by these mysteries
- And the QP Planetarium mentally has become part of the Groningen Dynamics Group

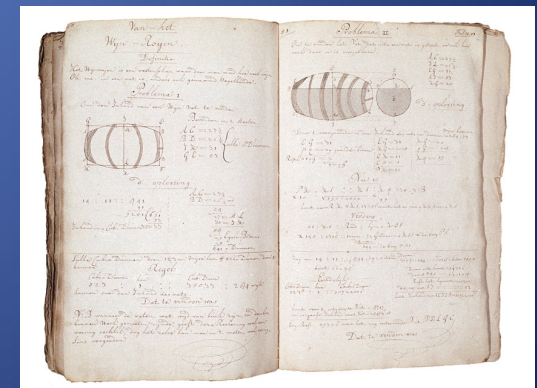


Life of Eise Eisinga (1)

- Eisinga born in 1774 in Dronrijp, was the son of a wool carder, Jelte Eises

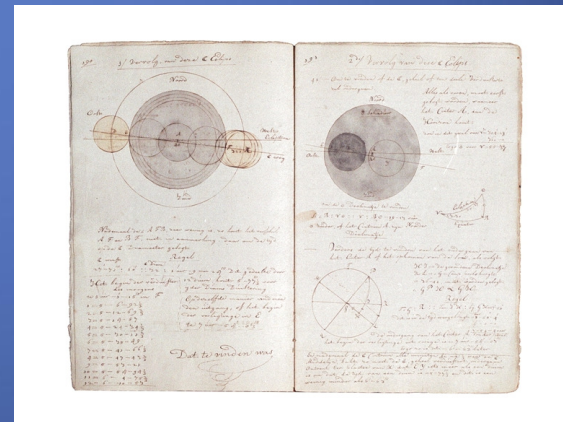


- As son of a hand worker he was not allowed to attend the Latin school
- He studied Euclid in his boyhood and wrote at the age of 17 a high-level maths book (665 pages)



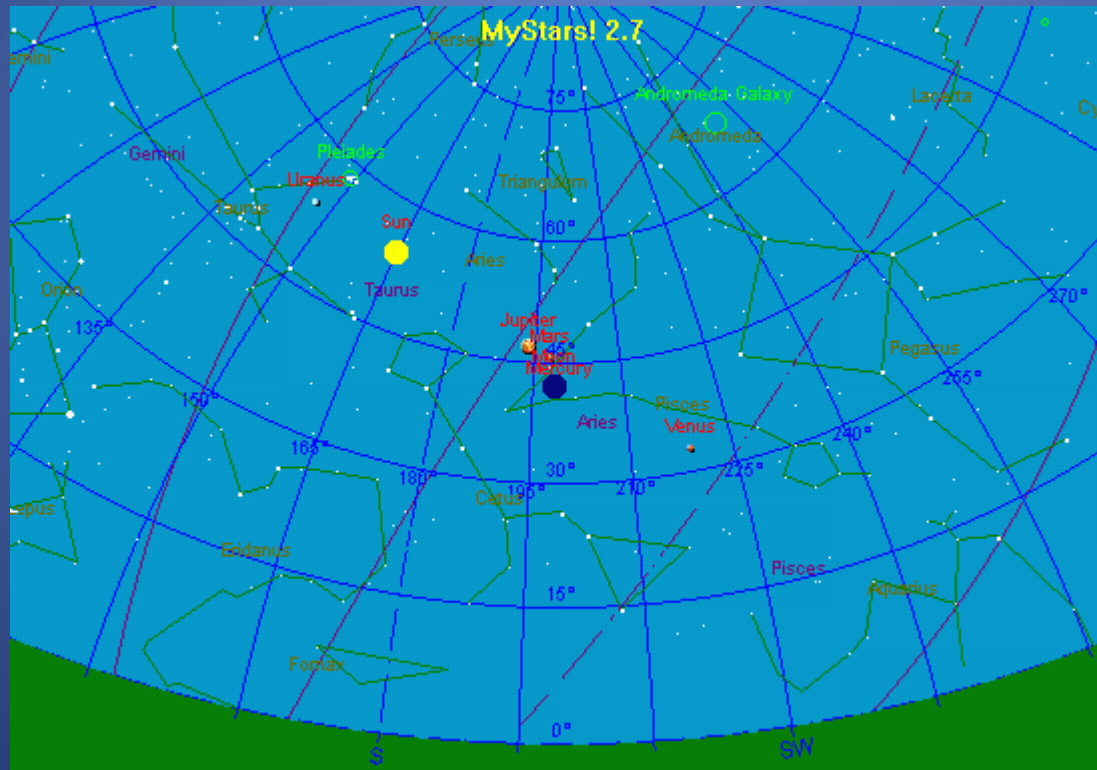
Life of Eise Eisinga (2)

- Eise Eisinga became also wood carder, married at the age of 24 with Pietje Jacobs and got three children
- By self study - not related to the Franeker University (Academy)- he wrote two books on astronomy



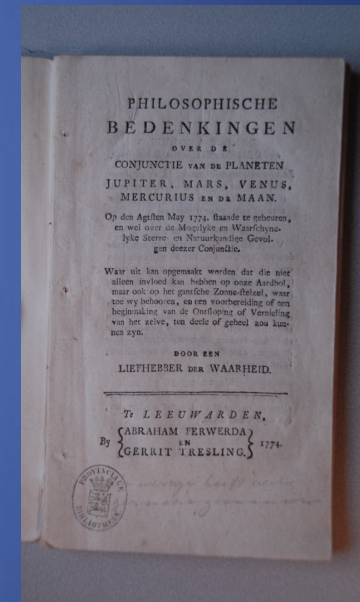
Building the planetarium

- On 8 May 1774 a conjunction of the moon and the planets Mercury, Venus, Mars, Jupiter would appear



Building the planetarium

- A reverend Eelco Alta published a booklet in which he predicted that the planets and the moon would collide, with the result that the earth would be pushed out of its orbit and burned by the sun.
- Due to this prediction there was a lot of panic in Friesland
- Having read this book, Eisinga found that it was time to teach the ignorant people something about dynamics, by making a working model of the Solar system
- Eisinga is typical of the Enlightenment. Like many other working men he was convinced that practicing knowledge improves both mankind and society (“Boereprofessors”)

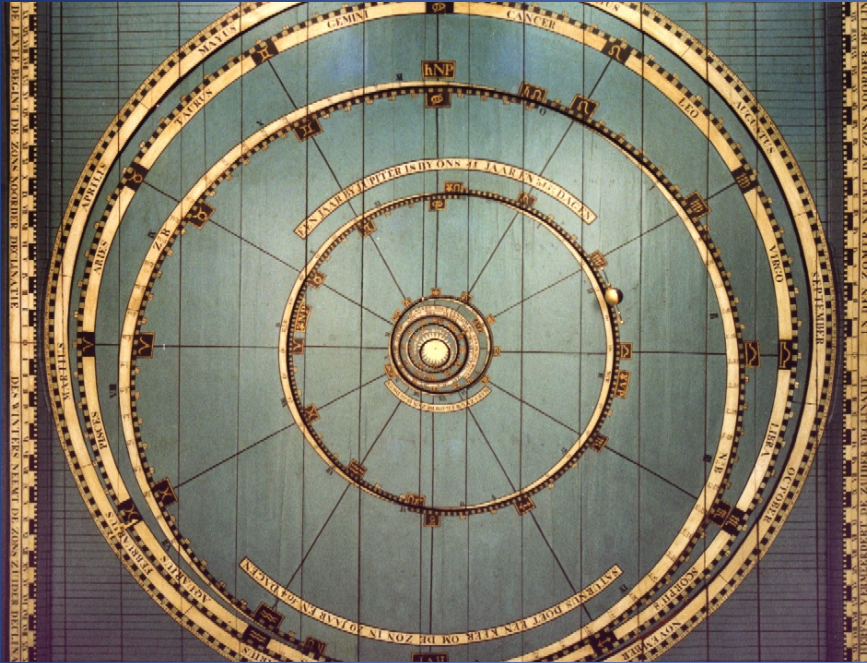


Building the planetarium

- Eisinga expected to finish it within six months and eventually finished it in 1781, 7 years after he started.
- Already during this period professors of the Franeker university came along (e.g. Prof van Swinden, 1780)

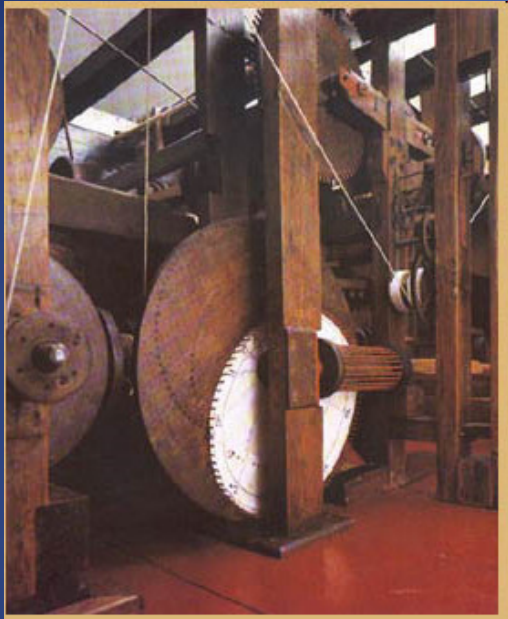


The planetarium



- Planetarium
 - is kept in motion by an impressive gear mechanism of wooden hoops and disks
 - with 10.000 hand-forged nails as teeth, scale 1mm : 1.000.000 km
- All the planets in Eisinga's model orbit the sun at the same speed as do the real planets: Mercury in 88 days, the earth in 1 year, and Saturn in more than 29 years!
- During the same year (1781) Uranus was discovered by Herschel , but for this planet there was no room on the ceiling of his living room
- Eisinga also built all kinds of special clocks that indicate the day, the date, the rising and setting of the sun and moon, the apparent movement of the heavens due to the rotation of the earth, and other phenomena.

Dynamics of the planetarium



- Persistence: planetarium still works, more 228 yrs correctly
- QP: motion of planets Mercury, Venus, Earth, Mars, Jupiter, Saturn
- Irregular motions: excentric gears
- Elliptical orbits: mimiced by offsetting the centres of the circles
- Kepler's equation (2nd Law): solved mechanically
- Forcing: 9 weights
- Synchronization: pendulum clock
- 3D: skew planes of planets and ecliptica

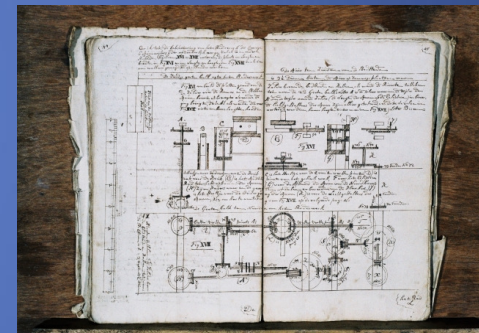
Life of Eise Eisinga (3)

- Due to a political crisis in 1787, Eisinga seen as a Patriotist had to leave his family and fled to Gronau (Germany)
- His wife died, he went to Visvliet (Groningen), put in jail for one year (Blokhuis, Leeuwarden), returned to Visvliet, in 1792 married Trijntje Eelkes Sikkema and got another three children
- In 1795 he returned to Franeker, rebuilt his life and the planetarium
- In 1818 King William I of the Netherlands visited the planetarium and bought it for the Dutch state
- Eise Eisinga died in 1828



Planetarium today

- In 1859 the planetarium was donated by the Dutch state to the city of Franeker. More than 40.000 visitors/yr
- Part of the Dutch History Canon
- Eisinga left drawings, explanations and a list of all things that should never be forgotten.



- Don't forget to set the date ring correctly on the leap day.
- Check the speed of the clock during sudden temperature changes.
- Adjust the orbit of Saturn every year because I made a little miscalculation.
- Don't forget to paint new year numbers every 22 years.

“ARCES ATTIGIT IGNEAS”



Painted by Willem Bartel van der Kooi (1827).

Web References

- Eisinga Planetarium:
<http://www.planetarium-friesland.nl/welkom.html>
- Wikipedia:
http://en.wikipedia.org/wiki/Eise_Eisinga
- Youtube:
<http://www.youtube.com/watch?v=uKej2M0Hd3M&feature=related>
- Canon van Nederland:
<http://www.entoen.nu/eiseeisinga>

