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'A device with changing roles and meanings: A 'cultural biography' of the Eysenbroek 'Grand Orrery' (1738) at the Adler Planetarium, Chicago'

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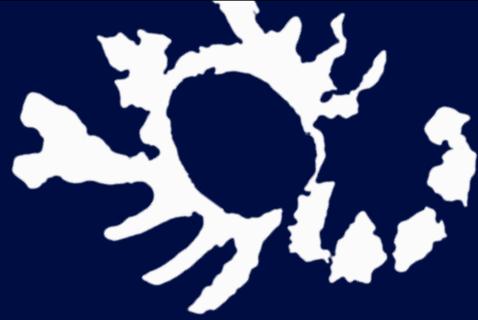
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A Device with Changing Roles and Meanings: The Eysenbroek Grand Orrery (1738) at Chicago's Adler Planetarium



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INTRODUCTION

In 1930, the Adler Planetarium acquired a large number of scientific instruments from the Amsterdam antiques dealer, auctioneer and instrument collector Anton Mensing (1866–1936).¹ Among these items was an interesting Grand Orrery, made in Haarlem, the Netherlands in the years 1737–1738 (figure 1). In its present context at the Adler Museum, this planetarium highlights the history of the representation of the heavens during the ages.² As a scientific instrument the Eysenbroek Orrery is just one of a series of planetaria in the Adler collection, which also holds one of the oldest Orreries in the world, the tabletop planetarium made by George Graham in England around 1705.

During its existence, the Eysenbroek instrument has also fulfilled several other roles. This paper intends to investigate these roles by looking at what the apparatus tells us, and confronting this knowledge with what archives and publications can reveal about the different contexts in which the apparatus has functioned throughout the almost three centuries of its existence. In doing so, we aim to enhance the present historical and representational value of this beautifully made apparatus.

The Apparatus at the Adler

As the Eysenbroek Orrery was not on display when the present author visited the Adler Planetarium in 2001, the following description is based on the testimony of an investigation of both exterior and interior, carried out in August 1972 by Henry C. King together with Adler's curator of the Collection of Antique Instruments, Roderick Webster.³

The Eysenbroek Orrery is a nicely crafted instrument, with a case of 31 cm height, having 12 concave-shaped sides, handsomely finished with walnut veneer (probably on oak). On the case a zodiac ring carrying an armillary hemisphere is attached, mounted on 12 silvered-brass pillars. The apparatus has a diameter of almost 81 cm and a total height of 78 cm. Small balls representing the planets, fixed on similar small stems, are attached to a series of concentric ring-shaped plates, painted blue. These rings can rotate around a gilded globe on a stem in the centre, which represents the Sun.

The central portion consists of two rings and a circular plate. The centre plate carries Mercury; the second ring carries Venus, and the next ring carries the



FIGURE 1. The Eysenbroek Orrery at its present location, the Adler Planetarium, Chicago.

Earth/Moon system. Diametrically opposite to this, a pointer aims to a small painted hour circle. The Earth is mounted on an inclined wire, which remains parallel to the same plane during its entire revolution around the Sun, but the earth has no diurnal motion. Also the Moon has no provision to keep its hemisphere properly orientated.

The next three rings have teeth cut along their outer edges. They carry the outer planets Mars, Jupiter (with four Satellites), and Saturn (four satellites and a ring). The satellites of both Jupiter and Saturn are driven by a wheelwork (figure 2).

For the interior of the Eysenbroek planetary, King provides the following description:

An unusual feature of this model is the saw-shaped teeth cut along the outer edge of the cover rings for Mars, Jupiter, and Saturn. These teeth mesh with those of small pinions (also cut from sheet brass) provided with 10 teeth for Mars and Jupiter and 20 for Saturn. The significance of this arrangement is immediately apparent when one looks inside the case through a door in one of the side-panels. At the far end is a clock movement driven by a heavy weight. The clock turns a horizontal steel shaft which extends to the side of the case, there to end in a substantial steel endless screw. This screw turns a vertical spindle to the top of which is fixed the above-mentioned pinion 20 of the Saturn ring. Below the Saturn-ring, and attached to it, is a radial arm made of a single strip of steel plate only about 2 mm thick. As the combination moves round the sun, a train of five wheels mounted in the arm is actuated by a fixed central wheel and turns (1) a small Rømer-type double-cone assembly for the parallelism of Saturn's ring and the motions of four of its satellites, and (2) a vertical spindle at the top of which is pinion 10, the drive of Jupiter's ring and arm. A similar arrangement on the



FIGURE 2. A close up of the Eysenbroek instrument.

*Jupiter-arm rotates the satellites of Jupiter and pinion 10 of the Mars-ring. The Mars-arm has a series of five wheels for rotating the planet in its axis, but the wheelwork associated with the Earth-Moon system, Venus, and Mercury is entirely concealed by a circular brass plate.*⁴

The apparatus is signed on the celestial circle for the Tropic of Cancer: “Door Pieter Isenbroek is dit Planetarium Uitgevonden den 5 Oct. 1737, en door den selve Volmaakt primo Zeptember, 1738. En verbeterd Door Jan Peres te Haarlem, 1793”; in English: “This planetarium was invented by Pieter Isenbroek on 5 October 1737, and was finished by him on the first of September 1738. The device has been improved by Jan Peres at Haarlem in 1793”.

So the question arises: who were these artisans “Isenbroek” and “Peres”, and why – and for whom – have they made an effort to produce this instrument or change it at a later date?

The Constructor: Pieter Eysenbroek

Remarkably, Pieter Eysenbroek (1701–1776), the inventor and maker of the Grand Orrery, was foremost not an instrument maker, but the owner and exploiter of a textile factory. He was born in Haarlem into a Mennonite family.⁵ In March 1744 he married (in Viersen, then an enclave in Westphalia) a Mennonite woman, Geertruyd van Beckenraad. Together they lived in a house at the Oude Gracht in Haarlem, near the Kleine Houtstraat. In this neighborhood the Eysenbroeks also owned a garden.⁶ In the early 1730s Eysenbroek became involved in a local, but very active, scholarly society, the *Natuur- en Sterrekundig Collegie*. This society was founded as a result of the lecturing tour made through the Netherlands in the early 1730s by English Newtonian John Theophilus Desaguliers, a renowned public lecturer. Desaguliers’s lectures, which involved experimental physics and observational astronomy, were extremely popular in the Netherlands.⁷ In the wake of his tour in almost every Dutch town of importance, an informal society for the study of physics and astronomy came into being. Some of these groups of *konstgenoten* (lovers of the arts) – as they called themselves – even organized their own housing, including a cabinet of scientific instruments and an astronomical observatory.⁸

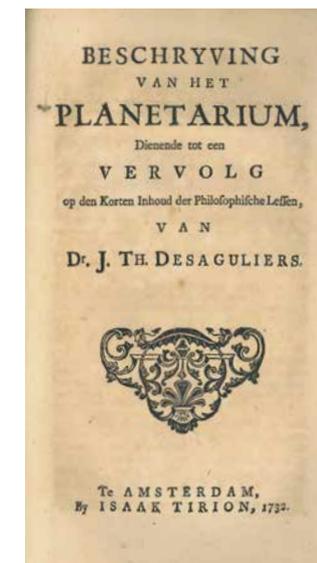
Haarlem was such a city. Here, too, a society was formed – the *Natuur- en Sterrekundig Collegie* – whose members became engaged in the study and practice of physics and astronomy.⁹ They bought a building to house their meetings and instruments, and on the roof of this house equipped an astronomical and meteorological observatory, where serious observations were carried out. In 1739, Dutch professor of physics Petrus van Musschenbroek, for instance, referred in the second edition of his textbook on physics to the cooperation of the Haarlem “Society of Smart Philosophers”, who had shared with him

their meteorological observations made in the past years.¹⁰ Eysenbroek was one of these “smart philosophers” who collected meteorological data.¹¹ He devoted himself also to astronomical observations. Surveyor and astronomer Dirk Klinkenberg (1709–1799), who until his move to Leiden in 1751 was one of the prominent members of this Haarlem Society, referred to Eysenbroek as “his first mathematical companion”.¹² Together they observed the comet of 1742.¹³ Alone, or with his fellow members of the Haarlem Collegie, Eysenbroek also made observations of the comets of 1757, 1760, and 1769, as well as of the Venus transit of 1761.¹⁴

But Eysenbroek was more than just an enthusiast for the sciences. Like many Mennonites, he was interested not only in science, but he also knew how to use this knowledge in a practical way. He had technical skills and had also a good knowledge of materials. Eysenbroek was trained to twine not only the threads of textiles, but also those of gold and silver. For this purpose he had designed and made his own machines. As a “*Mr. goud- en silverdraadtrecker*” (master gold and silver wire drawer) he had entered the Guild of Saint Luke.

So it is not strange that in the 1730s Eysenbroek became interested in one of the major instruments that Desaguliers had introduced during his trip through the Netherlands: his planetarium, which was used for demonstrations during Desaguliers’s astronomy lectures. In 1732, an illustrated description of this planetarium was published in Dutch, which description later was also included in Desaguliers’s physics course published in London in 1735, a text issued in Dutch a year later (figures 3a and b).¹⁵

But Desaguliers’s planetarium was rather expensive. In 1732 the Frisian (and later also Dutch) Stadholder Prince Willem IV of Orange-Nassau considered buying



FIGURES 3A AND B. Dutch edition of the description of Desaguliers’ Planetarium (Amsterdam, 1732). Collection of the author.

such a device, but eventually he withdrew this intention, probably because of its high price.¹⁶ Eventually only Utrecht University bought a Desaguliers planetarium, which item was lost already in the eighteenth century.¹⁷ As far as we know, no Desaguliers planetarium survives today.

Knowing this context, it seems rather plausible to suppose that in 1737 Eysenbroek decided to copy Desaguliers's planetarium. It took him a year to construct the instrument. The local Haarlem newspaper of 19 September 1738 proudly announced the completion of this 'Konstwerk' (masterpiece) as representing "the system of Copernicus" (figure 4).¹⁸

Eysenbroek probably made the instrument for usage in the Haarlem *Natuur- en Sterrekundig Collegie*. Eysenbroek's orrery was indeed used in this local Society, as stated in a letter of its former president, medical doctor and meteorologist Jan Engelman, written in 1780 to Franeker professor Jan Hendrik van Swinden, who just had published a description of the – today still operational – planetarium of Eise Eisinga, built in the years 1773–1778.¹⁹ In this letter, Engelman provides us with the following information:

From the introduction of your description of the Franeker planetary [of Eisinga], I have noticed that you have not seen the Haarlem example, made in olden days by P. IJzenbroek, which stands in the premises of the Physics Society in the Patientiestraat, and which as a result of the death of the other contributing members now has fallen to Mr. Voorhelm and me. Although the apparatus has been idle since the death of its maker, everything moved that also moves in the Heavens (the proportions of size and distance not taken into account). It circulates in a plane according to Desaguliers Orrery.²⁰

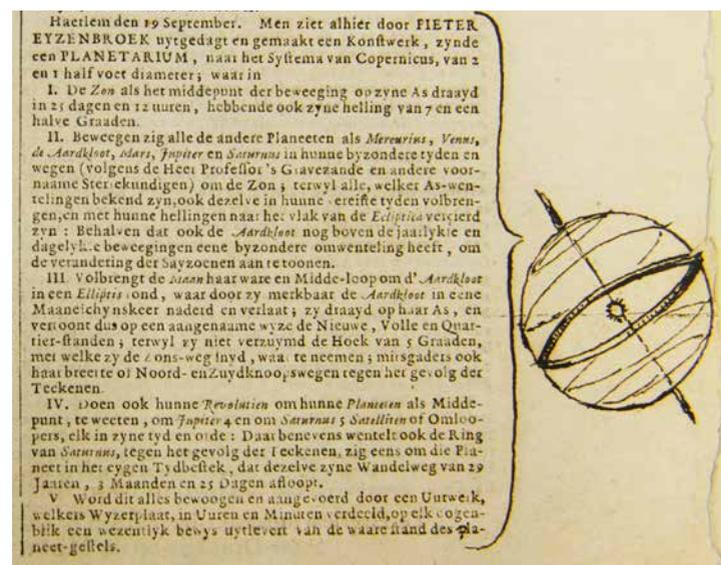


FIGURE 4. The announcement of the completion of Eysenbroek's planetarium in the *Oprechte Haelemse Courant* of 19 Sept 1738, illustrated with a hand drawn armillary sphere (Adler Planetarium, Chicago).

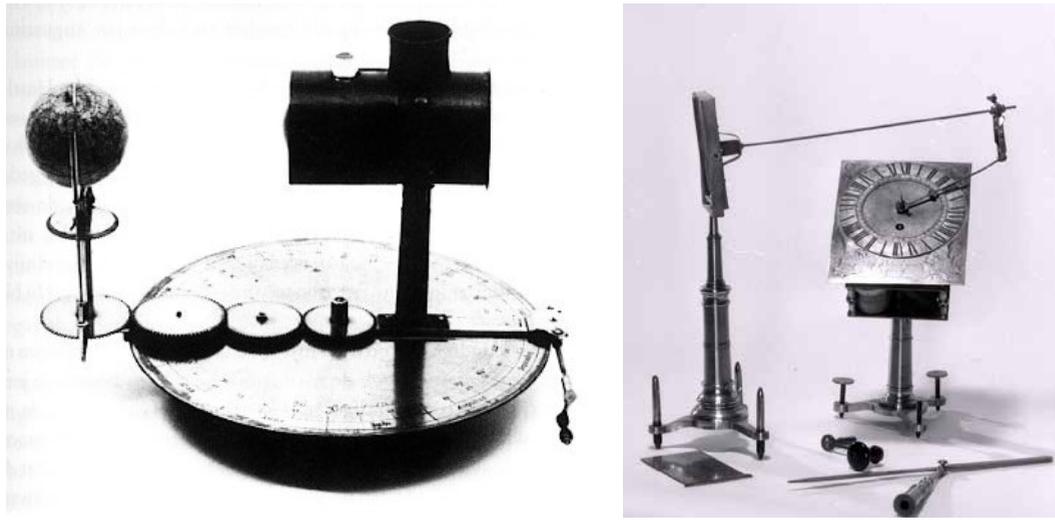
Thus Engelman confirms that the planetarium was used in the building of the *Natuur- en Sterrekundig Collegie*, that Eysenbroek had kept it working until his death, that the mechanism indeed was related to Desaguliers's orrery, and finally that the two remaining members of the Society (Engelman being one of them), were to be recognized as the current owners of the device.

In 1774, shortly before Eysenbroek's death, his planetarium was seen in its original location by French astronomer Joseph Jérôme Lefrançois de Lalande. Unfortunately Lalande has left us only some crude notes of this voyage through the Low Countries, but still we can learn from them that Lalande had the opinion that the members of the Haarlem Mennonite community were the richest and most useful of the city of Haarlem.²¹ One of them was Pieter Eysenbroek, who according to Lalande was "a manufacturer of folded ribbons". Lalande noted of Eysenbroek's orrery that the instrument "also represented the satellites of Jupiter and Saturn".²²

Still, Lalande seemed more impressed by Eysenbroek's other instruments, like barometers and thermometers. For indeed Eysenbroek had made many more instruments. Inspired by the construction of his planetarium, he had decided to become also a constructor of scientific instruments, in addition to his job as a textile producer. In 1739, he made a contract with Haarlem merchant Jan van der Meulen for the construction of "all sorts of spheres, air pumps, and all that can be needed for the pastime of mathematics".²³ Of these instruments only a few have survived, like a heliostat according to the design of Leiden professor Willem Jacob's Gravesande (published in 1742), a thermometer, a pyrometer, a small tellurium, and a table clock.²⁴ Probably for his instrument maker business Eysenbroek borrowed in 1746 four thousand guilders from the Amsterdam banker George Clifford, better known as the generous patron of the famous botanist Carl Linnaeus.²⁵ No wonder that Clifford's large cabinet of experimental philosophy also contained instruments made by Eysenbroek (figures 5a and 5b).²⁶

When Eysenbroek died in 1776, his estate contained 30 thermometers.²⁷ From auction catalogues we know that he also made several barometers and an electrical machine, as well as "a machine to demonstrate the seasons", probably a kind of tellurium.²⁸ In 1761, Eysenbroek even published one of his earlier findings: a way to consolidate the reference level of mercury in barometers, an invention also attributed to Eysenbroek's competitor, Amsterdam instrument maker Hendrik Prins.²⁹

Eysenbroek's own cabinet of scientific instruments, auctioned in Haarlem in 1777, contained – according to the advertisement – "instruments in physics, optics, astronomy, geometry, mathematics, air pumps, electrical machines,



FIGURES 5A AND B. A tellurium and a heliostat, made by Peter Eysenbroek (Utrecht University Museum).

telescopes, microscopes, burning mirrors, painted glasses, an illumination cabinet, a magic lantern, and a celestial as well as an terrestrial globe, barometers, thermometers, and a turner's lathe". In the advertisement for this auction Eysenbroek was referred to not as an instrument maker but as an "Enthusiast of Physics, Mechanics, and Astronomy in Haarlem".³⁰

We can therefore establish that for Eysenbroek, the orrery meant more than a device with which the movements of the planets could be demonstrated. For him, the construction of the orrery also appeared to be a road to a different career.

A New Owner: the Haarlem Watchmaker Jan Peres

In 1783, the *Natuur- en Sterrekundig Collegie* ceased to exist. Most of the active members had died during the years 1776–1782. Its former president, Jan Engelman, died in February 1782, and the last remaining contributing member, Mennonite florist Dirk Voorhelm, passed away in September 1783.³¹ A new generation chose to do things differently. Eventually in 1788, the Society's building was sold, the instruments auctioned. On that occasion, the Eysenbroek planetarium must have been bought by the Haarlem watchmaker Jan Peres, for it was surely no coincidence that in the very year 1788 Peres announced in a Dutch periodical the "invention" of a "movable planetarium of a completely new and special construction":

Its conception and the workmanship has been approved in all aspects by experts in this field. One can see on it all the planets, up to Uranus, with their satellites, in their true distance to the Sun, in a ratio with respect to the distance to the Earth. A lantern, lighted by a candle, functions as the Sun. In its place it shows clearly in what way the Earth and Moon are lighted by the Sun, as well as what causes Day and Night,

*Summer and Winter, Spring and Autumn. The eclipses of the Sun and the Moon are equally visible as in Nature, whether they are complete or partial, in North or South. Through a reflecting light the Moon always shines at the Earth, and it always has pointed the same side towards the Earth. As a result of its small specifications, since its movable parts contains not more than only one feet in diameter, the masterpiece is extraordinary suited for usage in Colleges and Societies, at the lessons in astronomy, especially because the movement [of the planets] can be organized so swift that [the revolutions] of a whole year can be demonstrated in less than a quarter of an hour.*³²

A few years later, Peres's inspiration and source of knowledge became clear. In March 1794, the same periodical published a note revealing that Peres was in the possession of the Eysenbroek planetary. Peres had "repaired and improved" the instrument for an unnamed gentleman in The Hague. But before he transported the orrery to its new location, Peres invited interested people to inspect the device in his workshop. The announcement in the journal reads as follows:

Haarlem, 10 March 1794: Our meritorious fellow townsman JAN PERES, master watchmaker in this city, of whose imaginative genius and mechanical competences we have reported to our readers several years ago, in the description of his newly invented movable Planetarium has since then again demonstrated, his advancement in the utilization of his skillful craft in the sciences and especially in astronomy, which skills he has attained by his own exercise, especially through the reading of the works of Smith, Martin, and Bode.

Recently he has finished the repair of a Planetarium or Orrery, which was made many years ago by the late mister PIETER EYSENBROEK in this city for the use by a certain Society of Physics Enthusiasts according to the description and illustration in the works of Mr. DESAGULIERS, but which device with the passage of time had become disordered. At the restoration of this device, he has not only renewed the clockwork almost entirely, but he also has improved the gearwork considerably, and made its movement more orderly, more correct, and more in accordance with nature. He has equipped the whole mechanism in line with his own planetarium, in such a way that the eclipses, both of the Sun and the Moon, as well as the different phases of the rings of Saturn, are represented.

This device, which in several days will be transported from here to The Hague, to be placed with its appropriate fittings in the library of its present owner, has a circular casing of 30 inches in diameter, with 12 reflex angles, in accordance to the number of the signs of the zodiac. The 6 angular lower end, where the pendulum swings, has a diameter of 40 Rhymland inches. The clockwork runs for eight days, and is driven by a weight of only 16 pounds. This gearing can be disengaged by lifting a cogwheel, in order to accelerate the movement by means of a handle, to demonstrate the course

of the heavenly bodies, like the movement in the other aforementioned Planetarium of the improver.³³

Very little is known about this watchmaker Jan Peres. He may be born in the Lutheran community of Purmerend, a small village north of Amsterdam.³⁴ In 1765 he had entered the guild of St. Luke as a watchmaker. He lived in the Grote Houtstraat, one of the major streets of Haarlem.³⁵ Peres passed away in 1812, leaving behind a widow, Maria van Weggels, who died six years later.³⁶ At that time the watchmaker shop at the Grote Houtstraat had already been dismantled, its inventory auctioned shortly after the death of its owner, on 15 October 1812. All Peres's golden and silver watches, his standing clocks, as well as his watchmaker tools, came under the hammer, but in the advertisement for this auction no planetarium or other astronomical clock was mentioned.³⁷ As far as we know, Peres's large planetarium that he made in 1788 surfaced only twice in a historical record. In November 1815, the apparatus was sold by a Haarlem auctioneer together with "an excellent electrical machine". The Peres planetarium surfaced again in 1852, when it was sold by another Haarlem auctioneer, together with some furniture, a standing clock, and maybe the same electrical machine, never to be seen again.³⁸ Who had possessed or used this instrument remains a mystery. Perhaps it could have been bought by a new Physics Society *Oefening in Wetenschappen*, which had been founded in Haarlem in 1798 and existed well into the nineteenth century.³⁹

Peres's workmanship unfortunately appeared not to be as good as he claimed. According to the 1972 investigation of King and Webster, his repair to the Eysenbroek instrument was not robust but they also doubted whether the instrument ever had performed as well as one might hope:

At first the excellent craftsmanship of the case led us to expect an equally high standard of design and finish in the mechanism, although the poor pinions and teeth on the top-plate assembly indicated otherwise. At the time it was not possible to set the clock-drive going, but this proved no drawback since a small provisional handle is incorporated with the main drive. One turn of the handle corresponds to one rotation of an index mounted on the earth-ring, that is, to 24 hours, but the amount of free play in the wheelwork is considerable and several of the more rapid notions are erratic. Despite the fact that the mechanism as a whole has obviously had rough usage, it is doubtful whether it ever performed satisfactorily, primarily because of the flimsy construction of the wheelwork and planetary arms. Saturn's arm is bent owing to the weight of the wheel assembly at its far end, the idler wheels arranged along it are misaligned, and even the large fixed wheels are made of relatively thin sheet brass.⁴⁰

We can thus establish that the Eysenbroek Orrery again fulfilled a role different from its original, this time in the years between 1788 and 1794. To the

watchmaker Peres, the instrument was an inspiration and a device from which he could learn how to build a planetarium of his own construction; at the same time the apparatus was also a commercial advertising tool by means of which he could present himself to the Haarlem community as a watchmaker with unusual skills. But after 1794 the role and meaning of the instrument again would change. For years to come, the orrery would function as the eye-catcher in the rich library of a wealthy gentleman in The Hague.

A Gentleman in The Hague

In his advertisement of 1794, Peres had mentioned that the Eysenbroek Orrery was on the brink of being transported to The Hague "to be placed [. . .] in the library of its present owner". This new owner appeared to be the magistrate Pieter van Buren (1741–1822), secretary of the States of Holland and West-Friesland, as well as "Eerste Commis der Finantien van Holland", both official positions of high ranking. The previous year, van Buren had been one of the four founding fathers of a local physics society in The Hague, the *Gezelschap ter Beoeffening der Proefondervindelijke Wijsbegeerte in 's Hage*, later to be renamed *Diligentia* (still in existence in 2013!). van Buren was one of the Society's most dedicated members, donating several instruments to *Diligentia's* physics cabinet (figure 6).⁴¹

van Buren was born in Leiden to Hendrik van Buren (1711–1789), a wealthy merchant, and Anthonia Marcus. In 1755, at the age of 14 he matriculated at Leiden University, when the professor of physics and astronomy, Johan Lulofs, was the Rector Magnificus. In March 1762, Pieter graduated with a dissertation in Law.⁴² After that he started a career as a civil servant in The Hague. In 1785, van Buren was appointed at his post as Secretary of the States of Holland and



FIGURE 6. Pieter van Buren (1741–1822).

West-Friesland. He lost this job in the French-oriented revolution of 1795, after which he retired as a gentleman of independent means. In 1789, his father died at the mansion *Spawijck* (presently *Vreewijk*), just outside Leiden, and it was from his father's legacy that Pieter van Buren bought a mansion of his own, the country house *Welgelegen*, near Voorschoten, where he spent parts of the summer.⁴³ In the early 1770s, Pieter van Buren became involved in the social life of The Hague. He became a member of several Literary Societies, such as *Kunstliefde Spaart Geen Vlijt* (1772) and *Kunst wordt door arbeid verkrege*n (1773). He also was involved in singing. In 1803, he was a member of the board of the *Godsdienstig zanggenootschap in 's Haage*.

In due time, van Buren evidently became very interested in science. He started to acquire what would become one of the largest private cabinets of experimental philosophy in the Netherlands. This tendency to collect scientific instruments was especially in vogue in The Hague, a place where many very wealthy aristocrats and diplomats lived. In 1823, the auction catalogue of van Buren's scientific instruments counted 560 items, one of them being the Eysenbroek Orrery, listed among the mathematical instruments (figure 7 and table 1).⁴⁴

van Buren's inclination towards the sciences became apparent in the 1780s, when he was elected a member or director of the major official scholarly societies in the Netherlands. In 1780, he became a contributing member of the *Natuur- en Geneeskundige Correspondentie Societeit*, the first institution in the Netherlands to systematically collect meteorological and medical observations.⁴⁵ In 1786, van Buren was appointed a Director of the *Zeeuwsch Genootschap der Wetenschappen*, followed by similar positions at the *Bataafsch Genootschap der Proefondervindelijke Wijsbegeerte* in Rotterdam (1798), and by the *Hollandsche*

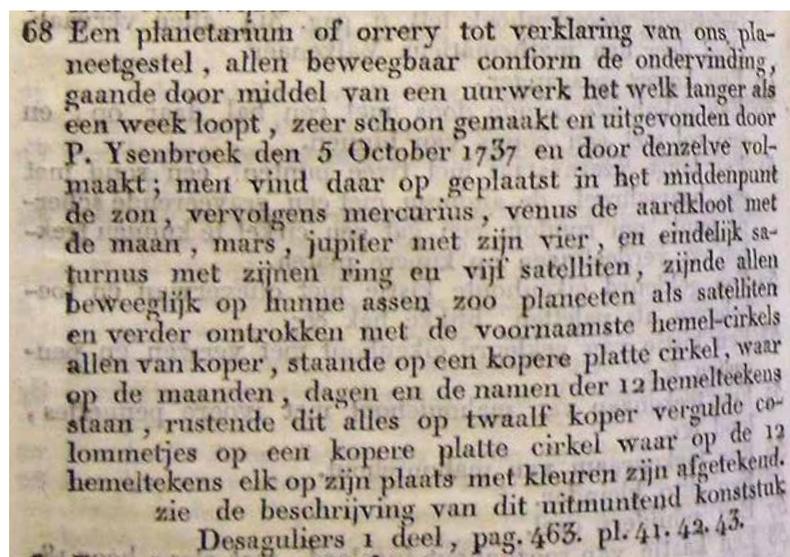


FIGURE 7. The Eysenbroek Orrery as described in the 1823 auction catalogue of van Buren's collection of scientific instruments (Royal Library, The Hague).

CATEGORY	NUMBER OF INSTRUMENTS	PERCENT
Pneumatics	133	24%
Optics	112	20%
Electricity	105	19%
Mathematical instruments	58	10%
Artificial airs	45	8%
Hydraulics	31	6%
Astronomy	31	6%
Mechanics	22	4%
Magnetism	16	3%
Heat	7	1%
	560	100%

TABLE 1. Categories in van Buren's Collection of Scientific Instruments.

Maatschappij der Wetenschappen in Haarlem (1805). van Buren's library also revealed his scientific interest. He possessed all of the recent Dutch books in the field of physics, astronomy, and natural history.⁴⁶

A Period of Mystery

In November 1823, the Eysenbroek Orrery was sold in The Hague with all other van Buren assets. The Royal Library in The Hague houses the auctioneer's copy of the catalogue, annotated with the prices and the names of the buyers. It shows that van Buren's copy of the extremely rare second volume of Hevelius's *Machinae Coelestis* was bought by Utrecht professor of astronomy Gerrit Moll for the – then very high – price of 208 guilders and that the Eysenbroek planetarium was sold for 250 guilders. Alas, the auctioneer, Bernardus Scheurleer, hammered the instrument off for an anonymous buyer on a commission marked “L”. Regrettably, I have not been able to identify this buyer, who bought some other items in the van Buren auction, for instance, a silver handheld achromatic telescope made by Gilbert & Wright in London.⁴⁷ So, unfortunately, we do not know where the instrument was during the next century.

Still it can be said that during this long period of mystery the Eysenbroek planetarium experienced an important change in role and meaning. For it was in this time that old scientific instruments no longer were considered as being useful for their original purpose, but gradually were regarded as valuable witnesses of an era that had passed away.⁴⁸ It was during this unknown period that the Eysenbroek Orrery became an historical instrument.

An Historical Item in the Anton Mensing Collection

In 1924, the Eysenbroek planetarium surfaced again in the Mensing collection, when the instrument was recorded in Max Engelmann's catalogue of the entire

collection.⁴⁹ How and where the auctioneer Mensing acquired the instrument is unknown. A photograph of the device is also included in the famous *Planetariumboek* issued in 1928 at the anniversary of the well-known Eisinga planetary in Franeker, but the authors remarked that about this planetarium they only could say that it was in the Mensing collection. Nothing else was known at the time (figure 8).⁵⁰

At the end of 1929, the Mensing collection was sold en bloc to the Adler Planetarium, changing in one stroke the mission of this institution from a site with a Zeiss projection machine presenting a “canned representation” of the heavens into an historical museum of astronomy.⁵¹ At that time, the Eysenbroek instrument was the Adler’s oldest orrery, although its condition was rather poor; on its arrival in Chicago in 1930, the instrument “was rather badly shaken in its long voyage”.⁵² In the 1990s, the instrument was damaged by visitors, after which it went to the Adler’s repository. It awaits further restoration and merits display once again in one of the world’s great science museums.

Conclusions – Changing Roles and Meanings

This sketch of the history of the Eysenbroek planetary has demonstrated that the role and meaning of the instrument over the ages has been plural in many respects. For the maker itself, the planetarium represented a technical challenge as well as a way to another career; to the Haarlem *Natuur- en Sterrekundig Collegie*, the instrument was a demonstration device, highlighting the Godly order of the Heavens ruled by Newtonian laws; for Jan Engelman, in 1780 one of the two remaining members of the Haarlem Collegie who *de facto* both had inherited the instrument, the Eysenbroek Orrery was little else than a memory of olden days; for the next owner, the watchmaker Peres, the



FIGURE 8. Anton W. M. Mensing (1866–1936) photographed in 1935 on the occasion of the 50th anniversary of the Frederik Muller & Co Auction House in Amsterdam. Photo from: De Clercq, *Scientific Instruments: Origins and Imitations. The Mensing Collection* (Leiden 1999).

abandoned Grand Orrery was not only an example from which he could learn how to make his own planetarium, but also a commercial advertising tool with which he could demonstrate his special craft in making all sorts of gear-works; for the gentleman-scholar van Buren, the orrery was foremost an icon in his library, showing his devotion to the arts and sciences; in Mensing’s day, the apparatus had become an historical instrument, as well as a gadget that could be traded. At the Adler, the instrument not only was a way to show the historical sequence of how scholars had represented the heavens, but it also contributed to the cultural credibility of this institution, whose collection of highly significant historical instruments distinguished it as an astronomical museum from other sites with solely a Zeiss-projection planetarium theater. For me, as an historian of science, the instrument presents a wonderful opportunity to devote myself for a moment to the “material turn” in my profession, in which artifacts are examined relating to various aspects of science and its practices.⁵³ In all cases, the object itself is central and essential. Without it, no history, role, or meaning could be described or analyzed. As a planetarium this object in particular fascinates the viewer, because of the amazing property of planetariums that the ongoing movement of the planets can be represented, whether it is done mechanically, optically, or by a modern computer.

1. On Adler’s acquisition of the Mensing Collection, see Liba Taub, “‘Canned astronomy’ versus cultural credibility: the acquisition of the Mensing Collection by the Adler Planetarium”, *Journal of the History of Collections* 7 (1995): 243–250; On Mensing, see Willem F. J. Mörzer Bruyns, “Frederik Muller & Co and Anton Mensing: The first international art auction house in Amsterdam, and its director”, *Quaerendo* 34 (2004): 211–239.

2. Bruce Stephenson, Marvin Bolt & Anna Felicity Friedman, *The Universe Unveiled: Instruments and Images through History* (Cambridge, 2000), 132–133.
3. Henry C. King & John Milburn, *Gearing to the Stars: The Evolution of Planetariums, Orreries, and Astronomical Clocks* (Toronto, 1978), 215–217. See also the condition report in the files of the Adler Planetarium, written by Henry King after his examination on 10 August 1972.

4. *Ibidem*.

5. The family name was written in several ways: Eysenbroek, Ysenbroek, Isenbroek, Eijzenbroek, etc.
6. Noord-Hollands Archief, Haarlem: archive mansion ‘Welgelegen’, inv. no. 17.

7. See, for instance, H. J. Zuidervaart, “Science for the public: the translation of popular texts on experimental philosophy in the Dutch language in mid-eighteenth century”, in S. Stockhorst, ed., *The circulation of Enlightened thought in Europe by means of translation* (Amsterdam/New York, 2010), 231–262. See also Eric Jorink & Huib Zuidervaart, “The Miracle of Our Time. How Isaac Newton was fashioned in the-Netherlands”, in Eric Jorink & Ad Maas, eds., *Newton and the Netherlands. How Isaac Newton was fashioned in the Dutch Republic* (Leiden, 2013), 13–65 (in press).

8. Huib J. Zuidervaart, *Van 'Konstgenoten' en Hemelse Fenomenen. Nederlandse Sterrenkunde in de Achttiende Eeuw* (Rotterdam, 1999).
9. Bert C. Sliggers, "Honderd jaar natuurkundige amateurs in Haarlem", in A. Wiechmann, ed., *Een elektriserend geleerde: Martinus van Marum, 1750–1837* (Haarlem, 1987), 67–102.
10. Petrus van Musschenbroek, *Beginsels der Natuurkunde, Beschreeven ten dienste der Landgenooten*, (Leiden, 1739), Preface: "eenige wakkere Wijsgeeren, een genootschap tot Haarlem uitmakende".
11. Nicolaas Duyn, *Aanmerkingen en aantekeningen van drie meer dan gemeene strenge winters* (Haarlem, 1743), 135–136.
12. Dirk Klinkenberg to Jacobus Barnaart jr., 23 September 1757. (Noord-Hollands Archief, Haarlem: astronomical correspondence Dirk Klinkenberg).
13. Nicolaas Duyn, *Nutte en noodige oeffening, of kort verhoog, dat de natuur- en sterrekunde nevens meer andere wetenschappen, den mensch opleiden en aanzetten tot de kennis van God en zyn dienst* (Haarlem, 1746), 698–701.
14. Barnaart to Klinkenberg, 20 September 1757; Eysenbroek to Klinkenberg, 23 October 1761 (n. 12); *Utrechtse Courant*, 18 January 1760; *Gazette van Gend*, 4 September 1769; Sliggers, "natuurkundige amateurs" (n. 9), 92–93.
15. [Anonymous], *Beschryving van het planetarium, dienende tot vervolg op den korten inhoud der philosophische lessen van Dr. J. Th. Desaguliers* (Amsterdam, 1732). J. Th. Desaguliers, *De natuurkunde uit ondervindingen opgemaakt* (Amsterdam, 1736), 481–483.
16. Peter de Clercq, "Science at Court: the Eighteenth-century Cabinet of Scientific Instruments and Models of the Dutch Stadholders", *Annals of Science* 45 (1988): 113–152. Desaguliers had offered his instrument for 470 guineas.
17. Zuidervaart, 'Konstgenoten' (n. 8), 78–84.
18. *Oprechte Haarlemse Saturdagse Courant*, 20 September 1738.
19. J. H. van Swinden, *Beschryving van een konst-stuk, verbeeldende een volleedig bewegelyk hemelgestel, uitgedagt en vervaardigd door Eise Eisinga* (Franeker, 1780).
20. "Uit de voorreden van uwe beschrijving der Franekers planetarium heb ik niet kunnen bemerken dat ge iets gezien had van 't Haarlems, weleer door P.I. IJzenbroek gemaakt, in de Patientiestraat
- op 't Natuurk-Collegie aldaar staat, en nu aan den Hr Voorhelm en mij door versterving der overige gecontribueerd hebbende leden, zoude toekomen. Schoon naa des makers dood stil staat, bewoog alles wat in den Hemel beweegt (de proportien van grootte en afstanden niet in aanmerking kunnende genomen worden) al vrij geregeld: het loopt op een plat rond op de wijze van Desaguilliers orerij'. Jan Engelman to J. H. van Swinden, 5 October 1780. See also Engelman's letter of 6 May 1776 (Leiden University Library, BPL 755).
21. J. J. de Lalande, *Travel notebook to the Netherlands* (1774), fol. 70. Bibliothèque de l'Institut de France (Paris), MS 2195.
22. Ibidem.
23. A contract for "het vervaardigen van alle soorten van sphaeraas, lugtpompen en alles wat verder eenigsints tot de liefhebberije der mathesis noodigh sou mogen sijn". (Noord-Hollands Archief, archive city of Haarlem, NA 1028–46). See for other contracts: NA 780–81 (1743) and NA 1057–105 (1756). Courtesy Bert Sliggers, Haarlem.
24. A thermometer is in Teylers Museum, Haarlem; a reading scale and a pyrometer are in the Museum Boerhaave, Leiden; a small tellurium and a heliostat are in the Utrecht University Museum. The present location of the table clock is unknown. See also 'Bericht van een nieuw gevonde pyrometer', *Hollands Magazyn* 1 (Haarlem: J. Bosch, 1750), 406–408 [with plate].
25. Amsterdam City Archive, family archive Clifford, no. 4: deed for Notary Wessel van Kleef, 14 June 1760, naming a private agreement between Eysenbroek and Clifford, dated 31 March 1746.
26. *Catalogus van de [...] kabinetten met rarityten. Bestaande in een zeer voortreffelyke versameling van veelerlye konstig gemaakte Mechanische, Hydrostatische, Optische, Astronomische en andere Phisische en Mathematische Machines en Instrumenten [...] Alles Nagelaten by [...] Mr. George Clifford* (Amsterdam, 1760). Copy in the Rijksmuseum, Amsterdam.
27. "Blijvende nu tusschen de comparanten alleen nog in 't gemeen en onverdeeld, dertig thermometers gemaakt door P. Eijzenbroek". Cited in Sliggers, "natuurkundige amateurs" (n. 9), 79.
28. Eysenbroek instruments mentioned in auction catalogues: Clifford (Amsterdam, 1760), barometer; Hasselaer (Utrecht, 1777), electrical machine & heliostat; Engelman (Haarlem, 1782), thermometer; Valkenburg (The Hague, 1784), "Een machine om de verandereing des Saisoenen aan te toonen"; Blassiere (The Hague, 1792), "een zeer goede barometer"; van Buren (1823), planetarium & "koper lineal" (brass ruler).
29. P. Eizenbroek, "Bericht wegens een merkelyke verbetering in het maken van barometers", *Verhandelingen van de Hollandsche Maatschappij der Wetenschappen* 6 (1761): 353–357. Amsterdam professor Jan Hendrik van Swinden attributed this invention to the Amsterdam instrument maker Hendrik Prins, who – according to van Swinden – would have invented this improvement in 1760. But such a "barometer of a new invention" made by Eysenbroek was already present in the cabinet of experimental philosophy of George Clifford, auctioned in August 1760 (n. 26). Clifford died in April 1760. Cp. J. H. van Swinden, *Positiones physicae* (Harderwyk, 1786): vol. 2, part 1, 99.
30. "Liefhebber der Phisica, Mechanica en Astronomie te Haerlem": *Oprechte Haarlemse Courant*, 12 December 1776. The now missing catalogue was available for two "stuivers". See also P. C. J. van der Krogt, *Advertenties voor kaarten, atlasen, globes e.d. in Amsterdamse kranten 1621–1811* (Utrecht, 1985), nr. 1388.
31. Sliggers, "natuurkundige amateurs" (n. 9): 80.
32. *Algemene Konst- en Letterbode* 1:4 (1788): 27.
33. *Nieuwe Algemene Konst- en Letterbode* 1 (1794): 87.
34. "Jan Peres, geboren te Purmerendt en alhier woonachtig" (Purmerend E.v. Luthers lidmaten register, 1760).
35. E. Morpurgo, *Nederlandse klokken- en horlogemakers vanaf 1300* (Amsterdam, 1970).
36. *Opregte Haarlemse Courant*, 30 April 1818.
37. *Advertentien, aankondigingen en verschillende berigten van Amsterdam*, 8 October 1812.
38. *Opregte Haarlemse Courant*, 31 October 1815; idem, 14 August 1852.
39. Sliggers, "natuurkundige amateurs" (n. 9): 100–101.
40. King & Milburn, *Geared to the Stars* (n. 4): 215–217.
41. Rob Claassen & Peter Wisse, *Tweehonderd Jaar Diligentia, 1793–1993* (Den Haag, 1993); Peter Wisse, "The Philosophical Society Diligentia [The Hague] and its instrument collection", *Bulletin of the Scientific Instrument Society* 64 (2000): 3–8.
42. Petrus van Buren, *Dissertatio juridica inauguralis de poenis* (Lugduni Batavorum [=Leiden] 1762).
43. van Buren's country house in Voorschoten was sold in 1822. See the advertisement in the *Opregte Haarlemse Courant*, 27 July 1822. Later in the 19th century the house was demolished. van Buren's house in The Hague was at the Lange Houtstraat, 'wijk K, no. 270'. It was here that he had accommodated his large cabinet of experimental philosophy.
44. *Catalogus van een uitmuntende en kostbare verzameling van mathematische, aardryks-, sterre-, zeevaartkundige en mechanische instrumenten [...] waar onder een konstig en uitvoerig planetarium, [...] alsmede een zeer fraai kabinet van kapellen, torren en anderen, insecten- hoorns, schulpen en gesteentens [...]* (n.p. [The Hague], 1822). This catalogue was issued together with the catalogue of van Buren's library. See following reference.
45. H. J. Zuidervaart, "An Eighteenth-Century Medical-Meteorological Society in the Netherlands. An Investigation on Early Instrumentation, Organisation and Quantification of the Science of Weather", *British Journal for the History of Science* 38 (2005): 379–410; 39 (2006): 49–66.
46. *Catalogus van eene uitmuntende Verzameling van Boeken, Prentwerken en Prenten [...] nagelaten door [...] Mr. P. van Buren: Het welk alles publiek zal verkogt worden op Maandag den 3. Nov. 1823, en volgende Dagen* (den Haag: B. Scheurleer, 1823).
47. Koninklijke Bibliotheek (The Hague), catalogue no. 5519.
48. Anthony J. Turner, "From Mathematical Practice to the History of Science. The Pattern of collecting Scientific Instruments", in Peter de Clercq & Anthony Turner, eds., *Origins and Evolution of Collecting Scientific Instruments* (Oxford, 1995), special issue of the *Journal of the History of Collections* 7 (1995): 135–150; idem, "The collecting, trade and display of early scientific instruments, 1830–1930", in Peter de Clercq, *Scientific Instruments: Origins and Imitations. The Mensing Collection*, (Leiden, 1999), 23–48. See also Huib J. Zuidervaart, "Cabinets for Experimental Philosophy in the Netherlands", in Jim Bennett & Sofia Talas, eds., *Making Science Public in 18th-Century Europe – the Role of Cabinets of Experimental Philosophy* [working title], (Leiden/Boston: Brill, forthcoming), in the series *Scientific Instruments and Collections*, vol. 3.
49. Max Engelmann, *Sammlung Mensing: Altwissenschaftliche Instrumente* (Amsterdam, 1924), no. 392.
50. E. Havinga, W. E. Van Wijk, & J. F. M. G. D'Aumerie, *Planetarium-Boek Eise Eisinga* (Franeker, 1928), 361–362.
51. Taub, "Canned astronomy", (n. 1).
52. Philip Fox, "The Adler Planetarium and Astronomical Museum of Chicago", *Popular Astronomy* 40:6 (1932): 320–350, esp. 325–326.
53. Liba Taub, "Reengaging with Instruments", introduction to the Focus section: "The History of Scientific Instruments" in, *Isis: International Review devoted to the History of Science and its Cultural Influences* 102 (2011): 689–696.