

## Les journées européennes du patrimoine

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### *National Maritime Museum*

Park Row, Greenwich, London, SE10 9NF

Tel: + 44 (0) 20 8858 4422

#### **Armillary sphere dated 1568 by Gualterus Arsenius**

36 cm high, 26 cm wide

An armillary sphere is a model of the heavens, based on the ideas of Claudius Ptolemy (about 85-165 AD). Ptolemy was a Greek astronomer and geographer, who lived in Alexandria in Egypt. The model has the Earth at the centre and the rings ('armillae' in latin) represent various celestial phenomena, including the apparent path of the Sun against the backdrop of the stars, called the ecliptic, the paths of planets, and the celestial equator. There are also a number of small pointers which represent the relative positions of individual bright stars. The instrument could be used to demonstrate the theory of the structure of the universe, or to calculate certain astronomical phenomena. An unusual feature is that it has a trepidation mechanism for demonstrating the accession and recession of the equinoxes. Three other such armillary spheres by Arsenius are recorded with certainty: Adler Planetarium, Chicago, dated 1562; Bayerisches Nationalmuseum, Munich (inv. no. 33/241), dated 1573; Musées Royaux d'Art et d'Histoire, also known as Musée du Cinquanteaire, Brussels, dated 1575. Apart from those by Arsenius, only two other instruments with a trepidation mechanism are known, one of the late fifteenth century in the Stadtische Sammiungen Schweinfurt and another from the sixteenth century, by an anonymous Flemish maker, in the Museum for the History of Science, Oxford.

This model shows the state of understanding of astronomy in the early sixteenth century. Gradually our representations of the solar system moved away from an Earth-centred model to a series on new theories about the structure of the universe, initially through observation and mathematical modelling, and eventually by sending probes and manned missions into space. The collections associated with the National Maritime Museum and Royal Observatory, Greenwich, enable this process to be traced.

Very little is known about the maker of the sphere, Gualterus Arsenius, who was an important member of a family of engravers and instrument makers, working in Louvain in the Low Countries in the middle years of the sixteenth century. In the inscriptions on his instruments, Gualterus often described himself as the nephew of the physician and mathematician, Gemma Frisius of Louvain. But this relationship has not been established by any reliable evidence, and may just have been an advertising ploy by Arsenius. Gemma Frisius wrote numerous works on instruments, but his main occupation was as professor of medicine at the University of Louvain. The earliest known instrument by Arsenius is an astrolabe dated 1554, made a few years after Mercator left Louvain. Nevertheless, Arsenius was quite clearly influenced by Gemma Frisius and Mercator. His lettering follows Mercator's style and his instrument design is typical of the tradition recognizable in the work of other Louvain makers. Arsenius' own exquisite craftsmanship brought the art of instrument making to new heights and it is not surprising that he was asked to make a variety of mathematical instruments for a number of important clients, including King Philip II of Spain.

This armillary sphere was presented to the National Maritime Museum in 1836 by shipping magnate Sir James Caird, who had bought it through the London dealers, Maggs. Previously it had been part of the Léo Goldschmied Collection and exhibited at the Musée des Arts Décoratifs, Palais du Louvre, Paris, from March to April 1936.

#### Technical description of the instrument

The inscription on the circular base plate reads: 'Gaulterus Arsenius Nepos Gemmae Frisy fecit / Louany 1568'. The primary sphere of 20.5 cm diameter consists of eight brass rings (with square sections), two of which are fixed perpendicularly to each other and represent the colures. The colures are labelled: Colurus aequinoctior(um) and Colurus solsti[tiorum]. Five parallel brass rings are fixed perpendicularly to the colures and represent the polar circles, the tropics, and the equator. The polar circles and the tropics are labelled: *Circulus Arcticus*, *Circulus Antarcticus*, *Tropicus cancri* and *Tropicus capricorni*, respectively. The equator is labelled underneath the ring: AEquinoctialis aequator; it is graduated on top [0°-360°; numbered every 10°, division 1°] and at the outer rim [0°-360°; not numbered, division 1°]. A zodiacal ring is also connected to the colures. Underneath it is twice engraved: *Zodiacus primi mobilis* and *In 24 boris circumuolutur*. On top, there are the Latin names, the symbols, and the Roman numerals [I-XII] of the signs of the zodiac. At the outer rim and on top it is graduated [12 times 0°-30°; not numbered, division 1°]. Twenty-one stars are included in the primary sphere, of which 18 are represented by pointers. The stars are labelled by their name, their planetary association (for 17 stars not given here), followed by the number of the magnitude (for 15 stars): Andromedae umbilicus 3, Aquila 2, Arcturus 1, Canicula 1, Canis maior 1, Canopus 1, Caput draconis, Caput [sign Gem] ante:, Caput hercules 3, Cor [sign Léo] 1, Dorsum [sign Leo] 2, Genu [sign Sag] sin:, Hircus 1, Hydra clara 2, Lanx meri: 2, Lyra, Medium caudas vrsae maioris 2, Oculus [sign Tau] 1, Ophiuchi caput, Orionis dex: hume:, Spica virginis 1.

Inside the primary sphere, there is a movable System of brass rings connected to two short axes fixed at the N & S ecliptic poles of the primary sphere. These latter poles are both la-belled: Polus Zodiaci. This System, representing the so-called 'ninth sphere', consists of three rings fixed perpendicular to each other. Two rings represent circles of latitude and the third, the ecliptic. This ecliptic is graduated [12 times 0°-30°; not numbered, division 1°] and shows the Latin names and the symbols of the signs of the zodiac; it is labelled: *Zodiacus nonae sphaerae* and: *In 100 annis vno gradu promouetur*.

Inside the ninth sphere, there is another System, representing the eighth sphere, which similarly consists of three fixed perpendicular rings. Its ecliptic is graduated [12 times 0°-30°; not numbered, division 1°]; it is labelled twice: *Zodiacus octavae sphaeras* and it has the Latin names and the symbols of the signs of the zodiac, as well as numbers for the first seven signs [1-7]. This system of the eighth sphere is connected to that of the ninth by means of two brass discs, each of which has at the rim 14 circular-shaped lobes. On the inside of one of these lobed discs, there is the inscription: *In 7000 annis circumuitur*, and on the inside of the other: *In 7000 annis circumuoluitur*. On the outside of both discs, there is a circular scale [0 - 7 units; numbered every unit, division 0.1 unit]. These discs fit into cutaways on the inside of the ecliptic of the ninth sphere. Their centres are connected to the equinoctial points (first points of Aries and Libra) of the ninth sphere. In turn, the equinoctial points of the eighth sphere are connected excentrically to the discs. By rotating the discs, the line connecting the equinoctial points of the eighth sphere moves around the axis connecting the equinoctial points of the ninth sphere, thus creating a motion of trepidation, or of accession and recession of the eighth sphere.

Inside this whole system of spheres, there is yet another, movable system, consisting of four brass rings, connected to the ecliptic axis of the eighth sphere. Two of the rings of this inner System are fixed perpendicularly to each other and represent circles of latitude. These rings are

connected to a third 'ecliptic' ring, which can slide along one of the other two 'fixed' rings. Connected to the 'ecliptic' ring is a fourth movable ring, which is excentric to the 'ecliptic' ring and, supposedly, represents the orb of the Moon. Finally, a single movable ring is directly connected to the ecliptic axis.

In the centre of the armillary sphere, there is a small terrestrial globe, mounted on the ecliptic axis so that its N & S equatorial poles point in the direction of the N & S equatorial poles of the armillary sphere. The terrestrial globe shows the outlines of the continents, which are labelled. America is separate from Asia, and Spain, Hispa, is the only country labelled in EVROPA.

The primary sphere is mounted in a graduated brass meridian ring [clockwise from N: 0°-90°; 90°-0°; 90°-0°; 0°-90°; numbered every 10°, division 1°]. There is an hour circle [twice 0-12 hours; marked every hour, division 15 minutes] and a pointer. The brass stand consists of four columns in the shape of two male and two female figures on a circular base plate which has a compass set into it. These four columns sustain a horizontal ring, which supports four quarter-circles, handsomely wrought in Renaissance style which, in turn, support the horizon ring. The horizon ring is fixed to the quarter-circles by screws. The horizon ring is engraved with scales (from inside to outside): for the zodiac [12 times 0°-30°; numbered every 10°, division 1°], with the symbols and the Latin names of the signs of the zodiac; for the Julian calendar [numbered every 10 days and last days of the month, division 1 day] with the Latin names, the Roman numerals [I-XI — that for December is missing], and the total number of days, dies, of the months (December has dies 31 1/4). The zodiac starts with respect to the calendar scale 11 days after the beginning of March, that is, the first point of Aries is at 11 March 24 hours or 12 March 0 hours. The circular base plate has 16 compass points with Italian names engraved radially around the compass in the centre, the four main compass points in Latin in a circle around the radially engraved names, and 12 wind directions in Latin in a circle at the edge of the base. The compass is complete with needle; its base is engraved with the Latin names of the four main compass points: Septentrio, Oriens, Meridies and Occidens and it is graduated [clockwise from N: 0°-90°; 0°-90°; 0°-90°; 90°-0°; numbered every 10°, division 2°]. There are two engraved arrows at the bottom of the compass, one pointing to a direction 14° west of north and another, presumably a later addition, pointing to 10° west of south.

[Note: This description is based on that given in E. Dekker, *Globes at Greenwich: a catalogue of the globes and armillary spheres in the National Maritime Museum, Greenwich*, Oxford University Press, 1999.]