Brass astrolabe, Persian script to throne, limb, mater, and womb, rete, and verso, with horse, and alidade.

SAFAVID ASTROLABE

[Brass Persian astrolabe]

Author
[KHALIL, Muhammad and Abd AL-A'IMMA]

Publication date
c1707].

Publisher

Publication place
[Isfahan,

Physical description
Brass astrolabe, Persian script to throne, limb, mater, and womb, rete, and verso, with horse, and alidade.

Dimensions
Diameter: 99mm (4 inches).

Notes
The Astrolabe

The astrolabe, sometimes called the slide rule of the heavens, can trace its history back to Hellenistic times. The smart phone of its day, it could perform numerous functions: calculate the

time of day or night; determine your position; show the movement and identify of heavenly bodies; cast horoscopes; help you navigate the oceans, and survey all the land you can see.

Among numerous other advances in the sciences and mathematics, the early Islamic scholars were responsible for spectacular developments in astrolabe design, from the thirteenth to the eighteenth centuries. The Islamic astrolabe consists of several components. The main body of the instrument is called the 'mater', with a suspension hook or chain often attached to the main circular form by a decorative 'throne'. Around the outer edge of the mater is the limb, on which are inscribed the degree scale and scale of hours. The centre of the mater is hollowed-out so that it can hold additional elements; for this reason it is fittingly called the womb.

Astrolabes often had a number of circular plates that could be inserted into the womb, and stacked on top of one another. These plates were engraved with stereographic projections, which represent on a flat surface the three-dimensional celestial sphere. Each plate specific to a certain latitude, meaning that different plates are required for each new latitude to be studied. On top of the plate sits the rete, a cut-out plate with several features: the star pointers, which mark the location of particular stars; the ecliptic ring, which represents the annual path of the Sun; the Zodiac, a circle divided into 30-degree intervals and extending around the ecliptic, within which the movements of the celestial bodies occur.

Across the front of the astrolabe a centrally-fixed bar, the rule, is rotated to relate positions found on the plate or rete to the scale marked on the limb of the mater. On the back of the astrolabe, a rotating bar called the alidade has small holes or slots at each end, through which to look at, for example, a celestial body.

Dating

Although the precise date is not given, the inscription on the throne bears the name of Shāh Sulṭān Ḥusayn al- Safawī al-Mūsawī, who ruled from 1694 to 1722. Similar astrolabes by the same makers do bear dates, including one manufactured in 1707-8, which may suggest a more precise time for their collaboration.

Attribution

Among the most prominent of the Safavid astrolabists, Muhammad Khalil was active in the late-seventeenth and early-eighteenth centuries and most likely based in Isfahan. Working with a number of artists and engravers to produce these instruments, it appears that Khalil was largely responsible for the technical and scientific aspects of astrolabe manufacture and design. Across his works, his signature varies, sometimes including a patronymic identifying his father as Hasan Ali, and often describing Khalil himself as the humble servant of God.

Despite being the most prolific of the Persian astrolabe engravers, nothing is known about the life of 'Abd al-A'imma. In addition to executing the designs of Muhammad Khalil, al'A'imma created instruments independently, and in collaboration with other artists including Muhammad Tahir and Muhammad Amin. He thus appears to have been one of the leading members of the Isfahan school of astrolabists, and to have been active from around 1678 to 1722. All of his work is characterised by rich calligraphy and detailed metalwork. Indeed, the precision and artistry of the present astrolabe is the result of the collaboration between the two craftsmen, al-A'imma and Khalil.

Rarity

Astrolabes by Muhammad Khalil and 'Abd al-A'imma are rare, and instruments made by the two in collaboration even more scarce. Mayer identifies five (IX, X, XVI, XVIII, XIX) which at the time of

writing were held in Oxford and St. Petersburg. There are current two examples held by the University of Oxford, one at the Victoria and Albert Museum, and one in the Chester Beatty Collection in Dublin. The present item is therefore only the sixth known example of a Khalil and al-A'imma astrolabe.

Full description of the Astrolabe

Recto
The bronze mater has an ornately engraved throne with a dedication in Persian. The limb bears a 360-degree scale with every fifth degree labelled with alphanumeric notations. Sections of three, comprising every 15 degrees and representing one hour, are jointly decorated. Engraved in the womb is a gazetteer presenting the names, longitudes, latitudes, and qibla direction of 46 localities:

Outer ring:
Mecca, Madīna, Miṣr (Cairo), Ṣanaʿa, Laḥsa, Bayt al-Maqdīs, Dimashq, Ḥalab, Mūsul, Nakhjiwān, Marāgha, Tabrīz, Ardabīl, Sarmanrā, Kūfa, Baghdād, Baṣra, Shustar, Qāzarūn, Shirāz, Yazd, Hamadān, Qazwīn, Jerfādfān, Isfahān, Kāshān, Qum, Ṭāliqān, Astarābād, Simnān, Dāmghān.

Inner ring: Mashad, Nīshabūr, Tūn, Sabzawār, Herāt, Qā'in, Belkh, Hurmūz, Kirmān, Qandahār, Lahūr, Kashmīr, Qanja, Tiflīs, Ṣīrwān.

Verso
To the back, the mater is divided into three parts: the upper left-hand quadrant is a sine graph with 60-unit parallel and perpendicular lines, with juxtaposed dots to every fifth line; the upper right-hand quadrant is engraved with nested circles representing the signs of the Zodiac, as well as intersecting arcs, which show the solar altitude at which the sun aligns with the direction of Mecca for six localities Ṭūs, Yazd, Isfahān, Qazwīn, Baghdād, and Shīrāz. Both quadrants have 90-degree scales along their rims.

The lower half presents a a cotangent scale with a base-12 system on the right edge and a base-7 system on the left edge; there is also a circular astrological scale, the double shadow square, a table of triplicities and the signatures.

Plate, rete, alidade, and rule
All pieces of the astrolabe apart from the mater are by a later and less-skilled craftsman, made as replacements for damaged or missing parts. The rete, with floral stems serving as star pointers, is designed after Muhammad Khalil, but executed with less artistry. The divisions of the signs of the Zodiac are particularly crude and often erroneous, and the typical subdivisions of three or six degrees are omitted.

The plate bears almucantars and seasonal hours for unknown latitudes. The alidade is distinctly different in style from those found on other astrolabes by Khalil, albeit only a few millimeters too long. The rule takes the form of a horse, which has played an important role in Persian culture for millennia, and which is found on other Khalil instruments, but here is by the same secondary maker as the other replacement parts. The similarities of the rete and rule to others by Khalil indicate that the maker had some access to the original parts or to another astrolabe by the maker, on which he based his designs.

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Bibliography

Gingerich, O. et al., ‘The ‘Abd Al-A’Imma Astrolabe Forgeries’, Journal for the History of Astronomy, 3(3), 1972, pp.188-198; Mayer, L. A., Islamic astrolabists and their works, 1956; Saliba, G., ‘The Buffalo Astrolabe of Muhammad Khalil’, Al Abhath, 26(01), 1973, pp.11-18.

Provenance

Price: £550000

Inventory reference: 23117