An Arabic celestial globe
in Tartu

EMILIE SAVAGE-SMITH

An Arabic celestial globe with major stars indicated by silver points, unsigned and undated.

- Inv. number: ÜAM 793/Aj
- The height – 195 mm
- Diameter of the globe – 107 mm
- Diameter of the outside edge of the horizon ring – 130 mm
- Height of the horizon ring from the table top – 142 mm

This is an outstandingly precise and well-made medieval Islamic celestial globe. The nature of the Kufic script, the quality of the engraving, and the star positions all suggest an early date of the c. 1250–1350. It is difficult to be precise in dating it, but the positions of stars
Photo 1. Arabian Celestial globe in Tartu (photo A. Tennus)
that are on or near the ecliptic are consistent with a globe reflecting the skies during that time period. The stars nearest or on the ecliptic display a difference of 4° from those made in 1620–1680 in Lahore. Thus, depending upon the value take for the precessions of the equinoxes (66, 70, or 100 years per degree) a date c. 1250–1350 is proposed. There are no factors that made a person question that date. All features appear consistent with what we know of other products of a similar age. There are, however, very few preserved examples of such an early globe.

The star positions and method of engraving are strikingly similar to an undated globe now in the Musée du Louvre, Paris, sect. Islam. MA0825 (ex coll. Marcel Destombes), whose date has been estimated to be between 1309 and 1315 with a place of production suggested as Maragha, but the Paris globe differs from the present globe now in Tartu in that the one in Paris has a full set of constellation figures and about 930 stars.¹

Moreover, there is a striking similarity in the style of Kufic script, as well as method of engraving and star positions, with those found on a globe by Muḥammad ibn Maḥmūd ibn Ṭabārī dated 684 H (= 1285 AD) and now in the Khalili Collection (acc. no. SCI21).²

The stand and ring

The stand with horizon ring may be a later replacement. The meridian ring is not missing, and would have consisted by of 180° arc attached at the two bored holes in the horizon ring. A modern replacement axis has been placed in the celestial poles of the globe; the axis of the globe would have been adjusted for different geographical latitudes by inserting the lower extension of the axis into one of the set of holes in the semi-circular under-support. This technique for making a globe with these adjustable features is found in the products of

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Jaʿfar ibn ʿUmar ibn Dawlatshāh of Kirmān and his son Muḥammad ibn Jaʿfar who produced globes in the mid-14th century as well as on some undated globes.

The present globe is adjustable by 5°-intervals. On one side of one of the two semi-circular under-supports for the horizon ring there are Kufic alphanumeric numerals indicating 5-degree intervals, and a hole is drilled through the semi-circular under-support at each of these intervals. The axis of the globe can be adjusted for different latitudes by placing the end of the axis in one of these holes.

On two of the four curved legs there are 90°-gnomons, each indicated by an engraved 90°-arc, carefully graduated by single degrees with every fifth indicated by a longer line and labelled (beginning at the top) in Kufic alphanumeric numerals.

There are, however, problems with this stand that suggests it might be a later replacement. Stand has been re-soldered where under supports are attached to legs and possible extensively repaired or changed. While the stand and horizon ring appear roughly contemporary with the sphere, the numerals appear to have been engraved less carefully than those on the sphere, and it is quite possible that they were engraved by a different person. The numbering of the horizon ring, and the placement of the drilled holes for the (now missing) meridian ring are particularly odd. While the horizon ring has been graduated precisely in single degrees, with every fifth indicated by a longer line, and labels for the four cardinal points of the compass have been engraved near the outside edge, the two holes for the meridian ring have been drilled about 4° off of the north-south line. The graduated ring is numbered in Kufic alphanumeric numerals beginning at the point marked South in three sequences of 100° and one sequence of 60°; this is a most unusual pattern for a horizon ring, and two of the numerals (the second and third occurrences of the letter-numeral for 100, ١) were incorrectly engraved and in one instance then corrected; it is evident that this ring was engraved by a different person than the one engraving the sphere.

Moreover, the occurrence on this globe of two 90°-arcs on the legs suggests that the base was intended to incorporate two gnomons – that is, two devices above each of the graduated arcs that would enable the altitude of the sun to be determined. These gnomons,
However, are missing. Such a stand that can serve as an elevation dial is preserved on a globe made in 1225 (622 H) and now in Naples, and there are three other later examples where portions of such a stand are preserved.\footnote{See Savage-Smith, p. 72.}

The sphere itself

It is unsigned and undated.

- It is made in hemispheres; there is a clear seam along the ecliptic.
- Diameter: 107 mm
- There are ecliptic latitude-measuring circles; the ecliptic poles (where the latitude-measuring circles intersect) are encircled by two
Engraved circles. There are holes at the celestial poles through which an axis (modern) has been passed.

The names of the twelve zodiacal signs are written in elongated Kufic along the ecliptic, in counter-clockwise sequence when viewed from the North. The House of Pisces is given the less common name al-samakah rather than al-ḥūt.

The ecliptic is graduated by 30°-intervals, each divided very precisely into single degrees, with every fifth degree indicated by a longer line and each 5°-interval labelled, in Kufic alphanumeric numerals (5°, 10°, 15°, 20°, 25°, 30°).

The celestial equator is graduated very precisely by single degrees with every fifth degree indicated by a longer line and each 5°-interval labelled in Kufic alphanumeric numerals, beginning with 5° at the vernal equinox and proceeding in anti-clockwise direction (5°, 10°, 15°, 20°, 25°...), until reaching 360°.

There are no lesser circles on the sphere.

The stars and zodiacal houses are labelled in a carefully engraved Kufic script, almost always without diacritical dots. None of the great circles nor the poles, nor other features, are labelled.
Labels:
There are 53 labelled stars or star groups: 16 north of the ecliptic, 23 near or on the ecliptic, and 14 south of the ecliptic. The stars are indicated by inlaid silver studs, each surrounded by an engraved circle.

Note: some names may not have been visible in the scans and hence overlooked.

Northern stars:

min al-ʿawāʾidh (ذئاب نم) ‘one of the camel-mothers’ = one of the four stars γξβν Draconis forming the square on the head of Draco
raʾs al-ḥawwā, ‘the head of the serpent charmer’, 1 star = Ras Alhague, α Ophiuchi
[qalb al-ʿaqrab, one star at 1° House of Sagittarius = Antares, α Scorpii and also Lunar Mansion 18
nasr al-ṭāʾir, 1 star at 288° equator = Altair, α Aquilae
nasr al-wāqiq, 3 stars = usually only Vega, α Lyrae, but by some associated with three stars, α, ε, ζ Lyrae)
al-ridf, ‘the follower’, 1 star = Deneb, α Cygni
dhanab al-dulfīn ‘tail of the dolphin’, 1 star = ε Delphini
simāk al-rāmiḥ, 1 star = Arcturus, α Boötis
munīr al-fakkah, 1 star = Alphecca, α Coronae Borealis; munīr is an unusual term, but not undocumented, for it occurs on a globe made in 1144.
mankib al-faras, ‘the shoulder of the horse’, 1 star = β Pegasi
al-muʾakkhkhar, 1 star = [?] muʾakkhkhar al-sharaṭayn, which is a star in Aries (γ Arietis), or it could refer to Lunar Mansion 27, known as muʾakkhkhar, though the star on the globe is a bit too far from the ecliptic to be the lunar mansion.
baṭn al-ḥūt, ‘the belly of the fish’, 1 star = β Andromedae, Mirach raʾs al-ghūl, ‘head of the ghoul’, 1 star = Algol, β Persei
al-kaff al-jadhmāʾ, ‘the severed hand’, 1 star = the name usually applies to six stars in the constellation of Cetus; it is here misplaced, for it should be much further south
al-kaff al-khaḍīb ‘the dyed hand’, 1 star = a single star in Cassiopeia (β Cassiopeiae).
al-ʿayyūq, 1 star = Capella, α Aurigae
al-aʿzal, 1 star, at 15° House of Libra = simāk al-aʿzal, Spica (α Virginis)

Stars near ecliptic:
- min al-sharaṭayn, 2 stars = Lunar Mansion 1, placed c. 25° House of Aries
- surr al-buṭayn [no star] = Lunar Mansion 2 (unusual term)
- dabarān = Lunar Mansion 4
- [al-haq]ʿah = Lunar mansion 5
- al-hanʿah, 2 stars = Lunar Mansion 6
- al-dhirāʾ, 2 stars = Lunar Mansion 7
- al-nathrah, 1 star = Lunar Mansion 8
- al-ṭarf, 2 stars = Lunar Mansion 9
- al-jabhah, 2 stars = Lunar Mansion 10
- al-ʿawwāʾ, 3 (?) stars at crossing of vernal equinox = Lunar Mansion 13
- al-aʿzal, 1 star at 15° House of Libra, near vernal equinox = simāk al-aʿzal, Spica, α Virgo = Lunar Mansion 14
- al-ghafir, 3 stars = Lunar Mansion 15
- zubānā, 2 (?) stars = Lunar Mansion 16
- al-iklīl, 3 stars in Scorpio = Lunar Mansion 17
- qalb al-ʿaqrab, 1 star at 1° House of Sagittarius = Antares, α Scorpii and also Lunar Mansion 18
- shawlah, 2 stars, placed above al-qaws, south of title for House of Sagitarrius = Lunar Mansion 19
- naʿāʾim, 1 star = Lunar Mansion 20
- baldah (no stars) = Lunar Mansion 21
- saʿd al-dhābiḥ, 3 stars = Lunar Mansion 22
- saʿd bulaʾ, 2 stars = Lunar Mansion 23
- saʿd al-suʿūd, 2 stars = Lunar Mansion 24
- akhbiyah, 3 stars, though usually said to be 4 = Lunar Mansion 25
- al-muqaddam, 1 star near vernal equinox = Lunar Mansion 26

Southern stars:
- suhayl, 1 star, near south ecliptic pole = Canopus, α Carinae
- akhir al-nahr ‘the end of the river’, 1 star = θ Eridani
min al-nahr (ربنلا نيم) ‘one of [the stars of] the river’, 1 star = unidentified star in Eridanus
rijl al-jawzāʾ, 1 star, = Rigel, β Orionis.
al-yamānīyah, 1 star = [?] al-shiʿrá al-yamānīyah, ‘the southern Sirius’, i.e. Sirius (α Canis Majoris)
‘āyn ... [under horizon ring in photo, not readable] at 133º ecliptic
– unidentified
yad al-jawzāʾ, ‘the arm of the giant’, 1 star = Betelgeuse, α Orionis
al-shāmīyah (هييماسلا), 1 star between ecliptic and equator = [?]
al-shiʿrá al-shāmīyah, ‘the northern Sirius’, i.e. Procyon (α Canis Minoris)
‘urqūb al-rāmī , ‘the archer’s tendon’, 1 star = β Sagittarii
min al-ḥūt (حوللا نيم) ‘one of [the stars of] the fish’, 1 star = [?]
dhanab al-ḥūt, ‘the tail of the fish’, κ Piscis Austrini
al-zalīm ‘the male ostrich’, 1 star = α Piscis Austrini
min al-qinṭūrus (سروطنقلا نيم) ‘one of [the stars of] the centaur’, 1 star = unidentified star in Centaurus
rijl-i qinṭūrus, 1 star = Rigil Kent, α Centauri
al-shujāʿ  ... = unidentified star in Hydra [name partially obscured]

Near the south pole there is an illegible inscription, in less distinct (possibly damaged or obliterated) engraving, which appears to read something like:
ناوبالا ... ادودملا

Emilie Savage-Smith, FBA, Professor of the History of Islamic Science, The Oriental Institute, University of Oxford, Senior Research Consultant