MUUSEUMIKOGUD

An Arabic celestial globe in Tartu

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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

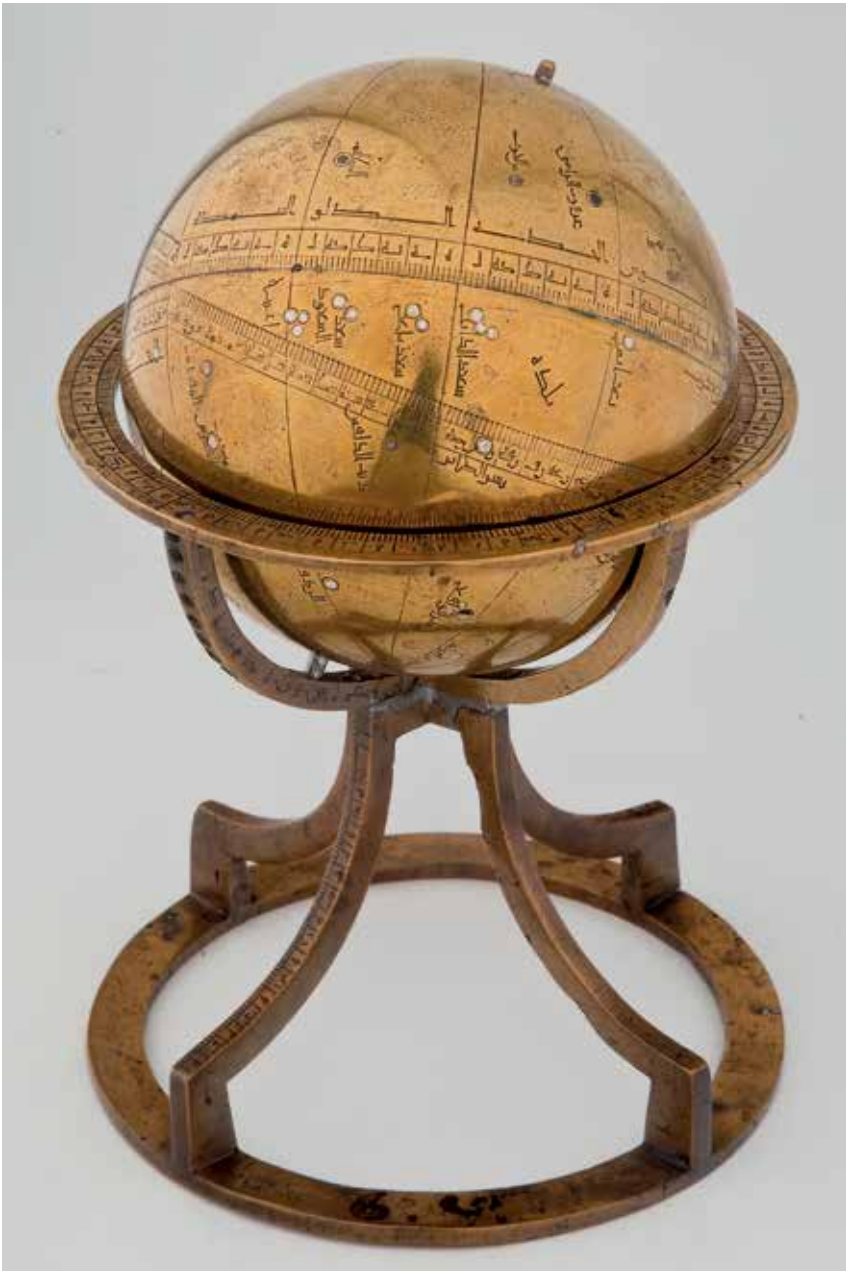

Photo 1. Arabian Celestial globe in Tartu (photo A. Tennus)

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 4º 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 ʿAli al-Ṭabarī 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 180º 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

[1] For the one now in Paris, see E. Savage-Smith, *Islamic Celestial Globes*: *Their History, Construction, and Use* (Washington, D.C.: Smithsonian Institution, 1985), pp. 236–237, no. 35.

[2] See Emilie Savage-Smith and Francis Maddison, *Science, Tools & Magic. Part One: Body and Spirit, Mapping the Universe* [The Nasser D. Khalili Collection of Islamic Art, vol. 12] (London/Oxford, 1997), pp. 212-213.

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 5º-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 90º-gnomons, each indicated by an engraved 90º-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 4º 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 100º and one sequence of 60º; 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, ق) 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 90º-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,

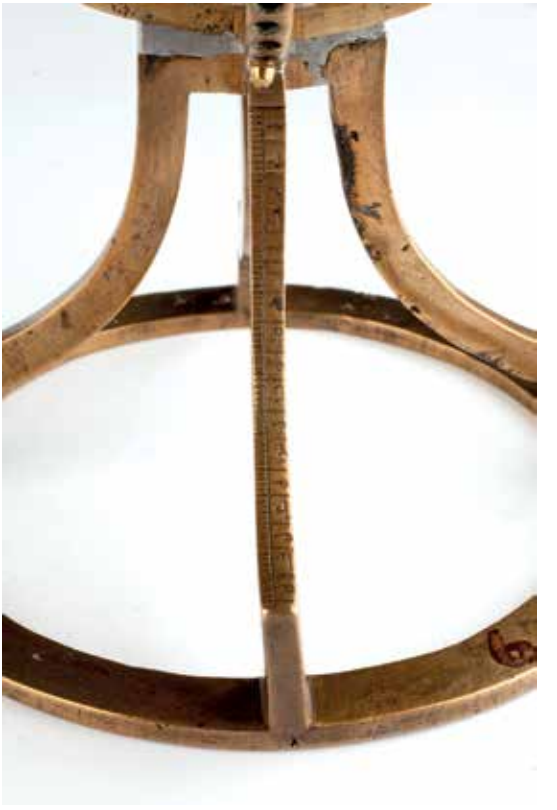

Photo 2. The stand (photo A. Tennus)

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.[3]

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

[3] See Savage-Smith, p. 72.

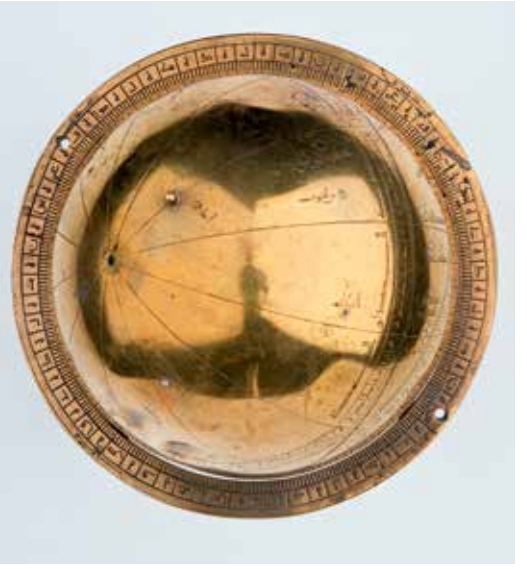

Photo 3. The ring (photo A. Tennus)

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

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

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 (من العواذي) '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 1º House of Sagittarius = Antares, α Scorpii and also Lunar Mansion 18

nasr al-ṭāʾir, 1 star at 288º equator = Altair, α Aquilae

nasr al-wāqiʿ , 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-muʾakhkhar, 1 star = [?] muʾakhkhar al-sharaṭayn, which is a star in Aries (γ Arietis), or it could refer to Lunar Mansion 27, known as muʾakhkhar, 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 15º House of Libra = simāk al-aʿzal, Spica (α Virginis)

Stars near ecliptic:

min al-sharaṭayn, 2 stars = Lunar Mansion 1, placed c. 25º 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-dhirāʿ, 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 15º House of Libra, near vernal equinox = simāk al-aʿzal, Spica, α Virgo = Lunar Mansion 14

al-ghafr, 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 1º 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 bulaʿ , 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 (من النهر) 'one of [the stars of] the river', 1 star = unidentified star in Eridanus
rijl al-jawzāʾ , 1 star, = Rigel, ß Orionis.
al-yamānīyah, 1 star = [?] al-shiʿrá al-yamānīyah, 'the southern Sirius', i.e. Sirius (α Canis Majoris)
ʿayn … [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 (الشاميه),1 star between ecliptic and equator = [?] al-shiʿrá al-shāmīyah, 'the northern Sirius', i.e. Procyon (α Canis Minoris)
ʿurqūb al-rāmī , 'the archer's tendon', 1 star = ß Sagittarii
min al-ḥūt (من الحوت) 'one of [the stars] of the fish', 1 star = [?] dhanab al-ḥūt, 'the tail of the fish', κ Piscis Austrini
al-ẓalīm 'the male ostrich', 1 star = α Piscis Austrini
min al-qinṭūrus (من القنطورس) '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:

الدودان ... الاوبان

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Araabia taevagloobus Tartus

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Tähtede asendi järgi võib Tartu Ülikooli ajaloo muuseumi valduses oleva gloobuse dateerida ajavahemikku 1250–1350. Nii varajasi islami taevagloobusi on maailmas väga vähe säilinud. Gloobuse jalg, mille töötlus on robustsem, on hilisem lisandus. Aegade jooksul on kaduma läinud gnoomonid, mis aitasid gloobuse abil määrata taevakehade asukohti. Sarnane gloobus on Louvre'is ja on arvatavasti valmistatud Maraghas (tänapäeval Põhja-Iraan) 1309–1315. Kasutatud kufa kirjastiil ja graveerimisviis sarnaneb Londonis erakollektsioonis oleva gloobuse omaga, mille valmistas 1285 Muhammad ibn Mahmud ibn Albi al-Tabari. Tähed on välja toodud hõbedaste märkidega ja nimeliselt on tähistatud 53 tähte või tähegruppi, sealhulgas 23 ekliptika lähedal, 16 põhja ja 14 lõuna pool. Gloobusel on näiteks järgmised tähed: Antaares, Altair, Deeneb, Arktuurus, Algol, Kapella, Riigel, Betelgeuse jt. Ekliptika on jaotatud 30-kraadisteks osadeks, need aga omakorda väga täpselt kraadideks (12 x 30 = 360). Taevaekvaator on samuti väga täpselt kraadideks jaotatud, kusjuures kufa kirjas on tähistatud iga viies kraad.