

This Way Up: Cosmological orientation in medieval Islamic cartography

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This paper presents a new theory regarding the ostensibly 'southward' orientation of medieval Islamic worldmaps. This feature, which persists across the majority of such maps from at least the so-called 'Balkhi School' (9th C. onwards) through to al-Idrisi's *Book of Roger* (12th C., fig. 1), has received a variety of explanations. They include the relative orientation of Mecca from Islamic territories; a hypothesized south-oriented archetype; or supposed psychological benefits, but all are wholly conjectural. Yet the dependency of Islamic mathematical cartography on a Ptolemaic model – a cartographic lineage which is evident in common features such as the sources of the Nile and testified to in contemporary sources – complicates matters further, because Ptolemy explicitly orients his maps northwards. Consequently, any plausible account must explain the need for a wholesale change in orientation, while maintaining the overall form of the inhabited earth.

Several additional observations may be significant. The first is that Islamic maps do not make use of any of Ptolemy's three global projections, let alone 'reverse' or 'flip' them from north to south. Second, the only element of Ptolemy's maps that remains axiomatic across all Islamic mathematical cartography is that the *oikoumene* [inhabited region] is constrained within exactly one hemisphere (180°) of the earth's sphere. Unlike Ptolemy, however, the reverse side of the earth is comprised solely of Ocean. Third, Ptolemy's maps are intended as simplified views of an image to be depicted on a terrestrial globe. Yet it is clear that while a 'north-oriented' planar map can easily be rotated to place south at the top, a 'south-oriented' globe is impractical because the area of interest is obscured by the bulge of the equator. In short, vertically-oriented globes force a north-orientation for an observer interested in the northern hemisphere. This is not the whole story however, because a tilting of the globe's axis, from vertical to horizontal, has the opposite effect: the northern hemisphere is best observed with south facing *away* from the viewer (fig.2). Rather than 'south-up', it is a 'south-away' perspective that Islamic maps appear to depict, as can be seen by comparison with a virtual globe, suitably oriented (fig.3).

While the visual comparison is striking, further evidence for this shift can be found through a careful comparison of the axial metaphors used in Greek and Islamic cosmology. Cosmologers in both traditions make clear that the conventional notion of 'up' is purely relative to the observer's place on the surface of the earth and cannot be applied to the cosmos itself. An important element of both world-views however, is that not only is the universe geo-centric (i.e. with the Earth at its centre), but that the Earth is stationary and the polar axis created by the rotation of the 'fixed stars' around it. This cosmic axis provides a natural directionality of sorts but the imagery used to describe it differs strikingly between the Greek and Islamic sources. From the perspective of a hypothetical observer, Greek metaphors for this axis seem almost universally vertical in nature, examples being a vortex of water swirling in a bowl (Empedocles), a column of light or a whirling spindle (Plato), a plant stem (Aristotle), or a human head (Ptolemy). Conversely, Islamic sources use horizontal metaphors such as an axle or lathe (al-Masudi, Al-Muqaddasi), or compare the terrestrial and oceanic hemispheres – which are divided by the polar axis – to an egg floating in a cup of water (al-Idrisi). It is this conceptual shift in axial orientation which may

thus have forced Islamic cartographers to change the orientation of earlier maps, even while retaining much of their content.

But even if evidence for this change can be observed in visual and literary sources, what explains the change in axial orientation itself? One possibility is the need to incorporate a second *spiritual* axis within the Islamic cosmological worldview. As with several other religions, Islam asserts that God's presence (or more technically, His Throne) has a specific spatial relationship to humankind – i.e. they are above it – and posits the existence of a number of other spiritual planes (heavens and hells) above and below the earth respectively. Conversely, the polytheistic nature of ancient Greek religion required no such consideration. Any literal interpretation of this doctrine – a necessity among medieval Islamic scholars – therefore requires that the axis by which 'above' and 'below' are understood must either coincide with the polar axis (i.e. with God above the north or south pole), or in some other orientation. Given the terrestrial/oceanic hemispheric divide, a more natural arrangement may have been an axis orthogonal to the poles, running through the equator at a point equidistant from both ends of the *oikoumene*, with land above and waters below.

In summary, medieval Islamic maps and geographic texts support the notion of a cosmological worldview in which a terrestrial hemisphere of the globe sits atop an oceanic hemisphere. This in turn explains why the orientation of Islamic maps requires south to be placed *away* from the viewer. It also implies a considerably more complex and three-dimensional depiction of the cosmos than is generally acknowledged, combining both a celestial and a spiritual dimension. Whether such maps and texts were based on now-vanished physical models is impossible to determine, although al-Biruni's reference to a 'hemisphere' that he had constructed, and a globe brought by the Persian Jamal ad-Din to China in 1276 strongly suggest the possibility. It is unclear when such a worldview became supplanted by the north-up model of today, but it was clearly incompatible with Copernican heliocentrism. Perhaps a final vestige can be seen in the globe depicted at the observatory of Taqi ad-Din in Constantinople (1577-1580), whose horizontal east-west axis allows it to be rotated between both vertical and horizontal perspectives (fig.4).



Fig. 1 : Circular world map, al-Idrisi, *Book of Roger*

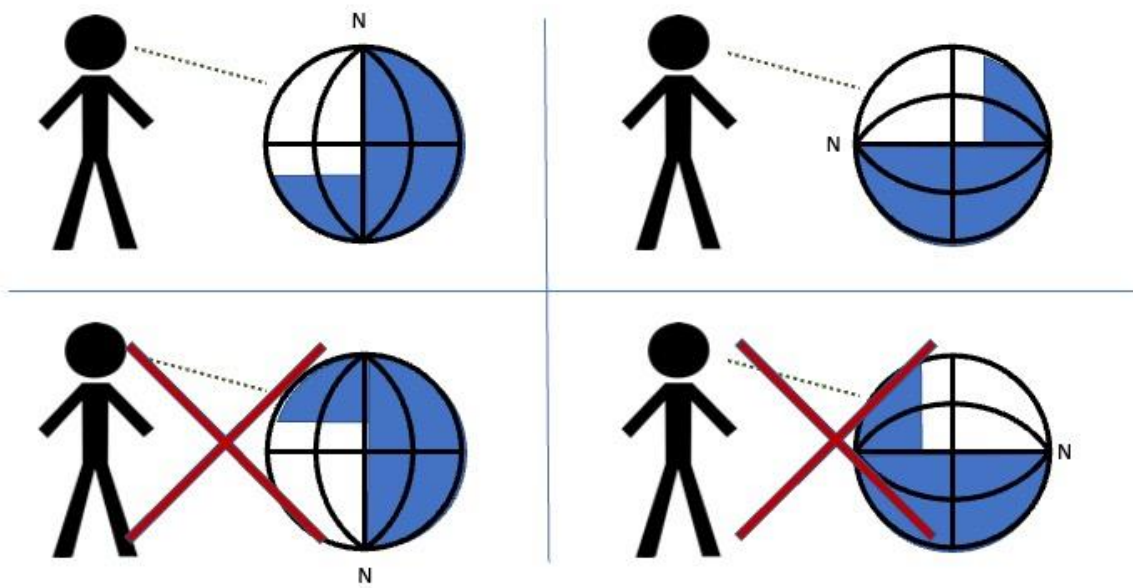


Fig. 2. View of oikoumene with differing orientations of globe

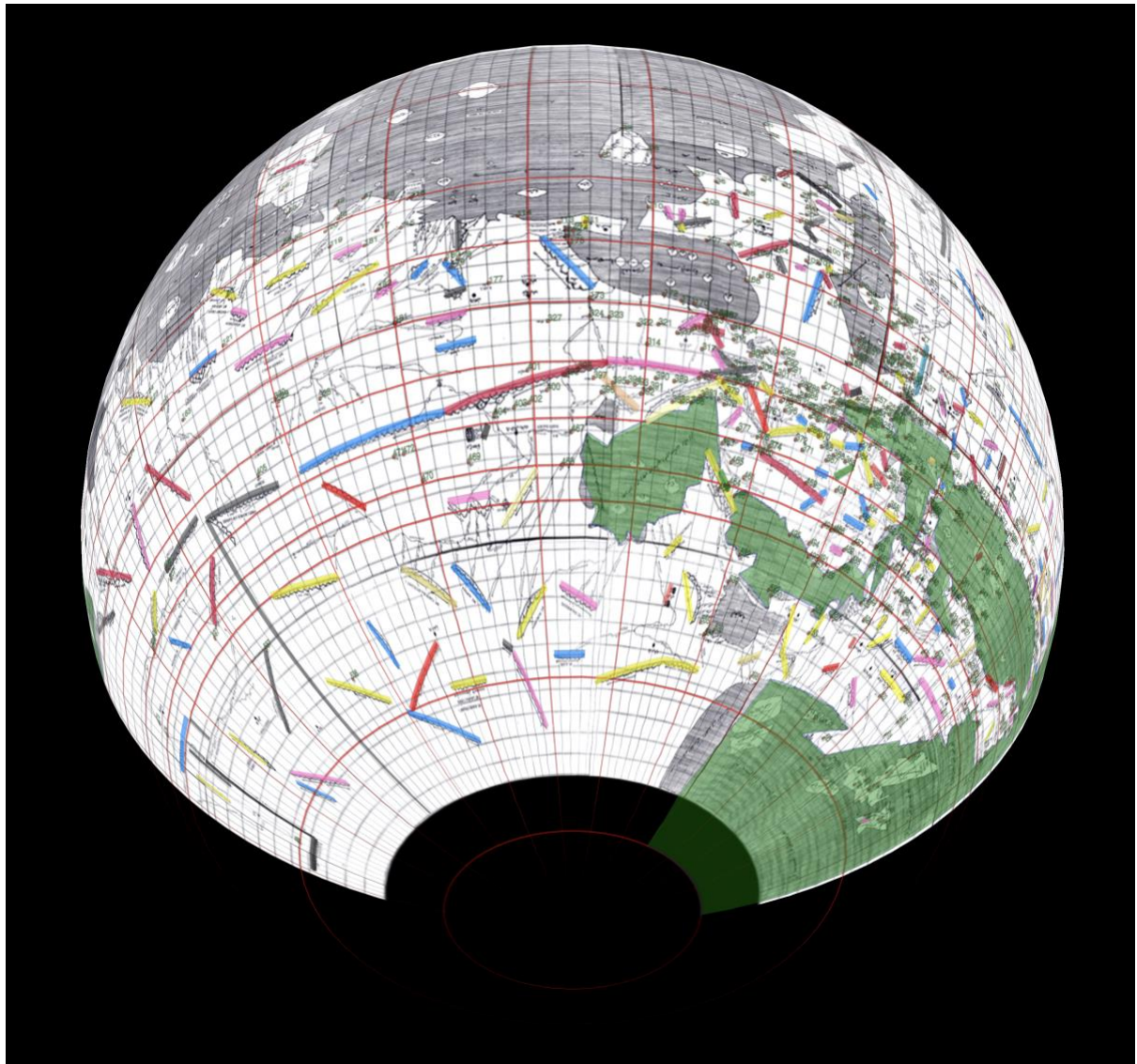


Fig.3 Mathematical geography of al-Khwarazmi plotted on virtual globe



Fig.4 detail of globe from drawing of Taqi ad-Din's observatory, Constantinople