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Marrākushī: Sharaf al-Dīn Abū ‘Alī al-Ḥasan ibn ‘Alī ibn ‘Umar al-Marrākushī

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Flourished (Egypt), second half of the 13th century

Marrākushī was one of the major astronomers in 13th-century Egypt. As his name indicates, he was originally from Maghrib, but his major astronomical activities took place in Cairo during the second half of the 13th century. It is not too surprising, given the turmoil affecting al-Andalus and Maghrib at that time, that a scholar from the westernmost part of the Islamic world would decide to emigrate to Egypt, whose capital Cairo was already established as the major cultural center of the Arab-Islamic world. Unfortunately, Marrākushī does not figure in any biographical sources, so we must rely on the scanty evidence provided by his own work in order to shed some light on his life.

Marrākushī is best known for his remarkable *summa* devoted to spherical astronomy and astronomical instrumentation, entitled *Jāmi‘ al-mabādi’ wa-l-ghāyāt fī ‘ilm al-mīqāt* (Collection of the principles and objectives in the science of timekeeping), which is intended as a comprehensive encyclopedia of practical astronomy. This work is the single most important source for the history of astronomical instrumentation in Islam. It was the standard reference work for Mamluk Egyptian and Syrian, Rasūlid Yemeni, and Ottoman Turkish specialists of the subject.

This voluminous work (most complete copies cover 250 to 350 folios of text, diagrams, and tables) has occasionally been qualified as a mere compilation of older sources without original contents. While it is true that this synthetic work heavily depends upon the works of predecessors, it is definitively original and without any precedent. In fact, no single part of the work can be proven to reproduce the words of an earlier author, except for the few sections where Marrākushī clearly states from whom he is quoting. In those occasional cases where an earlier source is mentioned, Marrākushī's text always turns out to be either a major rewriting of the original or an independent paraphrase.

The *Jāmi‘ al-mabādi’ wa-l-ghāyāt* is well written and logically organized, and employs a relatively literate style that is unusual for a work on technical topics. The author is clearly a very competent astronomer and also occasionally displays his knowledge of ancillary disciplines such as philosophy.

The *Jāmi‘* is made up of four books on the following topics:

- (1) On calculations, in 67 chapters. This book gives exhaustive calculatory methods (without

proofs) concerning chronology, trigonometry, geography, spherical astronomy, prayer times, the solar motion, the fixed stars, gnomonics, *etc.*

- (2) On the construction of instruments, in seven parts. The first part concerns graphical methods in spherical astronomy and gnomonics. The second through the seventh parts then treat the construction of portable dials, fixed sundials, trigonometric and horary quadrants, spherical instruments, instruments based upon projection, and observational and planetary instruments.
- (3) On the use of selected instruments, in 14 chapters.
- (4) The work ends with a “quiz” - *i.e.*, a series of questions and answers - in four chapters, whose aim is to train the mental abilities of the students.

An interesting confirmation of Marrākushī's Maghribi origin is provided by his geographical table: 44 of the 135 localities featured in the list of latitudes are written in red ink to indicate that the author visited these places personally and determined their geographical latitude *in situ* through observation. These 44 locations begin along the Atlantic coast of today's western Sahara, include numerous cities and villages in the Maghrib, two cities in al-Andalus (Seville and Cádiz), and continue along the Mediterranean coast *via* Algiers, Tunis, and Tripoli to end up in Alexandria, Cairo, Minya, and Tinnis. Marrākushī's western Islamic heritage is also apparent in the fact that his chapters on precession and solar theory depend upon the works of Zarqālī and Ibn al-Kammād.

Marrākushī appears to have written his major work in Cairo during the years 1276-1282. First, a solar table is given for the year 992 of the Coptic calendar (Diocletian era), corresponding to the years 1275/1276. Also, some examples of chronological calculations are given for the year 1281/1282, and his star table in equatorial coordinates is calculated for the end of the same year.

The arrival of Marrākushī in Cairo coincided with the establishment of the first offices of *muwaqqits* (timekeepers) in Egyptian mosques. His work can thus be seen as fulfilling a specific demand of Mamlūk Egyptian society (more specifically, the mosque administration, the muezzins and *muwaqqits*, instrument-makers, interested students, *etc.*). But the lack of any reference to the profession of the *muwaqqit* or to the milieu of the mosque would seem to indicate that Marrākushī was an independent scholar without institutional affiliation. The motive he gives for writing his *magnum opus* is the inadequate education of instrument-makers and their methodological failures. His introduction suggests that his target audience was instrument-makers, *i.e.* artisans and practitioners of applied science, who were not professional astronomers. However, this is somewhat contradicted by the technical level of the book, which certainly assumes the reader to know at least the basics of arithmetic, geometry, spherics, algebra, and trigonometry. Thus the *Jāmi' al-mabādi' wa-'l-ghāyāt* seems more likely to be a comprehensive reference work of intermediate to advanced level intended for active and apprentice *muwaqqits*, and for specialists of timekeeping and instrumentation who were associated with them.

Marrākushī must have died, most probably in Cairo, between the years 1281/1282 and *circa* 1320, since two early 14th-century sources refer to him as being deceased (an anonymous treatise on timekeeping entitled *Kanz al-yawāqīt*, datable to 723 H/1323 and preserved in MS Leiden Or. 468, f. 91r, and a treatise on instrumentation by Najm al-Dīn al-Miṣrī composed in Cairo *circa* 1330).

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