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(*b*. Cordoba[?], Spain, *ca*. 989/990; *d*.after1079)

mathematics, astronomy.

"Jayyānī'means from Jaān, the capital of the Andalusian province of the same name. The Latin from of his name is variously rendered in the manuscripts as Abenmoat, Abumadh, Abhomadh, or Abumaad, corresponding to either Ibn Muʻādh or Abu . . . Muʻādh.

Very little is known about al-Jayyānī. ibn Bashkuwal (d. 1183) mentions a Koranic scholar of the same name who had some knowledge of Arabic Philology, inheritance laws (*fard*), and arithmetic. Since in his treatise *Maqāla fi sharh al nisba (On Ratio)* al-Jayāni is called *qādī* (judge) as well as *faqīh* (jurist), he is thought to be identical with this scholar, who was born in Cordoba in 989/990 and lived in Cairo from the beginning of 1012 until the end of 1017. The date of al-Jayānī' death must be later than 1079, for he wrote a treatise (ldquo;On the Total Solar Eclipse") on an eclipse which occurred in Jaēn on 1 July 1079. This means that he took the real astronomical and not the average date according to the ordinary Islamic lunar calendar (3 July 1079). In *Tabulae Jahen* he explains that the difference between these two dates may amount to as much as two days.

"On the Solar Eclipse" was translated into Hebrew by Samuel ben Jehuda (fl. ca. 1335), as was a treatise entitled "On the Dawn."A Latin translation of the latter work, *Liber de crepusculis*, was made by Gerard of Cremona. The Arabic texts of these two works are not known to be extant.

The *Liber de crepusculis*, a work dealing with the phenomena of morning and evening twilights, was for a long time attributed Ibn al-Haytham, probably because in some manuscripts it comes immediately after his *Perspectiva* or *De aspectibus*, sometimes without any mention of the name of the author of the second work. In it al -Jayyānī gives an estimation of the angle of depression of the sun at the beginning of the morning twilight and at the end of the evening twilight, obtaining the reasonably accurate value of 18deg. On the basis of this and other data he attempts to calculate the height of the atmospheric moisture responsible for the phenomena of twilights. The work found a wide interest in the Latin Middle Ages and in the Renaissance.

Liber tabularum Iahen cum regulis suis, the Latin version of the *Tabulae Jahen,* was also translated from the Arabic by Gerard of Cremona. A printed edition of the Regulae, lacking the tables, appeared in 1549 at Nuremberg as *Saraceni cuiusdam de* Eris. These tables were based on the tables of al-Khwārizmī, which were converted to the longitude of Jaēn for the epoch of midnight, 16 July 622 (the date of the *hijra),* completed and simplified. For the daily needs of the qā dīa practical handbook without much theory was sufficient. The *Tabulae Jahen* contains clear instructions for determining such things as the direction of the meridian, the time of day, especially the time and direction of prayer, the calendar, the visibility of the new moon, the prediction of eclipses, and the setting up of horoscopes. Finally al-Jayyānīdeals critically with previous astrological theories. He rejects the theories of al-Khwārizmi and Ptolemy on the division of the houses and the theory of Abū Maʿshar on ray emission (áktivoB;emisso radiorum); his astrological chronology refers to Hindu sources

In the Libros *del saber* (II, 59, 309), al-Jayyānī is quoted as considering the twelve astrological houses to be of equal length. Other astronomical works by al-Jayyānī are the *Tabula residuum ascensionum ad revolutiones annorum solarium secundum Muhad Arcadius,* preserved in Latin translation (possibly a fragment of the Tabulae Jahen), and Matrah shuʻāʻāʻāal-Kawʻākib ("Projection of the Rays the Stars")

Several mathematical works by al-Jayyānī are extant in Arabic. His treatise *Kitāb majhūalāt qisiyy al-kura* ("Determination of the Magnitudes of the Arcs on the Surface of a Sphere"), which is also cited in *Saraceni cuiusdam de Eris*, is a work on spherical trigonometry.

Ibn Rushd mentions the Andalusian mathematician Ibn Muʻdh as one of those who consider the angle to be a fourth magnitude along with body, surface, and line (*Tafsir* II, 665). Although he finds the ar-gument not very convincing, he regards Ibn muʻdh as a progressive and high-ranking mathematician. This Ibn Muʻdh is presumably al-Jayyāin, especially since in on Ratio an even more elaborate point of view is found. Here al-Jayyāni defines five magnitudes to be used in geometry: number, line, surface, angle, and solid. The un-Greek view of considering number an element of geometry is needed here because al-Jayyāni bases his definition of ratio on magnitudes.

The treatise *On Ratio* is a defense of Euclid. Al-Jayyāni, a fervent admirer of Euclid, says in his preface that it is intended "to explain what may not be clear in the fifth book of Euclid's writing to such as are not satisfied with it." The criticism of Euclid, to which al-Jayyāni objected, was a general dissatis- faction among Arabic mathematicians with Euclid V, definition 5. The cool, abstract form in which the Euclidean doctrine of proportions was presented did not appeal to the Arabic mind, since little or nothing could be deduced regarding the way in which it had come into being. So from the ninth century on, the Arabs tried either to obtain equivalent results more in accord with their own views, or to find a relation between their views and the unsatisfying theory. Those who chose the second way, such as Ibn al-Haytham, al-Khayyāmi, and al-Tū, tried to explain the Greek technique of equimultiples in terms of more basic, better-known concepts and methods.

The most successful among them was al-Jayyānī.To establish a common base he assumes that a right-thinking person has a primitive conception of ratio and proportionality. From this he derives a number of truths characteristic of proportional magnitudes, without proofs, since "There is no method to make clear what is already clear in itself". He then makes the connection by converting Euclid's multiples into parts, so that magnitudes truly proportional according to his own view also satisfy Euclid's criterion. The converse is proved by an indirect proof much resembling the one of Ibn aL-Haytham, being based on the existence of a fourth proportional and the unlimited divisibility of magnitudes. In the third part analjayyāni deals with unequal ratios.

Al-Jayyāni shows here an understanding comparable with that of Isaac Barrow, who is customarily regarded as the first to have really understood Euclid's Book V.

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