Jābir Ibn Aflah Al-Ishb | Encyclopedia.com

(*fl*. Seville, first half of the twelfth century)

astronomy, mathematics.

Usually known in the West by the Latinized name Geber, Jābir has often been confused with the al-chemist Jābir ibn Hayyān and occasionally with the astronomer Muhammad ibn Jābir al-Battānī. He should also be distinguished from Abū Aflah ha-Saraqosṭī, the author of the *mystical Book of the palm*, and from the Baghdad poet Abu'l Qāsim 'Ali ibn Aflah's life. He can be roughly dated by Maimonides' citation in his *Guide of the Perplexed*: "... Ibn Alfah of Seville, whose son I have met ...."[1] That he came from Seville is deduced from the name "al- Ishbīlī" in manuscripts of his works and in the above quotation from Maimonides.

Jābir's most important work was a reworking of Ptolemy's *Almagest* in nine books. Its title in one Arabic manuscript (Berlin 5653) is *Iṣlāh al-Majisṭī* ("Correction of the *Almagest*"), but it had no fixed title in the West—Albertus Magnus calls it *Flores*, presumably short for *Flores Almagesti*, in his *Specu-lum astronomiae*.[2] According to the contemporary historian Ibn al-Qifṭī,[3] the text was revised by Maimonides and his pupil Joseph ibn 'Aqnīn. This revision seems to have been done about 1185, and so it was almost certainly from the unrevised text that Gerand of Cremona made his Latin translation. The *Iṣlāh* was translated from Arabic into Hebrew by Moses ibn Tibbon in 1274 and again by his nephew Jacob ben Māḥir; the latter translation was revised by Samuel ben Judah of Marseilles in 1335.

Jābir describes the principal differences between the *Iṣlāh* and the Almagest in the prologue: Menelaus' theorem is everywhere replaced by theorems on right spherical triangles, so that a pro-portion of four quantities is substituted for one of six; further, Ja-ir does not present his theorems in the form of numerical examples, as Ptolemy did. So far the changes seem to be the same as those made by Abu'l Wafā, but Jābir's spherical trigonometry is less elaborate. It occupies theorems 12-15 of book I and follows a theorem giving criteria for the sides of a spherical triangle to be grater or less than a quadrant (so that the sides may be known from their sines). In modern notation it may be summarized as follows:

Theorem 12. If all the lines in the figure are arcs of great circles, then

Sin AG :Sin GE =Sin AD :Sin DZ
= Sin AN :Sin NP.

Theorem 13. In any spherical triangle *ABG*, Sin *BG*:Sin Â = Sin *GA*: B = Sin *AB*:Sin Ĝ.

Theorem 14. In spherical triangle *ABG*, B is right, then Sin Â:Sin B = Cos Č: Cos *AB*.

Theorem 15. In spherical triangle *ABG*, B is right, then Cos *AG*:Cos *BG* = Cos *AB*:Sin (quadrant).

Theorems 13 and 15 are the most frequently used. Because of the differences in treatment it is unrea-sonable to suppose that Jābir copied directly from Abu'l Wafā, whose writings have survived. They may both have derived their fundamental theorems from Thābit ibn Qurra's tract on Menelaus' theorem, or all three may depend upon some source that in turn depends upon the third book of Menelaus' *Spherics*. As a trigonometer Jābir is important only because he was translated into latin, Whereas works such as Abu'l Wafā's—which carried an equivalent, or a better, trigonometry—were not.

Jābir criticized Ptolemy—sometimes very vio-lently —on a number of astronomical matters. Ptolemy's "errors" are listed in the prologue of the *Iṣlāh*. The most substantial, and most famous, devia-tion from the *Almagest* concerns Venus and Mercury. Ptolemy placed them beneath the sun, claiming that they were never actually on the line joining the eye of the observer and the sun. Jābir contradicted this justification, putting Venus and Mercury above the sun. The *Iṣlāh* is the work of a theorist. The demon-strations are free of all numbers and there are no tables. Jābir does, however, describe a torquetum-like instrument, which he says replaces all the instruments of the *Almagest*.

Although Jābir was quoted in the twelfth century by al-Bitrūjī and by the author of the compendium of the Almagest ascribed to Ibn Rushd, and although the *Iṣlāh* was epitomized by Qutb al-Dīn al-Shīrāzī in the thirteenth century, Jābir was better known in the West through Gerard of Cremona's translation. His name was used as that of an authority who criticized Ptolemy. But more serious was his influence on West-ern trigonometry. For instance, Richard or Walling-ford cited him several times in the *Albion* and in the *De sectore* (a variant of the *Quadripartitum*); Simon Bredon took a great deal from Jābir

in his commen/tary on the *Almagest*; and part of a commentary on the *Iṣlāh* i which Jā's theorms are made more general is extant. But his most important influence was upon Regiomontanus' *De triangulis*, written in the early 1460's and printed in 1533, which systema/tized trigonometry for the Latin West. the core of the fourth book of this treatise is taken from J¯bir without acknowledgement; the plagiarism was the subject of several pungent remarks by Cardano. Jābir was still quoted in the sixteenth and seventeenth centuries—for instance, by Sir Henry Savile and Pedro Nuñez. Copernicus'spherical trigonometry is of the same general type, but we have no reason to believe it was taken straight from the *Iṣlāh*. He called Jābir "egregious calumniator of Ptolemy."

NOTES

1. Pt. II, ch.9. see The Guide of the Perplexed, Schlomo Pines, trans, (Chicago, 1963), p.268.

2. See Erfurt, Wissenschaftliche Bibliothek, MS Q223, fols. 106r-106v, and other MSS. The 1891 ed. is somewhat corrupt at this point.

3. Ta'rikh al-hukamā', J. Lippert, ed. (Leipzig, 1903), pp. 319, 392-393. The text is the abridgment by Muhammad ibn 'Ali al-Zawzāni (1249); the original is lost.

BIBLIOGRAPHY

I. Original Works. *Iṣlāh al-Majisti* is in the following Arabic MSS: Berlin 5653; Escorial 910 and 930; Paris, B.N. héb. 1102 (fragment of bk. V in Arabic but in Hebrew scripts). Hebrew MSS are Moses ibn Tibbon, trans., Bodleian Opp. Add. fol. 17 (Neubauer 2011); and Jacob ben M¯hir, trans., rev. by Samuel ben Judah, Pairs B.N. héb. 1014, 1024, 1025, 1036. At the end of the text Samuel describes the circumstances of the translation. This passage is transcribed by Renan with a French paraphrase in "Les écrivains juifs francais," in Histoire littéraire, **31** (Paris, 1893), 560-563.

There are some 20 Latin MSS plus five fragments; the text was published by Peter Apian (Nuremberg, 1534) together with his *Instrumentum primi mobilis*. There is a description of a different but similar instrument in the Latin version, but the original diagrams remain. Jacob ben Māhir describes both instruments

The commentary on Thābit ibn Qurra's tract on Menelaus' theorem and the commentary on Menelaus'spherics (fragment) occur together and are extant only in Hebrew. MSS are Bodleian Hunt. 96(Neubauer 2008), fols. 40v-42v, and Bodleian Heb. d.4(Neubauer 2773), fols. 165r-177v. Berlin Q 747 (Steinschneider catalog no. 204) contains part of this text.

The anonymous Latin commentary on the Islāh is in Paris, B.N. Lat. 7406, fols. 114ra-135rb.

The six-book *Parvum Almagestum*, which exists only in Latin, is almost certainly not by Jābir, as has sometimes been held—see Lorch (below), ch. 3. Pt. 1.

II. Secondary Literature. See H. Bürger and K. Kohl, "Zur Geschichte des Transversalensatzes des Ersatz/theorems, der Regel der vier Grössen und des Trangenten/satzes," in *Abhandlungen zur Geschichte der Naturwisse/schaften und der Medizin*, **7** (1924), a substantial article following Axel Björnbo's ed. of Thābit ibn Qurra's tract on Menelaus' theorem; J. B. J. Delambre, Histoire de l'astronomie du moyen âge (Paris, 1819; repr. 1965), esp. pp. 179-185—Delambre is very hostile to Jābir; and R. P. lorch, "Jābir ibn Aflah and His Influence in the West" (Manchester, 1970), a Ph.D. thesis concerned mainly with spherical trigonometry.

For further references, see G. Sarton, *Introduction to the History of Science*, II (Washington, D.C., 1931), 206.

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