Epistles of the Brethren of Purity. On Astronomia: *An Arabic Critical Edition and English Translation of Epistle 3*. Edited and Translated by F. Jamil Ragep and Taro Mimura. Foreword by Nader El-Bizri. Oxford: Oxford University Press, in association with The Institute of Ismaili Studies. 2015.

The *Epistles of the Brethren of Purity* is an encylopaedic work comprising 52 epistles (or chapters) on various branches of knowledge, arranged in four divisions: mathematical and propaedeutic sciences, natural philosophy, sciences of the soul and intellect, and theology. The first division consists of fourteen epistles, including what in Latin was called the *quadrivium*, namely, arithmetic, geometry, astronomy, and music, as well as geography and five epistles on elementary logic. The publishers intend to make all 52 epistles available in critical editions of the Arabic text together with English translations, and many of the volumes have already appeared.

The Brethren of Purity (Ikhwān al-Ṣafā') were anonymous members of a tenth-century learned fraternity, based in Basra and Baghdad. As we learn from the foreword, many questions about the identity and doctrinal affilation of this group remain unanswered. The contents of these epistles are mostly elementary treatments of each subject; in particular, this encyclopaedia does not discuss major achievements by Muslim astronomers and mathematicians. Nevertheless, the presentation of the mathematical sciences is not without interest.

In the volume under review there is a critical Arabic text, based on seven manuscripts, the earliest of which was completed in 1182, some two centuries after the date of composition, and it was "already 'contaminated' by revisions and mistakes" (p. 12). For a number of reasons the editors preferred a somewhat later manuscript as the main witness, but they "strove to record, as far as possible, all variants from the seven manuscripts we used" (p. 17). Given the complicated textual history of this popular work, these editorial decisions seem most reasonable. The Arabic text is accompanied by a large number of variant readings from the manuscripts. In addition to the translation, there is an Arabic-English glossary of technical terms (pp. 137–150), a bibliography (pp. 151–154), a subject index (pp. 155–161), and an index of references to the Qur'ān and the Bible (p. 162).

The Arabic text is followed by an index of Arabic terms (Arabic pagination, pp. 5–160, and pp. 161–164, respectively). There are few notes to the translation, but that was an editorial decision (p. 19).

My interest in this text goes back a long way, for one of my first published articles was a translation of epistle 1, on arithmetic and number theory, based on the Cairo edition (1928) of the Arabic text.[1] As noted in the foreword to this new edition (p. xxi), all previous editions of the Arabic text were uncritical and did not reveal the manuscript sources on which they depended. For this reason, among others, I am most pleased to see this project moving towards completion.

Epistle 3 is called "On *astronomia*", where the Arabic term for this science was simply transliterated from the Greek ἀστρονομία, rather than using any of the usual Arabic terms for astronomy. The content concerns both what we would now call astronomy and astrology (with a few remarks on cosmology), but most of the chapters in this epistle deal with the science of astrology (*lit*. the science of judgments: *ʿilm al-aḥkām*). There are no references to Muslim astronomers, and only one explicit reference to Ptolemy:

> It is said that Ptolemy loved passionately the science of geometry, a stairway by which to ascend to the celestial sphere. He then measured the orbs and their distances, and the planets and their magnitudes; he then recorded it in the *Almagest*. That ascension was only with the soul, not with the body. (p. 62)

The passage continues:

> It is related thusly regarding Hermes the thrice-wise, who is Idrīs the prophet—peace be upon him: that he ascended to the orb of Saturn and rotated with it for thirty years until he had observed all the states of the orb. Then he descended to the Earth, and informed the people about the science of the stars.

Evidently, the focus of attention is the soul; knowledge of astronomy is mostly a matter of revelation or as a means to a mystical ascent to the heavens. With this knowledge,

1. B. R. Goldstein, "A treatise on number theory from a tenth-century Arabic source", *Centaurus*, 10 (1964), 129–160.

> the soul yearns to ascend to the celestial sphere and to examine what is there directly on its own. The ascension to that place is, however, impossible with this heavy body.... (p. 61)

The reference to Ptolemy concerning measurements of the planetary orbs and their magnitudes and distances is probably to his *Planetary hypotheses*, rather than to his *Almagest* (both works were available in Arabic translations). In fact, the descriptions of Ptolemy's models are inadequate for understanding how they work: indeed, as the editors point out (p. 6), there is no explanation of epicycles or eccentrics. What little is said about the planets from an astronomical point of view is found in chapters 17 to 22 (pp. 51–57), devoted to their periods, durations of retrogradation, durations of invisibility and, in the case of Venus and Mercury, their maximum elongations.

The cosmological passage in ch. 1 is of some historical interest:

> The orbs are spherical, transparent, and hollowed-out bodies; there are nine orbs that are set one inside the other like the rings of an onion. The closest one to us is the orb of the Moon, which encloses the air in all directions like the shell of an egg encloses its egg white. The Earth is in the interior of the air like a yolk in its egg white. Above the orb of the Moon is the orb of Mercury; above the orb of Mercury is the orb of Venus; above the orb of Venus is the orb of the Sun; above the orb of the Sun is the orb of Mars; above the orb of Mars is the orb of Jupiter; above the orb of Jupiter is the orb of Saturn; above the orb of Saturn is the orb of the fixed stars; above the orb of the fixed stars is the enclosing orb. (p. 26)

The ordering of the planetary orbs is Ptolemaic and derives from the *Planetary hypotheses*.[2] Ptolemy does not refer to the similarity of this concentric structure with that of an onion, but this comparison is relatively common and not unique to the Brethren of Purity. As the editors note (p. 26 n. 8), the same analogy appears in a treatise on astrology by al-Bīrūnī (d. *c*. 1050).[3] The reference to the egg in

2. B. R. Goldstein, *The Arabic Version of Ptolemy's* Planetary hypotheses. Transactions of the American Philosophical Society, 57.4. Philadelphia: American Philosophical Society, 1967.

3. R. R. Wright (ed. and tr.), *Al-Bīrūnī: The book of instruction in the elements of the art of astrology* (London: Luzac & Co., 1934), p. 43.

this passage also has parallels, but none is cited here.[4] Apparently, these analogies were still widely accepted at the time of Kepler who dismissed them as incompatible with the Copernican universe. As Kepler put it in the preface to his *Dioptrice* (1611):[5]

> The physicists and, moreover, some theologians as well, are certainly very much in error who think that there are nine or ten transparent spheres that encompass this world of the [four] elements, as the white of an egg is wont to encompass the yolk or as the skins of onions [successively] enclose one another.

The discussion of astrological concepts in the text is standard, and in the editors' notes there are references to parallel discussions in other Arabic astrological treatises. For example, in ch. 23 the zodiacal signs are associated with planets, their exaltations and dejections, etc. (pp. 57–59). The terms exaltation and dejection are described (p. 34) and the places of the exaltations in the zodiac are displayed (p. 38), but again al-Bīrūnī provides a clearer discussion.[6] A more detailed account of astrological concepts is given in Appendix B (pp. 107–116), based on chapters added to the text in only two of the manuscripts. The Brethren were aware of the controversial status of astrology and that those who opposed astrology treated their practitioners "with enmity and hatred" (p. 73).

There is one issue that could have been made clearer for the reader: the authors of this Arabic text seem to distinguish *jawzahar* referring to the planetary nodes (p. 34) from *ʿuqda* referring to the lunar nodes (pp. 35, 69). The former is a technical term in astronomy and astrology, whereas the latter is a common Ara-

4. For comparisons of the parts of an egg with the cosmos in ancient and medieval Latin sources see, for example, M.-P. Lerner, *Le monde des sphères* (Paris: Les Belles Lettres, 1996–1997), 2:242, and P. Dronke, *Fabula: Explorations into the uses of myth in medieval Platonism* (Leiden: Brill, [1974]1985), pp. 79–81, 154–166.

5. J. Kepler, *Dioptrice*, in J. Kepler, *Gesammelte Werke*, ed. M. Caspar (Munich: C. H. Beck, 1941), 4:334. In another work Kepler just rejected the comparison of the structure of the universe with the skins of an onion (without mentioning the egg): see J. Kepler, *Epitome astronomiae Copericanae*, in J. Kepler, *Gesammelte Werke*, ed. M. Caspar (Munich: C. H. Beck, 1953) 7:265. For an English translation, see C. G. Wallis (tr.), *Epitome of Copernican astronomy,* in Great Books of the Western World, vol. 16 (Chicago: Encyclopaedia Britannica, Inc., [1939] 1952), p. 861.

6. See Wright (*op. cit.* n. 2), p. 258.

bic term for "knot" or "node". According to al-Bīrūnī, in an astronomical or astrological context the two terms *jawzahar* and *ʿuqda* are synonymous and, when used alone, i.e., without specifying a planet, they both refer to the lunar nodes.[7] This seems to reflect common usage, in contrast to the distinction made in our text. The difficulty for the reader is that in the translation *jawzahar* is transliterated, whereas *ʿuqda* is simply translated "node", without giving the corresponding Arabic term to distinguish it.[8] The planetary nodes are displayed in figure 7 on p. 38 where they are called *jawzahar* (in the translation), but in the note to this figure they are called nodes (p. 39). According to Hartner, *jawzahar* is a term of Indian origin and it refers primarily to the lunar nodes (ascending called the "head", and descending called the "tail", of the dragon) and, later, by extension to the planetary nodes.[9] The lunar nodes are important in astrology, as the text emphasizes (e.g., p. 69). In sum, the information on the nodes is presented, but it is scattered. Indeed, in the Index there are separate entries for *jawzahar* and *node*, but no cross reference. An alternative would have been to translate both terms as "node", qualifying it where appropriate by "planetary" or "lunar".

In sum, Ragep and Mimura have produced a reliable edition and translation of this important text that sheds light on the reception of scientific ideas in the general Muslim community. This is a valuable work of scholarship that can be consulted with confidence.

B.R. GOLDSTEIN

7. Wright (*op. cit.*, n. 2), p. 92; this passage is cited by Ragep and Mimura on p. 35 n. 2. In Ptolemaic theory, the planetary nodes are fixed with respect to the planetary apogees, whereas the lunar nodes move in a westward direction, i.e., in the direction contrary to that of increasing longitude, by about 3 minutes of arc per day: see, e.g., E. S. Kennedy, *A Survey of Islamic Astronomical Tables*, Transactions of the American Philosophical Society, vol. 46 (Philadelphia: American Philosophical Society, 1956), pp. 141, 156.

8. The term *ʿuqda* is translated "node" in the glossary (p. 145), but the glossary is arranged in Arabic alphabetical order without transliteration, which makes it unhelpful to a reader who does not know Arabic.

9. W. Hartner, "al-Djawzahar", *Encyclopaedia of Islam*, 2nd ed., [1965] 1983, 2:501–502.