Two interesting articles have been published in recent years, about two outstanding scientists of medieval Armenia: Ananias of Širak (7th century)¹ and Mkhitar of Herat (12th century).²

Ananias was born c597, at the village of Anania in the canton of Širak in the Armenian province of Ararat. His 'Autobiography' has been published in English³ and French⁴ translations.

After studying in the schools of his native province, Ananias decided to go to the Greek Empire to study mathematics, which he considered to be the 'mother of all knowledge'. He studied (c620 to c628) with the famed teacher Tychicus of Trebizond, in whose rich library Ananias 'read the sacred and profane authors of Greek literature, scientific and historical works, books on medicine and especially on chronology'. In his lengthy account of his revered teacher, Ananias tells us that Tychicus (c610) 'journeyed to Constantinople, where he continued his studies under a famous Athenian scholar' whose name is not given by Ananias. That was 81 years after Justinian had closed the schools of Athens, an event traditionally regarded as marking the end of Athenian philosophy!

Upon leaving Trebizond, Ananias returned to Armenia and opened his own school, which was apparently the first Armenian school to teach the quadrivium. He wrote many works (in Armenian) on mathematics, astronomy and chronology, and during 667 to 669 he devised a perpetual calendar for the Armenian church.

His principle astronomical work is his 'Cosmography and the Calendar', in which he describes the spherical shape of the Earth, gives a clear account of the nature of lunar and solar eclipses 'and, like Aristarchus, expounds the theory that the Sun is the centre of the Universe'.⁵ He regards the Milky Way as a dense mass of faintly luminous stars. He denounces astrologers, rejecting their doctrine of stellar influence on human affairs, and he criticizes the ludicrous cosmology of Kosmas Indikopleustes. In a passage criticizing magic, Ananias makes the noteworthy remark that 'Those who wish to know the conditions of a pregnant woman's foetus should not consult deceivers who indulge in astrology and soothsaying, but instead to physicians who by listening to the heart beat of the pregnant woman's foetus, can definitely determine whether the foetus is alive or not'. (Ktsoyan,² p.5).
In his ‘Tables of the Motion of the Moon’, based on the principles of 5th century B.C. Athenian astronomer Meton, Ananias incorporates his personal observations and adapts Meton’s figures to conform to local time.

The principal surviving mathematical work of Ananias is his ‘Book of Arithmetic’, which contains a very extensive set of tables for performing addition, subtraction, multiplication and even division. The mathematical problems are drawn from real life, and give much incidental information about Armenian society of that period.

Other works attributed to Ananias are devoted to metrology, chronology, geography, mineralogy et cetera. Most of his surviving works have been published in Armenian or Russian. After his death his works were proscribed by the Armenian church, as a consequence of which most manuscripts of his works omit his name.

Armenian culture declined during the period of Arab rule (646 to 886), then flourished from the 10th to the 14th century. Armenian medicine reached a high level during that latter period, with some form of narcosis being used (Ktsoyan, p.57) in major surgery – but not, alas, in the vivisection which was then practised upon living criminals for anatomical studies (Ktsoyan, p.9).

The physician Mkhitari was born (c1118) in the Persian city of Herat, and practised in Cilician Armenia. His contemporaries praised him as an erudite scientist and astronomer and an outstanding physician, who was familiar with the Greek, Persian and Arabic languages and had mastered the latest advances in the natural sciences.

Several writings of Mkhitar on medicine and astronomy have survived (mostly in fragmentary form), but his reputation rests upon his ‘Consolation During Fever’. This comprehensive medical treatise was written in the vernacular, rather than in classical literary Armenian. ‘I have written this in the free and common language of the people so that it will be convenient and understandable to all readers’ (Ktsoyan, p.14). (Ktsoyan points out that when the great surgeon Ambroise Paré (1519-1590) was brought to trial by the Medical Faculty at the University of Paris for publishing his works on surgery, one of the principle charges made against him was that he had dared to print a medical book in French rather than Latin). The Armenian text was printed in Venice in 1832, and it has been translated into German and Russian.

The ‘Consolation During Fever’ gives detailed descriptions of many types of fever, including tuberculosis, typhoid, malaria and smallpox. Most of the commentators on the text consider that Mkhitar had got very close to correct understanding of the nature of
bacterial infection. He cites many Greek, Arabic and Persian authors, but frequently criticizes them and rejects some of their precepts. In particular, he condemns strongly the lethal practise of bleeding all patients as a routine, although he does advise bleeding in the early stages of typhoid fever, if the patient’s strength permits. (European physicians continued until the 19th century to kill many of their patients by habitually bleeding them). Mkhitar never employs concepts from mysticism, magic or theology, and in his discussion of environmental factors in disease he includes not only climate, water and food, but also the effects of the patient’s occupation! (The 18th century Italian physician Rammazinni is usually cited as the pioneer investigator of occupational diseases). His humane and rational precepts for the treatment of patients establish him firmly in the Hippocratic tradition.

Many additional references may be found in the cited papers of Hewsen\textsuperscript{1} and Ktsoyan\textsuperscript{2}.


5. Hewsen¹ p. 41, citing p. 399 of G.B. Petrosean, *Mathematics in Armenia in Antiquity and the Middle Ages* (in Armenian), State University Press, Yerevan, 1959. It would clearly be desirable to have the original text of Ananias made available in translation into some widely-used modern language.

6. The ‘Armenian Geography’ (based on the lost ‘Geography’ of Pappus of Alexandria) which has been printed in several editions under the name of the 5th century scholar Moses of Khorene, has more recently been ascribed by some scholars (including Hewsen¹) to Ananias. However, in his most recent article: Robert H. Hewsen, *The Geography of Pappus of Alexandria: a translation of the Armenian fragments*, *ISIS*, vol. 62, No. 212 (Spring 1971), 186-207, Hewsen now considers that Ananias cannot have been the author of the ‘Armenian Geography’.
