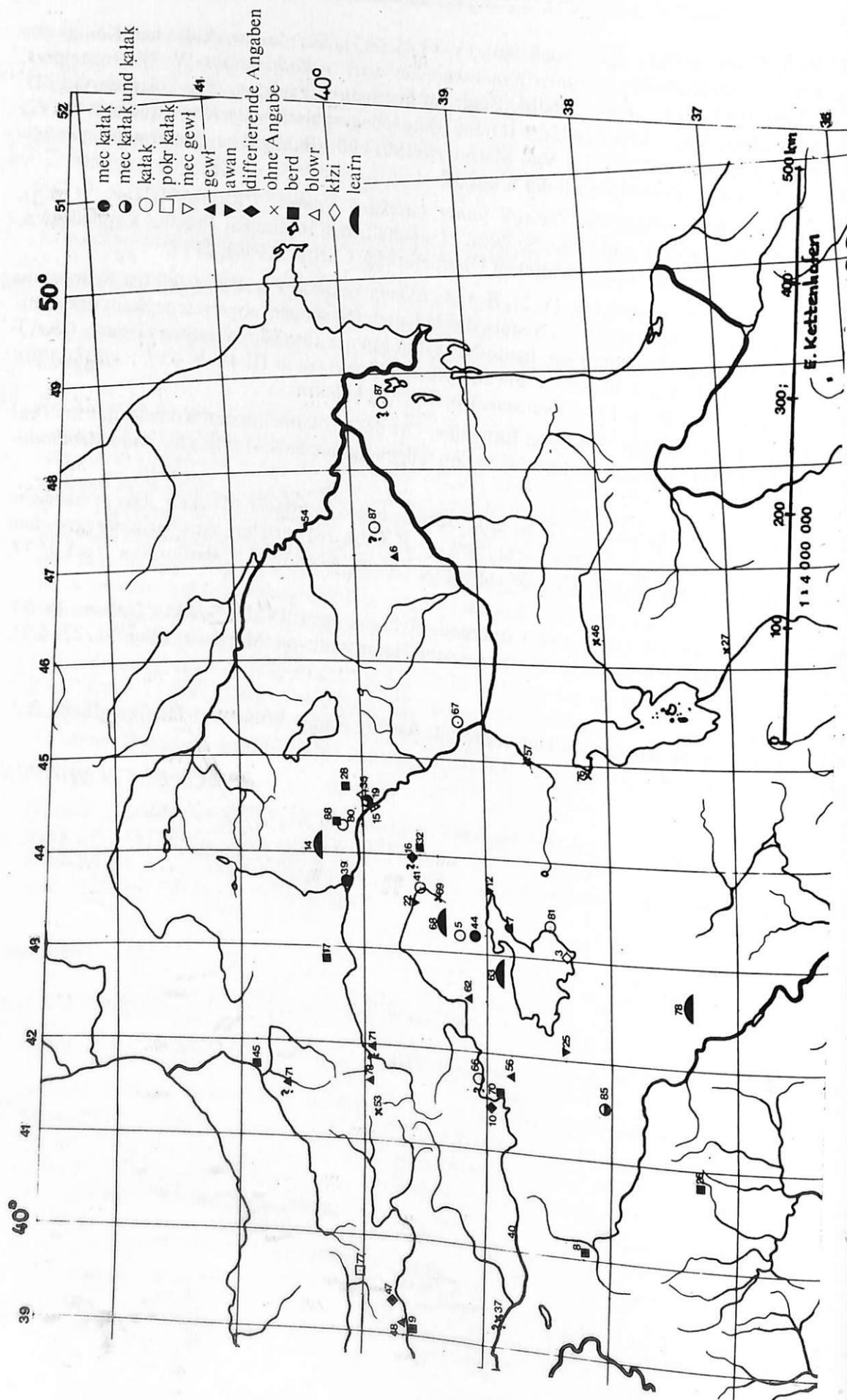


MEASURES OF LENGTH IN MEDIEVAL ARMENIAN TEXTS

Our knowledge of the measures of length employed on the Armenian plateau is sparse. From the Urartian period there is some archaeological evidence for the existence of units of length of 51.8 cm at Teishebanai and 47.1–47.4 cm from mud-bricks at Erebuni, each of which has been termed an “Urartian cubit”.^{1, 2} Early Armenian authors of the fifth century provide little information regarding exact lengths or distances. P’austos Bouzand, for instance, does so only once: general Manuél Mamikonyan had chased king Varazdat a distance of four սասարէզ-*asparéz*.³ Agat’angelos quotes a distance as two ձիոյ արշաւանո՞ւ-*dziroy arshavanōk’* (stadia) from the river Euphrates.⁴ Movsés Khorenatsi also quotes only one exact distance: the cities of Bagaran and Yervandashat were 40 սասարէզ-*asparéz* apart.⁵ On another occasion he states that king Yervand’s camp was “more than 300 սասարէզ-*asparéz* from his city”.⁶ Elsewhere he uses vague expressions such as “whole *asparézes*” and “many *asparézes*” to indicate large distances.^{5, 7} In another context he defines a distance as “half-a-day’s journey on a long day”,⁸ while the expression “a three-day journey” in the same chapter is probably not metrological but esoteric.⁹

Information on the relationship between various units of length first appears in the seventh-century Աշխարհագրութիւն-*Ashkharhagroui’un* (Geography)¹⁰ and the Յաղագս ընթացից արեգական և համարոյ չափուց-*Yaghags an’atsits aregakan ev hamaroy tchap’outs* (On the solar course and enumeration of the measures). Both of these works have at times been attributed to the seventh-century scholar Anania Shirakatsi.¹¹⁻¹³ The Աշխարհագրութիւն-*Ashkharhagroui’un* is extant in two editions, the basic measures in the longer edition being as follows:¹⁴⁻¹⁶



¹ R. H. Vardanyan and D. G. Asatryan, “A few comments on the metrology of Urartu” (in Russian), Պատմա-բանասիրական Հանդէս-*Patma-banasirakan Handés*, 1980, No. 2, 166–178.

² J. B. Brashinsky, “Urartian pithoi: a study in metrology and standardization”, *Orientalia Lovaniensia Periodica*, 9 (1978), 33–49.

³ P’austos Bouzand, Պատմութիւն Հայոց-*Patmout’iun Hayots*, V. 37 (St Petersburg, 1883), p. 204.

⁴ Agat’angelos, Պատմութիւն Հայոց-*Patmout’iun Hayots*, paragraph 811 (Yerevan, 1983).

⁵ Movsés Khorenatsi, Պատմութիւն Հայոց-*Patmout’iun Hayots*, II. 40 (Tiflis, 1913).

⁶ *Ibid.*, II. 46.

⁷ *Ibid.*, I. 11 and 16.

⁸ *Ibid.*, I. 12. Movsés also gives Alexander of Macedon’s height as 3 cubits (III. 8).

⁹ Edward Gulbekian, study in preparation.

¹⁰ This work has come to be known as the Աշխարհացոյց-*Ashkharhatsouyts*, but in the text itself it is called Աշխարհագրութիւն-*Ashkharhagroui’un*; cp A. S. Mat’evosyan, “The geometry section of Anania Shirakatsi’s Քննիկն-Օրնիկն” (in Armenian) Պատմա-բանասիրական Հանդէս-*Patma-banasirakan Handés*, 1979, No. 2, 169 f.

¹¹ e. g. Q. Patkanyan, Անանիայի Շիրակունւոյ մնացորդ բանից-*Ananiayi Shirakounvoy mnatsordq banits* (St Petersburg, 1877), p. 32–34.

¹² A. S. Mat’evosyan, “The geometry section of Anania Shirakatsi’s Քննիկն-Օրնիկն” (in Armenian), Պատմա-բանասիրական Հանդէս-*Patma-banasirakan Handés*, 1979, No. 2, 163–178.

¹³ For Anania Shirakatsi, see Հայկական Սովետական Հանրագիտարան-*Haykakan Sovetakan Hanragitaran*, vol. 1 (Yerevan, 1974), pp. 362–364; and Winfried Petri, “Ananija Schirakazi – ein armenischer Kosmograph des 7. Jahrhunderts”, *Zeitschrift der Deutschen Morgenländ. Gesell.*, 114 (1964), 269–288.

¹⁴ G. B. Petrosyan, “The measures of length in ancient Armenian sources and their new interpretation” (in Armenian), Պատմա-բանասիրական Հանդէս-*Patma-banasirakan Handés*, 1970, No. 3, 215–228.

¹⁵ R. H. Vardanyan, “A new attempt to elucidate the metrological tables in the longer and shorter recensions of the Geography” (in Armenian), Պատմա-բանասիրական Հանդէս-*Patma-banasirakan Handés*, 1970, No. 3, 203–214.

¹⁶ S. T. Yeremyan, “Attempt to re-establish the original text of the Geography” (in Armenian), Պատմա-բանասիրական Հանդէս-*Patma-banasirakan Handés*, 1972, No. 4, 209–230.

Table 1

| | | |
|---|-----------|--|
| 500 սասարեզ- <i>asparéz</i> (stadium) | is called | 1 մասն- <i>masn</i> (degree) |
| 1 սասարեզ- <i>asparéz</i> | is | 107 <i>ֆայլ-գայլ</i> (pace), <i>օդաչափ-odatchap'</i> |
| 1 <i>ֆայլ-գայլ</i> | is | 6 <i>ոտն-otn</i> (foot) |
| 1 <i>ոտն-otn</i> | is | 16 <i>մատն-matn</i> (finger) |
| 1 սասարեզ- <i>asparéz</i> | is | 643 <i>ոտն-otn</i> less one |
| 1 <i>մղոն-mghon</i> (mile) | is | 7 սասարեզ- <i>asparéz</i> |
| 1 պարսից սասարեզ- <i>parsits</i> (Persian) <i>asparéz</i> | is | 143* <i>ֆայլ-գայլ</i> |
| 1 <i>մղոն-mghon</i> | is | 1000 <i>ֆայլ-գայլ</i> , <i>գետնաչափ-getnatchap'</i> |
| 1 <i>հրասախ-hrasakh</i> (parasang) | is | 3 <i>մղոն-mghon</i> ** |
| 1 geometric <i>մասն-masn</i> , <i>օդաչափ-odatchap'</i> | is | 500 սասարեզ- <i>asparéz</i> square |
| 1 <i>մասն-masn</i> | is | 71 3/7 <i>մղոն-mghon</i> *** |

* Some manuscripts have 144. The Armenian numerals 3 (Գ) and 4 (Դ) are similar and easily confused.

** In his map of western Asia published in 1818, Reichardt equated the *Armenian parasang* with the *new Gallic league* which was also equal to about three Roman miles.¹⁷

*** 3/7 is expressed as the sum of unit fractions: one quarter, one seventh and one twenty eighth. This was a method used in Egypt which was adopted by the Greeks. It is described in the Rhind papyrus (ca. 17th century BC) and in a Greek papyrus (ca. 8th century AD) found at Akh-mim.¹⁸⁻²¹

The shorter edition of the Աշխարհագրութիւն-*Ashkharhagroui'iun* contains the following variants:^{14, 15}

| | | |
|--|----|--|
| 1 սասարեզ- <i>asparés</i> | is | 100 <i>ֆայլ-գայլ</i> , <i>օդաչափ-odatchap'</i> |
| 1 սասարիսաց սասարեզ- <i>asparisats asparés</i> (<i>asparés of asparéses</i>) | is | 143 <i>ֆայլ-գայլ</i> less one |
| 1 <i>փարսախ-p'arsakh</i> | is | 3 <i>մղոն-mghon</i> . |

Most scholars agree that the reading 144 in some manuscripts of the longer edition is a scribal error for 143, while 107 and 143 are rounded values representing 107 1/7 (i.e. 750/7) and 142 6/7 (i.e. 1000/7) respectively.^{14, 22} The expression "less one" thus means "less one seventh". The *սասարիսաց-asparisats* in the shorter edition is probably an error for *պարսից-parsits* (Persian).

The nature of these relationships, such as the equivalence of the *սասարեզ-asparéz* (stadium) to 143 *ֆայլ-գայլ* (pace), indicates that these units do not form-coherent system but represent an attempt to correlate units from different cultures, namely Roman miles, Greek stadia and Persian *farsangs*. It also appears that the units may be classified into two groups: *օդաչափ-odatchap'* (air-measured) and *գետնաչափ-getnatchap'* (land-measured).

¹⁷ C. G. Reichardt, *Orbis terrarum antiquus*, tabula 5 (Nüremberg, 1818).

¹⁸ Howard Eves, *An introduction to the history of mathematics*, 4th edn (New York, 1976), pp. 41, 48.

¹⁹ Alan Gardiner, *Egyptian grammar*, 3rd edn (London, 1957), p. 196 f.

²⁰ W. F. Richardson, *Numbering and measuring in the classical world* (Auckland, N. Z., 1985), p. 18.

²¹ O. A. W. Dilke, *Mathematics and measurement*, (British Museum, 1987), p. 14.

²² G. B. Petrosyan, "On the question of the *Մղոնաչափ-Mghonatchap'q* and the Աստղաբաշխական երկրաչափութիւն-*Astghabashkhakan erkratchap'out'iun*" (in Armenian), Պատմա-բանասիրական Հանդէս-*Patma-banasirakan Handés* 1972, No. 4, 200-208.

A number of scholars have attempted to discover the absolute measures of length which these units represented. Manandyan assumed that the above tables contained different systems of measures, and accepted the figure of 100 *ֆայլ-գայլ* to the *սասարեզ-asparéz* in the shorter edition of the Աշխարհագրութիւն-*Ashkharhagroui'iun* to be original. Taking the relations in the longer edition of the Աշխարհագրութիւն-*Ashkharhagroui'iun* and the Յաղագս ընթացից արեգակն եւ համարոյ չափուց-*Yaghags ent'atsits aregakan ev hamaroy tchap'outs* at face value, he calculated three different sets of values, but expressed doubts regarding the validity of several of his calculations. As his base value, he assumed the length of the *սասարիսաց սասարեզ-asparisats asparés* to be 230.112 m, which was Decourdemanche's remarkably precise value²³ for an Arabic unit (the *ghalva*), and calculated the *օդաչափ-odatchap' սասարեզ-asparés*, which he equated with the *stadion* used by Eratosthenes, to be 159.8 m.²⁴⁻²⁶

Mžik,²⁷ on the other hand, argued that the tables were related and that there was only one mile unit involved which was the Roman mile. Taking this to be about 1480 m, he calculated the *պարսից սասարեզ-parsits asparéz* to be 1480/7, i.e. 211.4 m. The "air-measured" *ֆայլ-գայլ* he took to be the Roman pace (1.48 m). Hence he calculated that the "air-measured" *սասարեզ-asparéz* was 1.48 × 107 1/7, i.e. 158.57 m. The ratio of the two *asparéses* was thus

$$158.57:211.4 = 3:4$$

as also the number of qayls

$$107 \frac{1}{7}:142 \frac{6}{7} = 3:4$$

On the assumption that distances quoted by Eratosthenes and those implied by Ptolemy were intended to be identical but expressed in different units, he calculated a conversion factor²⁸ and concluded that the ratio of Eratosthenes's *stadion* to that used by Ptolemy was also 3:4. The "air-measured" *սասարեզ-asparéz*, as concluded by Manandyan, was consequently the *stadion* used by Eratosthenes, even though his name was not mentioned in the Armenian sources, and the unit used by Ptolemy was the *պարսից սասարեզ-parsits asparéz* of 211.4 m.

Vardanyan²⁹ followed Manandyan in thinking that the two editions of the Աշխարհագրութիւն-*Ashkharhagroui'iun* contained different sets of measures, and further that each contained an *օդաչափ-odatchap'* and a *գետնաչափ-getnatchap'* system. He accepted that both the mile units were identical but equated them with the so-called "Philetæric-Roman mile" which Viedebant had calculated to be ca. 1598 m.³⁰ On this basis, he calculated two values for the *սասարեզ-asparéz*: 228.3 m for the *գետնաչափ-getnatchap'* unit in both editions and for the

²³ Jean-Adolphe Decourdemanche, "Traité pratique des poids et mesures des peuples anciens et des Arabes" (Paris, 1909). This is a theoretical work containing virtually no reference to sources. It makes three basic assumptions: (I) that the Attic tetradrachm was equal to 17 grammes exactly, (II) that units of volume and mass in antiquity were invariably related to units of length, and (III) that all ancient measures in historic times up to and including those of the Arabs were inter-related by simple ratios. None of these does he justify. A more systematic treatment of some of these ideas has been attempted by A. E. Berriman (*Historical metrology*, London, 1953).

²⁴ H. Manandyan, "The weights and measures in the oldest Armenian sources" (in Armenian), Yerevan, 1930; in *Works*, vol. 6 (Yerevan, 1985), p. 294-313.

²⁵ Hakob Manandyan, "Eratosthenes's *stadion* and the Պարսից սասարեզ-parsits asparés", (in Armenian), Yerevan, 1934; in *Works*, vol. 5 (Yerevan, 1984), p. 49; idem, *Das Eratosthenische Stadion und persische Asparés* (1934).

²⁶ H. Manandyan, "The measurement of the meridian and the earth's surface according to ancient Armenian sources" Տեղեկագիր Հասարակ. Գիտութիւնների-Teghekagir Hasarak. Git., 1953, No. 6; through G. B. Petrosyan, "The measures of length in ancient Armenian sources and their new interpretation" (in Armenian), Պատմա-բանասիրական Հանդէս-*Patma-banasirakan Handés* 1970, No. 3, 220.

²⁷ Hans von Mžik, "Erdmessung, Grad, Meile und Stadion nach den altarmenischen Quellen", *Հանդէս Ամսորայ-Handés Amsorya*, 47 (1933), 281-306, 432-459, 511-512, 559-588; also published as a book; *Erdmessung, Grad, Meile und Stadion nach den Altarmenischen Quellen* (Vienna, 1933).

²⁸ Mžik, *op. cit.*, 564.

²⁹ R. H. Vardanyan, *op. cit.*

³⁰ Oskar Viedebant, "Forschungen zur Metrologie des Altertums", *Abhandl. d. philologisch-hist. Klasse der k. Sächs. Gesell. d. Wissenschaften*, 34 (1917), 126.

օդաչափ-*odatchap'* value in the longer edition. For the օդաչափ-*odatchap'* value in the shorter edition he obtained 159.8 m. He then related the ratio of the number of *qayls* for the *asparézes* to the two principal calculations in antiquity of the circumference of the earth, namely Eratosthenes's value of 252 000 stadia and Posidonius's estimate of 180 000 adopted by Ptolemy, which were in the ratio 7:5. On the assumption that both represented the same length, the respective stadia would be in the ratio 5:7. This supposed connection between the designations օդաչափ-*odatchap'* and գետնաչափ-*getnatchap'* and the classical values for the earth's circumference was supported by Petrosyan.³¹ Considering in addition Posidonius's earlier estimate of 240 000, he related these three values to the numbers of *qayls* in the tables, viz.³²

$$180\ 000:240\ 000:252\ 000 :: 107\ 1/7:142\ 6/7:150$$

All these calculations are unacceptable for a number of reasons. In the first place, it is generally agreed that both editions of the Աշխարհագրութիւն-*Ashkharhagrou'iun* derive from a single original source.³³⁻³⁶ The figure of 107 in the longer edition cannot be a scribal error since it is supported by the value of the սալարէզ-*asparéz* as "643 ոտն-*otn* less one", i.e. 642 6/7, calculated as $6 \times 107\ 1/7$. Hence the value of 100 must be incorrect.³⁷ As for the "Ptolemaic" stadium, Mžik himself pointed out (and it can be demonstrated from Ptolemy's works) that the geographical distances he had utilised were adjusted as he saw fit from the estimates of others. The adjustments were not proportionally the same for all distances, hence it is not possible, as attempted by Mžik, to calculate a generally applicable correction factor. In addition there is no good evidence for the existence of Viedebant's "Philetaeric-Roman mile" of 1598 m.³⁸ According to Heron of Alexandria, a mile was 7.5 stadia,³⁹ and it has been shown that we can take his *Italic* foot to be about 272.4 mm.⁴⁰ Hence his mile is calculated to be 1471.0 m (i.e. $720 \times 0.2724 \times 7.5$), which is very close to the Roman mile of 1478.5 m.⁴¹ Nor can the value of 38.352 cm for the Philetaeric foot, proposed by Decourdemanche,⁴² be substantiated,⁴³ while a value of about 157 m for the "Eratosthenic" *stadion* has been shown not to be correct.⁴⁴

³¹ G. B. Petrosyan, "The measures of length in ancient Armenian sources and their new interpretation" (in Armenian), Պատմա-բանասիրական Հանդէս-*Patma-banasirakan Handés*, 1970, No. 3, 215-228.

³² Idem, "About a new elucidation of the metrological tables of the Geography" (in Armenian), Պատմա-բանասիրական Հանդէս-*Patma-banasirakan Handés*, 1973, No. 2, 227-232. Idem, "Systems of linear measures according to the 7th-century Armenian sources and their relation to the Hellenic measures" (in Russian), *Voprosy Istorii Estestvoznaniya i Tekhniki*, 1983, No. 2, 104-107.

³³ Manouk Abeghyan, Հայոց հին գրականութեան պատմութիւն-*Hayots hin grakanout'yan patmout'iun*, in Երկեր-*Yerker* (Works), vol. 3 (Yerevan, 1968), p. 424.

³⁴ A. G. Abrahamyan and G. B. Petrosyan (ed.) *Anania Shirakatsi, Մատենագրութիւն-Matenagrou'iun*, in Երկեր-*Yerker* (Works), pp. 258 ff, 352-353.

³⁵ S. T. Yeremyan, "Attempt to re-establish the original text of the Geography" (in Armenian), Պատմա-բանասիրական Հանդէս-*Patma-banasirakan Handés*, 1972, No. 4, 209-230.

³⁶ H. Manandyan, Խորենացու առեղծուածի լուծումը-*Khorenatsou ar'eghdsvadi loudsouvad* (Yerevan, 1934), pp. 12-15.

³⁷ G. B. Petrosyan, "The measures of length in ancient Armenian sources and their new interpretation" (in Armenian), Պատմա-բանասիրական Հանդէս-*Patma-banasirakan Handés*, 1970, No. 3, 215-228.

³⁸ Viedebant assumed that Heron's *Italic* foot was identical with the Roman foot. This gave a mile of $720 \times 7.5 \times 0.296 = 1598.4$ m. It is not clear why he called this a "Philetaeric" mile since according to Heron's tables, the mile contained 600×7.5 Philetaeric feet.

³⁹ E. M. Bruins (ed.) *Heronis Alexandrini Metrica*, Textus Minores 34 (Leiden, 1964), pp. 8, 15-16, 90.

⁴⁰ Edward Gulbekian, "The origin and value of the stadion unit used by Eratosthenes in the third century BC", *Archive Hist. Exact Sci.*, 37 (1987), 359-363.

⁴¹ Dilke, *op. cit.*, p. 26-27.

⁴² Decourdemanche, *op. cit.*

⁴³ cp Mžik, *op. cit.*, 289.

⁴⁴ Gulbekian, *op. cit.* It is sometimes noted that such a value for the stadium results in a good value for Eratosthenes's estimate of the mean circumference of the earth. His result, however, is not to be judged by a simple calculation of this nature but by analysing the elements of his method. His basic theory was sound but his assumption that Alexandria and Syene lay on the same meridian of longitude was incorrect since modern estimates indicate a difference of $3^\circ 7'$. The

Also unsubstantiated is the assumption that the ancient estimations of the circumference of the earth represented identical results expressed in different units. Neither the classical nor the Armenian sources provide evidence for such a view, and it is generally accepted that the ancient geographers understood the various calculations to represent different lengths.⁴⁵⁻⁴⁷ It follows that the interpretations of the terms "air-measured" and "land-measured" proposed hitherto in relation to the սալարէզ-*asparéz* are not well founded.

In order to interpret the Armenian tables convincingly, they have to be considered in relation to the texts which they precede. In the Աշխարհագրութիւն-*Ashkharhagrou'iun*, much of which is taken from Pappus's *Khorographia* (itself based on Ptolemy's world map), distances are recorded in miles, *asparézes* or degrees. At the end, the author states that he intends "to summarize distances in foot-measured miles, together with սալարէզ-*asparéz* observations", separately.^{48, 49} Consequently, the object of his table of measures is to explain and define the relationship between the սալարէզ-*asparéz*, mile and degree, together with their subdivisions. Thus, the author states that the սալարէզ-*asparéz* is "according to air-measurement, 107 քայլ-*qayl'*" and that "the սալարէզ-*asparéz* of the Persians is 143 քայլ-*qayl'*". This means that those who estimated distances by "air-measurement" divided the սալարէզ-*asparéz* into 107 parts, but the Persians divided it into 143 parts. This interpretation, that there is only one սալարէզ-*asparéz* unit defined in terms of the mile, is confirmed by the fact that the Աշխարհագրութիւն-*Ashkharhagrou'iun* quotes distances in miles or *asparézes* without qualification. If there were indeed two versions of each unit, then the author would have said which one he was using. Similarly in the brief treatise on the course of the sun, astronomical distances are quoted in *asparézes* without qualification.

The true significance of the terms գետնաչափ-*getnatchap'* ("land-measured") and օդաչափ-*odatchap'* ("air-measured") can be deduced from our knowledge of the classical world in conjunction with the Armenian sources. Three principal methods were used to determine geographical distances in the Hellenistic period. One was to measure distances physically on the ground by means of a special wheel attached to a carriage.⁵⁰ The Roman officials who were entrusted with this duty were called *agrimensores*, i.e. "land measurers".^{51, 52}

Another method is described by Vitruvius⁵⁰ and was mentioned by Ptolemy in his *Geography*.⁵³ This involved the measurement of distance on board ship. The author of the Աշխարհագրութիւն-*Ashkharhagrou'iun*

angle subtended at the centre of the earth (assumed to be a perfect sphere) by the arc of the great circle through Alexandria and Syene is 7.55° (to 3 sig. figures), which means that Eratosthenes's figure of 7.2° was too small by 4.6%. The accuracy of the measured distance between the two places is not known, but it is likely, as commented by Ptolemy in his *Geography*, that distances measured on the ground were over-estimated. Against this it is to be noted that the measurement of distance on the ground, according to Vitruvius, involved the use of a value for π of 3.125 which would have reduced distances by 1.7%. Overall, Eratosthenes's estimate is likely to have been too large by at least 5%.

⁴⁵ Urho A. Uotila, article "Earth, Figure of", in *Encyclopaedia Britannica* (Chicago, 1981).

⁴⁶ Eric H. Warmington, article "Ptolemy (4)", in N. G. L. Hammond & H. H. Scullard (ed.), *The Oxford classical dictionary*, 2nd edition (Oxford, 1970), p. 898.

⁴⁷ *Geography of Claudius Ptolemy*, I. 11; transl. Edward Luther Stevenson (New York, 1932), pp. 32-33.

⁴⁸ G. B. Petrosyan, "On the question of the Մղոնաչափ-*Mghonatchap'q* and the Աստղաբաշխական Երկրաչափութիւն-*Asghabashkhakan erkratchap'out'iun*", Պատմա-բանասիրական Հանդէս-*Patma-banasirakan Handés*, 1972, No. 4, 200-208.

⁴⁹ Գիրք աշխարհաց եւ առասպելաբանութեանց որ է Աղուէսագիրք-*Girq ashkharhats ev ar'aspelabanout'yants or é Aghouésagirq* (Amsterdam, 1668), pp. 65-69.

⁵⁰ Vitruvius, *On architecture*, Bk. X. 9.

⁵¹ O.A.W. Dilke, *The Roman land surveyors* (Newton Abbot, 1971).

⁵² A late-medieval commentator wrote that the սալարէզ-*asparéz* was "1000 paces according to the earth-measuring art"; H. Avgeryan, Բացատրութիւն չափուց եւ կշռոց նախնեաց-*Batsatrou'iun tchap'outs ev kshrots nakhneats* (Venice, 1821), p. 46 f.

⁵³ *Geography of Claudius Ptolemy*, I. 2; *op. cit.*, p. 26 f.

հազարութիւն-Ashkharhagrou'iun attributes this "sea-measured" method to Hipparchos^{54, 55} (2nd c. BC), who had used the distance between Alexandria and the island of Rhodes as his base measurement.

The third method, regarded by Ptolemy as the most accurate, was to ascertain distance "from an observation of the stars".⁵³ These results could be described as "air-measured" since the reference angles were estimated from celestial measurements, i.e. from the apparent motion of the sun or the star Canopus in the celestial spheres. The author of the Աշխարհազարութիւն-Ashkharhagrou'iun attributes the "air-measurement" method to Marinos of Tyre (c. AD 70-130), a precursor of Ptolemy (fl. AD 127-148), who had written "his cosmography according to journeys through the air, observing by means of instruments the rays of the sun and the moon and the stars".^{56, 57} On the basis of these and other results Ptolemy calculated his angles of latitude and longitude, after making such corrections as he thought apposite.

It now becomes obvious why the "land-measured" relationship in the Armenian tables refers to the mile defined as 1000 paces, as in the Roman system. The Roman mile was usually regarded as equal to eight Roman or eight and one third Greek stadia,⁵⁸⁻⁶¹ but another stadium, equal to one seventh of a Roman mile, was also known⁶² which Lehmann-Haupt designated "Phoenician-Egyptian".⁶³ The medieval Armenian evidence thus suggests that this unit had travelled to western Asia minor, whence Armenian scholars, perhaps Anania Shirakatsi, had obtained the information. For a stadium unit which was seven to the Roman mile, the սասարէզ-asparéz was thus calculated to be 1000/7, i.e. 142 6/7, "land-measured" ֆայլ-qayl or paces.

The "air-measured" relationship then should correlate with the Hellenic measures, but the six feet to the "air-measured" ֆայլ-qayl in the Armenian tables seems not to accord with the Greek system, in which 2 1/2 feet made one pace (bema),⁶⁴ while in the Roman system there were five feet to the pace. In Heron's tables, however, six feet is equal to one orguia (fathom)⁶⁵ and the

⁵⁴ S. T. Yeremyan, "Attempt to re-establish the original text of the Geography" (in Armenian), Պատմա-բանասիրական Հանդէս-Patma-banasirakan Handés, 1972, No. 4, 209-230.

⁵⁵ Mžik, op. cit., 295.

⁵⁶ Mžik, op. cit., 295-299.

⁵⁷ Օդաչափութիւն-Odatchap'out'iun was evidently an Armenian technical term and not a translation from the Greek. Although Mžik did not accept this view, he was unable to find a similar Greek term in the extant literature; op. cit., 450 f. From a comparison of a number of related manuscripts it has been shown that the terms Օդաչափութիւն-Odatchap'out'iun (air-measurement) and սաստեղաբաշխական երկրաչափութիւն-asteghabashkhakan erkratchap'out'iun (astronomical geometry) were interchangeable; A. S. Mat'évosyan, "The geometry section of Anania Shirakatsi's Քննիկն-Չննիկն" (in Armenian), Պատմա-բանասիրական Հանդէս-Patma-banasirakan Handés, 1979, No. 2, 163-178.

⁵⁸ Polybius, The histories, Bk III. 39.

⁵⁹ Pliny, Natural history, Bk II. xxi, 85-86.

⁶⁰ Censorinus, De die natali, xiii. 2.

⁶¹ Richardson, op. cit., p. 30.

⁶² Mžik, op. cit., 574.

⁶³ C. F. Lehmann-Haupt, article "Stadion", in Paulys Real-Encyclopädie der classischen Altertumswissenschaft (Stuttgart, 1929).

⁶⁴ Frederick N. Pryce and Mabel Lang, article "Measures", in N. G. L. Hammond & H. H. Scullard (ed.), The Oxford classical dictionary, 2nd edition (Oxford, 1970), p. 659.

⁶⁵ E. M. Bruins (ed.), Heronis Alexandrini Metrica, Textus Minores 34 (Leiden, 1964), pp. 8, 15-16, 90. Vardanyan (op. cit.) compared this ֆայլ-qayl with an Armenian measure of 1 գիրկ-girk (fathom) equal to 6 թիզ-tiz (hand), but gave no source for this information. Alishan quoted a manuscript which had:

1 գիրկ-girk is 8 թիզ-tiz (hand)
1 թիզ-tiz is 8 կոն-kotj (button)
1 կոն-kotj is 2 ըղունգն-əghoungn finger nail).

(Ghevond Alishan, Այրարատ-Ayrarat (Venice, 1890), p. 412-413 n. 6).

mile is 4500 (i.e. 600 × 7.5) Philetaeric feet. The mile therefore was equal to 750 (i.e. 4500/6) orguia. Thus in the context of the Armenian measures the "air-measured" ֆայլ-qayl represents the orguia/fathom.⁶⁶ Hence the mghon/mile would equal 750 օդաչափ ֆայլ-odatchap' qayl, and the սասարէզ-asparéz 750/7, i.e. 107 1/7, օդաչափ ֆայլ-odatchap' qayl. The սասարէզ-asparéz is thus the stadion, the basic unit of distance used by the Hellenic mathematicians which, by Anania's time, had been largely replaced by the Roman mile for terrestrial purposes.⁶⁷

There is thus no reason to doubt that the mile unit in the Armenian tables, equal to 1000 Roman paces or 750 Greek fathoms, is anything other than the Roman mile. Hence the Armenian tables contain only one mile and one սասարէզ-asparéz, but two ֆայլ-qayl units: one "land-measured" and the other "air-measured". The "land-measured" ֆայլ-qayl was the Roman passus while the "air-measured" ֆայլ-qayl was the Greek orguia. If we wish to translate these units into the metric system, the սասարէզ-asparéz would equal one seventh of a Roman mile (i.e. 1478.5/7) hence 211.2 m. The "land-measured" ֆայլ-qayl would be 1.48 m (i.e. 1478.5/1000), and the "air-measured" ֆայլ-qayl would be 1.97 m (i.e. 1478.5/750). At six feet to the "air-measured" ֆայլ-qayl this gives a foot of 32.9 cm, a value close to the "Doric" or "Philetaeric" foot, which was used principally in Greece. This unit was estimated to be 32.5 to 32.8 cm by Wesenberg,⁶⁸ and 33.0 to 33.2 cm by Lehmann-Haupt.⁶⁹ These conclusions are summarized in table 2.

Table 2 Units in the Աշխարհազարութիւն-Ashkharhagrou'iun

| Unit | Equivalent or modern name | Value |
|------------------|--------------------------------|---------|
| մղոն-mghon | Roman mile | 1.48 km |
| սասարէզ-asparéz | "Phoenician-Egyptian" stadium* | 211.2 m |
| ֆայլ-qayl (land) | Roman passus (pace) | 1.48 m |
| ֆայլ-qayl (air) | Greek orguia (fathom) | 1.97 m |
| նոն-otn | Philetaeric or "Doric" foot | 32.9 cm |
| մատն-matn | Finger breadth | 2.05 cm |

* Lehmann-Haupt's independent estimate⁶⁹ was 212.14 to 213.43 m.

The Աշխարհազարութիւն-Ashkharhagrou'iun, unfortunately, gives few distances which can be checked against modern values. The sea perimeters of Corsica and Sardinia (given as 400 and 980 miles respectively), for instance, can be assessed only if the method of measurement is known. The length and width of the Bznouneats sea (lake Van), given as 100 and 60 miles respectively, also requires interpretation since the author does not define his terms. If the maximum length in a straight line is intended, this is about 130 km, while the "width" from Datvan to the coast near Van is 90 km. Thus the "length" would imply a mile of 1.28 km and the "width" a mile of 1.50 km. Alternatively, the terms may indicate the distances between the extreme lines of longitude and latitude, as do for instance the values for Cyprus, in which case the

⁶⁶ cp H. Manandyan, "The weights and measures in the oldest Armenian sources" (in Armenian), Yerevan, 1930; in Works, vol. 6 (Yerevan, 1985), p. 298.

⁶⁷ Konrad Miller, Weltkarte des Castorius genannt die Peutinger'sche Tafel (Ravensburg, 1887), p. 107-108.

⁶⁸ Burkhardt Wesenberg, "Zum metrologischen Relief in Oxford", Marburger Winckelmann-Programm 1975/76, 16.

⁶⁹ C. F. Lehmann-Haupt, article "Stadion", in Paulys Real-Encyclopädie der classischen Altertumswissenschaft (Stuttgart, 1929).

length is 113 km and the width 78 km, giving miles of 1.13 and 1.30 km respectively. Others, such as the 20 miles from Constantinople to Heraclea Pontica, which was actually some 230 km, or the distance of 350 miles from Sicily to Sardinia, cannot be reconciled with the true distances and must be corrupt readings. Incidentally, since Ptolemy does not include these details, these distances must derive either from Pappus's *Khorographia* or the author's own observations.⁷⁰

Apart from the Աշխարհագրութիւն-*Ashkharhagrou't'iun*, there are astronomical texts^{71, 72} in which distances are expressed in stadia or miles, but these are based on the cosmography of the time⁷³ and not amenable to examination. The only other document extant which contains distances expressed in one of these units appears to be the itinerary called Վասն գիտութեան Մղոնաչափաց-*Vasn gitout'yan Mghonatchap'ats* (On knowledge of the measures in miles) known as the Մղոնաչափ-*Mghonatchap'q*,^{74, 75} which consists of a catalogue of distances between cities, apparently quoted to the nearest 5 or 10 miles. In general, the distances in Armenia, Asia minor and Syria, are reasonably self-consistent, but they become inaccurate for places such as Rome, perhaps because they were distant from the writer's homeland.

All the routes begin at Dvin, which became the capital of Armenia in the fifth century. Procopius characterised it as an important trade centre in the sixth century.⁷⁶ The seventh and eighth centuries, in Manandyan's view, "were a period of stagnation in international trade as far as Armenia was concerned", so he concluded that the Մղոնաչափ-*Mghonatchap'q* had been prepared in the ninth century, during the Bagratouni kingdom.⁷⁵ However, the itinerary for north Africa - Alexandria, Pentapolis, Tripolis, Africa, Sep'té (Sitifis), Ocean- does not support this conclusion since it reflects a period before the Arab invasions,^{77, 78} corresponding to the description of north Africa in the Աշխարհագրութիւն-*Ashkharhagrou't'iun*⁷⁹ and, except for the name *Tripolis*, to Ptolemy's map of Libya in book 4 of his *Geography*.⁸⁰

Others have suggested that the Մղոնաչափ-*Mghonatchap'q* is the summary promised by the author of the Աշխարհագրութիւն-*Ashkharhagrou't'iun*. This interpretation is attractive

⁷⁰ Ptolemy (*Geography*, I. 1) distinguished khorography from geography. The former dealt with details of a particular region while the task of the latter was "to survey the whole in its just proportions"; *op. cit.*, p. 25.

⁷¹ A. G. Abrahamyan and G. B. Petrosyan (ed.), *Anania Shirakatsi, Մատենագրութիւն-Matenagrou't'iun* (Yerevan, 1979), pp. 314, 330.

⁷² G. B. Petrosyan, "On the question of the Մղոնաչափ-*Mghonatchap'q* and the Աստղաբաշխական երկրաչափութիւն-*Astghabashkhakan erkratchap'out'iun*" (in Armenian), *Պատմա-բանասիրական Հանդէս-Patma-banasirakan Handés*, 1972, No. 4, 200-208.

⁷³ cp B. Toumanyán, "On two works attributed to Shirakatsi" (in Armenian), *Պատմա-բանասիրական Հանդէս-Patma-banasirakan Handés*, 1971, No. 3, 203-209.

⁷⁴ A. G. Abrahamyan and G. B. Petrosyan (ed.) *Anania Shirakatsi, Մատենագրութիւն-Matenagrou't'iun* (Yerevan, 1979), p. 312 f.

⁷⁵ H. A. Manandian, *The trade and cities of Armenia in relation to ancient world trade*, transl. by Nina, G. Garsoian (Lisbon, 1965), pp. 169-172.

⁷⁶ "For from India and the neighbouring regions of Iberia and from practically all the nations of Persia and some of those under Roman sway they bring in merchandise and carry on their dealings with each other there". The journey from Theodosiopolis (Karin) to Doubios (Dvin) took eight days. Procopius, *History of the wars*, II, 25, 1-3, transl. by H. B. Dewing (London, 1914), p. 481.

⁷⁷ cp. Alex. Keith Johnston, *Atlas of classical geography* (Edinburgh, 1866), plates 10, 19.

⁷⁸ cp. Hermann Kinder and Werner Hilgemann, *The Penguin atlas of world history*, vol. 1 (Harmondsworth, 1974), pp. 134-138.

⁷⁹ Arsène Soukry, *Géographie de Moïse de Corène* (Venice, 1881), p. 18.

⁸⁰ *Geography of Claudius Ptolemy*, IV; *op. cit.*

but but there are difficulties. One is that the itinerary gives the distance from Constantinople to Rome as 90 miles in one version and 6000 in another, while the Աշխարհագրութիւն-*Ashkharhagrou't'iun* quotes 200. Another is that distances in the Մղոնաչափ-*Mghonatchap'q* are expressed only in miles, the corresponding *asparézes* not being given as promised. Matévosyan's suggestion in regard to this objection was that "the *asparéz* observations" referred to a different work, the Աստղաբաշխական երկրաչափութիւն-*Asteghabashkhakan erkratchap'out'iun* (Astronomical geometry).⁸¹

Another problem is that the *ասպարէզ-asparéz* is defined differently as 170 paces. Petrosyan's explanation, that this is a scribal error for 107, is possible although the Armenian numerals for 7 (Է) and 70 (Չ) are not easily confused.⁸² Manandyan suggested that 170 was a rounded value for 171 3/7 (i.e. 1200/7), and that the itinerary had utilised a medieval Arabic mile of 1200 paces, measuring 1.9176 km.⁸³ He supported this by noting that the itinerary quoted 70 miles for the journey from Dvin to Nakhidjevan. This gave 70 × 1.9176, i.e. 134 km (to 3 significant figures), in good agreement with the distance from Kamarlu, "a few kilometres south" of Dvin, to Nakhidjevan along the post road which was 127 km.⁸⁴

In Asia minor and Syria, however, Roman miles generally fit the data best. From the data in Table 3, a mean value for the *մղոն-mghon* of 1.44 km with a standard deviation of 0.14 km, is obtained. Nor does Manandyan's solution help to explain the anomalous distances in Africa. Alexandria to the Pentapolis, for instance, is given as 1000 miles. In Roman miles, this would be 1480 km, and in Arabic miles, about 1920 km, whereas the actual distance was of the order of only 1000 km. Since the distances in north Africa are much higher than they should be, it is possible that measurements in various regions are given in local units, as may be the case in the Peutinger map.⁸⁵ Other anomalies may be due to scribal errors or omissions. Variant readings exist for some distances.

⁸¹ A. S. Mat'évosyan, "The geometry section of Anania Shirakatsi's *Qnnikon*" (in Armenian), *Պատմա-բանասիրական Հանդէս-Patma-banasirakan Handés*, 1979, No. 2, 163-178.

⁸² G. B. Petrosyan, "The measures of length in ancient Armenian sources and their new interpretation" (in Armenian), *Պատմա-բանասիրական Հանդէս-Patma-banasirakan Handés*, 1970, No. 3, 215-228. A possible explanation for the 170 paces to the *ասպարէզ-asparéz* is as follows: According to the system in use by the Arabs, 1° of arc at the surface of the earth measured 56 to 57 Arabic miles, one particular value favoured at the time of Al-Ma'mūn (813-833) being 56 2/3 miles (J. T. Reinaud & Stanislas Guyard, *Géographie d'Aboulféda*, vol. 1 (Paris, 1848), p. cclxx; cp Salvador de Madariaga, *Christopher Columbus* (London, 1939), p. 99). Taking 3000 cubits to the Arabic mile (Vazquez Queipo, *op. cit.*, p. 106), this makes the circumference of the earth 360 × 3000 × 56 2/3 = 61.2 × 10⁶ cubits. The value for the earth's circumference accepted in the middle ages being 180 000 stadia, this leads to a value of 340 cubits to the stadium. If, as indicated in another source (the anonymous Paris manuscript, in G. B. Petrosyan, "The measures of length in ancient Armenian sources and their new interpretation", *op. cit.*, 217), two cubits equalled one pace, this would give 170 paces to the stadium.

⁸³ For the length of the Arabic mile, cp. V. Vazquez Queipo, *Essai sur les systèmes métriques et monétaires des anciens peuples* (Paris, 1859), vol. 2, p. 108.

⁸⁴ Hakob Manandyan, "Eratosthenes's *stadion* and the Պարսից ասպարէս-*parsits asparés*", (in Armenian), Yerevan, 1934; in *Works*, vol. 5 (Yerevan, 1984), p. 49. Idem, *The trade and cities of Armenia in relation to ancient world trade*, *op. cit.*

⁸⁵ Konrad Miller, *Weltkarte des Castorius genannt die Peutinger'sche Tafel* (Ravensburg, 1887), pp. 107-108.

The խրասխ-*hraskh*, it seems, does not belong to this system.⁹⁸ In the Աշխարհագրութիւն-*Ashkharhagrout'ian*, a similar-sounding հրասխ-*hrasakh* or փարսախ-*p'arsakh* is found as a multiple of the մղոն-*mghon* (Table 1).⁹⁸ The գարեհատ-*garehat* appeared out of place to Mžik who suggested that there was a unit missing between it and the ներբան-*nerban*. In fact, the table indicates that one palm was equal to 8 barleycorns. This is comparable, for instance, to the English measures where one hand was equal to 12 barleycorns.⁹⁹

According to the Paris manuscript (Tables 4 and 7), the cubit would be equal to 3 feet, which is an unusual relationship. In the Babylonian and Hellenic measures, for example, a cubit was 1.5 feet. It is likely therefore that the data in the Paris manuscript are not coherent but consist of a collection of measures from different systems.¹⁰⁰ Taking the կանգուն-*kangoun* from Yeghvard as our base unit, we can select the following as a consistent set of measures:

Table 8 Possible values of Armenian measures in the 14th century

| | | | |
|--|---|------|----|
| 1 սասարէգ- <i>asparéz</i> (stadium) | = | 161 | m |
| 1 կանգուն- <i>kangoun</i> (cubit) | = | 53.5 | cm |
| 1 ներբան- <i>nerban</i> (step) | = | 15.3 | cm |
| 1 բուռն- <i>bour'n</i> (palm) | = | 7.6 | cm |
| 1 գարեհատ- <i>garehat</i> (barleycorn) | = | 0.96 | cm |

It is not possible to arrive at a more confident conclusion on the medieval Armenian measures in the absence of a statistical survey of the dimensions of Armenian buildings similar, for example, to that conducted by Thom on pre-historic western European monuments.¹⁰¹

EDWARD GULBEKIAN

⁹⁸ Mžik (*op. cit.*, 457, 577). He suggested that the խրասխ-*hraskh* represented a Greek *plethron* of which there were, according to Heron, 45 to the mile. Heron's calculations were based on a mile equal to 7.5 stadia. Hence for a mile equal to eight stadia, this would give 48 *plethra* to the mile.

⁹⁹ Prof. A. J. E. Cave, "Barleycorn in age of metrication", *The Times* (London, 24th August, 1988), p. 13. A direct connection between the Armenian and English systems is unlikely, but it is interesting that the ratio, in barleycorns, of the English hand to the Armenian palm (բուռն-*bour'n*) is 3:2, the same as that given in Epiphanius's *Treatise on weights and measures* (James Elmer Dean, ed., Chicago, 1935, p. 69). The *garehat* was also a unit of mass, and was used by Anania as a base unit to compare foreign measures; A. G. Abrahamyan and G. B. Petrosyan (ed.), *Anania Shirakatsi, Մատենագրութիւն-Matenagrout'ian* (Yerevan, 1979), p. 328.

¹⁰⁰ Mžik (*op. cit.*, 456 ff) conjectured that it consisted of six disparate components.

¹⁰¹ A. Thom, "Statistical examination of the megalithic sites in Britain", *J. Royal Statistical Soc. A*, vol. 118 (1955), 275-295.

ՈՍԿԵՐՉՈՒԹԻՒՆԸ ՀԱՅԱՍՏԱՆԻ ՄԷՋ ԺԵ.-ԺԶ. ԴԱՐԵՐՈՒ ԸՆԹԱՑՔԻՆ

Հայ Ազգի պատմութեան բոլոր ժամանակաշրջաններէն, սկսած նախաքրիստոնէական շրջանէն մինչեւ Գ. դար, եւ է. դարէն մինչեւ մեր օրերը բազմաթիւ են ոսկերչական արուեստի մեզ հասած նմուշները: Բացառութիւն կը կազմեն Դ.-է. դարերը որոնցմէ իրեղէն ապացոյցներ չեն հասած մեզ, թէեւ Ոսկերչարու եւ հետագայ դարերու մատենագիրներուն գործերուն մէջ կան բազմաթիւ վկայութիւններ անոնց գոյութեան եւ օգտագործման մասին:

Կան պատմական շատ վերիվայրումներ, որոնցմով կը բնորոշուին որոշ ժամանակաշրջաններու իրեղէն ապացոյցներու քանակի եւ որակի տարբերութիւնները: Այդ բացառիկ ժամանակաշրջաններէն են ԺԵ.-ԺԶ. դարերը, երբ ոսկերչական իրերու արտադրութեան մէջ սակաւութիւնը եւ որակի թուլացումը ուշագրաւ է:

Վերոյիշեալ երկու դարերու պատկերը տխուր է, մասնաւորաբար Արեւելեան Հայաստանի համար, որ չէր կրնար չանդրադառնալ ժողովուրդի կենցաղի մակարդակին վրայ: Լենկ-թիմուրի արշաւանքէն եւ ահաւոր աւերածութիւններէն յետոյ սկսած Թուրք-Պարսկական պատերազմներու երկար շրջանը, երբ վերոյիշեալ պատերազմներու պատճառով տուժած ժողովուրդներէն ամէնէն աւելի հայութիւնն էր որ ունեցաւ մեծագոյն նիւթական եւ մարդկային կորուստը, կերակրելով մեծաթիւ իսլամական բանակներ, որոնք տրորեցին Հայաստանի զանազան մասերը, բռնազրաւումներով, ու ծանր տուրքեր ծանրաբեռնելով, արդէն արեւնաբամ հայութեան:

Կ'արժէ այս մասին վկայաբերել «Հայ ժողովուրդի Պատմութիւն» բազմահատորեակէն հետեւեալը՝ «Հայաստանում տեղաբաշխուած քոչուոր աւագանու տեւական ճնշման տակ իրենց քաղաքական ու տնտեսական դիրքերը օրաուր կորցնում էին նաեւ հայ Ֆէոդալական միւս գերդաստանները՝ Սաչենի Հասան Զալալեանները, Մարի-Դոփեանները, Վայոց Ձորի ու Կոտայքի Պուռչեանները եւ ուրիշները»:

Քաղաքական իշխանութեան աստիճանական վերացմամբ որոշ նոր դերեր վիճակուած են Հայ Եկեղեցիին, երբ՝ «Հայ Ֆէոդալական տները վերացմանն ու նրանց տիրոջութեան բռնազրաւմանը գուզընթաց, Եկեղեցին աստիճանաբար իր վրայ էր վերցրել նաեւ հայ ժողովուրդի ներքին գործերի տնօրինման պարտականութիւնը, մի հանգամանք, որ հաշուի էին առնում նաեւ օտար տիրակալները»:

Հայ հոգեւորականութեան կատարած դրական դերի մասին կը վկայէ նաեւ հետեւեալը՝ «... պետութեան մասնատակաւ վարիչները սիրաշահում էին Հայ հոգեւորականութեան ազդեցիկ շրջաններին՝ Եկեղեցու արտօնութիւններն ընդարձակելու, նուէրներ բաշխելու...» եւայլն: «Հայ Եկեղեցու պաշտօնեաներն ու նրանց կալուածքները ազատուած են եղել մի շարք ծանր հարկերից ու տուրքերից»³: Անհրաժեշտ է Հայ հոգեւորականութեան վերապահուած այս լրացուցիչ դերը դրականօրէն գնահատել, նկատի ունենալով որ այսպէսով որոշ չափով կը պակսէր ազգային հարստութեան արտահոսքը դէպի օտար տիրակալներու գանձատուները:

Կան պատմական վկայութիւններ այն մասին, որ Հայ Եկեղեցին կը պաշտպանէր հայ աւատապետերու կալուածները, ընդունելով զանոնք իր պաշտպանութեան ներքոյ: Այս մասին ունինք նաեւ տեղեկութիւններ, ուր կ'ըսուի՝ «Հայ Եկեղեցական կալուածատիրութեան համար ստեղծուած համեմատաբար նպաստաւոր այս պայմաններն ի նկատի ունէին հայ Ֆէոդալական (աւատապետական) տների սակաւագօր ներկայացուցիչները, երբ ԺԴ.-ԺԵ. դարերում ենթակայ վանական հաստատութիւնների իրաւասութեան տակ էին դնում իրենց ընտանիքին պատկանող կալուածները»:

¹ Հայ ժողովուրդի Պատմութիւն, հատոր IV, Հայաստանի Գ. Ա. հրատարակչութիւն, Երեւան, 1972, էջ 61: Լ. Ս. Սաչիկեան, Հայաստանի վարչակարգը եւ սոցիալ-տնտեսական յարաբերութիւնները XIV-XV դարերում:

² Նոյն, էջ 64:

³ Նոյն, էջ 64-65: