



The Metrological Relief at Oxford

Author(s): Ad. Michaelis

Source: *The Journal of Hellenic Studies*, Vol. 4 (1883), pp. 335-350

Published by: [The Society for the Promotion of Hellenic Studies](#)

Stable URL: <http://www.jstor.org/stable/623377>

Accessed: 09/10/2014 11:05

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at <http://www.jstor.org/page/info/about/policies/terms.jsp>

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.



The Society for the Promotion of Hellenic Studies is collaborating with JSTOR to digitize, preserve and extend access to *The Journal of Hellenic Studies*.

<http://www.jstor.org>

THE METROLOGICAL RELIEF AT OXFORD.

[PL. XXXV.]

OF peculiar interest among the Arundel marbles of the Pomfret donation at Oxford, is a slab in the shape of a pediment, 'in which there is in basso relievo the figure of a man as big as the life with his arms extended as if he was crucified, but no lower than about his paps is seen, the cornice cutting him off as it were; and this extension of his arms is called a grecian measure, and over his arm is a grecian foot.' The marble thus described by George Vertue, the engraver,¹ was first published in Chandler's *Marmora Oxoniensia*, Pt. I., Pl. lix., No. 166, but its importance was completely overlooked until the late Prof. Matz, in one of his last papers, published a better drawing and pointed out the artistic interest of the relief as a sculpture belonging to a rather early period of Greek art.² On the other hand, the merit of the monument as an authentic document of Greek metrology was set forth, at my request, by my friend Dr. Fr. Hultsch, the author of *Griechische Metrologie*,³ whose views are repeated in my *Ancient Marbles in Great Britain*.⁴ The chief result of his exposition was that our relief unites in a most interesting way the indication of the length of a fathom (*ὀπρυιά*) of 2·06 or 2·07 m. with that of a foot of 0·295 m.,

¹ *Description of Easton-Neston in Northamptonshire, the Seat of the R. Hon. the Earl of Pomfret* (printed as an appendix to the *Catalogue of the Curious Collection of Pictures of G. Villiers, Duke of Buckingham*, London, Bathoe, 1758) p. 55 (see my *Anc. Marb. Gr. Brit.* p. 569). It appears from Horace Walpole's biographical sketch of G. Vertue, in the *Anecdotes*,

that the only visit Vertue ever paid to Northamptonshire, took place in 1734.

² *Annali dell' Istituto*, 1874, Pl. Q, p. 192.

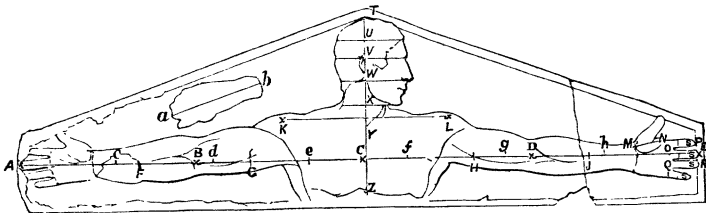
³ *Archaeol. Zeitung*, 1879, p. 177, 1880, p. 91. Hultsch, *Heraion und Artemision*, p. 21, *Griech. Metrologie*, 2 ed., p. 567, note 1.

⁴ P. 559: Oxford, No. 83.

which is not, as one might expect,¹ the sixth, but exactly the seventh part of the fathom. As such a division of the fathom does not agree with the well-known facts of Greek metrology, Hultsch imagined that the foot on our marble might rather be a *modulus* used by sculptors and architects, and he observed that the recent excavations of Olympia seem to show the dimensions of some of the temples, particularly of the very old temple of Herè, to be based on a double measure, on a foot but little longer (of 0·298 m.), as well as on a fathom of 2·084 m. which, again, corresponds to seven of those feet.

The problem thus presented appeared to me interesting enough to justify the desire of studying with greater care and exactness the measures afforded by our marble. I applied to Prof. H. Acland of Oxford, to whose kindness I had been indebted, in 1877, for free access to the university galleries, and he answered my application, not only by supplying me with a very successful photograph—the negative of which has served for the production of the autotype print, Pl. xxxv.—but also by having a cast of the relief made, with a copy of which he was kind enough to present me. This copy is now in the Archæological Museum of the Strassburg University, and it is with the aid of this exact reproduction that I have been able to revise, to correct, and to supplement the insufficient measurements taken on former occasions by myself and by others. I take this occasion publicly to repeat my sincere thanks to Prof. Acland for his liberal and effective aid.

I. METROLOGICAL ANALYSIS.



It appears that the meaning and scope of our monument were duly recognised by Lord Arundel's learned friends, for the

¹ Herod. 2, 149, ἑξαπέδου μὲν ῥῆς *Fragm. Greaves.* in Hultsch's *Metro-*
λογικῆς μετρομένης καὶ τετραπήχειος. *logici Scriptores*, i. p. 180, 5. §

authorities consulted by Vertue, the housekeeper and the gardener at Easton Neston, were not competent to find out the right interpretation of the relief. As Matz justly observes, it is a truly Greek idea to give the indication of standard measures not under the simple form of a rule or scale, but by figuring those parts of the human body from which the measures—fathom and foot—were originally derived. Now, the very scope of the monument implies necessarily the exactness of the measures. It is of scarcely any consequence that the right end of the marble has been broken off in ancient times, the fragment being fortunately preserved and fitting so exactly to the main part, that for measurements the fracture does not matter. A greater difficulty lies in the fact that the forepart of the foot, the sole of which appears over the right shoulder of the man, has suffered so much from scratching and rubbing, that at a first glance it seems impossible to determine with sufficient accuracy the top of the toes. On closer inspection, however, the task appears less hopeless, owing to a peculiarity which is a well known feature of very low Attic reliefs; ¹—the outline of the sole is formed by a shallow scraped line which shows distinctly the contour of the toes. The measurement of the line *a b* gives a length of 0.296 m.; the number of the millimeters however cannot be guaranteed with full confidence. This dimension, as is well known, is identical with the length of the Roman *pes monetalis* (0.2957 m.); but this coincidence of the Roman measure with our monument, which is certainly Greek, and older than the introduction of that standard in Rome, needs no longer to be explained, as Dr. Hultsch supposed, by the theory that our foot was merely a *modulus* used by artists, since Dr. Dörpfeld's acute inquiries ² have led to the important discovery, that the Attic foot, the length of which of 0.308 m. was considered to be one of the most certain facts of ancient metrology, had exactly the same length as the Roman foot, of which it became the model. Our monument, to be sure, is not of Attic origin, the material being neither Pentelic nor any other kind of marble used in Attica. Its greyish colour, and its rough and, as it were, gritty surface, which struck also Matz's

¹ Conze in the *Sitzungsberichte d. stituts in Athen*, 1882, pp. 277 ff.,
Berliner Akademie, 1883, pp. 568 ff. especially p. 304.

² *Mittheilungen des archäolog. In-*

attention, seem rather to point to the western coast of Asia Minor or the adjacent islands, in which statues and reliefs of a similar material have been frequently discovered; and precisely to these places the chief agent of the Earl of Arundel, William Petty, owed a great part of his treasures. In any case our monument is evidence that at the time of its origin, in the country where it was made the Attic foot was current measure.

This Attic foot would seem to require a fathom of six feet, equal to 1.776 m. Instead of this, our fathom (*A E*) measures 2.070 m., that is to say almost exactly seven Attic feet.¹ As a fathom of seven feet would be a thing unheard of, evidently our fathom must belong to a different system from that of our foot. Hultsch has rightly pointed out that the measure in question is an Egyptian fathom, which comprises four great or royal ells of 0.524 each,² and consequently has a length of 2.096 m., which is but a little greater than that of our fathom. It is well known that there was a double ell in Egypt, a smaller one of 0.450 m., divided into six palms, each of which contained four inches, and the great or royal ell of 0.524 m. which, being longer by one-sixth, had a length of seven palms.³ A fathom belonging to the latter system was consequently twenty-eight palms long. Now, the Attic foot, being one-seventh of this fathom, is equal to four Egyptian palms; and as the foot is divided by the Athenians also into four palms (*παλασται*⁴) and each palm into

¹ Seven Attic feet are equal to 2.072 m. The measurements taken on the cast vary between 2.064 and 2.070, owing to the slight inequalities of the surface of the relief, and to the outline of the middle finger of the right hand being defaced. Besides, the nature of the plaster, and the fracture near the right end may cause a trifling deviation. On the original itself Conze had measured 2.07, myself 2.06.—It is strange that Leonardo da Vinci (i. p. 183, No. 343, ed. Richter) makes the foot the seventh part of the length of the body. In the canonical statue of Polykleitos, the Doryphoros, the foot (0.33 m.) is nearly exactly the sixth part of the total length of 2 meters; see Benndorf in the

Zeitschrift für die oesterreich. Gymnasien, 1869, p. 265.

² Dörpfeld in the *Mittheilungen &c.*, 1883, p. 38.

³ I am not in a position to enter into the controversy arisen between Lepsius and Dörpfeld, *Mittheilungen &c.*, 1883, pp. 36 ff. and pp. 227 ff. I can say only what appears to me to be most likely, and add one new fact.

⁴ *παλαστή*, not *παλαιστή*, is the Attic form of the word, see *C. I. Att.* i. 321, 10; 322 (*Inscr. Brit. Mus.* i. 35), i. 28; 35; 38; ii. 26; 51; 56; 68; 69; 88; 97. *Ἀθηναιοῖον* vii. p. 48, c, 17. Photius *lex. s.v. παλαστή*, referring to Kratinos and Philemon. Phrynichos *ecl.* p. 150.

four inches (*δάκτυλοι*), it is clear that the Egyptian and the Attic palms and inches are the same. The difference of the system begins only when the Athenians constitute a foot, *πούς*, (not in common use in Egypt) of four palms; the ell (*πήχυς*) of one foot and a half, or six palms, and the fathom (*ὄργυιά*) of six feet or twenty-four palms, are the same as the smaller Egyptian ell with its fathom. As to the royal Egyptian ell, its apparent division into four (larger) palms and twenty-four (larger) inches¹ stands in no close relation to Attic measures.

Notwithstanding the incontestable connection between the Egyptian fathom and the Attic foot, it cannot but be striking to find the two measures united in one relief. As it would not be a reasonable supposition, that the marble served only to state a scientific fact of metrology, it must have been made for practical use; and the only remaining explanation is that in that country in which the relief originated, both the great Egyptian fathom (and ell, respectively) and the Attic foot were current measures. This again proves that the relief cannot be of Attic origin, as at Athens a different fathom was in public use. On the other hand we may be led to the very origin of our monument by a passage of Herodotos in which he affirms that the Egyptian fathom is equal to the Samian fathom.² As a matter of fact, an ell of 0·524 m. seems to have been used in the old temple of Herè, at Samos.³ What has been said above about the quality of the marble would well suit a Samian origin. Moreover we hear that this very island proved a most successful field for Petty's pursuits.⁴ Considering all this, I think it not too rash to conjecture that our relief may have come from Samos, or some place belonging to the Samian dominions, and that it may bear the most authentic, direct witness for the Samian fathom. In this case it is of great importance, for it shows that Lepsius is wrong in supposing the Samian ell of Herodotos to be the same as the *smaller* Egyptian ell,⁵ and that Dörpfeld was right in interpreting the words of the historian as referring to the great or royal ell. And indeed, if Herodotos

¹ See Lepsius' exposition, pp. 234 ff.

² Herod. 2, 168, ὁ δὲ Αἰγύπτιος πήχυς τυγχάνει ἴσος ἐὼν τῷ Σαμίῳ.

³ Hultsch in the *Archæol. Zeitung*, 1881, p. 99; see however, Dörpfeld,

ibid., p. 261 ff.

⁴ Michaelis *Anc. Marb. Gr. Britain*, pp. 16, 192, 194, 195.

⁵ *Mittheilungen &c.*, 1883, p. 238.

had intended to speak about the smaller ell, he would have made it equal to the common Greek or *Attic* ell which, according to Dörpfeld's conclusive argument, is exactly of the same length; by speaking of the *Samian* ell as identical with the Egyptian one, Herodotos implies that he means the royal ell. The Attic foot added on our monument to the indigenous Samian measure is easily explained by the influence exercised in that island by the commercial and political supremacy of Athens, even during the autonomy of Samos, and still more after the unsuccessful revolution of 441—439 B.C.

The combination of the two measures on the same slab necessarily suggests the question, whether the Attic foot and its subdivisions are in any way marked in the fathom as figured in our relief. So far as I can see, this is not the case. Dividing the whole length of the fathom into seven feet (*A c d e f g h E*), the divisions fall in no instance upon a distinctive point.¹ Nor can the subdivisions of the Attic foot, viz., the inch = $\frac{1}{16}$, the palm = $\frac{1}{4}$, and the span (*σπιθαμή*) = $\frac{3}{4}$ of a foot (equal to 0·0185, 0·074, 0·222 m. respectively), be found where they might at first be sought for in the relief. For the breadth of a finger at its root is about 0·022, the breadth of the palm 0·105 m.; so, as both dimensions are considerably too large, such a direct illustration of the 'finger' (inch) and the palm was not intended by the artist. We shall, however, come back to this question. The span finally, the distance of the ends of the second and the fifth fingers when outspread, cannot be directly measured on the relief; the distance as given there measures 0·190 m., or about ten Attic inches.

The metrological analysis of the fathom must consequently entirely exclude the Attic foot. The better marked is the main division of the fathom into four ells (*ABCDE*). According to the definition given by Pollux (2,158), ἀπὸ ὠλεκράνου πρὸς τὸν μέσον δάκτυλον ἄκρον τὸ διάστημα πῆχυς. The elbow itself is not visible; its position, as may be seen from anatomical diagrams², falls a little nearer towards the shoulder than that

¹ I feel bound to correct a false statement given in my *Ancient Marbles*, p. 560 (towards the end of the article, No. 83). The length obtained by measuring 'from palm to palm,' that is to say between the roots of the fingers, is not

1·77 m. (equal to six Attic feet or an Attic fathom) but 1·89 m. This number stands in no rational relation to the Attic measure.

² For instance Aug. Froriep, *Anatomie für Künstler*, Leipz. 1880, Fig. 23.

groove, which indicates the end of the *biceps* and the *brachialis internus*, included between the *radialis internus* and the *supinator longus*. It is exactly this spot on both arms (*B* and *D*) with which, on the relief, coincides the end of an ell of 0·5175 m. (being a quarter of a fathom of 2·07 m.), measured from the end of the middle finger (*A* and *E* respectively); the division of the second and the third ells falls on the middle of the breast (*C*). With less distinctness those places are marked, on which a foot measure of 0·345 m. (viz. two-thirds of an ell) would fall (*FGCHJ*). Starting from the middle of the breast (*C*), the end of a foot would coincide almost exactly with that spot where the sharp outline of the great pectoral muscle combined with the deltoid muscle reaches the upper outline of the arm, just at the junction of the shoulder and the upper arm (*G* and *H*). On the other hand, measuring from the end of the finger (*A* and *E*), the end of a foot falls approximately on the middle of the fore-arm (*F* and *J*). This point, however, is so indistinctly characterised, that it seems more than doubtful whether such a division of a foot is intended to be indicated. And, indeed, we do not even know precisely whether the Samians used such a foot;¹ nor is there any tradition as to how the Samian ell was otherwise divided. There appear to be two possibilities. Perhaps the Samians, in consequence of the relation of 7 to 6 existing between the royal and the smaller ell, and the wide currency of the latter among Greeks, divided their ell into 7 palms and 28 inches. As these subdivisions would coincide with the Attic palm and inches, we may refer to what has already been shown—that these measures do not agree with the real breadth of the palm and the greatest breadth of the fingers on our relief. Nevertheless they can be found in it, as the length of the fore-finger (*λιχάνος δάκτυλος*, *OP*) being 0·074 m. gives the exact length of a palm, and the breadth of the lowest joints of the four fingers excepting the thumb (*SSSS*) represents with the same exactness the

¹ Hultsch, *Metrologie*, 2 ed., p. 551, 568, supposes such a foot to be the model of the *ποὺς Φιλεταίρειος* of the Pergamene empire. Moreover he takes as ascertained a smaller Samian foot of 0·3145 m., equal to $\frac{2}{3}$ of the

ell, a supposition eagerly opposed by Dörpfeld in the *Archaeol. Zeitung*, 1881, p. 263. To such a foot would answer the length of the fore-arm in our relief (*DM*).

length of an inch of 0·0185 m. But with equal speciousness we may conjecture that the Samians adopted the common Greek system of dividing the ell into 6 palms (of 0·0864 m.) and 24 inches (of 0·0216 m.), a division which, according to Lepsius, would be in Egypt also the common division of the royal ell, and which, as a matter of fact, can be recognised in the Ptolemaean foot of later times, which is based upon it as comprising four of these larger palms.¹ Indeed, the breadth of the fingers at their root (which is absolutely the same in all the four above-named fingers) answers almost exactly the required measure of an inch (0·222 instead of 0·216 m.), and the length of the palm is with still greater exactness represented by the length of the fourth or ring-finger (*παράμεσος δάκτυλος, QR*); not to mention that the same length can also be traced in a line *MN* measured from the wrist (or from the root of the *abductor brevis pollicis, M*) to the end of a distinctly incised furrow (*N*) which answers, as to position, to the joint of the *metacarpus* and the *phalanx prima* of the fore-finger. I do not feel sure whether these slight indications will be considered to be sufficient to solve the question, whether the Samian ell was divided into six or seven palms. Possibly the conditions of international commerce at Samos were such as to require an indication of a double system of inches and palms; I am inclined, however, to give the preference to the division into six palms. The final decision will be left to further investigations, similar to those by which Dr. Dörpfeld has succeeded in discovering the true length of the Attic foot; we may hope that the excavations at the Heraeon may have afforded architectural fragments adapted to solve the riddle.

II. STYLE AND PROPORTIONS.

Besides the metrological questions connected with it, our monument deserves no less attention as a work of art which demands a place in the history of Greek sculpture. Matz, who first recognised the stylistic character of the relief, ascribed it to the first half of the fifth century B.C., basing his judgment on the following points: the shape of the skull, similar to that of

¹ Dörpfeld in the *Mittheilungen*, 1883, p. 45; Lepsius, *ibid.* p. 241.

the statue of Harmodios at Naples¹ and of the Massimi copy of the diskobolos of Myron;² the strong and prominent chin; the trace of archaic smile in the mouth; the high form of the eye, which seems to be represented *en face*; the powerful and muscular body, which, however, is modelled without hardness. Of these arguments, only that taken from the eye seems open to doubt, this part of the countenance being so much battered as to render the original form of the eye uncertain. Besides Matz's reasons, I should lay stress on the treatment of the hair, which is scarcely more than blocked out, as is the case, for instance, with the reliefs of the temple of Assos, with the metopes of the Olympian temple of Zeus, with some of the more archaic metopes of the Parthenon, with one of the terminal figures in the Villa Ludovisi,³ &c. Moreover, the strict profile of the head in combination with the front view of the body, though in keeping with the low style of the relief, still is less startling in a work of earlier date than it would be in a later age, which would have been able to employ other expedients; an elevation of the relief from the background of 0.045 m., as in our marble, would have permitted the sculptor to show the head to the front. Finally, the sharp outline of the great pectoral muscle, together with the very simple treatment of the surface, exhibits completely the method of archaic art. The excellent modelling, however, of the arms should warn us not to go back to a too remote period. This very modelling affords a further argument that the monument is not of Attic origin. An Attic artist would certainly have raised from the ground all the outlines rather strongly with a sharp edge, and would have represented the muscles of the arms with more subdued modelling. The sculptor of our marble followed a different method; he marked nearly throughout the contours by a slightly incised line, and from this very point he began the round modelling of the

¹ *Annali dell' Inst.* 1874, Pl. Q. Compare the heads of Herakles and of Aktæon in the Selinuntian metopes, Pl. vii. and ix. in Benndorf's *Metopen von Selinunt*.

² Unfortunately there exist neither casts nor good engravings of this capital statue (Matz-Duhn *Ant. Bildwerke in Rom*, i. No. 1098). According to

Kekulé (*Kopf des Praxitel. Hermes*, p. 12, note 1) the head offers great analogy with the athlete's head in Ince Blundell Hall, No. 152 (*Archæol. Zeitung*, 1874, Pl. 3).

³ Schreiber, *Villa Ludovisi*, No. 8. *Monumenti Inediti dell' Inst.* x. Pl. lvii. 1.

muscles and of the interior forms of the body generally. This system can be best traced at the neck, the shoulders, and the arms, as well as on both the flanks of the trunk: besides, the front part of the countenance would scarcely have been so entirely defaced, if the Attic system of sharp outlines had been employed.

The relatively early epoch of our relief is moreover established by the proportions of the body here figured. Vitruvius, in a passage often discussed,¹ treats of the normal proportions of the human body. So far as they can be applied to our relief, they are as follows:—

1. *The length of the body from the crown to the bottom of the feet is equal to the length of the outspread arms.* According to this rule, approved by modern authorities, the total length of the body of our fathom-man is 2·07 m.

¹ 3, 1, 2 and 3. I give the text as it is established by Lorentzen and by Val. Rose on the authority of the best manuscripts, adding the numbers of the following explanations: *corpus enim hominis ita natura composuit, uti* (7) *os capitis a mento ad frontem summam et radices imas capilli esset decimae partis, item* (3) *manus palma ab articulo ad extremum medium digitorum tantundem, (6) caput a mento ad summum verticem octavae, (5) cum cervicibus imis ab summo pectore ad imas radices capillorum sextae, (4) a medio pectore* [these three words are wanting in the manuscripts; the supplement is due to Galiani] *ad summum verticem quartae. (8) ipsius autem oris altitudinis tertia est pars ab imo mento ad imas nares, nasum ab imis naribus ad finem medium superciliarum tantundem; ab ea fine ad imas radices capilli frons efficitur item tertiae partis, pes vero altitudinis corporis sextae, (2) cubitus quartae, pectus item quartae...*(1) *si a pedibus imis ad summum caput mensum erit eaque mensura relata fuerit ad manus pansas, invenietur eadem latitudo uti altitudo.* In the old editions the numbers 5 and 4 run thus: *tantundem ab cervicibus imis, ab sum-*

mo pectori ad imas radices capillorum sextae, ad summum verticem quartae. The *tantundem ab* is an unhappy attempt to restore a misinterpreted passage, and the last period contains a gross error if the parting point of the measurement here again is the *summum pectus*. It is interesting to see how Leonardo da Vinci in a translation of the whole passage, the corruptness of which he duly recognised, has tried to guess the right sense: ‘*e dalla forcicella alla sommità del petto si è $\frac{1}{3}$ parte, e dalla forcicella del petto insino alla sommità del capo $\frac{1}{4}$ parte,*’ see *Literary Works of Leon. da Vinci*, ed. by Dr. J. P. Richter, i. p. 181, No. 340. In the same work, under No. 343, is given an interpretation and correction rather than a translation of the whole chapter; instead of the corrupt passage Leonardo says: ‘*dal di sopra del petto alla sommità del capo fia il sesto dell’omo; dal di sopra del petto al nascimento de’ capegli fia la settima parte di tutto l’omo; dalle tette al di sopra del capo fia la quarta parte dell’omo.*’ In a third article, No. 334, the words *ab summo*—*sxtae* are recognised as giving the just measure.

2. *The fore-arm and the breast measure each a quarter of the total length of the body.* We have seen above that this dimension of the fore-arm (*cubitus*) agrees with the relief. The same may be said as to the dimensions of the breast if we are right, in conformity with the common interpretation,¹ in referring it to the breadth of the shoulders, between the *acromia* *K* and *L*, or to the identical distance between those two points where the great pectoral muscle meets with the *deltoides*. The lower parts of the breast are considerably less than a quarter of the total length. It will be worth observing that in the Doryphoros of Polykleitos² the breadth of the shoulders is also exactly a quarter of the total length (0·50); it is but a little smaller in the statue of the British Museum ascribed by Dr. Waldstein³ to Pythagoras of Rhegion (0·435 instead of 0·454 m.).

3. *The length of the hand from the wrist to the end of the middle finger is one-tenth of the length of the body.* The left hand of the relief, from the sharply marked furrow at the wrist to the end of the middle finger, measures 0·20 m., the right hand a few millimeters more, as far as the marble, which is rubbed at this place, permits us to trace the outline of the finger. The length required by Vitruvius is but a little greater (0·207 m.). The hand of the Doryphoros seems nearly to agree with the rule.

4. *From the middle of the breast (if indeed this supplement of Galiani's gives Vitruvius' original meaning) to the crown is a quarter of the total length.* The height of the breast, *pectus*, here, as in the following rule, is the same as the length of the breast-bone, *sternum*, from the pit of the nape down to the ensiform appendix. As a matter of fact, in a normal human body the middle of the *sternum* is a point exactly dividing an upper quarter of the body from three lower quarters. This point lies about 0·03 m. higher than the nipples.⁴ Measuring, on our relief,

¹ See Leonardo's translation, No. 340, '*larghezza di spalle.*' The same expression returns in No. 333, 341, 343. As to the cubit being contained four times in the extension of the arms, see No. 347.

² *Monum. Ined. dell' Inst.* x. Pl. l. 1, 2.

³ *Journ. Hell. Stud.* i. pp. 168 ff.

Pl. iv. *Spec. of Ant. Sculp.* ii. Pl. v. *Anc. Marb. Brit. Mus.* xi. Pl. xxxii.

⁴ Froriep, *Anatomie für Künstler*, Fig. vii. In a man of normal proportions, 1·75 m. high, the *sternum* is 0·22 m. long and extends from 1·42 downwards to 1·20; the middle of it, in consequence, falls on 1·31 from the bottom and is 0·44 m. distant from the

from the crown (T) downwards 0·524 m. (equal to one cubit or one quarter of the total height), we come to the point Z , on the upper edge of the fracture of the marble, which seems to answer to the required point pretty exactly. Probably, our relief may have ended originally with the lower outline of the great pectoral muscle, under which the small lower cornice will have cut off the relief. The distance from the top to that point, measuring about 0·59 m., is but a little smaller than it ought to be (0·60 m.). The statue of the Doryphoros is in conformity with the rule as above given, the distance being 0·50 m., or one quarter of the total height of 2 meters; in the Choiseul-Gouffier statue the distance (0·435 m.) is a little less than one quarter of the height ($\frac{1\cdot815}{4} = 0\cdot454$ m.).

5. *The head, including the whole neck (caput cum cervicibus imis), from the upper end of the breast to the roots of the hair, is the sixth part of the total height.* The pit of the nape, which indicates the upper end of the *sternum*, is not marked in our relief, but its place can easily be made out as lying between the inner ends of the clavicles, considerably higher than the end of the groove figured in the relief, which is produced by the strong lateral flexion of the sterno-mastoid. The distance between this point, Y^1 and U (the level of the roots of the hair above the forehead) measures about 0·255 m., or the *eighth* part of the total length, not the sixth (0·345 m.), as required by Vitruvius. Leonardo² gives to that distance the seventh part, in conformity with normal fact, as well as with the Choiseul-Gouffier statue (0·025 instead of 0·026 m.), and the Apoxyomenos of Lysippos (0·28, total length 1·96 m.). Nevertheless it would be rash to alter the text of Vitruvius; for in the Doryphoros of Polykleitos, the proportions of which agree in many points with those given

crown. This point, recommended by Galiani, a physician, agrees better with Vitruvius' rule than the supplements proposed by Leonardo da Vinci: *dalla forcetta del petto* (No. 340), or *dalle tette* (No. 343), the latter of which has been approved by many, for instance by John Gibson, the sculptor, in his pamphlet on *The proportions of the human figure*, 2 ed., London, 1857. According to Froriep's diagram the

nipples fall on 1·28 from below.

¹ The point Y should really be placed to mark the pit of the nape, higher than it actually is in the woodcut, *i.e.* a little below X , and nearly at the point where the lines KL and TZ cross.

² *i. p.* 182, No. 343, ed. Richter: *dal di sopra del petto al nascimento de' capegli fia la settima parte di tutto l'omo.*

by our author, the dimension in question is but very little smaller than one sixth part of the total height (2.0 m.), viz. 0.32 instead of 0.333 m. The very different proportions of our relief are the consequence of the shortness of the neck, and especially of the narrowness of the forehead, which causes the level of the roots of the hair to descend so low. Comparing the exceeding smallness of this dimension with the normal length of the part considered in the fourth article, it is further evident that, what is lacking to the normal height of head and neck, goes to the credit of the breast; and indeed the height of the great pectoral muscle from the pit of the nape down to the end of the relief is about 0.265 m., that is to say about the eighth part of the total length of the body, instead of about the tenth part which would be required in normal proportions. This remarkable height of the pectoral muscle, the *λιπαρὸν στῆθος* praised by the *δίκαιος λόγος* in Aristophanes' *Clouds*, is a highly characteristic feature of such sculptures as either belong to an early period or follow the example of archaic art. Some instances will be sufficient to prove it.

	Height of pectoral m.	Length of body.	Proportion.
Choesel statue	0.23	: 1.815	= 1 : 8 ($7\frac{1}{4}$).
Harmodios	0.22	: 1.98	= 1 : 9.
Doryphoros	0.21	: 2.00	= 1 : $9\frac{1}{2}$ ($9\frac{1}{2}$).
Apoxyomenos	0.17	: 1.96	= 1 : $11\frac{1}{2}$ ($11\frac{9}{17}$).

6. *The height of the head from the crown to the chin is the eighth part of the length of the body.* The real measure of 0.255 m. agrees pretty well with this rule ($\frac{2.07}{8} = 0.259$). The apparent contradiction between this measure and the result obtained *ad* 5, is explained by the fact that, although the forehead is very low, still the upper part of the head as a whole has the true height.

7. *The length of face from the chin to the roots of the hair above the forehead is one tenth of the length of the body.* This proportion stands in close connection with the rule No. 5, which gives the explanation why the length of face, measuring 0.185 m., is considerably smaller than the length of 0.207 m. required by Vitruvius.¹ Here again a table will give some elements of comparison.

¹ No. 317 of Leonardo's notes (i. p. 172, ed. Richter) begins with the words : *'Dalla sommità del capo al di sotto del mento $\frac{1}{8}$, dal nascimento de' capelli al*

	Length of face.	Length of body.	=	Proportion.
Harmodios	0·175	: 1·98	=	1 : $11\frac{1}{2}$ ($11\frac{1}{2}\frac{3}{4}$).
Our relief	0·185	: 2·07	=	1 : $11\frac{1}{4}$ ($11\frac{1}{4}\frac{7}{8}$).
Apoxyomenos	0·18	: 1·96	=	1 : 11 ($10\frac{8}{9}$).
Choiseul statue	0·18	: 1·185	=	1 : $10\frac{1}{2}$.
Doryphoros	0·20	: 2·00	=	1 : 10.

(The place of the Apoxyomenos in this list is in conformity with the general norm of Lysippos' proportions as expressed by Pliny, 34, 65: *capita minora faciendo, corpora graciliora, per quae proceritas signorum maior videretur.*)

8. *The length of face is divided into three equal parts, reckoned upwards thus: from the chin to the nostrils, the nose from the nostrils up to the brow, the forehead from the brow to the roots of the hair.* This rule differs totally from the proportions of our relief. As exactly as the defaced marble allows us to take the measures, the three parts taken from above downwards, give the following dimensions: *UV* 0·039; *VW* 0·063; *WX* 0·083 m. We have already pointed out the exceeding narrowness of the forehead. This, however, is nowise a peculiarity of our relief, but it is an established fact that in a great number of the earlier works of Greek sculpture the forehead is low, especially in comparison with the inferior part of the face, in which the high and very prominent chin is remarkable; the dimensions of the three parts show constant increase from above downwards. Once more I give a comparative table of some characteristic instances.

	Forehead.	Nose.	Nostrils to chin.	Total height.
Our relief	39 mm.	63 mm.	83 mm.	185 mm.
Harmodios	38 ,,	60 ,,	77 ,,	175 ,,
Strangford 'Apollo' ¹	30 ,,	48 ,,	52 ,,	130 ,,
Prize-running girl ²	35 ,,	40 ,,	60 ,,	135 ,,
Stephanos' youth ³	30 ,,	45 ,,	55 ,,	130 ,,
Doryphoros	65 ,,	63 ,,	70 ,,	198 ,,
Hermes of Praxiteles	60 ,,	60 ,,	65 ,,	185 ,,

mento è $\frac{1}{3}$ dello spatio ch' è da esso nascimento a terra.' The first item agrees with Vitruvius (rule 6), the second will do so if instead of the second *nascimento* we read *mento*, in conformity with Leonardo's translation of Vitruvius (No. 340), as well as with his own views (No. 343).

¹ *Monumenti Ined. dell' Inst.* ix. Pl. xli.

² Visconti, *Museo Pio Clem.* iii. Pl. xxvii.

³ *Annali dell' Inst.* 1864, Pl. D. Kekulé *Gruppe des Menelaos*, Pl. ii, 3, Overbeck *Gesch. d. griech. Plastik*, 3d ed., ii. p. 413, Fig. 150a.

	Forehead.	Nose.	Nostrils to chin.	Total height.
Choiseul statue	60 mm.	60 mm.	60 mm.	180 mm.
Farnese Diadumenos ¹	55 „	50 „	45 „	150 „
Cassel Diadumenos ²	75 „	63 „	60 „	198 „
Apoxyomenos	50 „	65 „	65 „	180 „

The table shows that the narrowness of the forehead and the excessive length of the inferior part are gradually diminishing, to the advantage of the expression of mental strength and freedom, which reigns in the upper part of the face, instead of the former predominance of the more material parts of the head. The low forehead of the Apoxyomenos is as exceptional as is the equality of the three parts in so archaic a statue as is the 'Apollo' from Tenea.³

The preceding analysis, particularly the observations referring to rules 5, 7, and 8, will have proved that the vertical proportions of the body figured in our relief—the height of the great pectoral muscle, the shortness of the neck, the high chin and the low forehead—are in favour of an early period in which it must have originated. The proportions of the three parts of the face especially seem to point to an epoch preceding the art of Pheidias and Polykleitos—if, indeed, it is allowable to make such a chronology by reasoning from the development of Attic and Peloponnesian art to that of the Greek art of Asia Minor. Unfortunately there is a complete lack of characteristic monuments from Asia Minor belonging to the fifth century. The higher, therefore, we value the instance afforded by our relief, the greater is, on the other hand, the uncertainty as to special dates. Nevertheless Matz may be not far from the truth in assigning the work to the earlier half of that century; although, to be sure, it would be hard to disprove a date later by one or two decenniums. Consequently, if we are right in conjecturing the Samian origin of the relief, it would most probably belong to a period anterior to 439 B.C., in which the island was still enjoying its autonomy. During this period the old Samian cell, according to Herodotos' testimony, was certainly current; but we have no reason to doubt that it remained in currency at Samos also after the disastrous event of 439, as coins of Attic standard make only a short and exceptional appearance in the

¹ *Annali dell' Inst.* 1878, Pl. A. *griech. Plastik*, Pl. ii.
Murray, *Hist. of Greek Sculpt.* Pl. ix.

³ *Mon. Ined. dell' Inst.* iv. Pl. xlv.

² Conze, *Beiträge zur Geschichte der* Overbeck, *Plastik*, i. p. 91, Fig. 10.

Samian coinage, being probably confined to the first years after the conquest by Perikles.¹ Now, in connection with the Samian fathom, which the higher relief characterises as the chief object of the monument, appears in a much more modest form the Attic foot. Already when Samos was still the mightiest and wealthiest member of the Attic confederacy, the island stood in so close relations to Athens as the other centre of Greek maritime commerce, that the addition of the Attic standard measure would be far from startling. Possibly, however, this addition was only made after Samos had passed entirely into the dominion of victorious Athens. At any rate it is remarkable that the sole of the foot is not figured in relief, but indicated exclusively by an incised outline, the interior of the sole being exactly on the same level with the surrounding ground of the relief. The foot may therefore be a later addition. If this conjecture should be deemed to be right, the Attic foot on the Samian standard measure would have its closest analogy in the Attic olive-branch on the Samian coins after the conquest;² it would make of our humble, nay, apparently strange marble an interesting historical document, a very characteristic memorial of the most momentous event of Samian history.

AD. MICHAELIS.

STRASSBURG.

¹ Gardner, *Samos and Samian Coins* (*Numism. Chron.* 1882), p. 44, 52.

² Gardner, p. 43.

