

PROPORTIONS AND THE PALAIKASTRO KOUROS:
A Minoan Adaptation of the First Egyptian Proportional Canon

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Every part of the whole must be in proportion to the whole.
 (Leonardo Da Vinci, *Notebooks* 93 E.6v)

The chryselephantine statue of a young Minoan male (conveniently known as a *kouros*) was discovered in the town of Palaikastro on the northeastern coast of Crete.¹ Standing nearly 50 cm. high, it is the largest Minoan sculpture ever found and, despite having been badly burnt, it is virtually complete (only a small part at the waist is missing).² Except for its face,³ it is amazingly well preserved. Its very fine workmanship is evident, with highly realistic details such as sinews and blood vessels clearly indicated both on hands and feet. The statue is carved from four separate pieces of hippopotamus ivory, two lower canines for the torso and two large lower incisors for the legs.⁴ It had been broken apart in antiquity, presumably by looters avid to acquire its gold ornaments: the head, torso, arms and feet were found in an open square in a street outside Building 5, over ten meters from where the legs were later discovered within Room 2 of this building. Both inside and outside areas were covered in the thick burnt debris and wall collapse of a Late Minoan IB fire destruction.⁵

* The following abbreviations are used:

- Iversen E. Iversen, *Canon and Proportions in Egyptian Art*² (Warminster 1976).
 Robins G. Robins, *Proportion and Style in Ancient Egyptian Art* (Austin 1994).
 Schäfer H. Schäfer, *Principles of Egyptian Art*, (E. Brunner-Traut ed., J. Baines trans., Oxford 1974).

I warmly thank Prof. Gay Robins for her great kindness in sending me a copy of page proofs of her book in advance of publication.

¹ We may be grateful to the excavators, L.H. Sackett and J.A. MacGillivray, for their prompt publication of this extraordinary find, see J.A. MacGillivray et al., "Excavations at Palaikastro, 1987," *BSA* 83 (1988) 267, pl. 45; idem, "Excavations at Palaikastro, 1988," *BSA* 84 (1989) 426-27, figs. 7-8, pls. 62-63; idem, "Excavations at Palaikastro, 1990," *BSA* 86 (1991) 141-44, figs. 18-19, pl. 9), and to those who dealt with its meticulous conservation and restoration: A. Nikakis (Agios Nikolaos Archaeological Museum), A. Moraitou (Acropolis Museum), P. Harrison, and M.S. Moak. I am further indebted to Prof. Moak for his very kindly supplying me with the essential 1:1 drawings and detailed measurements of the statue, and to the excavators and the Managing Committee of the British School at Athens for permission to discuss and illustrate it. At the same time, I would like to thank Prof. B.M. Bryan for sending me extremely useful measurements of Egyptian 18th Dynasty statues and, once again, Prof. G. Robins for her generous help and lively criticism.

² With the gap at the waist estimated at 0.9 cm, its height is 49.9 cm from the top of the headdress to the soles of the feet; the pegs under the feet (which would have been hidden in the missing base) raise the overall height to 54.1 cm. The missing part at the waist could be anything from 0.0 — that is, the pieces touch — to a maximum of 0.9 cm (over 0.9 cm would make a decidedly grotesque figure and can be excluded).

³ The face is a thin ivory front for the hollow head encased within the serpentine headdress; see MacGillivray et al. 1989 (*supra* n. 1) 426, pls. 62-63.

⁴ Eight separate parts were carved from the four pieces: two torso sections and two separate arms, legs and feet; see M.S. Moak in MacGillivray et al. 1991 (*supra* n. 1) 141-44.

⁵ Proposed absolute dates for the LM IB period range widely. Two examples can be cited:
 — c. 1600/1575-1500/1475 B.C.; B.J. Kemp and R.S. Merrillees, *Minoan Pottery in Second Millennium Egypt* (Mainz 1980) 267; and
 — c. 1480-1425 B.C.; P.M. Warren and V. Hankey, *Aegean Bronze Age Chronology* (Bristol 1989) 169.

Having had the good fortune to attend the rebirth of the statue and able to follow its restoration closely, I could not help but be aware of the artistic unity of the figure and of the intelligence behind its achievement. The craftsman's ability to unite flawlessly eight separate pieces of carved ivory (n. 4 supra) was particularly intriguing. What technical procedure could he have used to ensure identical proportions on each of the sections? For example, Egyptian artists worked within a framework of guidelines or grids in order to draw and sculpt human figures according to a fixed canon of proportions.⁶ Such a grid would have also undoubtedly, if inadvertently, facilitated the fitting of separate parts into a seamless whole.⁷ Had the *kouros* been carved and assembled following some similar proportional system? I did not (needless to say) expect to find the Egyptian canon underlying this most Minoan-looking figure, but rather sought to discover if there were any retrievable system or rules of proportions.

Most scholars now accept that Egyptian artists established the proportions of major male figures according to a modular grid (we leave discussion of the grid's origin until later in this paper). In the first Egyptian canon (that is, at least from the 5th until the 25th-26th Dynasty when a second canon came into use) a standing figure's height, measured from the soles of his feet to the hairline, was divided into 18 equal parts.⁸ While the lines of the grid were inevitably slightly inaccurate — whether drawn with a straight edge or marked by a string dipped in red paint — they nonetheless consistently intersected the frontal body at fixed key points, though these precise points varied over time. For example, during the period that concerns us (the later Middle Kingdom and early 18th Dynasty) horizontal lines crossed major male figures at:

- Line 0 - below the soles of the feet;
- Line 6 - the upper knee;
- Line 9 - the hips (back: lower line of buttocks);
- Line 11 - the navel (back: small of back);
- Line 14 - the nipples;
- Line 16 - junction of neck and shoulders;
- Line 17 - the bottom of the nose; and
- Line 18 - the hairline.

⁶ On the artistic canons (citing previous literature) and the use of grids, see Iversen, 20-26, and Robins, chapt. 2; the discussion in Robins on the duration, development and variations in the first Egyptian canon is particularly relevant to this paper.

⁷ Identical proportions allow one to make exact duplicates or interchangeable companion pieces. Schäfer, 331, recounts that excavators at Thebes found in pieces two incomplete reliefs with the same subject-matter: "the discoverers were able to compose pieces taken from both reliefs into a single picture, and nobody would suspect that the result was not a unity from the start." This is, of course, highly reminiscent of the story told by Diodorus (i.98) quoted in the main text.

⁸ The crown of the head is not counted in the 18 parts because it is covered by a wig or headdress which is variable in height; thus, the hairline the highest *visible* point of the figure. The rule of 18-units to the hairline rarely varied except during the Amarna period when a 20-unit grid was established (Robins, chapt. 6). There had also been some experimentation with a 20-unit grid in the time of Thutmose IV, G. Robins, "Amarna grids:3. Standing figures of the king in the early style," *Göttinger Miszellen* 84 (1985) 62-4, and this occasionally reappears post-Amarna, G. Robins, "The canon of proportions in the tomb of Ramesses I (KV 16)," *Göttinger Miszellen* 68 (1983) 85-96.

Furthermore, when the arm was extended parallel to the body, the elbow fell on line 12 and the second knuckles of the hand at line 8. Across the horizontal lines, vertical lines were drawn equidistant on either side of a median line (running through the ear), thus creating a grid of equal-sized squares. Just as the horizontals passed through certain key points, the verticals were also fixed, marking the frontal torso at the armpits two squares from the median line and the widest point of the shoulders at three squares from the median line.

By following this grid and placing the key points on the correct horizontal and vertical lines, the artist could draw or sculpt perfectly-proportioned figures to any scale in accord with the first Egyptian canon. It is not to be imagined, of course, that all artists slavishly followed every detail of this grid; freehand drawing and an artist's eye always played some role. Still, in the 12th-13th and early 18th Dynasties, the use of this modular grid standardized the representation of major male figures to the extent that, in the absence of visible grid traces (by far the vast majority of cases), a hypothetical 18-square grid can be reconstructed which almost invariably picks out these key crossing points.⁹ Obviously, the Egyptians found these proportions satisfying and presumably exemplary. To argue that the rules of proportion were (or were not) natural rather misses the point of an idealized artistic canon.¹⁰ Eric Iversen, in an influential but controversial work, *Canon and Proportions in Egyptian Art*², claimed that "the canon was built on a metrological model, that it was an anthropometric description of the human body, based on the standardization of its natural proportions expressed in the Egyptian measure of length" (p. 33). The force of such an elemental model might explain the conservatism of proportional rules over some centuries. As elsewhere in the ancient world, the basic units of Egyptian linear measurement were standardized lengths for parts of the body, chiefly fingers, hands and arms: i.e. digits, palms (= 4 digits), small cubits (= 6 palms), royal cubits (= 7 palms), and a tripartite division of the cubit, the 2/3rds measure (= 4 palms), identified with the distance from elbow to wrist.¹¹ Iversen argued that each square of the grid

⁹ There are, however, inevitable variations even at this time; see Robins, chapt. 10. Some modifications were simply due to individual artists taking liberties or drawing freehand, but other wider changes took place too: note especially the altered representations of private persons in the late 12th-13th Dynasty; Robins, 249-54. In the 18th Dynasty (from the time of Thutmose III or Amenhotep II and continuing through the New Kingdom), more general modifications of proportional rules occurred, Robins, 87-94. Nonetheless, the 18-unit grid remained the basic convention (except in the Amarna period; n. 8 supra) until the introduction of the Second Canon in the 25th-26th Dynasties.

¹⁰ As one would expect, some proportions are natural while others are not. G. Robins, "Natural and canonical proportions in ancient Egyptians," *Göttinger Miszellen* 61 (1983) 17-25, studied Naqada and some Middle Kingdom period skeletons, estimating their living stature and length of limbs. She concludes that the approximate living length of the arms is slightly short of canonical height, while the canon follows natural proportions for the upper but not the lower leg (elongated to 1/3rd of hairline height; Robins, 94); the buttocks are also placed too high. No estimates are possible for 'natural' widths, e.g. between armpits and shoulders.

Cf. Schäfer, 333: "It would make very little difference indeed whether the proportions were deduced from measurements of large numbers of human bodies, whether they were read off works of art which were considered exemplary ... or even whether they were established by a single artist on the basis of his own sensibilities. There is no means of deciding the issue, though we can probably reject *a priori* the idea that the average was taken from measurements of large numbers of bodies; it is quite implausible for the period in question."

¹¹ On this measure, see Iversen, 29-30, and main text *infra*. While the length of the small cubit is standardised as ± 45 cm., its anthropometric equivalent is disputed: Iversen, 16-19, from elbow to thumbtip; Robins (following Lepsius), 41-45, from elbow to fingertips.

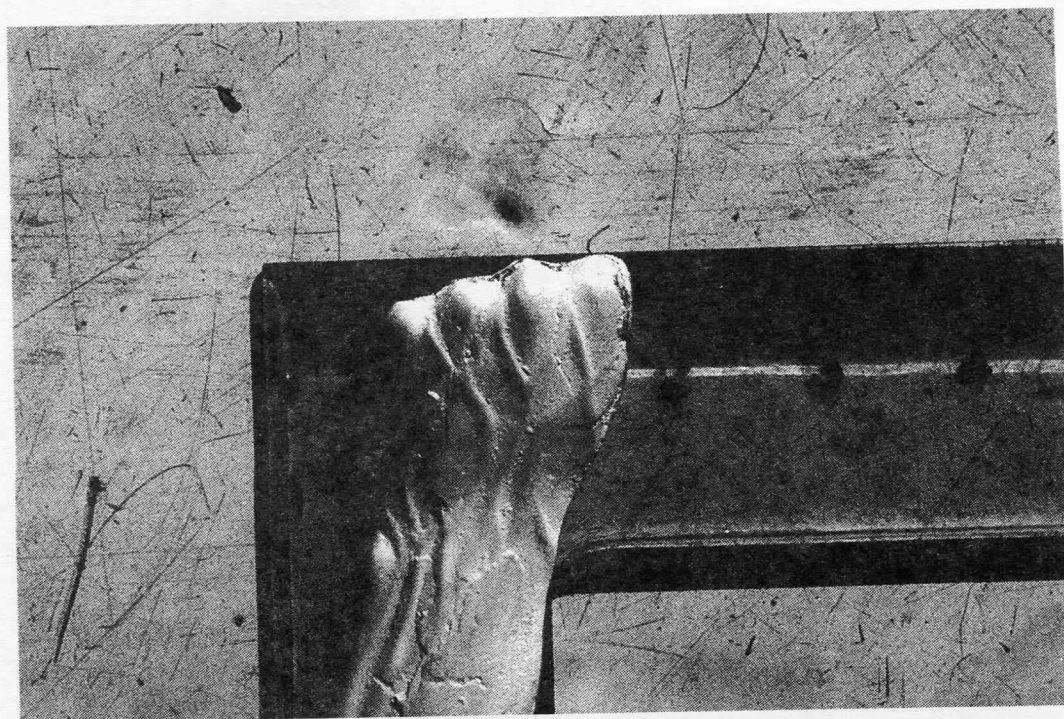
was a modular unit equivalent to one metrological fist (that is, the fist as a measure, equal to the width of palm + thumb or 1-1/3rd palms).¹² Thus, in his view, the fact that the clenched fist very commonly fits *exactly* in a grid square was not a consequence of the grid but its cause. If the fist was the grid's original and smallest unit of measurement, it had to follow that all further dimensions of the artistic canon could be deduced from this metrological fist. These claims have been vigorously disputed, most recently by Gay Robins in *Proportion and Style in Ancient Egyptian Art* (pp. 40-56) and it is certainly not my purpose — nor within my competence — to mediate between them. My intention is rather to show the results of testing the Egyptian grid model on the Palaikastro *kouros*.

The height of the *kouros* from the soles of the feet to the top of his stone headpiece has been restored to 49.9 cm (with an estimated 0.9 cm. gap for the missing waist) and the hairline falls at 48.4 cm above the soles of the feet. While the gap at the waist (as little as 0.0 or as much as 0.9 cm; n. 3 supra) makes discussion of height problematical, we are not so much interested in its original height as in the statue's internal proportions; thus, we tested each possible measurement *down* from the hairline and *up* from the soles of the feet to see which lines (if any) crossed meaningful points. When we construct a hypothetical grid of 18 equal parts from hairline to soles of feet (as in the Egyptian canon), the resultant grid unit lies between ± 2.6 -2.7 cm. Testing such a grid is simple and conclusive: if one has successfully recreated the original grid units, horizontal and vertical lines will mark a significant number of meaningful points. An 18-part grid built of ± 2.6 -2.7 cm modules, when superimposed on the *kouros*, fails to cross meaningful points, as it would have done on a canonical Egyptian statue. Not surprisingly, the proportions of the Minoan *kouros* do not match the first Egyptian canon.

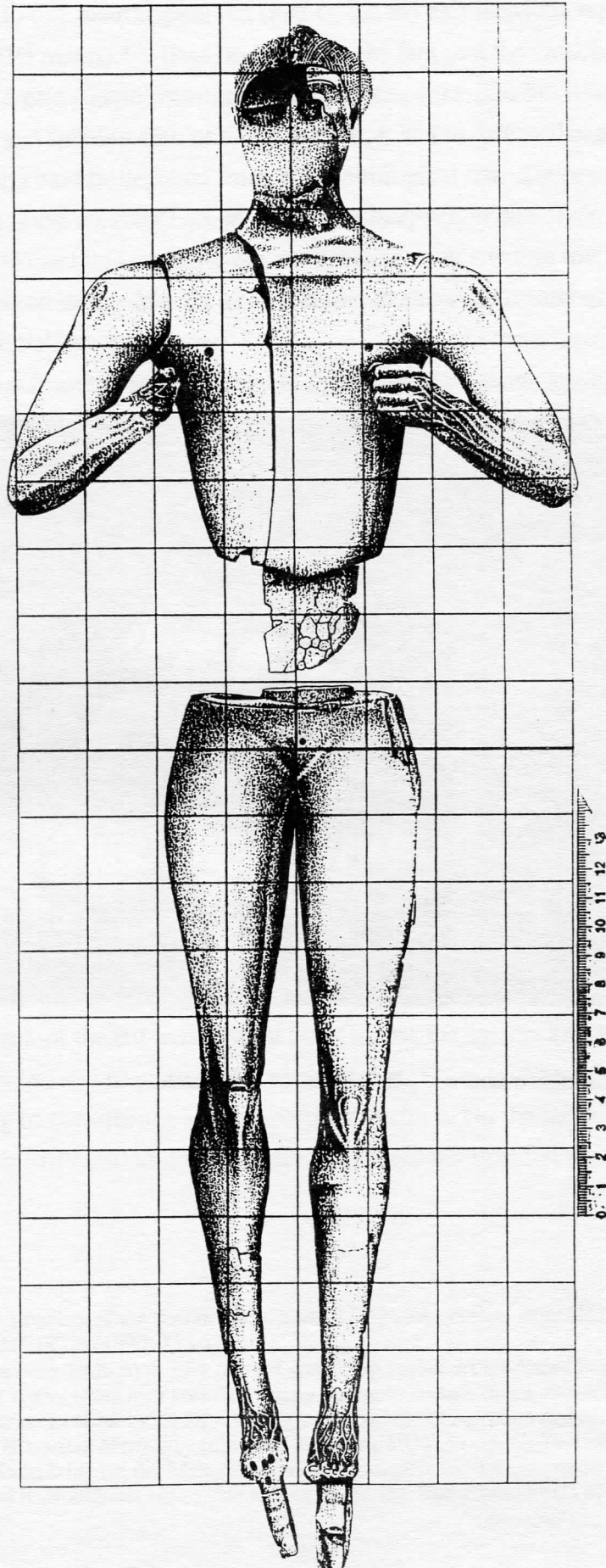
We next looked at the basic division of the cubit, the palm, measured across the back of the hand at the second knuckles and its derivative, the proposed metrological fist (palm + thumb).¹³ The statue's extant left hand is drawn with meticulous anatomical realism and can be accurately measured: the back of the fist at its widest point across the second knuckles (that is, equal to the width of one palm) is a fraction under <1.8 cm (fig. 1). A grid based on a palm of <1.8 cm also yields nothing of consequence so a proportional palm is not the modular unit. Adding the width of the thumb (0.49 cm) to the palm, gives us a hypothetical fist measurement

¹² For the proposed metrological structure of the canon, see Iversen, 27-38 and, perhaps more clearly, in E. Iversen, "Metrology and Canon," *MDIK* 46 (1990) 114-15.

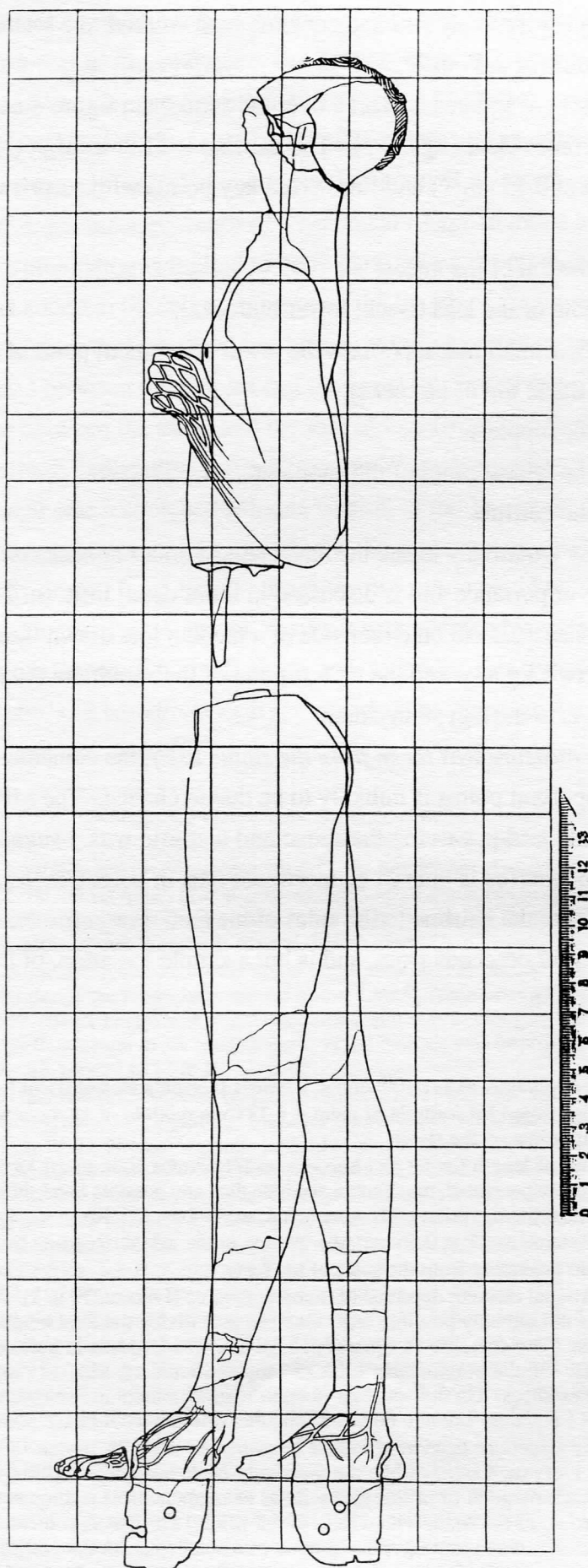
¹³ On the Egyptian palm measure (standardized at ± 7.5 cm, but surprising variations are found in extant wooden and stone measuring rods; votive stone rods seem especially eccentric in their divisions); see W.M.F. Petrie, *Ancient Weights and Measures* (London 1926) 38-40. A brief discussion of Egyptian and Near Eastern linear measures is A.E. Berriman, *Historical Metrology* (London/New York 1953) 51-55, 69-76; detailed measurements in R. Rottländer, "Fortschritte bei der Materialsammlung vormetrischer Längenmasse und deren Buchstabencode," in D. Ahrens and R. Rottländer eds., *Ordo et Mensura* II (St. Katharinen 1993) 85-107.



1. Palaikastro *kouros*: plaster cast of left hand.



2. Palaikastro *kouros*:
frontal view with
superimposed 2.3 cm-
square computer-
generated grid (drawing
M.S. Moak)



3. Palaikastro *kouros*:
left profile with
superimposed 2.3 cm-
square computer-
generated grid (drawing
M.S. Moak)

of <2.29 cm.¹⁴ Since it is hardly likely that ancient craftsmen worked to a tolerance of under 1 mm, we tested a grid module of 2.3 cm.¹⁵

When a grid of 2.3 cm squares is placed over the statue, the figure's underlying structure immediately becomes clear (figs. 2-3). The hairline is 21 units high (NB: with the estimated gap at the waist at 0.55 cm¹⁶) and lines cross key points with surprising precision. On the horizontals:

Line 6 - the top of the knees;

Line 10 - join of the legs (Back: lower buttocks);

Line 11 - two small holes, perhaps the lower attachment point of a Minoan codpiece (Back: top of buttocks);

Line 17 - the nipples;

Line 18 - the widest point of the shoulders;

Line 21 - the hairline.

In addition, we may tentatively locate the navel (Back: small of back) on Line 13, as this suggestion is of some importance and is discussed in more detail *infra* (n. 21).

On the verticals (lines ± 2.3 cm on either side of a median line drawn through the join of the legs): the armpits are two squares and the widest point of the shoulders three squares from the median line, the same as in the Egyptian canon.

Since *the modular measure was taken from the statue itself*, the coincidence of grid lines crossing so many important points is unlikely to be due to chance. The Minoan craftsman had clearly used a geometric grid in carving the statue and that grid was, I suggest, based on the proportional fist.¹⁷ The *kouros* is thus 21 proportional fists in height, measured (as on the Egyptian canonical grid) from the hairline to the soles of his feet. Furthermore, it seems highly likely that this 21-module grid descends from, and is but a simple variation, of the proportional grid of the first Egyptian canon.

¹⁴ The statue's thumb is thus equivalent to 1-1/10th digits, whereas Iversen's metrological fist takes the thumb as 1 1/3rd digits. We also tested his formula of palm x 1.33 for a module of ± 2.4 cm which, however, does not cross many significant points on the statue.

¹⁵ The minimum Egyptian unit of length (as far as I know) was 1/16th of a digit, or ± 0.12 cm. Note that the grids used for my tests are computer-generated, much more accurate than any possible hand-drawn grid, whether ruled or marked by strings (on how the Egyptian grids were made, see Robins, 26-30).

¹⁶ This gap is dictated by the statue itself: at 0.55 cm., the 9th line of the grid descending from the hairline overlaps the 12th line of the grid ascending from the soles of the feet.

¹⁷ That is, the fist as a proportional element deprived of numerical value (Iversen, 30 n. 1). While the 21-fist grid is the best fitting grid, it is not the only possible one. One can also divide the total height of the statue from *top of its headdress* to base (49.9 cm) into 18 squares of ± 2.8 cm, which results in horizontal and vertical lines crossing significant points. On the horizontals: Line 15 - top of shoulders; Line 14 - nipples & armpits; Line 9 - two dots; Line 5 - top of knees. On the verticals (though without a median line): armpit to armpit = 3 squares; shoulder to shoulder = 5 squares. I doubt, however, that this solution would have been attractive to the craftsmen because it requires the serpentine headdress and the ivory face to share the frontal 18th square: Line 17.5 would mark the top of the ivory (n. 4 *supra*) while the separately-made headpiece would have had a frontal measure of 1/2 square. The relatively good fit of this grid reflects its mathematical relation to that of 21-fists to the hairline (+ 1/2 fist to the crown of the head) with a ratio of 6:5 (21.5:18). This is coincidentally the same 6:5 ratio obtaining between the second and first Egyptian canons with somewhat similar consequences for grid lines; Robins, 164-66; Iversen, 75-78, pls. 30-31.

The vertical divisions are perfectly in accord with the Egyptian canon. The length of the statue's left forearm, too, maintains the distance from elbow to wrist (6.9 cm) = 3 squares in conformity with the original Egyptian $2/3^{\text{rds}}$ measure (4 palms = 3 fists; see *supra*).¹⁸ On the horizontals, the Minoans have obviously added three grid modules to the Egyptian 18-unit grid in order to create their ideal elongated male figure. It is interesting to see how the artist smoothly transformed the appearance of a canonical Egyptian into a Minoan image. The Minoan statue's elongation is limited to body parts below the nipples and above the knees.¹⁹ One square was added to the thighs, increasing the length of the upper legs from three to four squares.²⁰ Assuming that the navel has been correctly restored at Line 13,²¹ the second square was added between the nipples and the navel (increased from three to four squares) and the third square between the navel and the join of legs (from two to three squares).

The simplest explanation for the resultant image is that the 21-square grid used for carving the *kouros* was a stretched Minoan version of the 18-square grid underlying the first Egyptian canon of proportions. Consequently, the grid must originally have been imported (whether directly or not) from Egypt. Since the procedure could not be deduced from finished images, it seems reasonable to accept, firstly, it was adopted by craftsmen who learnt its use from Egyptian (or Egyptian-trained) artists and, secondly, this transfer could only have taken place in a sculptor's or wood/ivory carver's workshop, where artists were accustomed to work with three-dimensional grids.²²

¹⁸ Note that the statue maintains the elbow-wrist distance at three squares though this is not in harmony with its elongated proportions, which gives the forearms a slightly stunted appearance.

¹⁹ On both the Egyptian and proposed Minoan grid, the nipples are placed four lines below the hairline (on the *kouros* at Line 17; on the Egyptian grid at Line 14); the top of the knees is at Line 6 on both grids. It should be noted that the *kouros*'s nipples (unlike those in the Egyptian canon) are positioned quite unnaturally on the same line as the armpits rather than, as is natural, below them.

²⁰ A similar canonical lengthening of the upper leg is seen later in the 18th Dynasty (n. 9 *supra*); at the same time, the lower border of the buttocks is moved above Line 9, sometimes as high as Line 10; Robins, 87, fig. 5.2-4. Since the 18-square height was maintained, the result was to elongate the legs at the expense of the torso, now reduced from seven to six squares high; visual balance was improved by commonly extending the top of wigs from Line 18 $1/2-3/4$ to Line 19.

²¹ The navel on this line finds support on more complete LM I Minoan and Thera male figures set on hypothetical 21-unit grids (J. Weingarten, "Measure for Measure: What the Palaikastro *Kouros* can tell us about Minoan Society," in W.-D. Niemeier and R. Laffineur eds., *Politeia: Society and State in the Aegean Bronze Age I* (Aegaeum 12, Liege 1995) 249-64; this restoration also fits the its natural distance below the armpits.

For 'Golden Section' analyses, the navel on Line 13 yields a nearly perfect ratio of 13:21 (0.619 compared to an ideal 0.618) and both numbers 13 and 21 are in the Fibonacci Series. This would make the Minoan golden section ratio closer to this ideal than the Egyptian navel:hairline ratio of 11:18 (0.611), of which neither number is in the Fibonacci Series; see B. Kemp and P. Rose, "Proportionality in Mind and Space in Ancient Egypt," *CAJ* 1 (1991) 104, 107-109, with their cautious conclusions, pp. 126-27. NB: since these ratios exclude the crown of the head, the coordinates are not exactly comparable to those later used by Vitruvius for his spread-eagled 'man in a circle' (*De Architectura* III, i); for the same reason, the navel would not be quite the centre of an ideal Egyptian or Minoan male. A restoration of the Vitruvian canonical grid (also with a drawing of Leonardo Da Vinci's improvements) in B. Müller-Huber, in E. Berger, B. Müller-Huber and L. Thommen eds., *Der Entwurf des Künstlers: Bildhauerkanon in der Antike und Neuzeit* (Basel 1992) chapt. 7 and fig. 39. On a Fibonacci-like series in the Late Bronze Age, see K.M. Petruso, "Additive Progression in Prehistoric Mathematics: A Conjecture," *Historia Mathematica* 12 (1985) 101-106.

²² While the canon of proportions was the same for sculptors and painters, the technical consequences were different. A painter drew a figure's outline on a two-dimensional grid and kept his guidelines visible until he filled in the body colours and only then painted over them. A sculptor, on the other hand, blocked out a three-dimensional grid with an outline of the figure on each surface of the stone; as his work progressed, the

Current evidence does not even allow a guess as to whether this borrowing was the result of a single event or of repeated encounters between Minoan and Egyptian (or Egyptian-trained) artisans.²³ No more can we ascertain whether the Minoans intentionally drew a structural connection between a metrological palm+thumb and the grid module.²⁴ Yet the fact that the palm+thumb (= the calculated fist) was used as the basic grid unit on this statue does suggest a conceptual awareness of the module and perhaps a determination to conform to a Minoan standard. At the very least, the use of a fist module might be thought to argue against an independent Minoan metrological system based on a 'Minoan foot' and for the reintegration of Crete into the Egyptian-Near Eastern community of cubit-based metrology.²⁵

Indeed, the *kouros* himself is a monument to the attraction of the East: while its hippopotamus ivory is the tangible precious import, its modular structure is proof of some intellectual borrowings as well. On one level, of course, the proportional grid is an artist's tool but, on another, it functions as a geometric model for the conceptualization of space. In Egyptian royal workshops, that took the shape of an ideal male figure, a social and cultural construct. Of course, we do not know to what extent working artists understood the ideology underlying ideal proportions.²⁶ Still less can we judge if the Minoans adopted any beliefs

guidelines were cut away with the stone. Sculpture in the round also did not follow all conventions of painting and relief: when a sculptor sketched the side of a figure on the side of his stone, he drew it with both shoulders shown in correct profile; C.C. Edgar, "Remarks on Egyptian 'Sculptors' Models," *RecTrav* 27 (1905) 137-50.

The Palaikastro *kouros* steps forward with his left foot, as would any Egyptian canonical statue (and as will the archaic *kouroi*, n. 27 *infra*; but given a single statue, the odds are 50-50%). Schäfer, 322-23 explains this convention as a result of the Egyptian preference for figures walking to the right, with the blocked left side of the statue of lesser importance (his pls. 86-87 clarify this point).

²³ Current evidence does suggest the grid had been acquired by LM IA, Weingarten (*supra* n. 21) and possibly a good bit earlier. Thus, a 21-unit grid is not necessarily the original importation. Rather, one imagines that the Minoans had first taken over an 18-unit grid for major male figures, gradually adapting it to Minoan artistic requirements. In this, I suggest, the process mirrors that of the Egyptian demon Taweret: still Egyptian-looking in MM IIB, gradually Minoanized during MM III, changed into a true 'Minoan Genius' in LM I; J. Weingarten, *The Transformation of Egyptian Taweret into the Minoan Genius: a study in cultural transmission in the Middle Bronze Age* (SIMA 88, Partille 1991); and E. Hallager and J. Weingarten "The Five Roundels from Malia with a Note on Two New Minoan Genii," *BCH* 117 (1993) 1-18.

²⁴ One Egyptian artist may have constructed a 'scaled' palm/fist grid: on an early 12th Dynasty stela from Naga ed-Der in northern Upper Egypt, surviving horizontal gridlines suggest a total of 23-1/2 squares from the male figure's hairline to soles of his feet; see R.E. Freed, "A Private Stela from Naga ed-Der and Relief Style of the Reign of Amenemhet I," in W.K. Simpson and W. Davis eds., *Studies in Ancient Egypt, the Aegean, and the Sudan: Studies in Honor of Dows Dunham* (Boston 1981) 70 fig. 2. However, Robins, 81, fig. 4.15, is able to superimpose a hypothetical, entirely canonical 18-square grid on the stela. This reconstruction lends some support to Iversen's model of the metrological fist in the Middle Kingdom canon: if the fist = 5 1/3rd digits, 18 x 5.33 = 95.94 digits; compare a palm of 4 digits, 23.5 x 4 = 94 fingers, a difference of only two proportional digits.

²⁵ A Minoan foot of 30.36 cm was advanced by J.W. Graham, *The Palaces of Crete* (Princeton 1969) 222-29, but more recent statistical analysis of Graham's data suggests a unit of ± 46 cm; see J. Cherry, "Putting the best foot forward," *Antiquity* 57 (1983) 52-56. On possible shorter and longer Minoan cubits of ± 54 and ± 66 cm, see D. Preziosi, *Minoan Architectural Design: Formation and Signification* (Berlin/New York/Amsterdam 1983) 489-93. Preziosi also proposed that two wooden measuring rods from Lahun, which W.M.F. Petrie thought exhibited non-Egyptian measures, might be Minoan cubit rods (pp. 490-93). Their divisions (averaging ± 10 cm) could indeed indicate fist measures but there is now some evidence that they are not of Minoan origin; C. Simon, "Le *nbi* et le canon de proportions," *JEA* 79 (1993) 157-77, suggested that they are, in fact, indigenous Egyptian *nbi* measures used by draftsmen for setting out fist-sized grid squares (I hope soon to publish the evidence showing that these rods, although not Minoan, are most unlikely to be Egyptian either).

²⁶ I use 'ideology' in its weak sense, as half-formulated beliefs and assumptions, in this case relating to prestige and prerogatives. I do not think it anachronistic to claim that master artists, those who were chiefs of

along with the proportional grid, though it is difficult to imagine that the original travellers would not have been exposed to this ideology when they came to learn and understand the technique. The artist who carved the *kouros* was not alone in utilising the 21-module grid (n. 21 supra) but whether Minoan artists would have used it as a creative jumping-off point as did archaic Greek artists a millennium later is not a question for archaeology or for any number of measurements:

“For one half of the [wooden cult statue of Pythian Apollo] was worked by Telecles in Samos, and the other half was finished by his brother Theodorus at Ephesus; and when the two parts were brought together they fitted so perfectly that the whole work had the appearance of having been done by one man. This method of working is practised nowhere among the Greeks, but is followed generally among the Egyptians. For with them the symmetrical proportions of the statues are not fixed in accordance with the appearance they present to the artist’s eye, as is done among the Greeks, but as soon as they lay out the stones ... they take the proportions, from the smallest parts to the largest; for, dividing the structure of the entire body into twenty-one parts and one-fourth in addition, they express in this way the complete figure in its symmetrical proportions.” (Diodorus I. 98, trans. C.H. Oldfather, *Loeb* ed.).

Diodorus erred in thinking that the two sons of Rhoecus were the only Greek sculptors of *kouroi* to have adopted the modular grid.²⁷ But he was quite right in pointing to the Egyptian origin of the system, in this case, to the proportions of the second Egyptian canon (21 1/4-squares). And even the indefatigable Diodorus could hardly have guessed that a still earlier sculptor had similarly found the means of perfect proportions in royal workshops across the ‘Great Green.’

royal workshops or of crews of artisans, would have been aware that canonical portrayal was among the dignities due to deities, royals and nobility. For the canon as an expression of elite power in a stronger sense, see W. Davis, *The Canonical Tradition in Ancient Egyptian Art* (Cambridge 1989) chapt. 7.

²⁷ E. Guralnick, “The Proportions of Kouroi,” *AJA* 82 (1978) 461-72, employed cluster analysis to compare the proportions of 17 *kouroi* with eight statues of the second Egyptian canon and living Greek, Turkish and Italian men; she found five of the *kouroi* (late 7th to late 6th centuries B.C.) were made in accordance with the Egyptian second canon while another three had similar proportions (pp. 469-70). A later study, using profile analysis, demonstrated the evolution of *kouroi* away from this adaptation of the Egyptian canon towards an idealized human figure; see her “Profiles of Kouroi,” *AJA* 89 (1985) 399-409.

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Studies in Honour of Martha Rhoads Bell

Volume II

edited by

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with

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Martha Rhoads Bell
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