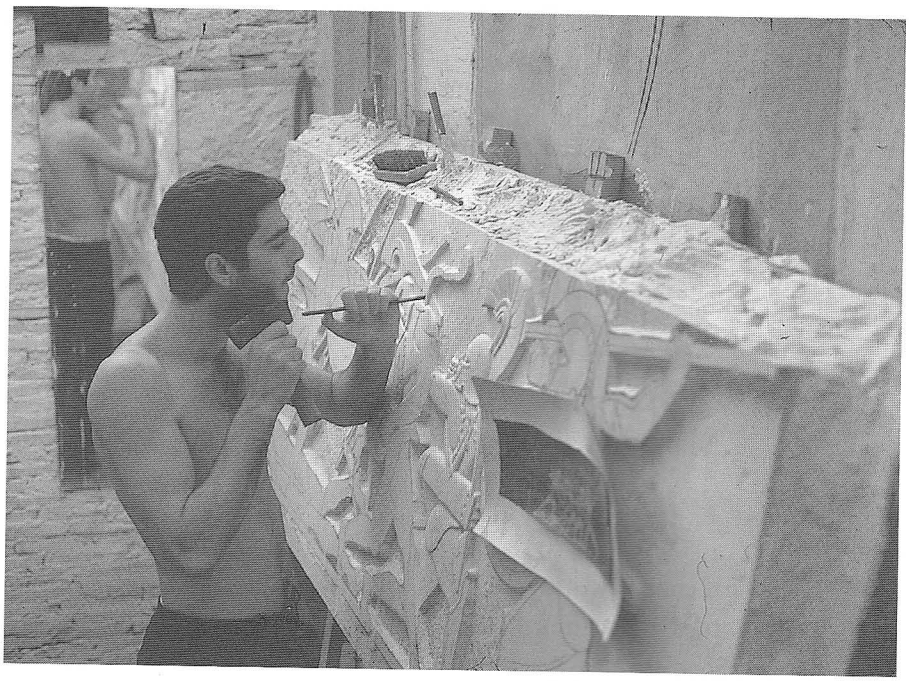
WORK SECTIONS AND REPEATING PATTERNS IN THE PARTHENON FRIEZE

JOHN G. YOUNGER

The Parthenon and its sculptures are often studied as works of art; often, too, it is assumed that master sculptors did all the work, and many scholars have focused on identifying these (*Meisterforschungen*) and relating them to the known Athenian sculptors working in the mid fifth century BC. Pheidias, however, may have actually produced relatively few of the extant sculptures, if the Erechtheion building accounts are any guide (Paton 1927; Randall 1953); these mention common citizens, resident aliens, and slaves who sculpted the Erechtheion's frieze.

A close technical study of the Parthenon's frieze reveals many details of the sculpting process, and these suggest gangs of workers working from prepared sketches, transferring cartoons, repeating figures and poses, and making mistakes and rectifying them. This paper attempts to recreate the process of sculpting the Parthenon's frieze; it is based on many hours I spent alone in the Duveen Gallery of the British Museum[1] and on separate studies of modern Greek sculptors at work in their Athens studios, like Pavlos Samios in Pangrati (Fig. 3.1) and Vassily Arvanites on Anapauseas Street. The techniques of these modern artists for making relief sculpture are basically the same as those that can be reconstructed for classical sculpture – little apparently has changed in sculpting relief since antiquity.

To prepare the marble slab for the sculpture, the sculptor smoothes its surface but allows a comfortable margin of blank stone at either end of the block, flanking the area to be carved (some margin is also left at the top and bottom: Neils 2001, fig. 58). These side margins allow the slab to be set in place with minimum risk to the edges when it is pried into position. Such margins



3.1. Pavlos Samios sculpting a frieze based on the Siphnian Treasury, 1972. Photo by the author.

can be seen on architectural blocks of unfinished buildings (e.g., the temple to Nemesis at Rhamnous), and they can be inferred from the often rough and deep chiseling by which they were removed in the final finish (e.g., at the right edge of North XLII/47[2] [Neils 2001, fig. 26] and the left edge of West XVI [Neils 2001, fig. 39]). In sculpted friezes, once the slabs are set in place on the building, the sculptors can then sculpt away the margins. Or if the slabs contain integral scenes already sculpted on the ground, as in the Parthenon's west frieze, the carvers will sculpt minor details from the margins, such as horse hooves, drapery, or feet. If all the slabs, however, are still entirely blank when set on the building, as in the Parthenon's north frieze, the entire composition will be carved across the joins, and the margin areas will receive elements just as important to the entire composition as those in the central sections of each slab (human heads, however, tend to respect the join).[3]

To create the sculpture, the sculptor prepares a sketch ("cartoon"), which he then lays out according to a grid, and he grids the marble blank within the reserved side margins (today in pencil and in antiquity with red ochre [miltos] or charcoal similar to that attested in literature).[4] The sculptor then copies the sketch to the marble, drawing in each grid on the marble the pattern drawn in

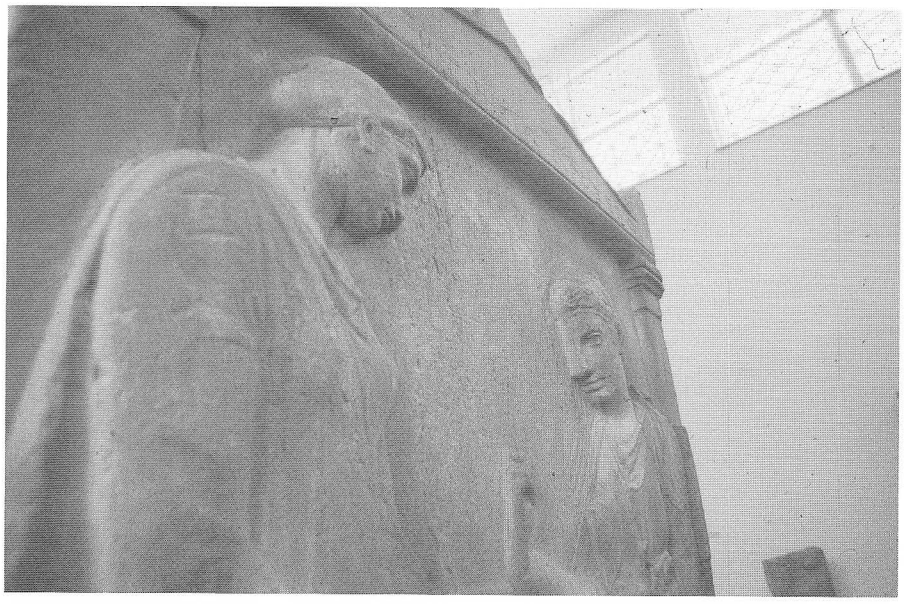
3.2. Unfinished Roman sarcophagus behind the Red Building, Pergamon, Turkey. Photo by the author.

each grid on the sketch. In the first stage of the sculpting process, the sculptor carves the background down and away from the sketched profile lines. The figures thus stand out from the background like cut blanks.

This process of sketching and then cutting the background away is very old. We see it first in the Bronze Age: the well-known stele from Mycenae Shaft Grave V, *c.* 1550–1500 BC, carries a chariot racing over a fallen warrior almost totally concealed by his cut-blank figure-eight shield (Younger 1997, esp. 235–6).

We can infer the same process in later antiquity: an unfinished sarcophagus of Roman date at Pergamon (Fig. 3.2) carries finished rosettes and swags as well as blank templates that were never finished (cf. the unfinished relief from the Archaic sanctuary of Artemis Orthia, Sparta, depicting a flat cut-out warrior against a removed background; Bluemel 1969, fig. 56). More interesting, perhaps even shocking, is the famed Hegeso stele (Fig. 3.3); viewed from the side, the figures reveal how the background was sharply cut back perpendicularly from the blank stone – the figures stand out from the background like cut cookies.

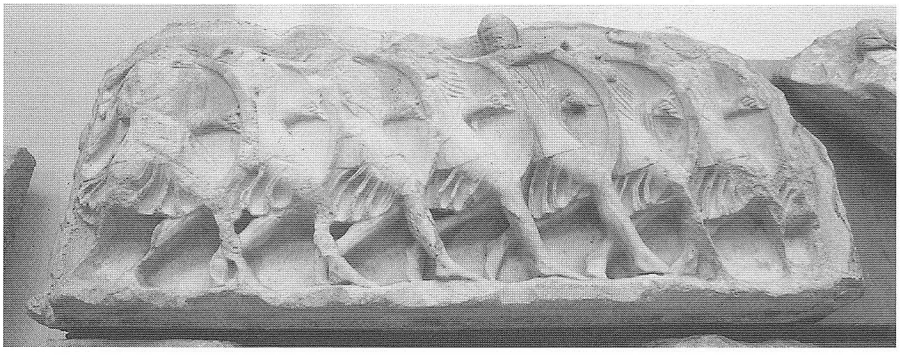
Sculpting is hard work, and sculptors tend to avoid unnecessary effort. It is common, for instance, to find the backs of pedimental sculpture unfinished, even merely blocked out (e.g., Olympia and the Argive Heraion).[5] For relief



3.3. Tombstone of Hegeso seen from the side, National Museum, Athens 3624. Photo by the author.

sculpture, economy demanded time-saving devices, like repeating figures in similar poses. Many monuments, however, must employ a string of figures in different poses, like the individually posed gods in the Parthenon's east frieze (Neils 2001, fig. 76). But amongst many strings of different figures we can often discern repeating pairs. In the Siphnian Treasury's north frieze, for instance, we can discern the repeated figures of Artemis and Apollo and the duplicate (rather, triplicate) giants they are attacking.[6] Where possible, however, sculptors will often employ repeating figures, sometimes repeated right next to each other (I term this process "dittography").[7] Obvious examples include the walking soldiers on the late Archaic Hockey-Player base (Neils 2001, fig. 35) and the procession of running figures in the late fifth century Nereid frieze (Fig. 3.4). A more subtle example occurs in the dittographed figures of three maidens in another late Archaic frieze, the Harpy monument (Fig. 3.5), whose only variation lies in which arm holds the flower.

Another type of dittography (repeating designs set next to each other) is found in recurring fold patterns in garments. A good example occurs in the Parthenon's north slab VI/6 (Fig. 3.6); the folds of the himation across the lower leg of all three youths are almost exactly the same: a long fold cuts just below the knee, two more break at mid calf and just above the shin, while the lowest fold joins the hem. These identical fold patterns could have been freely

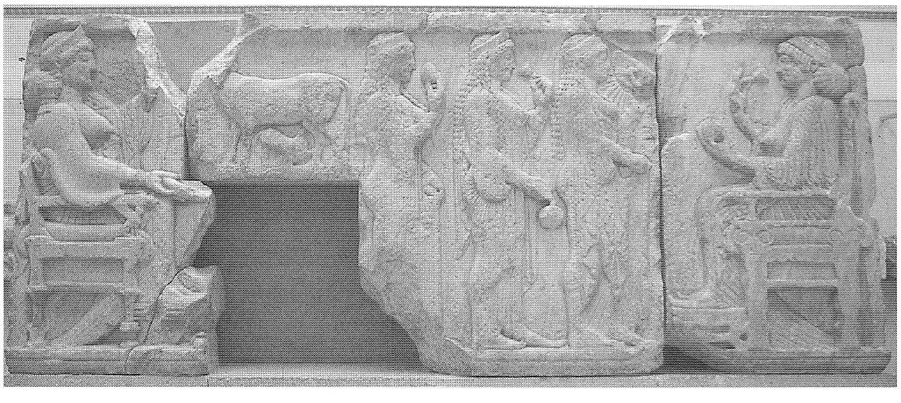


3.4. Nereid monument, frieze block 860, British Museum. Photo by the author.

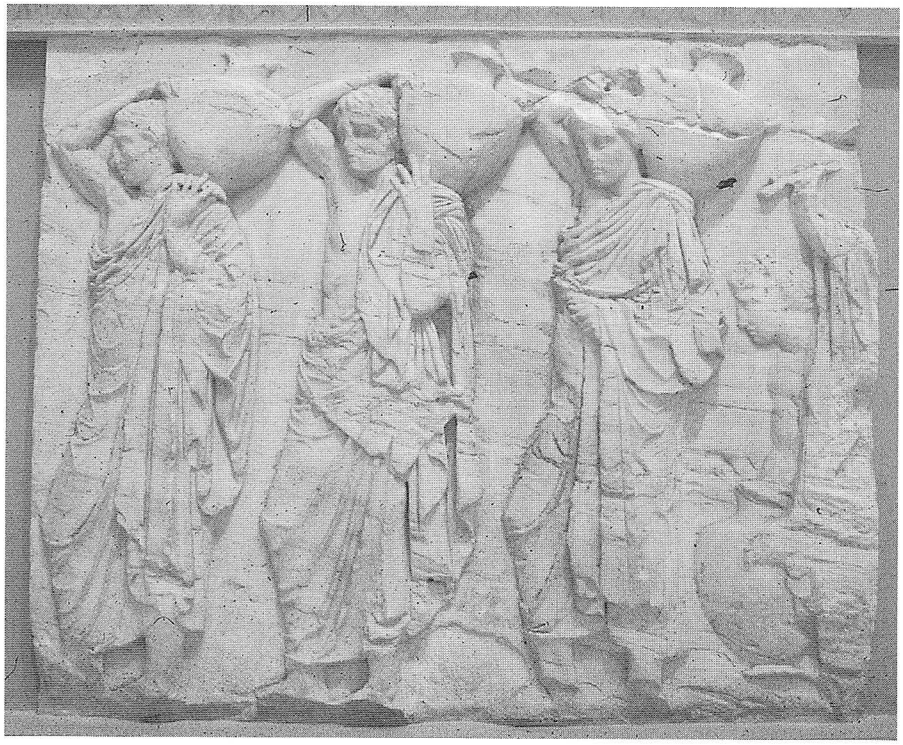
sketched on the blank marble, relying on some kind of mental or conceptual pattern; the areas around the sketched folds would have been carved down and away from the sketch lines – the folds therefore are simply the areas below the sketch lines left raised on the blank marble surface.

For long reliefs, sculptors seem to have worked up one section separately from another, with a space of blank marble as a buffer zone between them; the blank buffers would eventually be sculpted with some transitional figure. These work sections hypothetically could consist of a discrete compositional unit separated by a small amount of blank space from another section, thus allowing different teams of workmen to work separately without interference, even if side by side.

Many work sections must have been simply discrete iconographical units; in the Harpy monument (Fig. 3.5), the various sections can be identified by their differences in composition and scale and by the physical features that separate them (e.g., the passage into the tomb). The frieze from the early Archaic temple



3.5. Harpy tomb, west side, British Museum. Photo by the author.



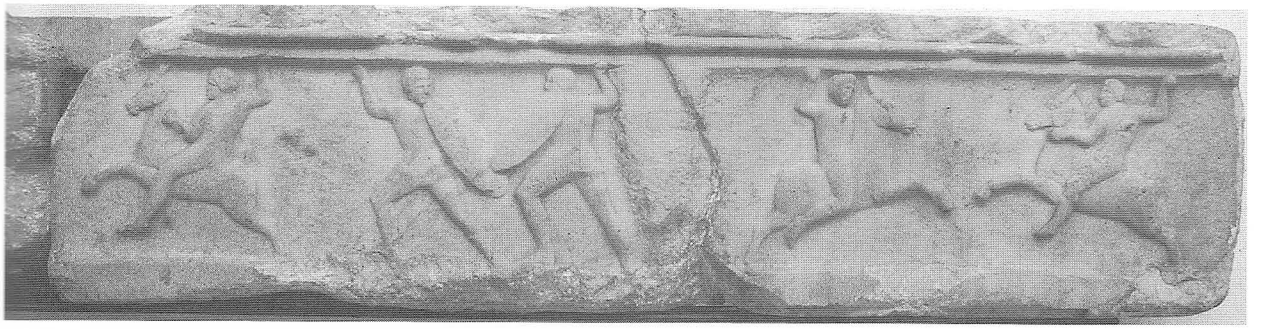
3.6. Parthenon frieze, North VI/6. Photo by the author.

to Athena at Assos employs similar differences in iconography and scale as well separating features, such as a blank area later transformed into the tail of the Old Man of the Sea that Herakles wrestles.

In a long frieze like that of the Parthenon, it would have made good sense to have several gangs of workers working on different areas of the frieze concurrently, each section divided from the others by blank buffer areas to be carved later – one such, on the Nereid monument (Fig. 3.7), was never carved. These gangs would resemble the ones consisting of roughly four to six men hypothesized by A. Trevor Hodge (1975) for laying ashlar courses of masonry.

We can easily identify several of these buffers in both the north and the south friezes. In the south frieze, two open areas in the cavalcade, at the end of South XVI (Fig. 3.8) and in the middle of South XIX (Neils 2001, fig. 142), each preceded by the same horse and rider, probably betray the presence of blank buffers that never received figures; compare the similar open area in North VIII/8 that separates kithara players (Neils 2001, figs. 107–8).

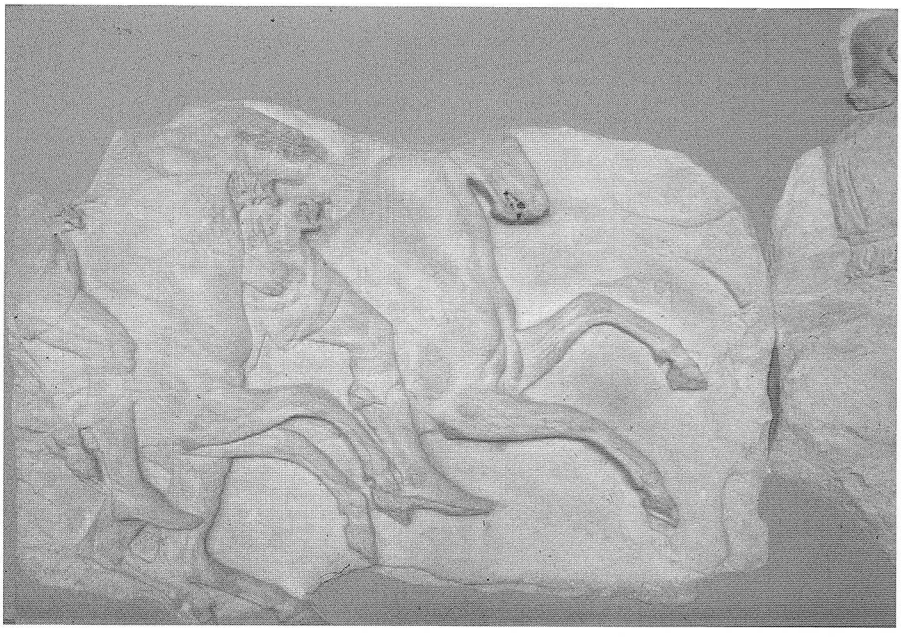
Other buffer areas, however, were filled in. In the chariot section of the north frieze, we can identify these because the several buffers were filled in



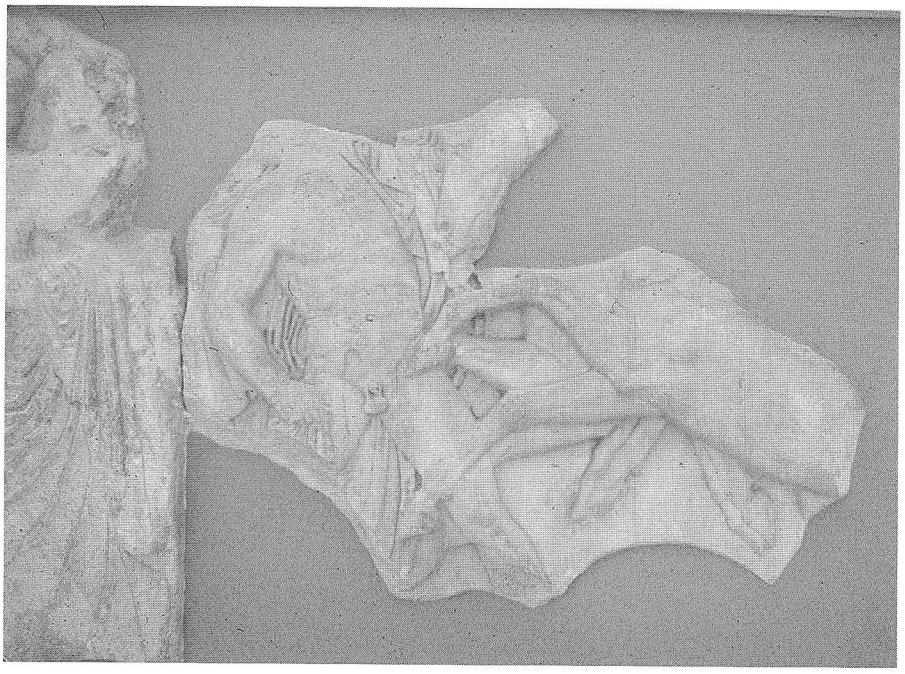
3.7. Nereid monument, frieze block 894, British Museum. Photo by the author.

with identical figures, men striding left in poses where their legs look like lambdas (one leg outstretched, the other bent). These recur on extant slabs North XI/11.44 (Fig. 3.9), XII/12.47 (Fig. 3.10), XVII/23.65 (Fig. 3.11; Neils 2001, fig. 103), and XXIV/29.74 (Fig. 3.12). We can discern a similar break between work sections in XXII/27, between the warrior with shield (figure 71) and the standing groom (figure 72). More such buffer figures may have existed in the lost slabs of this section (as Neils conjectures for XX/25).

These buffers figures look like typical transition figures, awkward in their pose and compositionally jarring; note how the juxtaposition between them

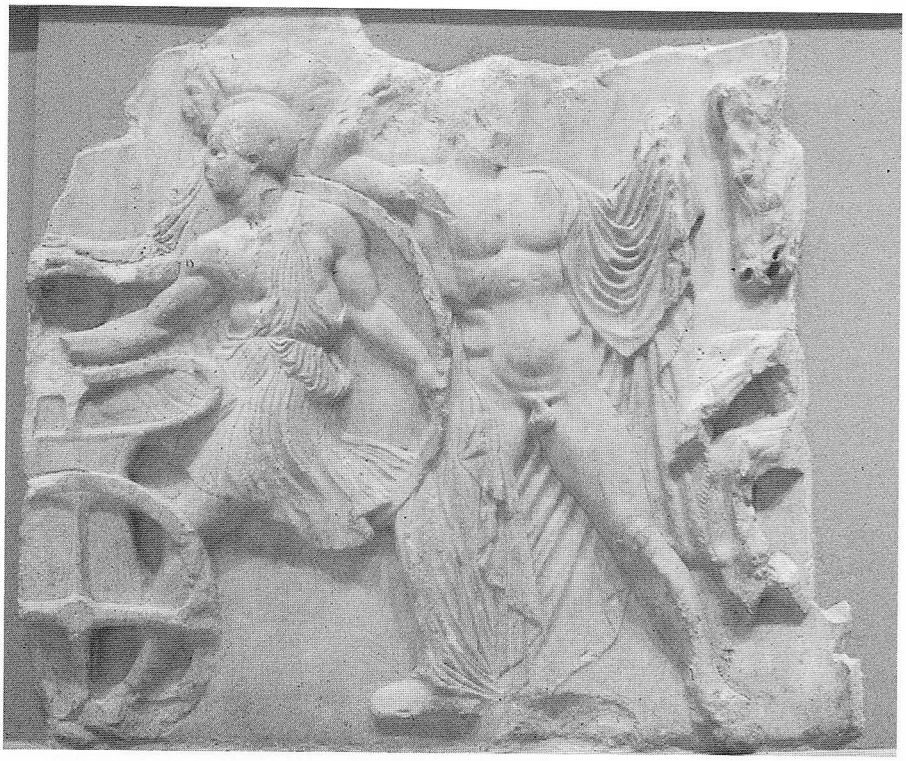


3.8. Parthenon frieze, South XVI. Photo by the author.



3.9. Parthenon frieze, North XI/11. Photo by the author.

3.10. Parthenon frieze, North XII/12. Photo by the author.

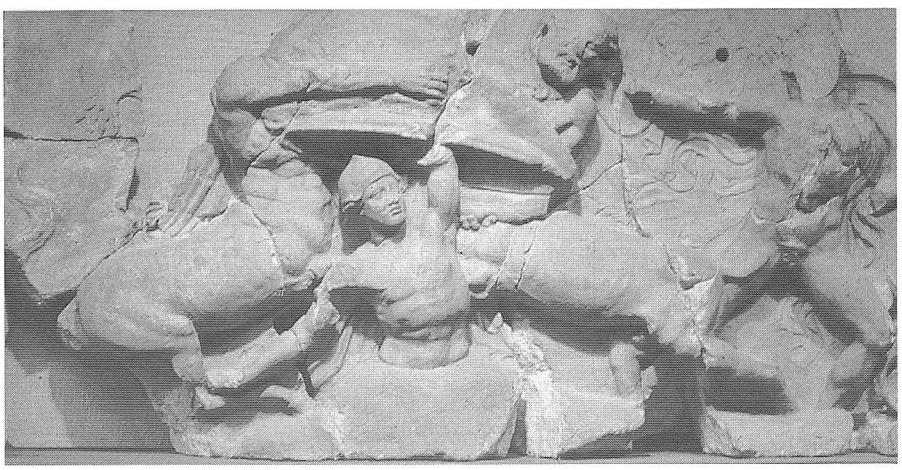


3.11. Parthenon frieze, North XVII/23. Photo by the author.

3.12. Parthenon frieze, North XXIV/29. Photo by the author.

3.13. Bassae frieze, British Museum 536. Photo by the author.

and the figures around them seems cramped, as if the blank buffer space left between work sections was actually insufficient for the figure. In North XI/11, horse forelegs cross over figure 44's left thigh; in North XVII/23, figure 65's entire proper right side fits snugly against the shield of figure 64, conforming to its outline; and in North XXIV/29, figure 74's shield cuts off the horse's one foreleg. In the chariot section, of the south frieze, figure 63, which stands in



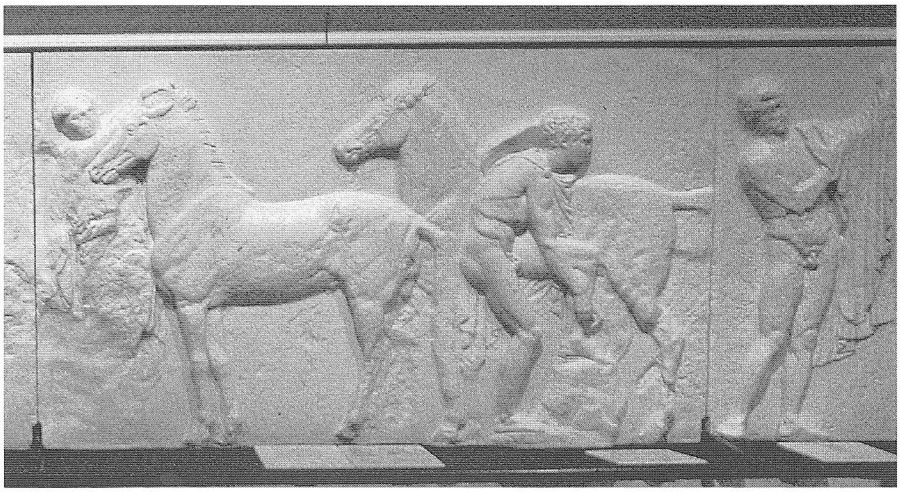
3.14. Bassae frieze, British Museum 530. Photo by the author.

3.15. Parthenon frieze, West VI, British Museum cast. Photo by the author.

the foreground at the left edge of South XXV, looks like a carved buffer (cf. South XXVI.66).

We can hypothesize that the lambda figures who occupy the buffer zones between work sections were formed from a single pattern that could be transferred from one section of the frieze to another. To understand how these patterns might have worked, we need to see some more examples of figures that repeat in widely separated areas. For instance, in the temple to Apollo at Bassae, near the middle of the east frieze, on slab 536, a wounded warrior kneels, one leg stretched out in front of him, his left hand holding his shield above his head to protect him from the Amazons that flank him (Fig. 3.13). The same figure appears diagonally opposite the cella on slab 530 near the middle of the west frieze: Kaineus holds his shield above his head while the earth, in outline the same as the legs of 536's warrior, rises to engulf him (Fig. 3.14).

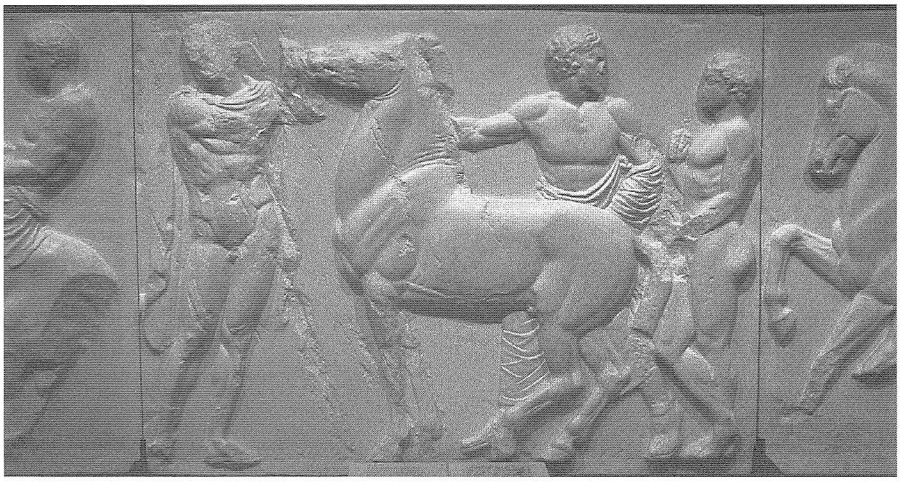
In the Parthenon's west frieze, two sandalbinders, West VI.12 (Fig. 3.15) and West XV.29 (Fig. 3.16), are almost twins, the only difference being the



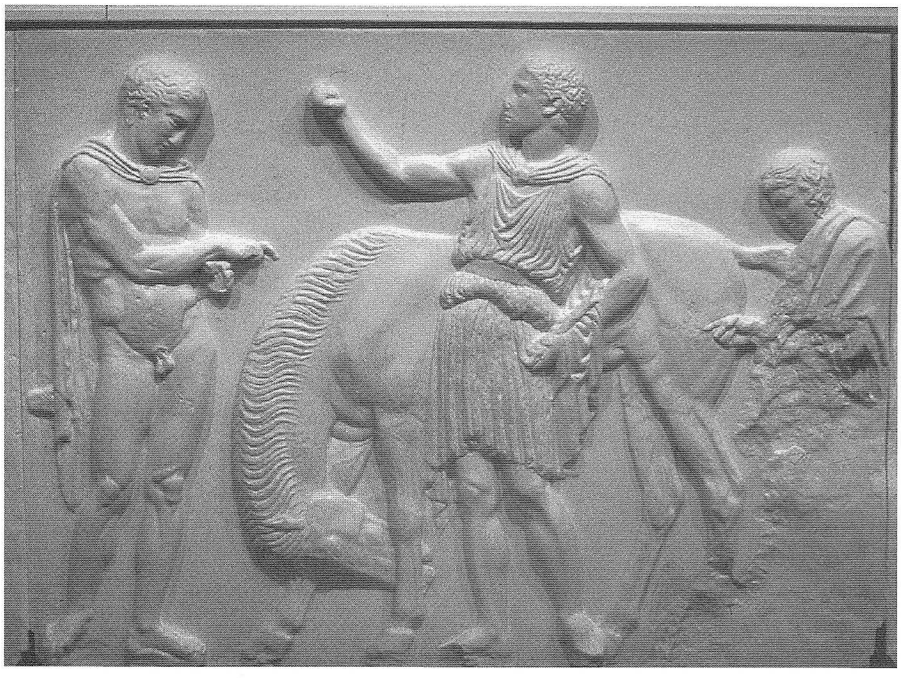
3.16. Parthenon frieze, West XV and XVI, British Museum casts. Photo by the author.

slightly more compressed form of the latter figure. The two sandalbinders anticipate porch columns 3 and 6, as the young squires in West III.6 (Fig. 3.17) and XII.24 (Fig. 3.18; Neils 2001, fig. 90) anticipate columns 2 and 5.[8]

For these duplicated figures we can envision a basic sketch that is transportable and transferable. The sketch might have consisted of an outline of the figure (as in the case of the Bassae figures), which, once transferred to the stone, could be redrawn and varied. Such an outline sketch would be convenient for conveying the basic pose and proportions of the figure. The sketch itself might have been a cartoon of these compositions drawn thickly in charcoal or miltos



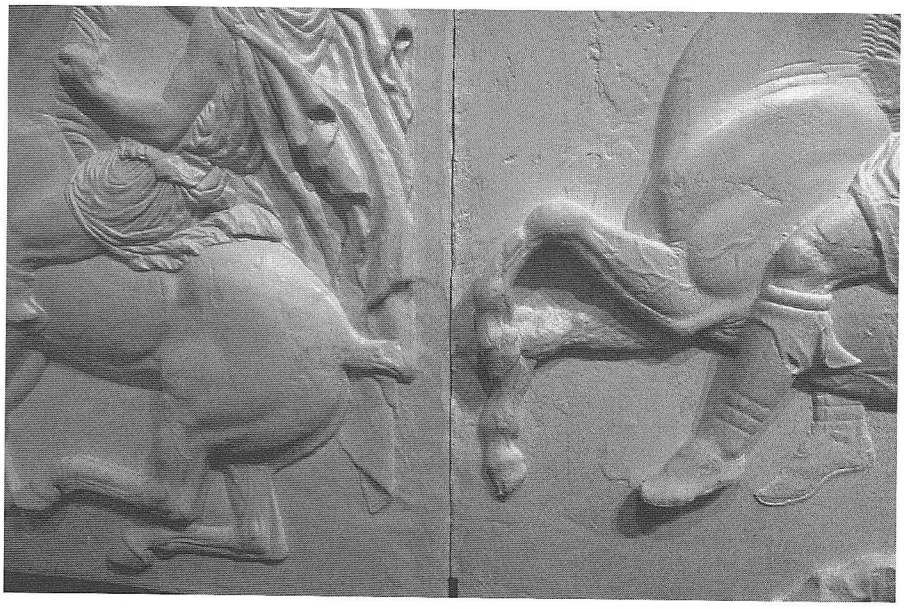
3.17. Parthenon frieze, West III, British Museum cast. Photo by the author.



3.18. Parthenon frieze, West XII, British Museum cast. Photo by the author.

on papyrus or perhaps vellum. The sketch would be moved from one block to another, and the drawn design would be rubbed onto the blank marble and then redrawn to vary the figure and to strengthen the design. We know, for instance, that papyrus came in strips as high as fifty-three centimeters and as long as one wanted (Parkinson and Quirke 1995, 16–7) – most of the repeating designs discussed in this chapter are not as wide as half a meter.

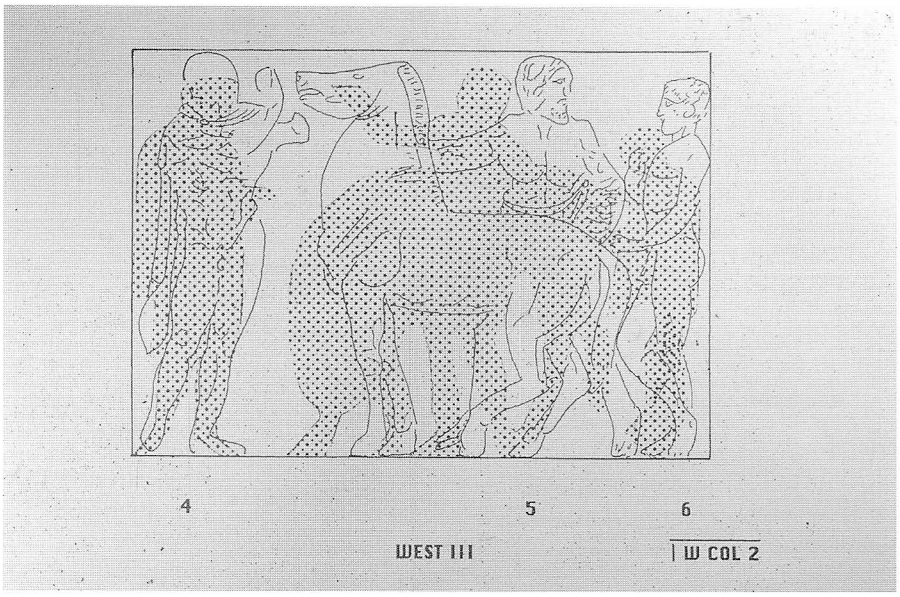
With a series of transportable designs, workers could compile larger compositions from smaller units. When the edges of the frieze slabs themselves provided the boundaries of the work sections (i.e., when compositions respected the slab joints, as in the Parthenon's west frieze), then it was fairly easy for the scupltors to position the iconographical subunits correctly. We can hypothesize that a figure would be aligned more or less with the left or right edge of the slab. Figures with trailing feet (as in lambda poses) could be "tabbed" into place, their pointed foot set into the lower left or right margin of the slab; compare the many figures in lambda poses whose trailing feet fit into the lower corners of Bassae frieze slabs and, on the Parthenon, the nude youths West III.4 and West XII.22 (Figs. 3.17 and 3.18). Similarly, the men and the youth who stand contrapposto in the headers of East I, West I (Neils 2001, fig. 87), and



3.19. Parthenon frieze, West IX and X, British Museum casts. Photo by the author.

West XVI (Fig. 3.16) have their trailing foot tabbed into the lower corner of the block, just like the left horse in West IX.

Horses may have been tabbed into place using their tails. The right-hand horses in slabs II, IV, V, VII, X, XI (?), XIII, and XV (Fig. 3.16) of the west frieze were positioned to have their tails carved eventually from the right margins of their slabs; the tails of the right-hand horses in slabs V, IX (Fig. 3.19), and X coincide with the raised horse hooves on the adjacent blocks to the right. The fact that the tail of the right-hand horse in slab XV (Fig. 3.16) does not continue into the header block XVI (Neils 2001, fig. 39) implies that XVI was already fully carved when XV was put in place. Since the end blocks of a course were set in place first before the intervening blocks (Hodge 1975), we can hypothesize that all four of the frieze's header-stretcher blocks had been set in place first (three of them carry one man in contrapposto). Thus, the final carving of slab XV would have occurred after header block XVI had been put in place. We can imagine that the sculptor of XV would have assumed that whatever block was going to be to the right of it would have had ample margin for continuing the tail; that that block (XVI) no longer had that margin implies that the sculptor of XV did not know which block would be to the right of it, which in turn implies that the sculptors of the individual west frieze slabs did not know exactly where



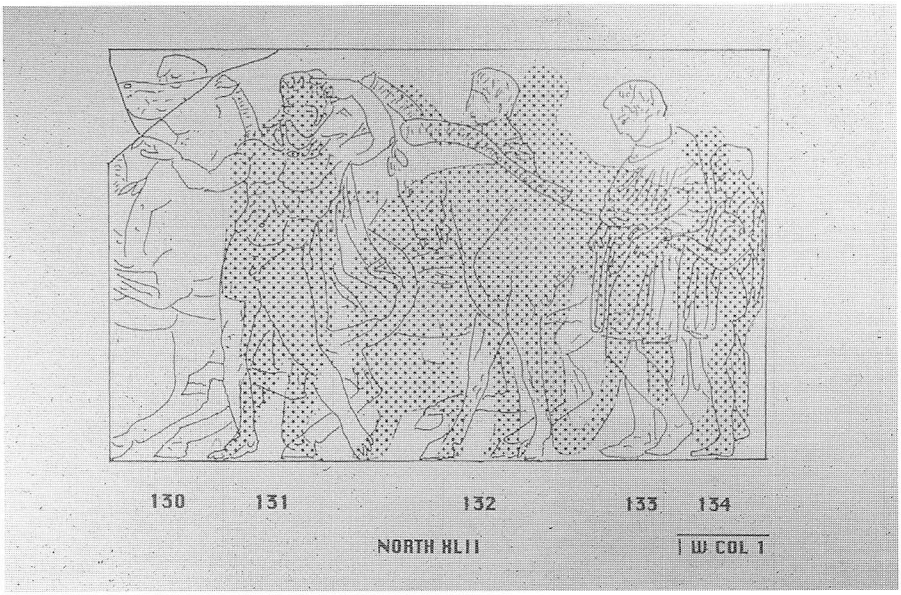
3.20. Drawing of West XII over West III. Drawing by the author.

many, if not most, of the slabs were destined to go. And all this implies that the west frieze was assembled without a rigid overall composition in mind.[9]

While each slab was being carved (presumably on the ground), the left and/or right figures would have been tabbed into place, the rest of the composition sketched in, and the background carved away, though with the margins at the sides left intact. Again, from the margins of the individually sculpted slabs, sculptors carved incidental elements like horse forelegs and hooves (e.g., those over the join of west frieze slabs VI and VII [Fig. 3.15] or those at the left margins of IX and X [Fig. 3.19] and XI), the drapery of the nude youths III.4 (Fig. 3.17; Neils 2001, fig. 73) and XII.22 (Fig. 3.18; Neils 2001, fig. 90), or the necessary but apparently initially omitted squire XV.28.

Several of the tabbed figures, like the standing men in contrapposto (West I.1, III.4, XII.22, XVI.30 [Fig. 3.16], all with their left leg at rest, and V.9 reversed), all look so similar to each other that they might be based on a single outline cartoon.

We can even go so far as to imagine that a larger composition might be composed of several such cartoons. For instance, the four-figure composition of nude squire, horse, draped man, and boy appears with slight variations in spacing, age, and posture in two slabs of the west frieze, West III and XII (Figs. 3.17 and 3.18). We can check their similarities by putting a shaded drawing of



3.21. Drawing of West XII over North XLII/47. Drawing by the author.

XII over a drawing of III (Fig. 3.20). The same basic composition recurs on North XLII/47 (Fig. 3.21), the last block of the north frieze, just around the corner from the west frieze.

Other full figures based on a single cartoon can be identified, such as the awkwardly standing horses in North XXXIV/39 ridden by figure 108, XXXIX/44 ridden by 124, and XLI/46 ridden by 129 (Fig. 3.22; cf. the two slightly differently awkward horses at the right edge of South I). And entire compositions repeat, as in the placement of horse heads in South VI and IX and in South XI and XII.

Most of the repeating compositions, however, are smaller; we can easily see them in the cavalcade sections of the north and south friezes, patterns of juxtaposed horse and rider heads and positions of horse forelegs and horse hindlegs. While such repeated patterns occur throughout the cavalcade sections of the friezes (e.g., the curved horse forelegs at the right edges of South X and XI), I concentrate here on the cavalcade in the north frieze.

For instance, in the north cavalcade we see in the upper right corner of slab XXXII/37 a composition of horse and rider head where the horse seems to be resting its muzzle against the rider's nape or high on his shoulder (Fig. 3.23); I call such horses "high nuzzlers" for convenience of reference. High nuzzlers recur three and six slabs farther along: in the upper right corner of XXXV/40 (Fig. 3.24) and again in slab XXXVIII/43 but with a variation (Fig. 3.25; the

3.22. Parthenon frieze, North XLI/46. Photo by the author.

3.23. Parthenon frieze, North XXXII/37. Photo by the author.

3.24. Parthenon frieze, North XXXV/40. Photo by the author.

3.25. Parthenon frieze, North XXXVIII/43. Photo by the author.

3.26. Parthenon frieze, North XLI/46, detail. Photo by the author.

rider's arm is raised before the horse head and obscures it). Other horses rest their muzzles lower on the shoulder; "low nuzzlers" occur in between the high nuzzlers: in the middle of XXXIII/38, XXXIV/39, XXXV/40 (pushed forward, Fig. 3.24), XXXVI/41 (obscured by rider 113's shoulder), XXXVII/42 (pushed forward), XXXVIII/43 (Fig. 3.25), XXXIX/44, and XL/45, and at the left edge of slab XLI/46 (Fig. 3.26), this time with low nuzzler's jaw obscured by drapery.

Another repeating pattern of horse heads consists of one horse head raised horizontally in a normal position and another right behind it tucked in vertically. This doublet occurs in the right half of slab XXXVI/41 and in the left half of XXXVIII/43 (Fig. 3.25), approximately one and a half slabs (of normal length, 1.2 meters) apart. Another one and a half slabs farther on, in the right half of slab of XXXIX/44, the two horses recur but are slightly apart.

Both these patterns, of nuzzlers and tucked-in horse heads, occur in the next three blocks, XL/45, XLI/46, and XLII/47, but with differences, probably because, due to their position, these three blocks are longer than the other medial blocks in the north frieze:[10] the low nuzzler pattern occurs in XLI/46 (Fig. 3.22), approximately at the same distance, a full medial block length, from its position in block XL/45, but because of that block's longer length it now occurs toward the left edge, and the tucked-in horse head pattern also occurs in slab XLI/46, toward the middle, at approximately its normal distance, one and a half normal block lengths, from its last occurrence at the right edge of block XXXIX/44.

It is in this left section of block XLI/46 that we see three mistakes: in the low nuzzler, in a mane-like strip of drapery above the tucked-in horse head, and in the tucked-in horse head's dittographed form to its immediate left now turned into drapery (Fig. 3.26). Apparently the tucked-in horse head was originally positioned about ten centimeters to the left of where we now see it (Neils 2001, fig. 62; Pernice 1890). Since the preceding slab, XL/45, is ten centimeters longer than normal and slab XLI/46 is another ten centimeters longer still (twenty centimeters in all), the three mistakes covered by drapery in the left half of XLI/46 may be due to workers' transferring their cartoons at normal distances along the frieze but not taking into consideration their placement within this lengthened slab.

Why the mistakes occurred is uncertain, but it is possible that after the blocks were set in place the workers in charge of transferring designs worked from two different directions, one set concentrating on the composition in the final block, XLII/47, and another set beginning as far back as block XXXV/40. The team working on block XLII/47 adapted the four-figure composition found twice in the west frieze to occupy most of its length (the nude youth stands contrapposto to the left instead of to the right, and an additional horse was added in the extra space at its left edge for him to hold steady). In slab XLI/46, the tucked-in horse head of the doublet was moved to the right, its original form turned into drapery; a now-lost horse mane above the tucked-in horse head (behind the head of rider 129) was turned into drapery; and the nuzzler's mouth at the left edge was recut as drapery. Apparently, part of the final phase of sculpting the frieze was to turn mistakes into drapery.

Other repeated patterns can be discerned for complete horses (e.g., those ridden by riders XXIV/29.7, XXV/30.80 [as preserved in a drawing by Stuart and Revett], and XXX/36.98), just horse forelegs (e.g., the horses ridden by riders XXXVI/41.113, XXXVII/42.116, and XXXVII/42.117), or just horse hindlegs (e.g., the horses in midair ridden by riders XXXVII/42.117 and XXXVIII/43.120).

All these repeated patterns demonstrate that the Parthenon sculptors adhered to standard sculpting practices using repeating modules at various intervals, including side by side, random, and measured. Once the overall composition was defined in general terms, workers could be separated into gangs, and the gangs themselves could have been differentiated by level of expertise: unskilled workers for transferring sketches, moderately skilled workers for removing backgrounds, and skilled carvers for modeling figures and perhaps for recarving mistakes as drapery. The skilled workers are ones we read about in the

final Erechtheion accounts (Paton 1927; Randall 1953; Stanier 1953) that mention the figures of the frieze and their sculptors. These men came from various strata of society – citizen, resident alien, and slave – but all of them received a drachma per day or a couple of drachmas per finished figure regardless of their station or skill (cf. the Parthenon, Erechtheion, and Epidauros accounts: Stanier 1953, Randall 1953, Burford 1969).

My goal in this exercise, therefore, has been to democratize the sculpting process and to get away from the limiting notion of Master Sculptor, whose participation may instead have been confined to the general design and perhaps some details or some figures to be used as templates. The vast majority of workers on the Parthenon are now nameless, but they do not deserve to be ignored.

NOTES

This study amplifies my earlier abstract (Younger 1991). For convenience, I refer the reader to the text and illustrations in Neils 2001, esp. chap. 3.

1. I am grateful to Dr. Leslie Fitton and the staff of the Greek and Roman Antiquities Department of the British Museum for allowing me access to the sculptures over a two-week period in the summer of 1992.
2. In numbering the slabs, I use Roman numerals for the conventional system devised by Micaelis and employed by Brommer 1977 and Arabic numerals for the recent renumbering by Jenkins 1994. For the human figures, I use the conventional system of Arabic numerals appended to the slab (e.g., North I/1.1 identifies the first figure on the first slab in the north frieze).
3. At the join of slabs XXXVIII/43 and XXXIX/44, the head of rider 121 bows forward to avoid the join behind, but the horse head behind him lost its chin at the join and had one tenoned in place.
4. Whitened boards (*leukómata*) were used primarily for temporary documents (Birt 1907, 5 and 207; Liddel and Scott, s.v. "leukoma"; cf. their use in the "Themistocles" decree [Meiggs and Lewis 1969, 48–52 no. 23, lines 28–9]). Still, the concept of using such boards to draw preliminary sketches in red paint seems plausible. The sketched lines for transferable designs, however, would have to have been thick and dry, something powdery, like that used in modern chalk lines: both charcoal and miltos (an earth stained with ferric oxide [ground haematite]) would have been excellent.
5. The exceptions include the late sixth century pedimental gigantomachy from the Athens Acropolis (Hekatompedon?) and the Parthenon's pediments. Their finished reverses suggest that it was important for the public to be able to view them, at least while they were being sculpted. Georg Treu (1897, 55) calls attention to the modeling of the horses from the east pediment of the temple to Zeus at Olympia and notes their detailing, but since he believes the pole horses hid the outriggers, which he places behind in the farther plane, he explains the finished modeling of their flank thus: "Die künsterlerische Freude an dem Begonnenen mag dann den Bildhauer dazu verlockt haben, weiter zu gehen als der unmittelbare Zweck erforderte" (An artistic joy at the beginning drove the sculptor on further than his immediate goal warranted [author's translation]). It is a rule of thumb that a sculptor took nearly a year to complete a single life-size figure (in the Asklepios temple building accounts [Burford 1969, 212–17], both *Hektoridas* and *Theo[ ]* received 3,010

drachmas for the two pediments of approximately twenty-eight under-life-sized figures, thus implying 215 days of sculpting for each figure). Finishing the modeling of one horse flank may therefore have taken several months; finishing two flanks may have taken half a year or more. I doubt an "artistic joy" could have been sustained so long.

6. Lullies and Hirmer 1960, pl. 50.
7. I borrow the term "dittography" from palaeography to indicate identical figures sculpted next to each other, implying that the cartoon for one figure was simply moved over slightly to produce the sketch for the second figure (cf. the many dittographed figures in the Late Minoan "Harvester Vase" from Ayia Triada [Marinatos and Hirmer, n.d., pls. 104–6]).
8. Similar emphasis is placed on the east porch columns of the Hephaisteion: the two dead Greek warriors lie over the columns.
9. Temples were built from the outside in, the colonnade before the cella; the Delos and Epidauros building accounts for their temples to Asklepios specify the order of building (Durbach 1926, no. 500; Burford 1969, 212–17), Manolis Korres (1995) assumes this order in his reconstruction of the building of the first marble Parthenon, and the temple to Athena Aphaia in Aigina demonstrates the gap that had to have been left in the outer colonnade for the workers, equipment, and material to go in and out while the cella was built (the three north columns in the west colonnade are built of drums whereas the other columns are all monolithic). If this gap occurred in the west end of the Parthenon, the frieze there could only have been assembled after the cella had been constructed up to the ceiling level and the porch columns installed. This might explain the jumbled composition and awkward sculpting across the joins.
10. The normal length for the north frieze medial blocks is approximately 1.2 meters (Brommer 1977). The last three blocks at the west end of the north frieze are longer: 1.64 meters for the final block, 1.4 meters for the penultimate block, and 1.3 meters for the propenultimate block. At the east end, only the penultimate block, II/2, survives intact, with a length of 1.4 (Michaelis gave 1.4 for the lost propenultimate block, III/3). The south frieze is different, but it still has longer penultimate blocks: 1.38 meters for the penultimate block and 1.34 meters for the propenultimate block at the east end and 1.42 meters for the penultimate block and 1.2 meters for the propenultimate block at the west end. Since these three blocks, the final, penultimate, and propenultimate, rest atop the epistyle blocks that span the gap from the anta to the corner prostyle columns of the porch, they may have been made longer to physically and/or visibly effect this transition.

REFERENCES

Birt, T. 1907. *Die Buchrolle in der Kunst: archäologisch-antiquarische Untersuchungen zum antiken Buchwesen.* Leipzig: B. G. Teubner.

Bluemel, C. 1969. *Greek Sculptors at Work.*[2] London and New York: Phaidon.

Brommer, F. 1977. *Der Parthenonfries.* Mainz: Philipp von Zabern.

Burford, A. 1969. *The Greek Temple Builders at Epidauros.* Liverpool: Liverpool University Press.

Durbach, F. 1926. *Inscriptions de Délos: comptes des hiéropes.* Paris: Librairie ancienne Honoré Champion.

Hodge, A. T. 1975. "Bevelled Joints and the Direction of Laying in Greek Architecture." *AJA* 79:333–48.

Jenkins, I. 1994. *The Parthenon Frieze.* Austin: University of Texas Press.

Korres, M. 1995. *From Pentelikon to the Parthenon: The Ancient Quarries and the Story of a Half-worked Column Capital of the First Marble Parthenon* (Greek and English). Athens: Publishing House "Melissa."

Lullies, R., and M. Hirmer. 1960. *Greek Sculpture.*[2] New York: Harry N. Abrams.
Marinatos, S., and M. Hirmer. N.d. *Crete and Mycenae.* New York: Harry N. Abrams.
Meiggs, R., and D. Lewis. 1969. *A Selection of Greek Historical Inscriptions to the End of the Fifth Century B.C.* Oxford: Oxford University Press.
Neils, J. 2001. *The Parthenon Frieze.* Cambridge: Cambridge University Press.
Parkinson, R., and S. Quirke. 1995. *Papyrus.* Austin: University of Texas Press.
Paton, J. M., ed. 1927. *The Erechtheum, Measured, Drawn, and Restored.* Cambridge, Mass.: Harvard University Press.
Pernice, E. 1890. "Zum Nordfries der Parthenon." In *Bonner Studien R. Kekulé Gewidmet* (Münster: Universität Bonn), 194–7.
Randall, R. H., Jr. 1953. "The Erechtheum Workmen." *AJA* 57:199–210.
Stanier, R. S. 1953. "The Cost of the Parthenon." *JHS* 73:68–76.
Treu, G. 1897. *Olympia: Die Ergebnisse der von dem deutschen Reich veranstalteten Ausgrabung.* Vol. 3. *Die Bildwerke von Olympia in Stein und Thon.* Berlin: Verlag von A. Asher & Co.
Younger, J. G. 1991. "Planning the Parthenon Frieze." *AJA* 95:295.
Younger, J. G. 1997. "The Stelai of Mycenae Grave Circles A and B." In *Techne: Craftsmen, Craftswomen and Craftsmanship in the Aegean Bronze Age*, ed. R. Laffineur and P. Betancourt, (*Aegaeum* 16), 229–39. Liege: Université de Liège.