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Cycladic Metallurgy and the Aegean Early Bronze Age

COLIN RENFREW

PLATES 1-10

The Aegean Early Bronze Age does not develop gradually and uniformly. On the contrary, the early phase in each cultural region is little more than an extension of the Neolithic, from which it is distinguished principally by a variation in ceramic styles. In the following phase there is a sudden expansion: Early Helladic II, Early Minoan II, Troy II and the Keros-Syros culture of the Cyclades are now more prosperous societies, on the very threshold of urbanization. Their wealth is illustrated by rich finds, including gold and silver, such as those of Levkas and Zygouries in Greece, Mochlos and Lebena in Crete, Troy and Poliochni in the East Aegean and Syros and Amorgos in the Cyclades. The closing phase of the Early Bronze Age is in most regions less brilliant (Crete is apparently an exception): it is a period of consolidation already belonging to the Middle Bronze Age. There is no such burst of cultural activity again until the Late Bronze Age and the empires of the Minoans and Mycenaeans.

The contrast between the remarkable cultural intensity of the Early Bronze 2 period and the preceding phases has not often been sufficiently appreciated, for there has been a tendency among scholars to see in the Aegean Early Bronze Age some essential overall unity, often an ethnic one, on very doubtful grounds. Not until this phase, in fact, are the signs found of extensive commercial intercourse, and not until then is there significant indication of metallurgy in the Aegean.

¹ Miss Sylvia Benton first put this article in my mind when she generously suggested that I publish the analyses of Cycladic metal objects in the Ashmolean Museum, Oxford, which had been made at her request by the Research Laboratory for Archaeology and the History of Art, Oxford. Much of the material for it was gathered during my stay in Greece, as School Student of the British School of Archaeology at Athens, and later as the holder of a Greek Government Scholarship. I have had much courtesy and kindness at the Ashmolean Museum, Oxford, from Mr. H. W. Catling; at the British Museum from Dr. I. H. Longworth and Mr. R. A. Higgins; at the Fitzwilliam Museum, Cambridge, from Mr. R. V. Nicholls; at the Herakleion Museum from Dr. S. Alexiou and at the Musée du Louvre from Monsieur P. Devambez. I am indebted to them

It is the purpose of the present article,¹ in presenting new evidence for the importance of metallurgy in the Cyclades at this time, to illustrate the extent to which trade and commerce, stimulated by the new technology, brought about an international spirit, new to the Aegean, with in its wake the first urban societies of Europe. In the first section the Cycladic culture sequence, hitherto not precisely defined, is briefly set in its Aegean context. The evidence for various aspects of Cycladic metallurgy is then examined—the important role of lead and silver as well as copper, the rich and aristocratic tomb finds of Amorgos and other islands, the Kythnos hoard, which documents the importance of tools as well as the weapons and luxury goods of other finds, and the remarkable series of daggers and spearheads from Amorgos. Analyses are now available for many of these. In the metallurgical appendix by Mr. J. A. Charles, the important point is established that arsenic-bronze was deliberately produced at this time for reasons which are intelligible today.

This material leads to the conclusions presented in the last three sections. The speed of the spread in the knowledge and practice of metallurgy is the most surprising of these. The widespread, broadly based nature of the new prosperity is probably the most important. We are faced not with an empire based upon a single dominant region, but with a number of autonomous areas, each of which had

for permission to publish the objects illustrated, as to the Keeper of the Department of Antiquities, Ashmolean Museum; the Trustees of the British Museum; the Metropolitan Museum of Art; the Committee of the British School of Archaeology at Athens; Dr. A. Ozanne and Professor E. Kunze. Mr. David French has supplied me with much useful information, as well as correcting omissions in the distribution maps. The final versions of the maps were drawn by Mr. H. A. Shelley with the aid of a grant from the Research Fund of the University of Sheffield. The Appendix by Mr. J. A. Charles, with the analyses by Mrs. A. Millett, adds a completely new dimension to the work. I am very grateful to her for her assistance, and to him for his interest and cooperation.

something to contribute to the international spirit of the time.²

EARLY CYCLADIC CHRONOLOGY

During the past fifteen years, the chronology of the Aegean Early Bronze Age has been much more precisely defined.³ The Cincinnati excavations at Troy⁴ have put the culture sequence of the Troad on a sound basis. The recent excavations at Lebena and Knossos in Crete⁵ have at last given a stratigraphical substantiation for Evans' Early Minoan subdivisions, emphasizing the importance of the Early Minoan II period. In southern Greece, the excavations at Lerna and Eutresis⁶ have defined the Early Helladic cultures more clearly, emphasizing the poverty of the Early Helladic I period, and the wealth of Early Helladic II.

In the Cyclades a systematic reexamination of the extensive material available,⁷ and in particular of Duncan Mackenzie's unpublished Daybooks, a careful record of the excavations at the key site of Phylakopi,⁸ has allowed the definition of three principal Early Bronze Age cultures and of their geographical and chronological extent.⁹ The sequence, based on internal Cycladic evidence alone, is cor-

roborated and supplied with an absolute chronology in terms of years, by comparison with the well-established sequence of Crete and south Greece, and to a lesser extent the Troad.¹⁰ The earliest of the three groups, the Grotta-Pelos culture, includes much of the cemetery material classed by Åberg and Childe in their Pelos Group.¹¹ It has proved possible to equate this with the domestic material found stratified below the First City at Phylakopi and at Professor Kondoleon's important site at Grotta in Naxos.¹² Thus in addition to the funerary pottery, largely pyxides and footed jars, often decorated with herringbone incisions, there is a new range of ceramic forms, prominent among which is the open bowl with inturned, rolled rim, which has been justly linked with those of the Kum Tepe Ib culture of the Troad.¹³ Schematic figurines, and marble vases of well-defined shape are also found. The Grotta-Pelos culture thus differs in important respects from what earlier writers have termed "Early Cycladic I," and the Early Cycladic I, II, III terminology has been deliberately avoided as bringing in preconceptions and *a priori* assumptions of equivalence with Early Helladic I, II and III, and Early Minoan I, II and III, which seem undesirable.¹⁴

² The abbreviations used in the footnotes are those recommended in *AJA* 69 (1965) 199ff, together with the following: Bossert: E. M. Bossert, "Zur Datierung der Gräber von Arkesine auf Amorgos," *Festschrift für Peter Goessler* 23f.

D-S: X. Τσοῦντας, 'Αἱ Προϊστορικαὶ Ἀκροπόλεις Διμνίου καὶ Σέσκλου.

Deshayes: J. Deshayes, *Les Outils de Bronze de l'Indus au Danube*, Institut Français de Beyrouth Bibliothèque Archéologique et Historique, Tome LXXI (1960)

Eutresis: H. Goldman, *Excavations at Eutresis in Boeotia* (1931) *Λευκας*: W. Dörpfeld, *Alt-Ithaka* (1927)

Mochlos: R. Seager, *Excavations in the Isle of Mochlos* (1912)

Montelius: O. Montelius, *La Grèce Préclassique I* (1924)

Papathanasopoulos: Γ. Παπαθανασόπουλος, 'Κυκλαδικὰ Νάξου'. *ArchDelt* 17 (1961-62) A'

Poliochni: L. Bernabò Brea, *Poliochni, Città Preistorica nell'Isola di Lemnos I* (1964)

Stephanos: C. Stephanos, "Les Tombeaux Prémycénien de Naxos," *Comptes Rendus du Congrès Archéologique à Athènes* (1905) 215f.

Stronach: D. B. Stronach, "The development and diffusion of early metal types in Early Bronze Age Anatolia," *AnatSt* 7 (1957) 89f.

Thermi: W. Lamb, *Excavations at Thermi in Lesbos* (1936)

Troy: C. W. Blegen, J. L. Caskey, M. Rawson, J. Sperling, *Troy I* (1950)

Ts. 1898: X. Τσοῦντας, *Κυκλαδικὰ*, *ArchEph* 1898, 137f.

Ts. 1899: X. Τσοῦντας, *Κυκλαδικὰ II*, *ArchEph* 1899, 73f.

³ J. L. Caskey, "Greece, Crete and the Aegean Island in the Early Bronze Age," *CAH* I, Ch. xxvi (1964); S. S. Weinberg, "The Relative Chronology of the Aegean in the Stone and Early Bronze Ages," in R. W. Ehrich (ed.), *Chronologies in Old World Archaeology* (1965).

⁴ Cf. *Troy*.

⁵ M. S. F. Hood, "Stratigraphical excavations at Knossos, 1957-61," *Κρητικά Χρονικά* (1963); Σ. Αλεξίου, 'Οἱ Προτομινωϊκοὶ Τάφοι τῆς Λεβήνου καὶ ἡ Εξέλιξις τῶν Προτομινωϊκῶν Ρυθμῶν', *Κρητικά Χρονικά* (1963) 88f.

⁶ J. L. Caskey, "The Early Helladic Period in the Argolid," *Hesperia* 29 (1960) 285f; J. L. and E. G. Caskey, "The Earliest Settlement at Eutresis," *Hesperia* 29 (1960) 126f.

⁷ Colin Renfrew, *The Neolithic and Early Bronze Age Cultures of the Cyclades and their External Relations*, doctoral thesis at the University of Cambridge, submitted April 1965.

⁸ Duncan Mackenzie, *Daybooks of the Excavations at Phylakopi in Melos, 1896, 1897, 1898 and 1899*. Unpublished transcript by Colin Renfrew, 1963, available at the library of the British School of Archaeology at Athens, the Library of Classical Archaeology, Cambridge, and the Library of the University of Cincinnati.

⁹ They differ in various significant respects from those outlined in the clear and useful summaries of Weinberg and Caskey, *op.cit.* (supra, n. 3).

¹⁰ Colin Renfrew, "Crete and the Cyclades before Rhadamanthus," *Κρητικά Χρονικά* (forthcoming).

¹¹ N. Åberg, *Bronzezeitliche und früheisenzeitliche Chronologie IV* (1933) 60; V. G. Childe, *The Dawn of European Civilisation* (6th ed. 1957) 51.

¹² T. D. Atkinson, D. Mackenzie *et al.*, *Excavations at Phylakopi in Melos* (Society for the Promotion of Hellenic Studies, Occasional Paper 4, 1904) 239; N. Κοντολέον, 'Ἀνασκαφαὶ ἐν Νάξῳ', *Πρακτικά* (1949).

¹³ D. H. French, "Late Chalcolithic pottery in north-west Turkey and the Aegean," *AnatSt* 11 (1961) 99f.

¹⁴ This point, which is of great methodological importance,

At this time, some contact between the cultures of the Aegean, seen in the import of objects, was beginning, where previously it is documented only by the transport of the raw material, obsidian, from Melos.¹⁵ Interestingly, apart from the Kum Tepe Ib bowls, and certain signs of Anatolian influence in Crete, the objects which are found in foreign contexts are principally Cycladic—clay bottles in Crete and Thermi, marble rhyta in Samos and Iasos—and Early Minoan I or Early Helladic I finds are not made outside their homelands. Direct contacts in the Early Bronze 1 phase¹⁶ are thus extremely rare, and are totally insignificant beside those of the Early Bronze 2 phase.

The Keros-Syros culture includes the "Syros Group," with the rich finds from the cemetery of Chalandriani in Syros.¹⁷ Dark-on-light painted ware, comparable with that of Early Helladic II, is now found for the first time in the Cyclades, and the folded-arm figurine of marble (pl. 3: 15 and 16) makes its appearance. Typical also are the footed jars and "frying pans" with their incised and stamped decoration. They are accompanied by a new range of marble vessels. Sauceboats, often with "Urfirnis" decoration are of fairly common occurrence, and the Anatolian *depas* cup is found in Syros. Copper, and sometimes bronze, objects are now found.

At Phylakopi, the Keros-Syros culture is represented only by a few sherds between the Grotta-Pelos levels and those of the Phylakopi I culture. Indeed it is nowhere convincingly stratified above deposits of the Grotta-Pelos culture. The distribution, however, overlaps extensively with that of its predecessor in a manner which demonstrates that they are not contemporary—there are important finds in Naxos, Siphnos and especially in Keros, at the important site of Dhaskalio, excavated recently by Mr. C. Doumas. Scarcely anywhere are Grotta-Pelos and Keros-Syros finds made in the same grave, and a detailed consideration of the grave groups documents the homogeneity and distinctness of each.

The chronological position of the Keros-Syros culture is confirmed by the many links which are now

seen with the other Early Bronze 2 cultures of the Aegean. Cycladic folded-arm figurines of marble are now found extensively in Crete, where they first occur in Early Minoan II contexts. They are found also on the Greek Mainland, where the most important links are provided by the pottery. "Urfirnis" sauceboats and Early Helladic II patterned ware are common to both areas. There are links too with the East Aegean. By far the most important of these from the chronological standpoint are the finds of Early Helladic II/Keros-Syros sauceboat fragments at Thermi, Poliochni and in late Troy I and Troy II.¹⁸ Although the context of these Aegean imports has been doubted,¹⁹ it would seem that they establish an important chronological link between Early Helladic II, together with the Keros-Syros culture (and hence Early Minoan II) and Troy II.

The extent of contact at this time is very striking (pl. 12) particularly since such contact in the preceding and succeeding periods was much less marked. The distribution of one-handled cups, for example (of which just a few are of Early Bronze 1 date) links all the regions of the Aegean at this time in a manner without precedent in the earlier record. Only Crete remains a little cut off from Anatolian or Helladic influence, having contacts principally with the Cyclades. This is the period too of the earliest fortified settlements or townships in the Cyclades and the Greek Mainland. Troy and Thermi were fortified in the preceding period, but it is now that the well-known wall with bastions at Chalandriani finds counterparts at Lerna and at Panermos in Naxos.

The Phylakopi I culture, seen at the type site in Melos, in Paros, Naxos, Thera and elsewhere, succeeds the Keros-Syros culture in these islands. The principal ceramic finds consist of incised pottery—duck vases and conical pyxides—and dark-on-light painted ware, including beaked jugs, inturned-rim bowls and the characteristic kernoi.²⁰ Phylakopi is now a considerable town, although still unfortified, and burial was in rock-cut tombs rather than in cist graves.

Finds of duck-vases on the Greek Mainland suggest that the Phylakopi I culture may overlap with

cannot be adequately treated here, cf. Renfrew *op.cit.* (supra n. 7) 10f.

¹⁵ C. Renfrew, J. R. Cann and J. E. Dixon, "Obsidian in the Aegean," *BSA* 60 (1965) 225f.

¹⁶ The terms "Early Bronze 1," "Early Bronze 2," etc., which are not capable of precise definition, are throughout applied to the Aegean rather loosely, for the sake of convenience.

¹⁷ *Ts.1899*.

¹⁸ *Thermi* 90, fig. 524; *Poliochni* pl. cxxix c; *Troy* 40, 54, 222.

¹⁹ J. Mellaart, "Anatolian chronology in the Early and Middle Bronze Age," *AnatSt* 7 (1957) 79; D. H. French, *op.cit.* (supra, n. 13) 117.

²⁰ Atkinson *et al.*, *op.cit.* (supra, n. 12) pls. iv, vii, ix.

the Middle Helladic. But in the Second City of Phylakopi Minyan ware and Middle Minoan I Kamares ware is found, so that the culture of the First City is still essentially an Early Bronze Age one.

There is evidence, however, that the Keros-Syros culture persisted into the time of the Phylakopi I culture both in Amorgos and south Naxos, in a late form which has been termed the Amorgos Group. Thus Phylakopi I vessels are sometimes found in cist graves with goods of Keros-Syros tradition,²¹ together with daggers. These daggers, although originating in the Early Bronze 2 period, clearly were still made well into the Middle Bronze Age.

This account of the Cycladic culture sequence, although brief, will serve as a necessary background for the consideration of the metal finds. Other arguments are required to set up the absolute chronology, which is not strictly relevant here. The essential point is to establish the contemporaneity of the Keros-Syros culture with the other Early Bronze 2 cultures of the Aegean, whose duration was probably from ca. 2500 B.C. to ca. 2100 B.C.

EARLY WORKING OF LEAD AND SILVER

Lead, because of its low melting point—327° C, compared with 1083° C for copper—is one of the easiest metals to work.²² In the Near East it makes its appearance as early as copper, being found at Çatal Hüyük in the seventh millennium B.C.²³ It is found rather frequently in the Aegean Early Bronze Age, more so perhaps than is generally realized, on nearly as many sites as copper. A frequent use seems to have been the manufacture of rivets for the repair of broken pottery. Plate 2:b shows a red slipped-and-burnished Early Helladic bowl from Aegina, repaired in this way.²⁴ Other Early Helladic sites where lead rivets were used for this pur-

pose are Asea,²⁵ Asine,²⁶ Ay. Kosmas²⁷ and Zy-gouries,²⁸ where a lump weighing 1200 grams, evidently held in reserve for such use, was found.

Similar finds have been made in the Cyclades at Phylakopi, Chalandriani and in Naxos.²⁹ At Phylakopi lead ingots in the form of discs were found³⁰ (pl. 2:a) although the stratigraphical position was not clear. Tsountas at Chalandriani likewise found evidence for the actual working of lead on the site, with rivets, ingots and the use of a flat sheet of the metal, apparently to repair a broken pot. There is evidence of lead metallurgy from the important settlement of Ay. Irini in Kea.

Lead ores are of common occurrence in the Cyclades, being known from Melos, Kimolos, Antiparos, Thera, Anaphi, Seriphos, Mykonos, Kea and other islands.³¹ Their ready availability led to their use at an early date. In 1964 I found a small fragment of cast lead on the surface at the Grotta-Pelos settlement site of Cheiromylos in Dhespotikon,³² and this may be the earliest indication of metallurgy in the Cyclades. Significantly the site is only a couple of kilometres from Ay. Georgios in southwest Antiparos, where galena was mined into the present century.

Lead, despite its softness, was not used exclusively for minor domestic repairs. From Antiparos again comes the little lead figurine (Cat. no. 1, pls. 1 and 2) which is of considerable interest in its own right. It was found by Bent, as were other objects of lead and silver (Cat. Nos. 2 to 6; pl. 2) in a grave in his "richer cemetery" on that island.³³ The cemetery is probably to be equated with the Krassades of Tsountas.³⁴ These objects were first published by Edgar,³⁵ who erroneously described the figurine as of silver. It is flat and not well preserved, but the elbows show that the arms were either folded at the waist, like the folded-arm figurine, or meeting at the waist, like the Plastiras type,³⁶ or conceivably

²¹ F. Dümmler, "Mitteilungen von den griechischen Inseln," *AM* 11 (1886) 15f.

²² It is much easier to smelt also. The ore, galena, smelts below 800° C, and R. F. Tylecote, *Metallurgy in Archaeology* (1962) 76, has determined by experiment that it is possible to smelt lead in a hot camp fire, surrounded by a ring of dry stones. The cupellation of argentiferous lead, to obtain silver, requires a temperature of about 1100° C.

²³ James Mellaart, "Excavations at Çatal Hüyük 1963," *AnatSt* 14 (1964) 111 and pl. xxv a.

²⁴ I am grateful to Professor E. Kunze for permission to illustrate this unpublished find from the excavations of Welter, cf. G. Welter, *Aegina* (1938).

²⁵ E. J. Holmberg, *The Swedish Excavations at Asea in Arcadia* (1944) 131.

²⁶ O. Frödin and A. W. Persson, *Asine* (1938) 257.

²⁷ G. Mylonas, *Aghios Kosmas* (1959) 138 and fig. 132.50.

²⁸ C. W. Blegen, *Zygouries* (1928) 184.

²⁹ Atkinson *et al.*, *op.cit.*, (supra, n. 12), pl. XL, 21; *Ts.1899* 126; *Stephanos* 224.

³⁰ Atkinson *et al.*, *op.cit.* (supra, n. 12) 92.

³¹ A. Κορδελλάς, 'Ο Μεταλλευτικός Πλοῦτος καὶ αἱ Ἀλυκαὶ τῆς Ἑλλάδος (1902).

³² Cf. *Ts.1898* 176.

³³ J. T. Bent, "Researches among the Cyclades," *JHS* 5 (1884) 53.

³⁴ *Ts.1898* 140.

³⁵ C. C. Edgar, "Prehistoric tombs at Pelos," *BSA* 2 (1896-97) 49 and fig. 18.

³⁶ Cf. C. Zervos, *L'Art des Cyclades* 110, fig. 112.

supporting the breasts, as in a small marble figurine from Ios, now in the Fitzwilliam Museum, Cambridge.³⁷ Another Early Cycladic figurine of lead was described by Wolters, who first doubted and then accepted its authenticity.³⁸ It was found on the island of Ios, and was given by Finlay to the National Museum in Athens,³⁹ where it cannot at present be located. Although the lead figurine from Troy is probably rather later,⁴⁰ and the origin of an example from Crete is not certain,⁴¹ these Cycladic finds are sufficient to substantiate the existence of metal figurines in the Aegean Early Bronze Age. Their existence at this time in Central Anatolia has been magnificently documented by the finds at Horoztepe.⁴²

No attempt will be made here systematically to collect all the instances of lead objects in the Aegean Early Bronze Age. In the East Aegean they are evidenced, for example, by the elegant bracelet or diadem from Thermi,⁴³ and in Crete by the double axes from Mochlos.⁴⁴ Further examples are listed in the Catalogue (v. infra). The remarkable ship models from Naxos, hitherto unpublished, are of great importance however, not only from a metallurgical standpoint but for the light they throw on Early Bronze Age shipping (Cat. nos. 12-14, pls. 1 and 3).

That these ship models have not previously been published is perhaps at first sight surprising, since they have been in the possession of the Ashmolean Museum, Oxford, for nearly 30 years. It may be that the rather unexpected material of which they are made has led to doubts as to their authenticity. But the realization that lead was, in fact, a popular material invalidates such an argument, and there seems little doubt that they are genuine.

No. 12 of the Catalogue was reputedly found in Naxos with the two marble figurines nos. 15 and 16 (pl. 3). This sets it therefore in the Keros-Syros culture. The other boats may originally have been part of the same find, although this cannot now be

established. What is particularly interesting is that these supply independent corroboration, in a totally unexpected way, for the incised representations of boats on the Syros "frying pans,"⁴⁵ as well as solving a long-standing problem as to which end of these was, in fact, the bow.

The boats are each made of three lengths of lead. The prow and keel is a rod of lead, flattened by hammering along two-thirds of its length to form a flat bottom for the boat, while the sides are formed of two similar flat strips. The prow rises steeply—this higher projection, contrary to the views of some scholars⁴⁶ is clearly the bow—while a part of the length towards the stern is canted at a more gentle angle, just as the Chalandriani incisions show.

These boats had no sails: the models and the incised "frying pans" agree on this, and the supposed masts on the Orchomenos sherd⁴⁷ appear to be accidental incisions. Unlike the contemporary models from Palaikastro and Mochlos⁴⁸ they are long boats, and on the "frying pans" they are frequently shown with about a dozen oars on each side. If this figure be accepted, they will have been capable of very impressive speeds. Until the last century there were pirate ships in the Islands, all of this type, and the tradition of shipbuilding and seafaring, whether by trader or pirate, thus extends back over four and a half millennia.

Silver occurs widely in association with lead ores, from which it is extracted by the process of cupellation. It is not surprising, therefore, that finds of Early Cycladic silver objects are common, although gold is scarcely ever found.⁴⁹ Silver can occur too in the native form, and this can usually be identified on analysis by the presence of various impurities. The diadem and dish from Amorgos⁵⁰ proved on analysis to contain 5% gold, and are probably of native silver. On the other hand Partington cites the great purity of silver found at Troy⁵¹ as proof

³⁷ L. Budde and R. Nicholls, *A Catalogue of the Greek and Roman Sculpture in the Fitzwilliam Museum, Cambridge* (1964) pl. 2, 13.

³⁸ P. Wolters, "Praehistorische Idole aus Blei," *AM* 23 (1898) 462, and *AM* 25 (1890) 339.

³⁹ Athens NM 7817, Μόλυβος 71.

⁴⁰ H. Schliemann, *Ilios* (1880) 337.

⁴¹ A. J. Evans, *Cretan Pictographs and the Mycenaean Script* 132, fig. 137.

⁴² B. Tezcan, "New finds from Horoztepe," *Anatolia* 5 (1960) pl. xxiv.

⁴³ *Thermi* 206, fig. 61.

⁴⁴ *Mochlos* 36.

⁴⁵ *Ts.1899* 90, figs. 16-22. Compare also the engravings on

two stones from southeast Naxos, cf. C. Doumas, 'Korphi t'Aroniou,' *Deltion* 20 (1965) 49, fig. 4 and pl. 35.

⁴⁶ Dussaud, Sovoronos and Koster, quoted by S. Marinatos, "La Marine Creto-Mycénienne," *BCH* 57 (1933) 182.

⁴⁷ E. Kunze, *Orchomenos* III, pl. xxix, 3.

⁴⁸ *Mochlos* fig. 48, 31.

⁴⁹ There is a single gold bead from the cemetery of Phyrroghes in Naxos, see *Papathanasopoulos* 224 and pl. 71. The rich ores of Siphnos were presumably not discovered until the Iron Age.

⁵⁰ *Ts.1898* 187 and pl. 8, 1 and 3.

⁵¹ J. R. Partington, *The Origins and Development of Applied Chemistry* 347f.

that cupellation was already known at the time.

In any case, silver was widely used in the Cyclades, and on the Greek Mainland—the tweezers at Manika are all of silver.⁵² In Crete, on the other hand, despite the silver daggers from Koumasa,⁵³ gold is the more common.

The silver diadems of Amorgos and Syros are well known,⁵⁴ and bracelets are of common occurrence. Three forms of bracelet are known: the torque of twisted silver, as found by Bent on Antiparos (Cat. no. 2; pl. 2), the simple bangle of circular section (Cat. no. 10; pl. 2) which in one case is lengthened to form an arm spiral (Cat. no. 9; pl. 2) and the flat bracelet. This is concave in section, and may be undecorated, like the example from Dokathismata in Amorgos⁵⁵ or another unpublished find, supposedly from Pholegandros, and now in the Fitzwilliam Museum, Cambridge.⁵⁶ On the other hand the terminals may be decorated with light incised lines (Cat. no. 8; pls. 1 and 2) as in a specimen from Amorgos in the National Museum in Copenhagen.⁵⁷

Silver pins are found in the Cyclades, usually with vase heads (as in finds by Mr. C. Doumas at the cemetery of Ay. Anargyroi in Naxos), or other embellishment.⁵⁸ Beads are also found. All the silver finds known from the Cyclades are to be set in the Keros-Syros culture⁵⁹ (although some in the Amorgos Group, which is of longer duration). Together they make impressive testimony to the wealth of the time.

DÜMMLER'S GRAVE GROUP "D" FROM KAPROS IN AMORGOS (plate 4, with no. 17, pls. 1 and 10)

In 1896 F. Dümmler published an account of a visit to Amorgos⁶⁰ with drawings which he made in Athens of objects said to derive from that island. The interest of this record is that the original associations of the finds are given. Frau E-M Fischer Bossert has already published another grave group⁶¹ which is now divided between the Ashmolean Museum and the National Museum in Copenhagen, and from the association she has drawn important

chronological conclusions. The contents of Grave D at Kapros, now in the Ashmolean Museum and here published in their entirety for the first time, are likewise of interest, particularly in their exotic nature.

The site of Kapros lies in a fertile valley, one and a half kms. northeast of the port of Katapola in west Amorgos. It is situated on the right side of the stream, dry in summer, which runs down from Mt. Profitis Ilias to the sea at Katapola. The location of the settlement is not clear, but slabs from cist graves are now incorporated in the modern field wall. I was told there in 1964 that in recent years as many as 60 cist graves have been opened, some of them containing large figurines of marble. I was given the foot of one of these (now in the Katapola Museum), which will have been of the folded-arm form, and must have stood originally to a height of some 50 cms.

Most of the finds (Cat. nos. 17-29; pls. 1, 4, 10) were illustrated by Dümmler, although he showed only 6 of the pendant beads of necklace Cat. no. 24, where 14 complete beads and several fragments are now preserved. He referred to four figurines, but it was Wolters who first illustrated these.⁶² There is a discrepancy between the sizes given by Dümmler and those of the figurines illustrated by Wolters, moreover only two of the four in Oxford (Cat. nos. 26 and 28; pl. 4) correspond to his illustrations, so that the association of the Ashmolean figurines with the remainder of the finds cannot be regarded as certain. One of the figurines figured by Wolters is now in the Antikensammlung in Munich,⁶³ and the form would seem to belong with the Grotta-Pelos culture.

A green-stone spoon, strengthened with silver, was also published by Wolters as belonging to this group:⁶⁴ it is now in Athens. The stone is the same as that of the handles, Cat. nos. 20 and 21 (pl. 4), and similar finds have been made by Mr. C. Doumas in the Keros-Syros culture cemetery at Ay. Anargyroi in Naxos.⁶⁵ This stone, termed "natro-

⁵² Γ. Παπαβασιλείου, *Περὶ τῶν ἐν Ἑνβοῖα Ἀρχαίων Τάφων*, figs. 4 and 13, pl. H 3.

⁵³ S. Xanthoudides, *The Vaulted Tombs of the Messara*, pl. xxix, b, 212-214.

⁵⁴ *Ts.1898* pl. 8, 1; *Ts.1899* pl. 10, 1.

⁵⁵ *Ts.1898* pl. 8, 2.

⁵⁶ Inv.no. GR.7.1901.

⁵⁷ Inv.no. 4675.

⁵⁸ Naxos Museum 4018 and 4019, cf. X. Ντρούμας, *Ἀνασκαφαὶ ἐν Νάξῳ*, *ArchDelt* 17 (1961-62) B', 272f.

⁵⁹ The silver beads in the Louros grave, belonging to the de-

veloped Grotta-Pelos culture, are an exception: *Papathanasopoulos* pl. 67.

⁶⁰ *Op.cit.* (supra, n. 21).

⁶¹ Bossert 23f.

⁶² P. Wolters, "Marmorkopf aus Amorgos," *AM* 16 (1891) 48.

⁶³ Zervos *op.cit.* (supra, n. 36) 77 fig. 48.

⁶⁴ Wolters *op.cit.* (supra, n. 62) 50. Athens NM 4275 and 4276.

⁶⁵ Naxos Museum 4016, cf. Doumas *op.cit.* (supra, n. 58); also Copenhagen National Museum 3263.

nagalmatolith" by Blinkenberg,⁶⁶ has been identified as anhydrite or calcite,⁶⁷ both common enough in the Cyclades. There are further examples of these handles in the National Museum in Copenhagen. The green beads of necklace Cat. no. 23 (pl. 4) seem also to be of this stone.

Shell figurines, like Cat. nos. 26 and 27 (pl. 4), are unusual, but there are two similar examples from Paros in the Fitzwilliam Museum in Cambridge.⁶⁸ The "ivory" fragment is a unique find in the Cyclades (Cat. no. 25; pl. 4) but bone with similar incised concentric circles is known from Second City and later contexts at Troy.⁶⁹ Incised or stamped concentric circles are so common upon the pottery of the Keros-Syros culture that there is nothing remarkable in finding a similar motif upon the ivory. The seal (Cat. no. 19; pl. 4) is likewise unique in the Cyclades, although the angle-filled cross device at the end is commonly found on Minoan seals, and in the East Aegean, as well as on pottery of the Keros-Syros culture.⁷⁰ There are related forms in the Lerna sealings⁷¹ on the Greek mainland. Frankfort classed this seal as Jemdet Nasr on account of the square "loop-bore" suspension, but this early date is disputed by Dr. V. E. G. Kenna.⁷² The form is certainly a new one to the Aegean: there is a similar form of seal only at Poliochni,⁷³ which is different again in material and decoration. Frankfort's very early date of 3000 B.C. can certainly be set aside, and a date at the very end of the Early Bronze Age, perhaps ca. 1900 B.C., would seem more appropriate.

The silver bowl (Cat. no. 17; pls. 1 and 10) is in some ways the most interesting object in the group, being the only metal vessel now preserved from

the Cyclades. Dümmler illustrated a little footed cup of silver⁷⁴ from a grave at Notina in Amorgos, but its whereabouts are not now known. Rare as the find is, however, it is not without parallels. The famous gold bowls, supposedly from Euboia and now in the Benaki Museum,⁷⁵ and the silver bowl in the Metropolitan Museum in New York⁷⁶ (pl. 10: e) belong to this period. The tombs at Mochlos in Crete produced a silver cup, and a silver bowl was found in the Second City at Troy.⁷⁷ Other metal vessels are also illustrated in pl. 10.

These finds establish amply that the ownership of vessels of precious metals was not limited to the rulers at Troy or Alaca or Horoztepe. Although Greece, Crete and the Cyclades cannot boast of treasures like those of the rich Anatolian sites, they were certainly not backwaters at this time. The relationship of some of these vessels to ceramic forms is discussed below.

Another indication of the wealth of Amorgos during this period is the size and quality of the numerous folded-arm figurines of marble that have been found there, and the number of spearheads and daggers from the cist graves. The very numerous finds from Chalandriani in Syros, Ay. Anargyroi in Naxos and Dhaskalio in Keros give a similar indication of prosperity.

THE KYTHNOS HOARD AND OTHER TOOLS

Hoards of tools are extremely rare in the Aegean Early Bronze Age. Indeed to the European prehistorian the relative scarcity of metal finds in general is surprising—there is certainly nothing to compare with the extensive finds of central and northern Europe. Perhaps the use of the sea as the principal

⁶⁶ C. Blinkenberg, "Antiquités Prémyceniennes," *MemSoc-RoyAnt du Nord* 1896.

⁶⁷ Kindly identified from examples in the Athens National Museum by Professors A. N. Georgiades and G. M. Paraskévopoulos.

⁶⁸ Budde and Nicholls, *op.cit.* (supra, n. 37) pl. 1, 5-7.

⁶⁹ C. W. Blegen, *Troy and the Trojans* (1963) pl. 26. The material of this find from Amorgos has not been examined scientifically, and its identification as ivory is uncertain. Ivory was commonly used in Crete at this time, however, for seals.

⁷⁰ F. Matz, *Die Frühkretischen Siegel* (1928) pl. 11.7a, pl. 11.10, pls. 1x, x etc.; *Poliochni* pl. CLXVIII, 9 and pl. CLXXV, 3-4; an impression from Syros is published by E-M Bossert, "Die gestempelten Verzierungen auf frühbronzezeitlichen Gefäßen der Ägäis," *Jdl* 75 (1960) 1f. Vessels in the Mykonos Museum bear similar stamped decoration.

⁷¹ Martha C. Heath, "Early Helladic Clay Sealings from the House of Tiles at Lerna," *Hesperia* 27 (1958) pls. 21-22.

⁷² Personal communication. cf. H. Frankfort, *Cylinder Seals* (1939) 70 and 301; also Briggs Buchanan, *Ancient Near East-*

ern Cylinder Seals in the Ashmolean Museum. I. Cylinder Seals (1960) no. 741.

⁷³ L. Bernabò Brea, "Recenti scavi a Poliochni nell'isola di Lemnos," *BdA* 42 (1957) 208, fig. 25.

⁷⁴ Dümmler *op.cit.* (supra, n. 21) Beilage 1, 4. There is also a fragmentary silver dish from Dokathismata in Amorgos, *Ts.1898* pl. 8, 3, which is now in the National Museum in Athens.

⁷⁵ B. Segall, *Katalog der Goldschmiede-Arbeiten, Benaki Museum* pl. 1-3 and 67-68. The silver bowl, pl. 69, has several similarities with the Kapros bowl.

⁷⁶ Accession no. 46.11.1 (purchased 1946, Joseph Pulitzer bequest), cf. G. M. Richter, *Handbook of the Greek Collections, Metropolitan Museum of Art* (1935) 16 and pl. 11, i. Another similar bowl, reputedly found with this one, is illustrated by D. von Bothmer, *Ancient Art from New York Private Collections* (1961) no. 96.

⁷⁷ *Mochlos* 52 and fig. 22 (V.1.8); *Troy* fig. 359; cf. also the Troy treasures, H. Schmidt, *Heinrich Schliemann's Sammlung Trojanischer Altertümer* (1902) 225f.

means of communication is in part responsible. The well-known double axe is essentially a later form, and indeed one does not tend to regard the shaft-hole axe as an Aegean shape at all. The few finds that are now known, however, may serve to correct that impression. Of these the Kythnos hoard is the most important.

In 1866 the British Museum purchased from a Mr. C. Merlin a hoard of tools of copper or bronze, which are described in the catalogue as "from the Isle of Thermia," the Cycladic island today called Kythnos. Although some of the objects were illustrated at the time, and some again since,⁷⁸ it has never been published in full.

The hoard contained, as well as the four shaft-hole tools, three massive flat axes (Cat. nos. 34-36; pl. 5:35 and pl. 6) and three narrow flat axes or chisels (Cat. nos. 37-39; pl. 5:39 and pl. 6). The larger axes, each with a perforated heel for mounting, are classed by Deshayes in his monumental survey⁷⁹ as Type K4, which includes also examples from Naxos, the East Aegean island of Saria and various East Mediterranean sites. The distribution of Type K focuses on Syria rather than Anatolia or the Aegean, but the Syrian examples are chiefly later than the Cycladic ones.

The narrow flat tools from the Kythnos hoard are again perfectly at home in the Aegean. They fall in Deshayes' Type C4b, distinguished by the divergent sides, straight heel, long narrow blade and rounded cutting edge. Other finds of this form have been made in Amorgos, Naxos⁸⁰ and Levkas.

Flat axes and adzes are in fact fairly common in the Aegean, including the Cyclades, often as stray finds. Deshayes lists 59 from the Aegean, of which 18 are Cycladic. There are three unpublished Cycladic examples in the Museum of Archaeology and Ethnology, Cambridge,⁸¹ and three more are published here (Cat. nos. 43-45; pl. 9). The first, from Amorgos, no. 43, falls in Deshayes' Type D2b, together with an adze of Early Helladic II date from Eutresis.⁸² Another, from Paros, no. 44, broken at the cutting edge, compares most closely with an axe from the Eutresis hoard.⁸³ The third, no. 45, from Amorgos, falls apparently in Deshayes' Type B3a,

resembling B3b examples from Eutresis and Amorgos in several respects.

The shaft-hole tools from the Kythnos hoard are in some ways more interesting. The axe-adze (Cat. no. 30; pls. 5-6) affords the best evidence for the date of the find. It compares closely with the axe-adze from the Early Helladic II hoard of Pit 5 at Eutresis.⁸⁴ With its flaring profile, corresponding to Deshayes' Type B1, it falls amongst a large series of axe-adzes from the Aegean which are distinguished by the absence of a collar from those of Iran and the Near East, and by a number of traits from those of the Balkans. The various parallels seem to place this and other tools of the Kythnos hoard in the Early Bronze 2 period of the Aegean, and hence within the span of the Keros-Syros culture.

The flaring line of this axe-adze form was replaced in the Aegean by a more straight-profiled variety, seen chiefly in Crete, and in the Late Minoan period by a form in which the adze is more sharply differentiated from the axe. The distribution of this later form is centered on Crete,⁸⁵ but there are two examples from Naxos (Cat. nos. 41 and 42; pl. 9) and one from Athens.⁸⁶

The first of the shaft-hole axes from the Kythnos hoard (Cat. no. 31; pls. 5-6) is of a notably simple form, again virtually restricted in its distribution to the Aegean, although there is a possible prototype from Iran. Other examples of similar shape are finds from Delphi, Gaudourophas and from a Middle Minoan I context at Palaikastro.⁸⁷ There is nothing here to contradict the Early Bronze 2 date suggested for the axe-adze.

The second shaft-hole axe from the hoard (Cat. no. 32; pls. 5-6) has a much less rounded butt. Indeed so long is the butt that the form suggests itself as a prototype for the symmetrical form, the familiar double axe. Rather similar tools are known from Chios⁸⁸ and in two unpublished specimens in Copenhagen. Deshayes suggests an Anatolian prototype, corresponding to Stronach's Type 2,⁸⁹ and an Early Bronze 2 date again seems appropriate.

The third shaft-hole axe from Kythnos (Cat. no. 33; pl. 5-6) with its curious button butt presents something of a problem, since there is nothing

⁷⁸ A. W. Franks, "Communication," *Proceedings of the Society of Antiquaries* 3 (1867) 435 and fig. p. 437; *Montelius* pl. IV, 1, 6 and 7; *British Museum Bronze Age Guide* (1920) 163 fig. 174.

⁷⁹ Deshayes 75.

⁸⁰ Papathanasopoulos pl. 77.

⁸¹ Foster Bequest, 128, 131 and 132.

⁸² Eutresis fig. 286, 1.

⁸³ Eutresis fig. 287, 1.

⁸⁴ Eutresis fig. 287, 2.

⁸⁵ Cf. R. W. Hutchinson, "Battle axes in the Aegean," *ProcPS* 16 (1950) 52f.

⁸⁶ Montelius fig. 488.

⁸⁷ Deshayes II, 79; *Montelius* pl. 4, 11.

⁸⁸ W. Ridgeway, *The Early Age of Greece* I (1901) 51 fig. 27.

⁸⁹ Stronach 118.

quite like it known, apart from a very similar object from Naxos, now in Copenhagen.⁹⁰ Deshayes puts them in a separate category, Type G2a.⁹¹ Stronach compares the form with examples in his Type 1,⁹² which would be chronologically acceptable, but the similarity does not seem a close one. So far the form is uniquely Cycladic.

Now the remarkable thing about the distributions of these four types, with shaft-holes, is that they are essentially Aegean. The axe-adze described is of a form restricted to the Aegean, the third of the shaft-hole axes with the knob on the butt is restricted to the Cyclades, while the other two are not notably well represented further east. The ultimate inspiration for these forms may well be an oriental one, but its expression in these precise forms is an Aegean contribution, and it would be wrong to see the Aegean smiths as following slavishly supposed eastern prototypes.

The three other tool hoards from the Aegean Early Bronze Age do not contradict this picture (cf. the map, pl. 11). That from Eutresis contains an axe-adze and flat tools from open moulds.⁹³ The Petralona hoard, on show in the Thessaloniki Museum, is to be published by Mrs. A. Sakellariou. It contains, in addition to flat axes or chisels, several shaft-hole axes of a type familiar from Poliochni, where it occurred with several daggers in the deposit of Vano 829.⁹⁴ This deposit is probably to be set in the Early Bronze 2 period, on account of the Early Helladic II/Keros-Syros culture sauceboat fragment from levels of the same phase,⁹⁵ and the Poliochni axe is consequently older than several others of this form.⁹⁶ The Thebes hoard,⁹⁷ which is to be set in the Early Helladic II or III period, contained another example of this shaft-hole axe, together with flat axes, awls and chisels and an early occurrence of the double-axe. The shaft-hole axe of this type should certainly be included in the Aegean repertoire of the time, although it has not been found in the Cyclades, and it may be of Aegean origin.

Shaft-hole tools of two other types have been found in the Cyclades. The first, a shaft-hole axe of

bronze (Cat. no. 40; pl. 9) is from Amorgos. The form is close to Maxwell-Hyslop's Type 3,⁹⁸ for the axe is considerably thicker at the shaft-hole than it is along the length of the blade. It compares also with two examples from Crete,⁹⁹ and may be of Early or Middle Bronze Age date.

Double axes have also been found in the Cyclades: some 16 are quoted by Deshayes, and among unpublished examples is one from Naxos in the Museum of Archaeology and Ethnology in Cambridge.¹⁰⁰ The form is essentially a Middle and Late Bronze Age one,¹⁰¹ but there was one from a First City context at Phylakopi,¹⁰² an example from Thebes has been cited above, and that from the Tlos hoard¹⁰³ may be of Early Bronze Age date. The miniature examples in lead from Mochlos¹⁰⁴ have already been mentioned. Number 32 from the Kythnos hoard is itself, although asymmetrical, not so far from a double axe in shape, and there seems to be no difficulty therefore in finding an Aegean prototype for this essentially Aegean, and especially Cretan, form.

These, however, add little to the picture presented by the Kythnos hoard: that in the Early Bronze 2 period, useful tools as well as weapons and ornaments were made in the Aegean, including the Cyclades. Many of them are local forms.

CYCLADIC DAGGERS AND SPEARHEADS (plate 7)

That the Cyclades formed an important centre in the distribution of Aegean dagger finds has long been realized. To the present time, however, no systematic survey of Aegean weapons of the Early Bronze Age has been undertaken, and although an exhaustive study would be beyond the scope of the present paper, it is important to establish the basic distinctions in order to set in their contexts the 26 daggers here published, most of them for the first time.

In what follows, no firm distinction is made between daggers and spearheads, since the difference is one of mounting. Probably the slotted examples were used as spearheads (although it is curious that they are not followed in the archaeological record

⁹⁰ Montelius pl. 4, 8.

⁹¹ Deshayes 193.

⁹² Stronach 118 n. 202.

⁹³ Eutresis fig. 287.

⁹⁴ Poliochni pl. CLXXIII.

⁹⁵ Poliochni pl. CXXIX c.

⁹⁶ Deshayes 92; Stronach 120.

⁹⁷ N. Platon and E. Stassinopoulou-Touloupa, "Ivories and Linear B Tablets from Thebes," *ILN*, December 5, 1964, 89 and fig. 5.

⁹⁸ R. Maxwell-Hyslop, "Western Asiatic shaft-hole axes," *Iraq* 11 (1949) 92.

⁹⁹ Montelius pl. 4, 4 and 9; Deshayes II, 105f.

¹⁰⁰ Foster Bequest 129; also A.1904.525 from "one of the Cyclades."

¹⁰¹ H-G. Bucholz, *Zur Herkunft der Kretischen Doppelaxt*.

¹⁰² R. M. Dawkins and J. P. Droop, "Excavations at Phylakopi in Melos," *BSA* 17 (1911) 22 and pl. xiv.59.

¹⁰³ S. Przeworski, *Die Metallindustrie Anatoliens*, 40 and pl. ix, 10 (I am indebted to Mr. David French for this reference).

¹⁰⁴ Mochlos 36.

by numerous socketed spearheads). The terms "dagger" and "spearhead" are used loosely for convenience. In the same way "sword" merely implies a long dagger, of length greater than about 40 cms. Halberds (where the blade is mounted transversely to the shaft) have at times been claimed in the Aegean, but an asymmetrical blade cannot alone be a sufficient indication that such a mounting was used.

The essential feature of the Aegean dagger series is that the separate tang, as an aid to hafting, was not much in favour. This is in marked contrast to the Anatolian series, where a tangless dagger or spearhead is an oddity. Not all Aegean examples are included in the rather pragmatic classification which follows, but it allows for all the daggers and spearheads known from the Cyclades (see pl. 7).

I. Daggers With Rat-Tail Tang

Ia. *Without slots*. This is equivalent to Stronach's Anatolian spearhead Type 1,¹⁰⁵ and is common in Anatolia and Cyprus.¹⁰⁶ It is known in the Cyclades from a single find, in the Keros-Syros culture settlement of Panermos, excavated by Mr. C. Doumas, and to be published by him. There are other examples in the Troad (pl. 7:1a).

Ib. *Slotted*. This is Stronach's Anatolian Type 2. In the Cyclades it is known from a single find at Dokathismata in Amorgos.¹⁰⁷ It occurs in the Troad and elsewhere in Anatolia, notably at Horoztepe (pl. 7:1b).

II. Slotted Daggers/Spearheads (Without Rat-Tail Tang)

Ia. *With well defined tang and round shoulders*. Catalog nos. 47-50 (pls. 5, 7:IIa, 9). This is essentially a Cycladic type, being known from Stavros in Amorgos,¹⁰⁸ the examples listed here, from Levkas and Troy, and an example in the National Museum in Copenhagen.¹⁰⁹ Probably the type is of Cycladic origin.

Iib. *Shoulders narrowing to the tang*. Catalogue no. 51 (pl. 7:IIb). This is equivalent to Stronach's Anatolian spearhead Type 3a. The description in-

cludes many varieties of form, and indeed probably more than one type. It is known in the Cyclades from only two examples. The first is from Amorgos, now in the British Museum (Cat. no. 51). The other, considerably longer and made of tin-bronze, was found at Chalandriani in Syros by Frau E-M Fischer Bossert, and is to be published by her. The type is probably an Anatolian one.¹¹⁰

Iic. *Constricted and then broadening at the butt, to form a tang*. Catalogue no. 52 (pls. 7:IIc and 9). This form is known from two examples, one from Arkesine in Amorgos,¹¹¹ and the other from the same island (Cat. no. 52). Typologically it might be placed midway between IIa and IIb.

IId. *Other slotted varieties*. Catalogue no. 53 (pls. 7:IIb and 9). There are several types in this group. First, the form with four holes in the blade for hafting purposes. An example (Cat. no. 53) from Arkesine in Amorgos was described by Dümmler and has been most fully published by Frau Fischer Bossert.¹¹² With this may be set the other varieties of Stronach's spearheads Type 3b and 3c,¹¹³ chiefly from Crete. The spearheads from Sesklo and Levkas¹¹⁴ may also be set in Class IId.

III. Short Daggers

There are several classes of Aegean daggers which are both flat and short, generally less than 12 cms. in length.

IIIa. *Tanged*. These are uncommon in the Aegean. Examples are known from Arkesine in Amorgos,¹¹⁵ Chalandriani in Syros, and elsewhere (pl. 7:IIIa).

IIIb. *Cretan type*. Very broad butted, often rather shield-like in shape, sometimes with a scalloped butt. These have been found exclusively in Crete, where they first occur in Early Minoan II contexts¹¹⁶ (pl. 7:IIIb).

IIIc. *Round heeled*. This form, very common in western Europe, is rare in the Aegean. The best known examples are those from Ay. Marina in Phokis (pl. 7:IIIc)¹¹⁷ and another was found by Frau E-M Fischer Bossert at Chalandriani.

¹⁰⁵ Stronach 104.

¹⁰⁶ H. W. Catling, *Cypriot Bronzework in the Mycenaean World* (1964) 56 and figs. 1 and 2.

¹⁰⁷ *Ts.1898* pl. 12, 2. In Anatolia Stronach quotes Larisa, Troy, Alaca, Horoztepe, Til Barsib.

¹⁰⁸ *Ts.1898* pl. 12, 5.

¹⁰⁹ *Levkas* pl. 63, 1 and 2; H. Schmidt, *op.cit.* (supra, n. 77) no. 5848; Copenhagen National Museum 3121.

¹¹⁰ Stronach 111, Type 3a (Thermi, Troy, Larisa, Ahirköy).

¹¹¹ *Ts.1898* pl. 12, 1.

¹¹² Bossert 23f.

¹¹³ Stronach 97 (Chrysosakkos, Marathokephalon, Chaimazi).

¹¹⁴ *D-S* pl. 4, 10; *Levkas* pl. 73, 16.

¹¹⁵ Bossert pl. 14, 1-2.

¹¹⁶ E.g. *Mochlos* figs. 12 and 44; Xanthoudides, *op.cit.* (supra, n. 53) pl. xxiv, 1193-94, pl. xxxix, 1432-33.

¹¹⁷ G. Sotiriades, "Fouilles Préhistoriques en Phocide," *REG* 25 (1912) 276, fig. 15, right.

IV. *Broad Butt Daggers, Generally with Two or Four Rivet-Holes, Symmetrically Placed.*

Often the dagger has a rhomboidal section resulting in a central rib. This rib has been used as an important classificatory criterion by some writers, but in most daggers it is no more than a low prominence formed by two of the faces which define the dagger's rhomboidal section. This is the most common Aegean form.

IVa. *Straight butt.* Cat. nos. 54-62 (pls. 7:IVa, 8 and 9). This form is very common in the Cyclades, being known from Ormos Apollona and Karvounolakkoi in Naxos,¹¹⁸ Dokathismata in Amorgos¹¹⁹ and numerous other finds from that island (Cat. nos. 54-62, and two unpublished examples in the Fitzwilliam Museum, Cambridge: GR.14 and 14a.1901). One in the National Museum, Copenhagen, is apparently from Melos (ABa.955), and there are at least four unpublished specimens in the Apeiranthos Museum, Naxos. A remarkable find from Spedos in Naxos, now in the Naxos Museum, appears to be silver plated. It is 35 cms. in length, decorated with incised grooves, and may well date from the Middle or Late Bronze Age.

The form is very common also in Crete, from such sites as Koumasa, Platanos, Pyrgos, Mallia, Palaikastro, Lebena and doubtless others.¹²⁰ It appears to be the commonest form in Mainland Greece also, being known from Zygouries, Lerna and Levkas.¹²¹

This is clearly the principal Aegean form: it is not found, apparently, in Anatolia. Occurring in Early Bronze 2 contexts in the Cyclades and on the Mainland, it is not yet attested with certainty as early as Early Minoan II in Crete, where the short dagger of Class IIIb is at first the commonest form.

IVb. *Rounded butt.* Cat. no. 63 (pls. 7:IVb and 8). This form, almost invariably with midrib, and sometimes rather long, shows typological development towards the swords of Class VII. There is an example from Amorgos (Cat. no. 63), and another

in the Apeiranthos Museum. The form occurs in Middle Helladic Lerna, Athens,¹²² and especially in Crete.

V. *Broad Butt Flat Daggers with a Single Row of Rivets.*

The rivets are usually flat headed and are often very prominent. Cat. no. 65 (pls. 5 and 7:V).

This form is more easy to recognize than to characterize. It has both a tapering and a tongue-shaped variety, the second being the later, continuing into Late Bronze Age contexts. Probably Class V is not earlier than the Middle Bronze Age. It is known from Kapsalon in Amorgos and other sites on the island, as well as from Levkas, Sesklo, Drachmani in Phokis,¹²³ and many Middle Minoan contexts in Crete. A short dagger from Ay. Marina in Phokis might be a prototype.¹²⁴

A badly corroded dagger from Amorgos, now in the Ashmolean Museum (Cat. no. 64; pl. 9), is probably of this type. According to the Museum records, it was found in a cist grave, together with a ribbed duck-vase¹²⁵ and a beaked jug¹²⁶ (both forms of the Phylakopi I culture) and a "prochos" bottle,¹²⁷ a form particularly associated with the Amorgos Group. These finds suggest a date in the Phylakopi I culture, towards the end of the Early Bronze Age.

VI. *Narrow Butt Daggers, with various rivet arrangements.* Cat. nos. 66 and 67 (pls. 7:VI and 9).

In this form, the narrow butt is the equivalent of a tang. The type corresponds to Stronach's dagger Type 6. It is not common in the Cyclades, and is found more often in Anatolia and in Cyprus.¹²⁸

VII. *Daggers and Swords With Prominent Midrib, usually without rivets.* Cat. nos. 68-72 (pls. 5, 7:VII and 8).

A single example is known from a Cycladic grave,¹²⁹ but there are others in the Apeiranthos Museum, and Mrs. A. Ozanne (née Furness) ac-

¹¹⁸ Papathanasopoulos pl. 77; Stephanos 224.

¹¹⁹ Ts.1898 pl. 12, 8.

¹²⁰ Early Cretan metalwork is to be the subject of a special study by Mr. Keith Branigan. His survey of the many unpublished examples, and the much needed chronological conclusions which should result, will be of great importance. In view of his work, no attempt has been made here to survey the Cretan material in detail.

¹²¹ Blegen, *op.cit.* (supra, n. 28) 182 and pl. xx, 25; J. L. Caskey, "Excavations at Lerna, 1954," *Hesperia* 24 (1955) pl. 23, b; Levkas pl. 63 a, 3 and 4.

¹²² J. L. Caskey, "Excavations at Lerna, 1956," *Hesperia* 26

(1957) pl. 42, c; Montelius pl. 7, 9.

¹²³ Ts.1898 pl. 12, 3 and p. 190, fig. 11; Levkas pl. 73, 15; D-S pl. 4, 11 and pl. 5, 16; Γ. Σωτηριάδης, Προϊστορικά ἀγγεία Χαίρωνείας καὶ Ἐλαρείας, *ArchEph* (1908) 93 fig. 16.

¹²⁴ G. Sotiriades, *op.cit.* (supra, n. 117) fig. 15, right.

¹²⁵ Museum no. AE 265; cf. Caskey, *op.cit.* (supra, n. 122) pl. 42, d.

¹²⁶ Mus. no. AE 264, cf. Atkinson *et al.*, *op.cit.* (supra, n. 12), pl. ix, 1.

¹²⁷ Mus. no. AE 262, cf. Bossert pl. 13, 6.

¹²⁸ Catling, *op.cit.* (supra, n. 106) 60, fig. 3, 7-11.

¹²⁹ Ts.1898 pl. 12, 6.

quired others at Vroutsi north of Kastraki in Amorgos¹³⁰ (Cat. nos. 70 and 71). Two more from the same island are in the Ashmolean Museum in Oxford (Cat. nos. 68 and 69). There is an Early Bronze Age find from Levkas,¹³¹ and they are common enough in Crete. This Class would in fact include the long swords of the Late Bronze Age of Karo's Type A—Cat. no. 71 has the tang which is one of Type A's defining features. Most of those here listed are probably earlier however, as well as shorter, and are prototypes for the fully developed Aegean sword.¹³²

Other Daggers. Most Aegean spearheads and daggers can be fitted into the above categories, partly since these are not very closely defined. The tanged dagger from Manika¹³³ has however a definitely Anatolian look, and will not fall into any of them. Many other varieties of dagger are also found in the Troad and at Poliochni.

Two principal conclusions arise from this survey. First, the dagger appears simultaneously in the Cyclades, Crete and Mainland Greece in the Early Bronze 2 period. Furthermore the forms which subsequently are the most important, especially Classes IIa and IVa, are Aegean inventions, the former probably a Cycladic one.

There is admittedly some Anatolian influence in the Keros-Syros culture, indicated by daggers of Class Ia and IIb, and this is also suggested by the Manika dagger. The dagger develops in all four regions from this time, but finds are notably more abundant in Crete and the Cyclades (especially Amorgos) than in the Mainland of Greece or West Anatolia.

Classes I to IV, and VI, begin in the Early Bronze Age, but their duration has not been established, and unfortunately no clear stratigraphical evidence has yet been obtained for them in Crete. The type IV dagger, however, clearly contributed in the formation of the sword of Karo's Type A. In Amorgos these daggers last through the time of the development of the Phylakopi I culture, and despite the absence of Middle Cycladic associations, it is

likely that their use continued well into the Middle Bronze Age.

CYCLADIC TECHNOLOGY

Several sites in the Aegean have yielded remains of metal working. The most important finds are those by Dr. D. Theocares in Attica, but slag and moulds were also found in various levels at Poliochni.¹³⁴

In the Cyclades there are several sites with such remains. Chalandriani in Syros, with its rich grave-goods as well as copper slag and schist moulds for flat axes and chisels,¹³⁵ is the most notable. Tsountas recovered copper slag at Avyssos in Paros.¹³⁶ Signs of metallurgy, with crucibles, were detected at Phylakopi in Melos.¹³⁷ The blue pigment contained in the little pots from the Louros grave¹³⁸ is probably azurite, a copper ore, and several of the islands have ore deposits.¹³⁹

Bivalve moulds have not been found in the Aegean, but their existence may be assumed for the manufacture of some of the shaft-hole tools, such as Cat. nos. 30-33. The clay mould at Poliochni¹⁴⁰ indicates also the use of the *cire perdue* method. Probably, however, open moulds like those of Chalandriani were most widely used, with forging and cold-hammering to produce the desired refinements in shape. Mr. J. A. Charles, in his Appendix, has emphasized the beneficial effects of alloying copper with arsenic to facilitate cold-working and especially hot-working. It seems that archaeologists have insufficiently realized the results which may be achieved by working in this way. For instance, none of the daggers of Classes I to VI here described is likely to have been cast in a bivalve mould, even when there is a medial rib. The daggers of Italy (Remedello—Rinaldone) and Spain (Alcalà etc.) are likely to have been shaped by hammering-up also, rather than by any more complicated process of casting.

The Aegean tin problem still remains a central one for the Bronze Age, since no tin sources whatever are known in the area.¹⁴¹ When tin-bronze is

¹³⁰ J. M. Cook, "Archaeology in Greece 1949-50," *JHS* 71 (1951) 251.

¹³¹ *Levkas* pl. 62, 3.

¹³² N. K. Sandars, "The First Aegean Swords and their Ancestry," *AJA* 65 (1961) 17f.

¹³³ Παπαθασσιλείου, *op.cit.* (supra, n. 52) 11, fig. 13 (This observation was suggested by Mr. David French).

¹³⁴ Δ. Θεοχάρης, 'Ανασκαφή ἐν 'Αραφῇνι, *Praktika* (1952) 129f; *Poliochni* 591, 658.

¹³⁵ *Ts.* 1899 124, figs. 35-37.

¹³⁶ *Ts.* 1898 176.

¹³⁷ Dawkins and Droop, *op.cit.* (supra, n. 102) pl. vii, lower; also Atkinson *et al.* (*op.cit.*, supra n. 12) 190.

¹³⁸ Παπαθανασopoulos 132.

¹³⁹ Κορδελλᾶς, *op.cit.* (supra, n. 31); O. Davies, *Roman Mines in Europe* (1935) 256f.

¹⁴⁰ *Poliochni* pl. LXXXV, d.

¹⁴¹ O. Davies, "Two north Greek mining towns," *JHS* 49 (1929) 89, reviewed the evidence and suggested one source only at Itea (Kirrha) in Phokis. This site has been convincingly

found, therefore, the tin must either have been brought in from some distant source such as Italy and Spain, or have been found in small and probably alluvial deposits, now worked out, of which no trace is to be found today.

Tin-bronze is indeed rare in the Aegean Early Bronze Age. Few of the objects which have been analyzed for the present study are of tin-bronze. The two bronze axe-adzes from Naxos (Cat. nos. 41 and 42) and the sickle from Amorgos¹⁴² (Cat. no. 46) are of Late Bronze Age date. The three swords from Amorgos (Cat. nos. 70-72), now in Athens, are likewise later than the Early Bronze Age, as may also be the shaft-hole axe (Cat. no. 40).

Only three Cycladic daggers are of tin-bronze: the example of Class V from Tomb 10 at Kapsalon in Amorgos,¹⁴³ a specimen of Class VI from the same island (Cat. no. 67), and the dagger of Class IIb from Chalandriani in Syros. To this list should be added the tin-bronze bracelet from Tomb 14 at Dokathismata in Amorgos.¹⁴⁴

Regrettably few Early Bronze Age metal objects have yet been analyzed from the Greek Mainland, and none yet published is of tin-bronze. Early and Middle Minoan objects in the Herakleion Museum have been analyzed by the Arbeitsgemeinschaft für die Metallurgie des Altertums, Freiburg. Of the several Early Minoan daggers, only one had a significant quantity of tin, and few even of Middle Minoan date were of tin-bronze.¹⁴⁵

In the East Aegean, tin-bronze was more common at this time, in the Early Bronze 2 phase.¹⁴⁶ Of the 22 analyses of Troy II date materials given by Bittel, 15 are of tin-bronze, 4 are low in tin but with high arsenic (greater than 3%), and 3 have small quantities of tin and arsenic. Interestingly, 3 of the tin-bronzes have more than 5% lead.¹⁴⁷ So high a proportion of lead is not seen in any of the other Aegean analyses available, although Cat. nos. 42 and 62 have more than 2% lead.

There is no known source for the Cycladic or

Troadic tin in Anatolia,¹⁴⁸ and the import of the material to Kültepe in Cappadocia in the Middle Bronze Age confirms that there was no local supply in that part of Anatolia. Indeed no source is known in the East Mediterranean.

Sources in the West Mediterranean have been suggested. Iberia certainly has abundant tin, but this is located in the west. The absence of any tin from the objects which have been analyzed from Los Millares or Vila Nova de São Pedro¹⁴⁹ is itself an argument against its export at that time. It is true that ingots of copper have been found in Sardinia, and these may well have been exported to the Aegean (they are unlikely to be from the Aegean) but they are later in date. There is indeed no evidence that tin was used in the area at all at so early a period. Even the supposed tin button from a Rinaldone context at Mte. Bradone, quoted by Childe as evidence for the tin trade, is a disappointment, proving as it does to be of antimony.¹⁵⁰ There is thus no evidence for a tin trade with the West Mediterranean in the Early Bronze Age.

The apparent abundance of tin in the Early Bronze 2 Troad may indeed be the best clue to its origin. And the only object of pure tin from the Aegean Early Bronze Age is from the nearby site of Thermi.¹⁵¹ As yet one can only hazard a guess, but the most likely source for the Early Bronze Aegean would seem to be some alluvial deposit of tin, in or near the Troad, which is now worked out. This would explain its early occurrence and frequency in the Troad, and seems a more probable explanation than some hypothetical and distant tin trade, for which there is no good evidence.

For the Cyclades, however, it is not the lack of tin but the response to it which is the more significant. It has been known for some time that Cycladic and other bronzes sometimes contain a high proportion of arsenic, rather than of tin. There has been disagreement, however, as to whether or

dismissed by Miss Sylvia Benton, "No tin from Kirrha in Phokis," *Antiquity* 38 (1964) 138.

¹⁴² Deshayes 147, no. 2801, pls. XLVI, 19 and LXII, 8.

¹⁴³ Ts.1898 190, pl. 12, 3 (12.85% tin).

¹⁴⁴ Ts.1898 187 and pl. 8, 2 (13.52% tin).

¹⁴⁵ Cf. also A. Mosso, *The Dawn of Mediterranean Civilization* (1910) 307.

¹⁴⁶ Schmidt, *op.cit.* (supra, n. 77) nos. 5801, 5855, 5823; H. Schliemann, Ilios, *The Country and City of the Trojans* 477; K. Bittel, "Beitrag zur Kenntnis Anatolischer Metallgefäße des dritten Jahrtausend v. Chr.," *JdI* 74 (1959) 1.

¹⁴⁷ Bronze with a high proportion of lead appears to be a deliberate product in the Late Bronze Age of Britain, cf. M.

Smith and A. E. Blin-Stoyle, "A sample analysis of British Middle and Late Bronze Age material using optical spectrometry," *ProcPS* 25 (1959) 188f.

¹⁴⁸ P. J. Forbes, *Studies in Ancient Technology* IX (1964) 130.

¹⁴⁹ S. Junghans, M. Schröder and E. Sangmeister, *Metallanalyse kupferzeitlicher und frühbronzezeitlicher Bodenfunde aus Europa* (1960) nos. 297, 737 and 825.

¹⁵⁰ V. G. Childe, *op.cit.* (supra, n. 11) 241; L. Cambi, "I metelli dei cimeli della grotta tombale di Monte Bradone," *Bulletino di Paleontologia Italiana*, NS XII, 67-68 (1958-59) 221f.

¹⁵¹ Thermi 215. The possibility that this also is of antimony cannot be ruled out, as Mr. J. A. Charles has pointed out to me.

not these arsenic-bronzes were the result of deliberate alloying rather than the chance selection of copper ores rich in arsenic.¹⁵²

There are notably high percentages in the analyses here quoted. In four daggers and a sword (Cat. nos. 54, 58, 59, 63, 69) the proportion of arsenic is greater than 4%. Significantly, perhaps, all four of the daggers are of Class IV. There is an appreciable amount of arsenic also in dagger no. 53, and in a chisel (no. 38).¹⁵³ A saw excavated by Stephanos at Aila in Naxos¹⁵⁴ had 2.62% arsenic.

Mr. J. A. Charles, in his Appendix, establishes clearly the beneficial consequences which the alloying with arsenic will have had upon the properties of the bronze, especially for objects to be further worked by forging, which most of the articles here, and certainly all the daggers, were. He gives compelling reasons for accepting this arsenic-bronze as a deliberate alloy, the result of adding specially selected arsenic-rich minerals to the smelting mix. His technical arguments seem to settle the matter, and it now appears proven that deliberate alloying was carried out in the Cycladic Early Bronze Age.

THE ORIGINS OF AEGEAN METALLURGY

There is no long ancestry for the metallurgy of the Early Bronze Age in the Aegean. In Anatolia, the use of native copper is attested as early as Early Neolithic Çatal Hüyük,¹⁵⁵ and the casting of copper is indicated both by slag at that site and by a macehead from Chalcolithic Can Hasan.¹⁵⁶ At Beycesultan too, in the Late Chalcolithic period, there was some expertise in the manufacture of copper tools.¹⁵⁷ But in the Aegean, use of metal in the Neolithic period is attested solely by the two copper axes, with a couple of gold pendants, from Late Neolithic levels at Sesklo in Thessaly,¹⁵⁸ and by a copper axe stratified below a Late Neolithic floor at Knossos in Crete.¹⁵⁹ Traces of copper from the surface at the Late Neolithic site of Kephala in

Kea¹⁶⁰ may indicate some Cycladic use at this time also.

No single object of metal is known from the Early Helladic I culture of Mainland Greece, while the Louros necklace and possibly Bent's Antiparos finds, described above, are the only metal objects which might be ascribed to the Grotta-Pelos culture. There is no metal in Crete from stratigraphically authenticated Early Minoan I levels. Only in the East Aegean is metallurgy attested so early. At Poliochni, the first metal finds are in the blue phase, to be correlated with Troy I. The finds from the First City at Troy are not impressive—Dörpfeld¹⁶¹ listed only a few trinkets of gold, a ring of tin-bronze and two knives, a ring and pins and needles of copper. The Cincinnati excavations there had similar finds.¹⁶² At Thermi, however, there were more impressive finds: axes, daggers, and a bangle, probably of tin.

It thus seems likely that metallurgy came earlier to the Troad than to the remainder of the Aegean. But it should not be overlooked that Early Helladic II/Keros-Syros imports are found already at Thermi and Troy I. It may be, therefore, that the later part of the Troy I phase is contemporary with Early Helladic II, the Keros-Syros culture and Early Minoan II, and should consequently be set in what has here rather loosely been termed the Early Bronze 2 period. The priority of northwest Anatolian metallurgy over that of the remainder of the Aegean is not yet established beyond question.

The notion conforms, however, to the belief that metallurgy came to the Aegean from the east. Whether its origins were in Mesopotamia or southern Anatolia, metal working was practiced in both areas well before its relatively sudden arrival in the Aegean. A number of metal types in the Aegean certainly seem to be imports from the Troad, showing Anatolian influence—the tanged dagger, the slotted dagger of Class IIb, and probably some of the awls and pins of Syros.¹⁶³

¹⁵² E. R. Caley, "On the prehistoric use of arsenical copper in the Aegean region," *Hesperia* Suppl. 8 (1949) 60f; S. Przeworski, *op.cit.* (supra, n. 103) 107-08; I. R. Selimkhanov, "Spectral analyses of metal articles from archaeological monuments," *ProcPS* 28 (1962) 76f; I. R. Selimkhanov, "Was native copper used in Transcaucasia in Eneolithic times," *ProcPS* 30 (1964) 69f.

¹⁵³ The curiously high content of zinc in Cat. no. 47 has yet to be explained. The spearhead is, indeed, of brass, apparently the earliest object known of this alloy. Cf. P. R. S. Moorey, "An interim report on some analyses of Luristan bronzes," *Archaeometry* 7 (1964) 79.

¹⁵⁴ *Stephanos* 224; *Papathanasopoulos* pl. 62, b.

¹⁵⁵ Mellaart, *op.cit.* (supra, n. 23) pl. xxxv a, slag p. 114.

¹⁵⁶ D. French, "Excavations at Can Hasan," *AnatSt* 12 (1962) 33.

¹⁵⁷ Seton Lloyd and James Mellaart, *Beycesultan I* (1962) 285.

¹⁵⁸ D-S, 352. For the gold from Sesklo, *ibid.* 350, 291.

¹⁵⁹ A. J. Evans, *The Palace of Minos* IV, 14 and fig. 3, f.

¹⁶⁰ Cf. J. L. Caskey, "Excavations in Kea, 1963," *Hesperia* 33 (1964), 314f.

¹⁶¹ W. Dörpfeld, *Troja und Ilion* 324.

¹⁶² *Troy* 42.

¹⁶³ *Ts.1899* pl. 10. The bird-headed pins of bone have bronze

What has to be emphasized, nonetheless, is the essential autonomy of the Aegean Early Bronze Age. After an initial impetus, which our ignorance of the Late Neolithic and Anatolian Late Chalcolithic makes it very difficult to document, it developed in its own way, with its own metal types. The most common Aegean dagger, Class IVa, is certainly of local origin (cf. the distribution, pl. 11). So too is the slotted spearhead of Class IIa, which probably originated in the Cyclades. The idea of the shaft-hole tool may be an eastern one, but some of the forms discussed above are purely Aegean. The range of metal types at the time is an impressive one, and such forms as diadems of sheet metal, and especially tweezers (distribution, pl. 11) are apparently local also.

The originality and independence of the industry correlates with the cultural autonomy which is evident from other finds. Despite the intensive trading which clearly took place in the Early Bronze 2 period, each local region had its own culture, which is best characterized today by the ceramic material. It is less clearly seen among the metal finds (contrast pl. 11 with pl. 12), but the concentration of Type IIIb daggers in Crete, for instance, shows that there was some regionalism even in metallurgy. The idea of metallurgy may have been brought to the Aegean from outside, but the manner of its adoption was very much a local affair. Its impact on the Aegean, and its influence in bringing together the disparate cultures of the various regions, is discussed in the next section.

THE INTERNATIONAL SPIRIT OF THE AEGEAN EARLY BRONZE 2 PERIOD

Metallurgy developed rather suddenly in the Aegean, in several regions, in the Early Bronze 2 period. There are other and remarkable changes in the archaeological record at this time, and it is of interest to consider to what extent these events are related.

In the Late Neolithic of the Aegean, such homogeneity as there may have been in the earlier phases

disappears completely. Very little contact of any kind can be documented between the different regions, although obsidian from Melos is still found in Crete and the Mainland.¹⁶⁴ The "coal scuttle" of Sesklo is found again at Kephala in Kea,¹⁶⁵ and the Elateia rhyton has parallels as far away as Danilo,¹⁶⁶ but these are rare examples, which simply serve to underline the cultural isolation of the various regions. Only the distribution of the rolled-rim bowls at the end of the Neolithic¹⁶⁷ suggests some more prolonged influence.

At the outset of the Early Bronze Age, the same is true, and few if any direct imports into one region from another can be recognized during Early Bronze 1, although some of the new forms of Early Minoan I have Anatolian resemblances. The one-handled cup (distribution, pl. 12) is already found, however, at Thermi, Eutresis¹⁶⁸ on the Greek Mainland and at Lebena in Crete.¹⁶⁹

It is against this background that the extensive contact which came about in the Early Bronze 2 period seems so astonishing an innovation. The *depas* cup, for instance, has an extensive distribution throughout Anatolia, and certainly originates there, but it is found in the Cyclades and the Greek Mainland (distribution in the Aegean, pl. 12). The "sauceboat" is certainly a Helladic or Cycladic form, but it is found in the East Aegean. The marble folded-arm figurines are undoubtedly Cycladic in origin, yet exports or copies are numerous in Crete and the Greek Mainland (pl. 12). These distributions suggest something of a cultural continuum in the Early Bronze 2 period. This is not, however, a cultural unity, for each region retains its identity, which is seen in many other finds of more restricted distribution.

The widespread adoption of these forms indicates a very marked increase in trade and in contact: there is something of an international spirit at this time. It seems to have been the result, principally, of the impact of metallurgy.

Metal vessels are extremely rare in the Aegean Early Bronze Age, but those few that have sur-

counterparts at Thermi (*Thermi* pl. xxv, 31.18 and 31.19). For the wider affinities of the spiral-headed pins, see V. G. Childe, "The axes from Maikop and Caucasian metallurgy," *Liverpool Annals of Archaeology and Anthropology* 23 (1936) 113f and pl. LII, c. Direct East Mediterranean influence must also be considered a possibility now, in view of the daggers from Byblos imported to Crete at least as early as the Middle Minoan I period, cf. K. Branigan, "Byblite daggers in Cyprus and Crete," *AJA* 70 (1966) 123f.

¹⁶⁴ Renfrew *et al.*, *op.cit.* (supra, n. 15) 225f.

¹⁶⁵ D-S 116, 3 and pl. 21, 1; Caskey, *op.cit.* (supra, n. 160) pl. 46, e-f.

¹⁶⁶ S. Weinberg, "Excavations at prehistoric Elateia," *Hesperia* 29 (1962) fig. 12; J. Korošec, *Danilo in Danilška Kulturna* (1964) pl. 36.

¹⁶⁷ French, *op.cit.* (supra, n. 13).

¹⁶⁸ J. L. and E. G. Caskey, *op.cit.* (supra, n. 6) 141, fig. 7, 111.6.

¹⁶⁹ Renfrew, *op.cit.* (supra, n. 10).

vived bear a striking relation to the dominant ceramic forms, which must have been radically influenced by them. The Urfinnis "sauceboat" of Early Helladic II and the Keros-Syros culture (pl. 10:b is from Chalandriani) has been recognized for some time¹⁷⁰ to be an imitation of the elegant drinking cup of gold, an example of which survives (pl. 10:a). The *depas* cup, with its prominent handles, seen at Orchomenos and Chalandriani¹⁷¹ (pl. 10:d from Troy) as well as widely in west and central Anatolia, now has a prototype in silver¹⁷² (pl. 10:c). The elegant cups of Syros and Siphnos¹⁷³ have a metal counterpart at Troy,¹⁷⁴ and there can be little doubt that the new fashion in the Aegean for thin-walled pottery, with an elegant flowing line, is a consequence of the imitation of metalwork.

Probably the Early Helladic II open bowl¹⁷⁵ is an imitation of a metal prototype which has not survived (compare however pl. 10:e and pl. 10:17). Even the "frying pans" of the Keros-Syros culture have plausible metal prototypes in the Alaca treasure¹⁷⁶ and in recent finds in the Troad,¹⁷⁷ where a wide range of metal vessels is now seen. In Crete, as elsewhere, the various handled jugs may indicate metal prototypes which have not survived,¹⁷⁸ and indeed the widespread appearance in the Aegean at this time of the "hand-grip" handle may reflect the influence of metal forms. The Middle Minoan I footed bowl, with its twisted rim has a silver counterpart from Gournia,¹⁷⁹ which it undoubtedly imitates.

Metal forms were imitated even in marble: there are versions of the two-handled cup at Knossos¹⁸⁰ and in Lerna III.¹⁸¹ A complete footed sauceboat in marble, from the Cyclades, is now in the National Museum in Athens.¹⁸² It is interesting, indeed, to speculate whether the folded-arm figurine of marble may not itself derive from a metal prototype.

Metal figurines are attested in the Cyclades, as discussed above, and one from Ios was apparently of the folded-arm form, perhaps not unlike the silver figurine from Horoztepe.¹⁸³ It cannot be excluded that the Cycladic marble workers, already skilled during the time of the Grotta-Pelos culture in the making of schematic figurines, copied a metal prototype when forming the new convention of the folded-arm representation.

The influence of metallurgy upon the cultures of the period is thus a profound one, influencing the forms of expression as well as the economy. It is difficult for us today to reconstruct the economy of those times, and easy to exaggerate the economic importance of prehistoric trade. Before trade can play an important economic role in society, there must both be a useful commodity to be traded, and a market for it. Now, contrary to the view of some writers, obsidian can never have been required in sufficient bulk to have had any major economic significance.¹⁸⁴ It is unlikely that essential foodstuffs were traded in great quantities in prehistoric times, since until organization was rather more efficient and sophisticated, as in Classical times, a regular supply could not be assured. A society consequently had to be largely self-supporting in its diet, and could hardly depend on irregular and uncertain supplies of food from outside.

The arrival of metallurgy must radically have changed the situation, hitherto unfavourable to extensive or systematic trade. For the first time there existed, in localized regions, a commodity universally desirable and with considerable economic and political significance. Its impact on crafts—as illustrated by the Kythnos hoard—and on warfare—as demonstrated by the Amorgos daggers—must have been immense. In the early stages, finished objects were probably traded, as documented by the

¹⁷⁰ V. G. Childe, "A gold vase of Early Helladic type," *JHS* 44 (1924) 163. Compare also the three-spouted vessel, Zervos, *op.cit.* (supra, n. 36) figs. 185-186, with the metal vessel from Troy, Schmidt, *op.cit.* (supra, n. 77) no. 5863.

¹⁷¹ Kunze, *op.cit.* (supra, n. 47) pl. xxiii, 1; J. L. Caskey, "Chalandriani in Syros," *Essays in Memory of Karl Lehmann* (1964) 63f, fig. 8.

¹⁷² R. D. Barnett, "A review of acquisitions, 1955-62, of Western Asiatic antiquities," *BMQ* 27, no. 3-4 (1963-4) 79 and pl. xxix, b.

¹⁷³ *Ts.1899* pl. 8, 3-4.

¹⁷⁴ Schmidt, *op.cit.* (supra, n. 77) nos. 5685, 5973.

¹⁷⁵ J. L. Caskey, *op.cit.* (supra, n. 6) 291, fig. 1, B, D and E. It is unlikely that the Late Neolithic thin-walled pottery vessels of the Greek mainland were based on metal prototypes as suggested by F. Schachermeyr, *Die älteste Kulturen Griechenlands* (1955) 126f. So early a *Metallschöck* is not supported by

evidence of metal vessels, nor indeed by other metal finds.

¹⁷⁶ M. Mellink, "The tomb at Alaca Hüyük and the Aegean world," *The Aegean and the Near East: Studies Presented to Hetty Goldman* (1956) pls. iv-vi.

¹⁷⁷ Bittel, *op.cit.* (supra, n. 146) Abb. 1-2.

¹⁷⁸ But cf. the gold jug from Horoztepe, B. Tezcan, *op.cit.* (supra, n. 42) pl. xv.

¹⁷⁹ H. Boyd Hawes, *Gournia* (1908) pl. c, 1.

¹⁸⁰ Åberg, *op.cit.* (supra, n. 11) p. 89, fig. 174; cf. Schmidt, *op.cit.* (supra, n. 77) no. 5873 in silver.

¹⁸¹ J. L. Caskey, "Excavations at Lerna, 1955," *Hesperia* 25 (1956) 164, fig. 4. This is the more squat form of *depas* cup, corresponding to Troy form A 44 rather than A 45.

¹⁸² Athens, National Museum 6292.

¹⁸³ Tezcan, *op.cit.* (supra, n. 42) pl. xxiv, 1-2.

¹⁸⁴ Renfrew, Cann and Dixon, *op.cit.* (supra, n. 10) 241.

Manika dagger and the spearheads of Class IIB. Later, with the dissemination of the essential technological "know-how," whose spread is indicated by the slags of Askitarío, Chalandriani and Avyssos, the raw material itself may well have been traded, or at least the local, Aegean-made products of the craft.

Fortunately we have, on the "frying pans" and in the models (pl. 3), documentation for the very adequate shipping available, and the transport of the copper ore, or of ingots like those of the Middle and Late Bronze Age¹⁸⁵ must have been perfectly feasible. The systematic and well-organized metal trade of the Assyrian colony at Kültepe was undertaken only a little after this time,¹⁸⁶ and the Cape Gelidonya wreck¹⁸⁷ shows that, in the second millennium at least, both copper and tin formed important sea cargoes.

We do not, however, have to imagine so extensive or far-reaching a trade in the later third millennium. There is little evidence, for instance, that the Aegean was already in systematic trading contact with Italy or Sardinia, let alone Spain. Indeed it may be wrong to imagine a bulk trade in raw copper at so early a date; perhaps only the finished objects were traded. But some systematic and regular trade within the Aegean is certainly indicated.

Some of the consequences of this trade have already been discussed. The principal metal types have a wide and rapid distribution: double-spiral pins, awls in incised bone handles and tweezers, as well as tools, weapons and more precious objects, are widely found. One result of the numerous contacts which are implied by these distributions must have been the widespread exchange of information of various sorts. This, ultimately, was more important than the transport of the objects themselves. For any major increase in the amount of contact between human groups, in the information communicated between them, marks a significant increase in the complexity of society. Whereas the Aegean formerly comprised a number of separate and unconnected cultural regions, it became at this time, or began to become, a larger cultural organism. The regions probably remained autonomous politically—there is no evidence for an "empire" until the Late Bronze Age—but economically and culturally the Aegean

became something more than the simple juxtaposition of unrelated cultures which it was in the Late Neolithic.

Urbanization is not easy to define, nor to recognize in the archaeological record. But while Dhimi-ni was only a fortified village, Lerna and Phylakopi as well as Troy II and Poliochni may be regarded as towns. Specialization of labour is as much a criterion as fortification or population-size, and it is certainly exemplified in the metallurgy, while the town-plan of Phylakopi and the sealings of Lerna suggest a fairly advanced social organization.

In the third period of the Early Bronze Age many of these advances are consolidated, but the international spirit declines somewhat. The stimulating transition to a metal-using society has had its impact, and the metal vessels, for instance, have lost their novelty, and their shapes no longer pre-occupy the potter. The metal types remain widespread, and new ones are introduced, but the trade must in some way have changed in character, for in the archaeological record, signs of contact actually diminish. The painted wares of Lerna IV, for instance, do not have the widespread distribution of the Urfinis and patterned ware of Early Helladic II.

The coming of metallurgy to the Aegean can thus be correlated with the increase in trade and specialization and other signs which indicate the process of urbanization. Of course the importance of the role of metallurgy in bringing about such changes could easily be exaggerated. Indeed metal only came to these regions rather belatedly, when their cultures were, in a sense, ready for the innovation, and ready to support the specialists which the craft demands.

There is still much to learn about the preceding Late Neolithic and Early Bronze 1 periods, and until this background is better understood, our comprehension of the remarkable economic expansion of the Aegean Early Bronze 2 period will remain an imperfect one. The impact of metallurgy, and the social contacts which resulted, are likely, however, to be the key to our understanding of the unifying features which appear in the archaeological record of the time. Some of these were retained throughout the Middle Bronze Age, and served as

¹⁸⁵ H-G. Bucholz, "Der Kupferhandel des zweiten vorchristlichen Jahrtausends," *Minoica, Festschrift zum 80. Geburtstag von Johannes Sundwall* (1958) 92f.

¹⁸⁶ A. Goetze, *Kleinasien* (Handbuch der Altertumswissen-

schaft III. 1.3.3.1) 67.

¹⁸⁷ G. F. Bass, "The Cape Gelidonya Wreck, Preliminary Report," *AJA* 65 (1961) 267f.

a basis for the subsequent development of Aegean civilization.

UNIVERSITY OF SHEFFIELD

CATALOGUE OF UNPUBLISHED OR REPUBLISHED OBJECTS

Objects with a BM serial number are in the British Museum. Numbers 70-72 are in the British School of Archaeology at Athens. The remainder are in the Department of Antiquities, the Ashmolean Museum, Oxford.

1. Lead figurine. BM 84,12-13,20. Head missing, left arm broken. Height 4.9 cms. Found by J. T. Bent¹⁸⁸ in a cist grave in Antiparos. Pls. 1 and 2.
2. Silver torque. BM 84,12-13,21. Diameter 11.3 cms., thickness ca. 0.4 cms. Found by Bent in a cist grave in Antiparos.¹⁸⁸ Pl. 2.
- 3-6. Four small lead (?) bracelets. BM 84,12-13,22 to 25. Numbers 3 and 4 have a flat-ended section, numbers 5 and 6 have a circular section, thickness ca. 0.4 cms. Present diameter ca. 4 cms. Found by Bent in a cist grave in Antiparos.¹⁸⁸ Pl. 2.
7. Lead fragment. AE 243. Lower surface smooth, upper rough. Probably cast in an open mould. Length 8.6 cms., thickness 1.2 cms. From Amorgos, bought in Athens 1893. Pl. 2.
8. Silver bracelet. AE 253. Concave section. Terminals decorated with incisions. Present diameter 6.5 cms., thickness 0.1 cms. From a cist grave in Amorgos. Bought in Athens in 1896. Pls. 1 and 2.
9. Silver arm spiral. AE 255. Present length 4.0 cms., diameter 5.0 cms., thickness 0.3 cms. Provenance as no. 8. Pl. 2.
10. Silver bracelet. AE 260. Circular section. Present diameter 6.5 cms., thickness 0.3 cms. Provenance as no. 8. Pl. 2.
11. Lead (?) bracelet. AE 254. Circular section. Present diameter 6.9 cms., thickness 0.5 cms. Provenance as no. 8. Pl. 2.
12. Lead boat. 1929.26. Made from 3 strips of lead. Length 40.3 cms., width 3.3 cms. Found in a cist grave in Naxos with figurines, cat. nos. 15 and 16. The find is said to have comprised four boats (possibly including cat. nos. 13 and 14) and three figurines. Bought in Athens in 1917 by Professor R. M. Dawkins and presented by him to the Ashmolean Museum through Sir Arthur Evans. Pls. 1 and 3.
13. Lead boat. 1938.725. Originally the longest of the three boats. Preserved length 39.0 cms. From Naxos. Presented by Sir Arthur Evans. Pl. 3.
14. Lead boat. 1938.726. Preserved length 34.0 cms. Provenance as no. 13. Pl. 3.
- 15 and 16. Marble folded-arm figurines. 1929.28 and 27. Height 18.4 and 13.5 cms. respectively. Provenance as number 12. Pl. 3.
17. Silver bowl. AE 158. Max. diameter 9.2 cms., thickness 0.1 cm. From Dümmler's cist grave D¹⁸⁹ at Kapros in Amorgos. Pls. 1 and 10.

¹⁸⁸ C. C. Edgar, *op.cit.* (supra, n. 35).

¹⁸⁹ Dümmler, *op.cit.* (supra, n. 21).

18. Needle of copper or bronze. AE 164. Square section. Length 4.9 cms., thickness 0.1 cms. Provenance as no. 17 (not illustrated).

19. Greenstone cylinder seal. AE 159. Suspension loop. The cylinder is carved at the side and the end. Height 4.6 cms., height of design 3.3 cms., diameter 1.9 cms. Provenance as no 17. Pl. 4.

20. Greenstone handle. AE 160. Of calcite or anhydrite. Not wheelturned, not pierced at end. Length 6.7 cms., diameter 1.6 cms. Provenance as no. 17. Pl. 4.

21. Greenstone handle fragment. AE 161. Of calcite or anhydrite. Not wheel turned, pierced at end (possibly to take the needle, no. 18 above). Length 3.2 cms., diameter 1.7 cms. Provenance as no. 17. Pl. 4.

22. Three silver beads. AE 163. Flat silver foil, with oblique rippled decoration of straight lines, rolled to form beads. Length 4.3 cms., diameter 0.9 cms. Provenance as no. 17. Pl. 4.

23. Five stone beads. AE 162. Three green (cf. nos. 20 and 21). Two, of the same material as the green ones, are pale brown. Tubular, swelling at the middle. Neatly pierced. Length from 3.8 to 2.4 cms., diameter 1.0 to 0.8 cms. Provenance as no. 17. Pl. 4.

24. Fourteen pendant beads, and four fragments. AE 166. White stone, probably limestone. Graded in size from 5.3 to 4.5 cms. Provenance as no. 17. Pl. 4.

25. Rectangular piece of ivory (?) with incised concentric circles at the edge. AE 165. Motif of circles, recurring five times, each with a central point and two concentric rings. Length 5.5 cms., width 1.6 cms., thickness 0.5 cms. Provenance as no. 17. Pl. 4.

26. Shell figurine. AE 156. Arms apparently folded, legs separated, head delineated with facial features. Back plain. Height 5.4 cms., thickness 0.7 cms. Probably from Dümmler's Grave D, with no. 17. Pl. 4.

27. Shell figurine. AE 157. Schematic "violin figurine." Long neck without separate head. Height 4.7 cms., thickness 0.5 cms. Possibly from Dümmler's Grave D, with no. 17. Pl. 4.

28. Marble figurine. AE 1551. Arm stumps, separate legs and head. Height 9.5 cms. Probably from Dümmler's Grave D, with no. 17. Pl. 4.

29. Marble figurine. AE 154. Folded-arms. Height 16.8 cms. Possibly from Dümmler's Grave D, with no. 17. Pl. 4.

30. Axe-adze. BM 66,2-7,10. Circular shaft hole. Length 11.6 cms., length of axe blade 3.8 cms., length of adze blade 2.9 cms. Weight 250 grams. From the Kythnos hoard.¹⁹⁰ Pls. 5 and 6.

31. Shaft-hole axe. BM 66,2-7,7. Circular shaft hole. Length 15.8 cms., length of blade 7.7 cms. Weight 1490 grams. Provenance as no. 30. Pls. 5 and 6.

32. Shaft-hole axe. BM 66,2-7,9. Circular shaft hole. Length 10.6 cms., length of blade 6.0 cms. Weight 950 grams. Provenance as no. 30. Pls. 5 and 6.

33. Shaft-hole axe. BM 66,2-7,8. Circular shaft hole. Length 15.6 cms., length of blade 6.8 cms. Weight 1250 grams. Provenance as no. 30. Pls. 5 and 6.

¹⁹⁰ Franks, etc., *op.cit.* (supra, n. 78).

34. Flat axe. BM 66,2-7,1. Square perforation. Edge beveled at both faces. Length 19.8 cms., thickness 0.9 cms. Weight 940 grams. Provenance as no. 30. Pl. 6.

35. Flat axe. BM 66,2-7,2. Square perforation. Edge beveled at both faces. Length 19.9 cms., thickness 0.7 cms. Weight 710 grams. Provenance as no. 30. Pls. 5 and 6.

36. Flat axe. BM 66,2-7,3. Square perforation. Edge beveled at both faces. Length 17.1 cms., thickness 0.9 cms. Weight 710 grams. Provenance as no. 30. Pl. 6.

37. Flat axe (narrow). BM 66,2-7,4. Edge beveled at both faces. Length 21.7 cms., thickness 0.4 cms. Weight 250 grams. Provenance as no. 30. Pl. 6.

38. Flate axe (chisel). BM 66,2-7,5. Beveled at one face. Length 18.6 cms., thickness 0.5 cms. Weight 145 grams. Provenance as no. 30. Pl. 6.

39. Flat axe (chisel). BM 66,2-7,6. Edge beveled at one face. Length 16.2 cms., thickness 0.5 cms. Weight 135 grams. Provenance as no. 30. Pls. 5 and 6.

40. Shaft-hole axe. 1927.2968. Oval shaft-hole. Length 14.5 cms. Length of blade 7.3 cms. From Amorgos, bought in Athens 1893. From the collection of Sir John Evans, presented by Sir Arthur Evans in 1927. Analysis infra. Pl. 9.

41. Axe-adze. AE 86. Oval shaft-hole. Length 14.0 cms., length of axe blade 4.5 cms., length of adze blade 4.1 cms. From Naxos, bought in Athens in 1895. Analysis infra. Pl. 9.

42. Axe-adze. AE 87. Oval shaft-hole. Length 17.9 cms., length of axe blade 5.1 cms., length of adze blade 4.7 cms. From Naxos, bought in Athens in 1895. Analysis infra. Pl. 9.

43. Flat axe (chisel). 1927.1357. Edge beveled at one face. Length 15.9 cms., thickness 0.5 cms. From Amorgos, bought in Athens in 1883. Analysis infra. Pl. 9.

44. Flat axe. 1910.618. Edge damaged. Length 12.8 cms., thickness 0.4 cms. Bought in Paros. Analysis infra. Pl. 9.

45. Flat axe. AE 236. Edge beveled at both faces. Length 6.2 cms., thickness 0.8 cms. From a cist grave in Amorgos, bought in Athens in 1893. Analysis infra. Pl. 9.

46. Sickie. 1927.1362. Broken at tip. Length 23.5 cms. From Amorgos,¹⁹¹ bought in Athens in 1883. Analysis infra. Pl. 9.

47. Dagger (spearhead) Class IIa. AE 237 (1896-20). Medial ridge. Length 15.2 cms. From Amorgos, bought in Athens 1896. Analysis infra. Pl. 9.

48. Dagger (spearhead) Class IIa. 1927.1361. Medial ridge. Length 19.5 cms. From Amorgos, bought in Athens 1883. Analysis infra. Pl. 9.

49. Dagger (spearhead) Class IIa. BM 81,5-9,5. Medial ridge. Length 18.8 cms. Weight 110 grams. From Amorgos. Presented to the BM by A. W. Franks in 1881. Pl. 5.

50. Dagger (spearhead) Class IIa. BM 81,5-9,6. Flat section. Length 17.9 cms. Weight 100 grams. From Amorgos. Presented to the B.M. by A. W. Franks in 1881. Pl. 7:IIa.

51. Dagger (spearhead) Class IIb. BM 81,5-9,7. No prominent medial ridge, but thickens at middle. Length 17.0 cms. Weight 85 grams. From Amorgos. Presented by A. W. Franks in 1881. Pl. 7:IIb.

52. Dagger (spearhead) Class IIc. AE 233. No prominent medial ridge, but central thickening. Length 20.5 cms. From Amorgos, bought in Athens in 1893. Analysis infra. Pls. 7:IIc and 9.

53. Dagger (Spearhead) Class IId. AE 231. Broad thick blade, tapering at edge, pierced with four holes for mounting. Length 23.5 cms. From Arkesine in Amorgos.¹⁹² Bought in Athens in 1893. Analysis infra. Pls. 7:IIId and 9.

54. Dagger Class IVa. AE 238. Prominent medial ridge. Four rivet holes. Length 17.1 cms. From Amorgos, bought in Athens. Analysis infra. Pl. 8.

55. Dagger Class IVa. AE 240 (1898.17). Medial ridge. Four rivet holes. Length 18.1 cms. From Amorgos, bought in Athens. Analysis infra. Pl. 8.

56. Dagger Class IVa. 1927.1360. Prominent medial ridge. Four rivet holes. Length 14.6 cms. From Amorgos, bought in Athens 1883. Analysis infra. Pl. 8.

57. Dagger Class IVa. AE 230 (1893.61). Slight medial ridge. Two rivets (length 0.6 cms.). Length 17.1 cms. From Amorgos, bought in Athens, Analysis infra. Pl. 8.

58. Dagger Class IVa. AE 239. Slight medial ridge. Four rivet holes. Length 21.4 cms. From Amorgos, bought in Athens. Analysis infra Pl. 8.

59. Dagger Class IVa. AE 252 (1893.60). Slight medial ridge. Five rivet holes, with three rivets (length 1.6 cms.). Length 20.0 cms. From Amorgos, bought in Athens. Analysis infra. Pl. 8.

60. Dagger Class IVa. BM 81,5-9,8. Prominent medial ridge. Two rivet holes. Length 22.4 cms. Weight 100 grams. From Amorgos, presented to the BM by A. W. Franks in 1881. Pl. 7:IVa.

61. Dagger Class IVa. AE 229. Flat section. Four rivet holes, with two square rivets (length 1.0 cms.). Length 15.4 cms. From Amorgos, bought in Athens 1892. Pl. 9.

62. Dagger Class IVa. 1927.1358. Flat section, four rivet holes. Length 12.2 cms. From Amorgos, bought in Athens in 1883. Analysis infra. Pl. 9.

63. Dagger Class IVb. 1927.1359. Medial ridge. Originally four rivet holes. The rounding of the butt is not as pronounced as in some of this class. Length 15.9 cms. From Amorgos, bought in Athens in 1883. Analysis infra. Pls. 7:IVb and 9.

64. Dagger Class V. AE 267. Flat section. Three rivet holes in line. Fragmentary. The original shape, and hence the attribution to Class V, is uncertain. From Amorgos. Associated, according to the Museum Catalogue, with a duck-vase, a beaked jug and a "prochos" bottle. Pl. 9.

65. Dagger Class V. BM 81,5-9,4. Flat section. Four rivet holes in line. Length 12.1 cms. Weight 35 grams. From Amorgos, presented to the BM by A. W. Franks in 1881. Pl. 5.

66. Dagger Class VI. AE 234 (1893.64). Flat sec-

¹⁹¹ Cf. supra, n. 142.

¹⁹² Cf. supra, n. 112.

tion. Three rivet holes. Length 19.4 cms. From Amorgos, bought in Athens in 1893. Analysis infra. Pls. 7:VI and 9.

67. Dagger Class VI. AE 235. Slight medial ridge. Two rivet holes. Length 16.6 cms. From Amorgos, bought in Athens in 1893. Analysis infra. Pl. 9.

68. Dagger Class VII. AE 241 (1896.22). Prominent midrib. Length 19.7 cms. from Amorgos. Analysis infra. Pl. 8.

69. Dagger (sword) Class VII. AE 242 (1896.21). Prominent midrib. One rivet preserved (length 0.9 cms). Length 33.2 cms. From Amorgos, bought in Athens in 1893. Analysis infra. Pls. 7:VII and 8.

70. Dagger (sword) Class VII. British School at Athens B 181, B. Medial ridge. Two narrow decora-

tive ribs run parallel to the central ridge on each side of it. Preserved length 36.0 cms. Bought in 1949 near Vroutsis in Amorgos by Miss Audrey Furness.¹⁹³ Analysis infra. Pls. 5 and 8.

71. Dagger (sword) Class VII. British School at Athens B 181, C. Medial ridge. A narrow decorative rib runs parallel to the central ridge on each side of it. The butt has a tang. Preserved length 25.6 cms. Provenance as no. 70. Analysis infra. Pls. 5 and 8.

72. Dagger Class VII. British School at Athens B 181, A. Medial ridge which is not as prominent as those of nos. 68 and 69. This dagger might equally be classified with those of Class IVa. Length 19.5 cms. Provenance as no. 70, above. Analysis infra. Pl. 8.

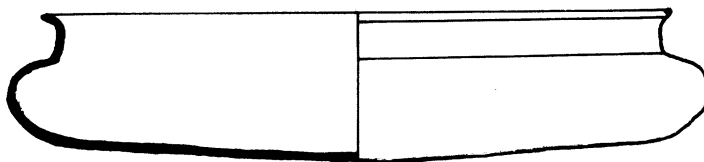
¹⁹³ Cf. supra, n. 130. The narrow ribs on each side of the central ridge are a common feature on Minoan weapons, cf. Branigan, *op.cit.* (supra n. 163) 123.

METAL ANALYSES, by Mrs. A. Millett, and others

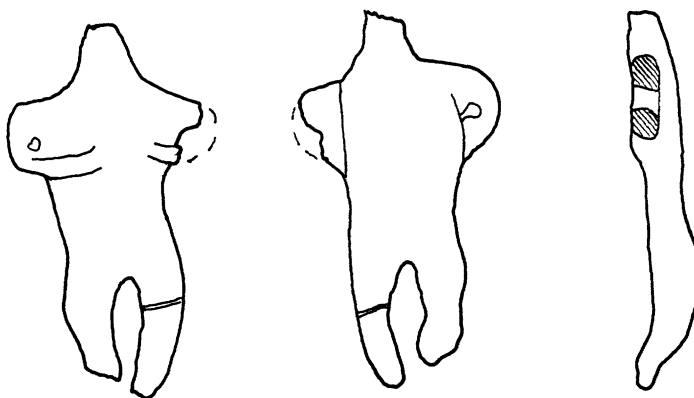
Analyses 40-69, of objects in the Ashmolean Museum, Oxford, were conducted, principally by Mrs. A. Millett, at the Oxford Research Laboratory for Archaeology and the History of Art, through the kindness of the Director, Dr. E. T. Hall. Analyses 70-72, of objects in the British School of Archaeology at Athens, were supplied by Professor E. Sangmeister of the Arbeitsgemeinschaft für die Metallurgie des Altertums bei dem Römisch-Germanischen Zentralmuseum, Freiburg.

Cat. no.	Object	%	Cu	Sn	Pb	As	Sb	Ni	Bi	Fe	Zn	Ag	Au	Co
40	Shaft-hole axe		88.0	8.8	0.59	—	0.14	0.12	<0.01	0.038	—	0.078	—	—
41	Axe-adze		91.5	7.3	0.26	0.79	—	0.026	<0.01	0.055	—	<0.005	—	—
42	Axe-adze		88.5	8.3	2.1	—	—	0.062	<0.01	0.084	—	0.011	—	—
43	Flat axe		99.3	<0.1	0.11	—	—	0.018	<0.01	0.034	0.16	0.32	—	—
44	Flat axe		95.2	—	0.25	3.4	—	0.66	0.32	—	—	0.018	—	—
45	Flat axe		95.8	0.85	0.13	1.1	—	0.11	0.080	1.9	—	0.088	—	—
46	Sickle		92.2	5.5	1.1	0.66	—	0.046	<0.01	0.028	—	<0.005	—	—
47	Dagger Class IIa		94.0	—	0.5	—	—	0.072	<0.01	—	5.1	0.037	—	—
48	Dagger Class IIa		99.8	—	0.45	—	—	0.18	<0.01	—	—	0.029	—	—
52	Dagger Class IIc		97.0	0.24	0.13	1.5	—	0.30	<0.01	0.56	—	0.051	—	—
53	Dagger Class IVa		95.5	—	0.1	3.5	—	0.012	<0.01	0.38	—	0.022	—	—
54	Dagger Class IVa		95.0	—	—	4.9	—	0.029	<0.01	0.11	—	0.064	—	—
55	Dagger Class IVa		99.1	—	0.54	—	—	0.15	<0.01	0.023	0.14	0.022	—	—
56	Dagger Class IVa		99.2	—	0.38	—	0.12	0.13	<0.01	0.018	—	0.18	—	—
57	Dagger Class IVa		99.9	—	—	—	—	0.032	<0.01	0.070	—	0.0054	—	—
58	Dagger Class IVa		90.0	—	0.054	9.5	0.18	0.23	0.04	—	—	0.03	—	—
59	Dagger Class IVa		90.2	—	0.19	9.5	—	0.045	0.011	—	—	0.032	—	—
62	Dagger Class IVa		96.5	0.27	2.6	—	—	0.063	<0.01	0.50	—	0.057	—	—
63	Dagger Class IVb		90.7	—	0.19	8.7	—	0.024	<0.01	—	—	0.04	—	—
66	Dagger Class VI		99.2	0.18	0.17	—	—	0.058	<0.01	0.30	—	0.023	—	—
67	Dagger Class VI		95.0	4.4	0.93	—	—	0.036	<0.01	0.18	0.15	0.066	—	—
68	Dagger Class VII		98.0	—	1.2	—	—	0.067	<0.01	0.020	0.40	0.036	—	—
69	Dagger Class VII		91.5	—	0.024	7.7	—	<0.01	<0.01	—	—	0.073	—	—
70	Dagger Class VII		88.4	8.3	2.2	0.79	Sp	0.16	0.01	+	0	0.17	0	0
71	Dagger Class VII		92.1	6.1	0.64	1.0	0	0.12	Sp	++	0	0.02	0	0.09
72	Dagger Class VII		91.7	6.7	0.4	1.0	Sp	0.06	0	+	0	0.19	0	0

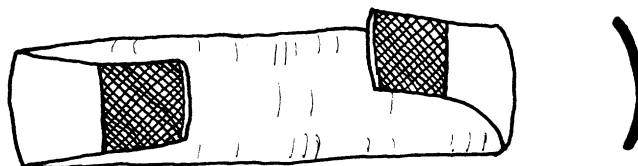
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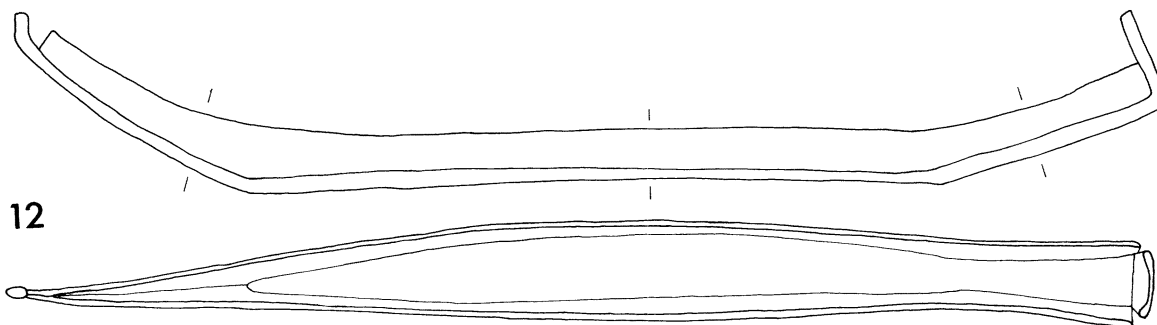
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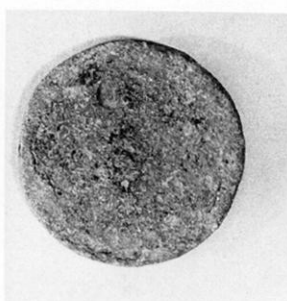
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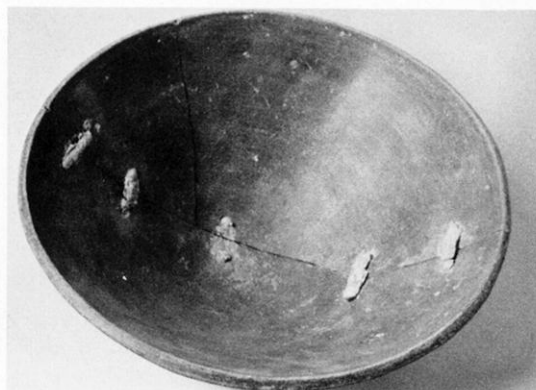
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Silver bowl and bracelet from Amorgos, lead figurine from Antiparos and lead boat from Naxos. See catalogue

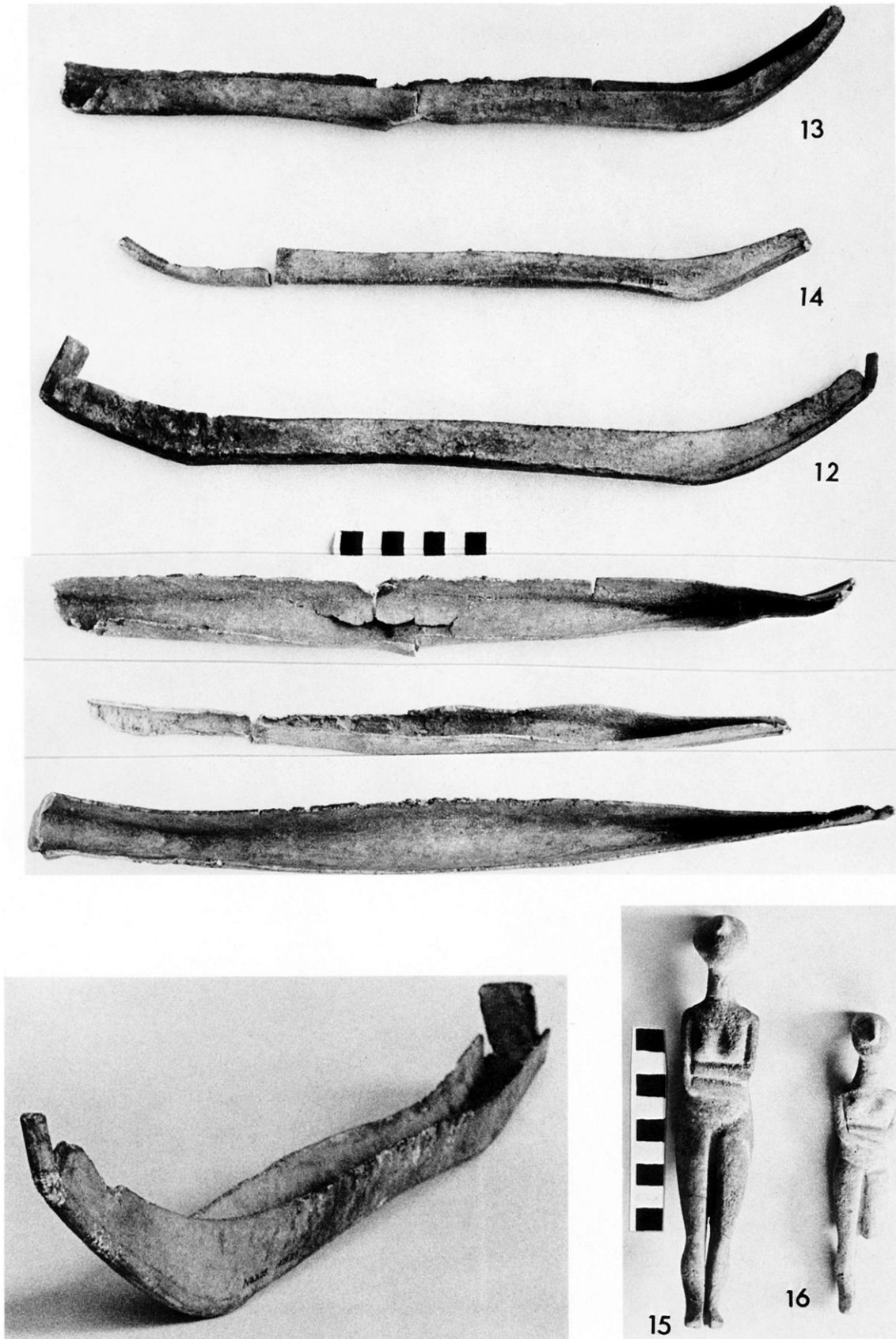


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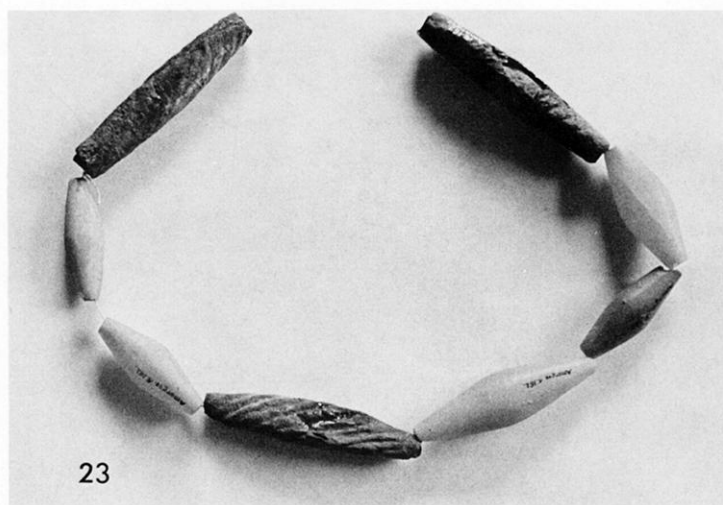
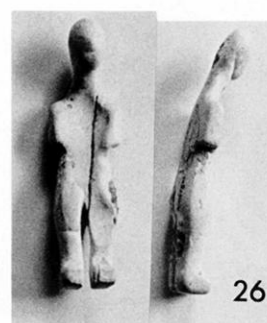
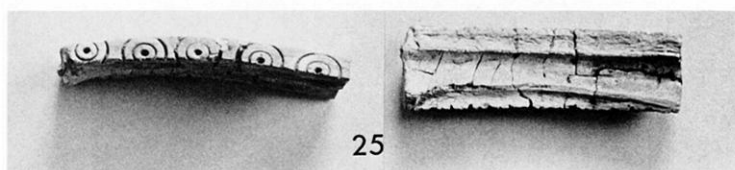
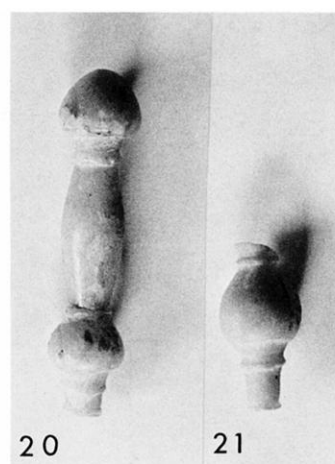
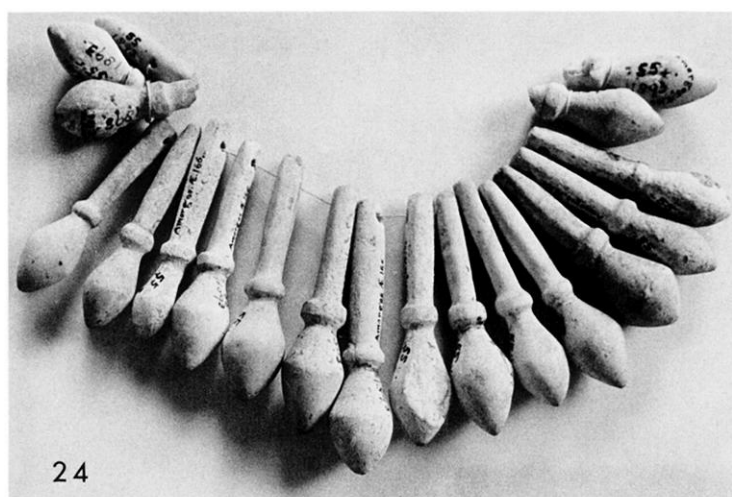
b

Lead and silver objects, 1-6 from Antiparos, 7-11 from Amorgos, a: lead ingots from Phylakopi in Melos, b: Early Helladic bowl from Aegina repaired with lead rivets

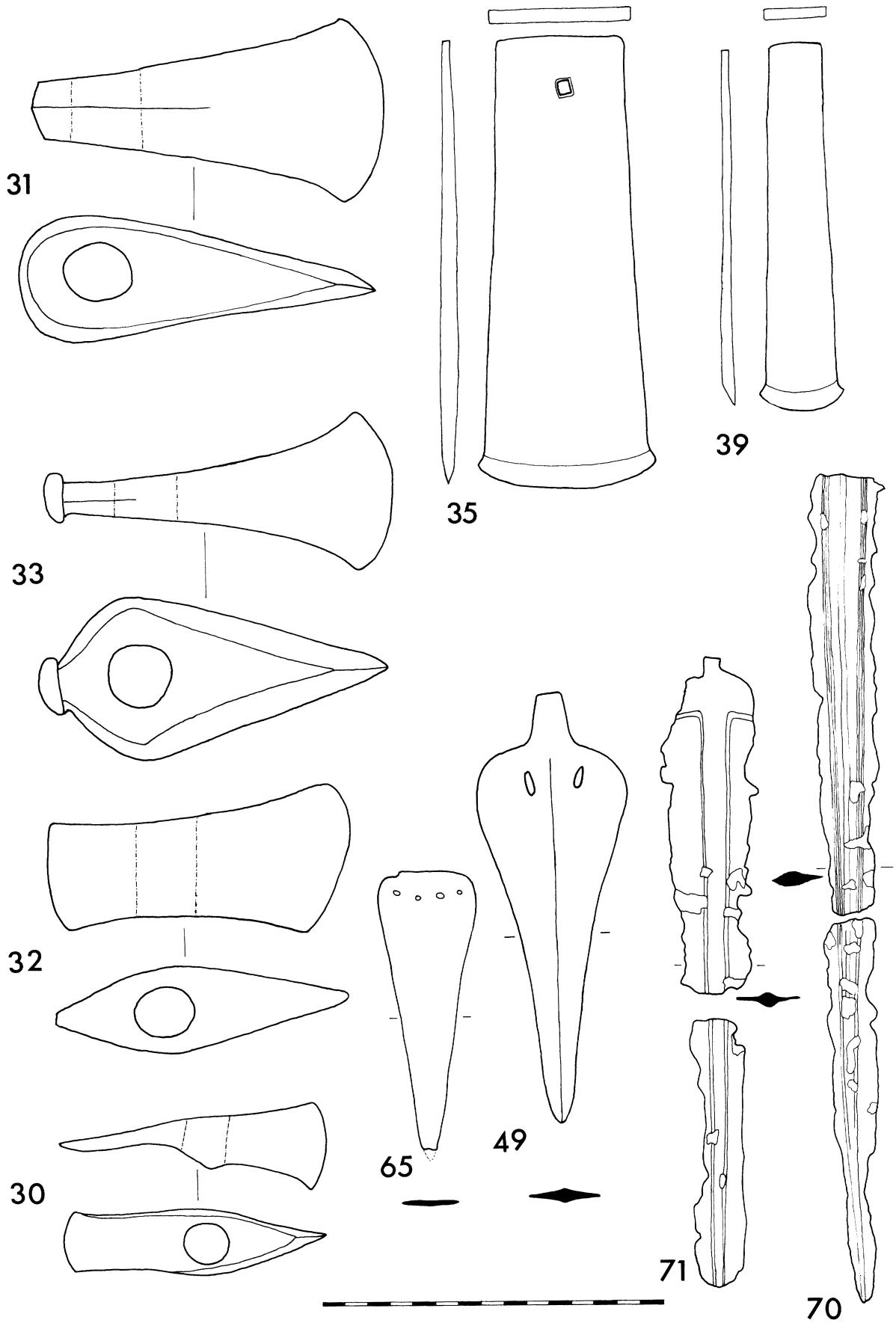


12

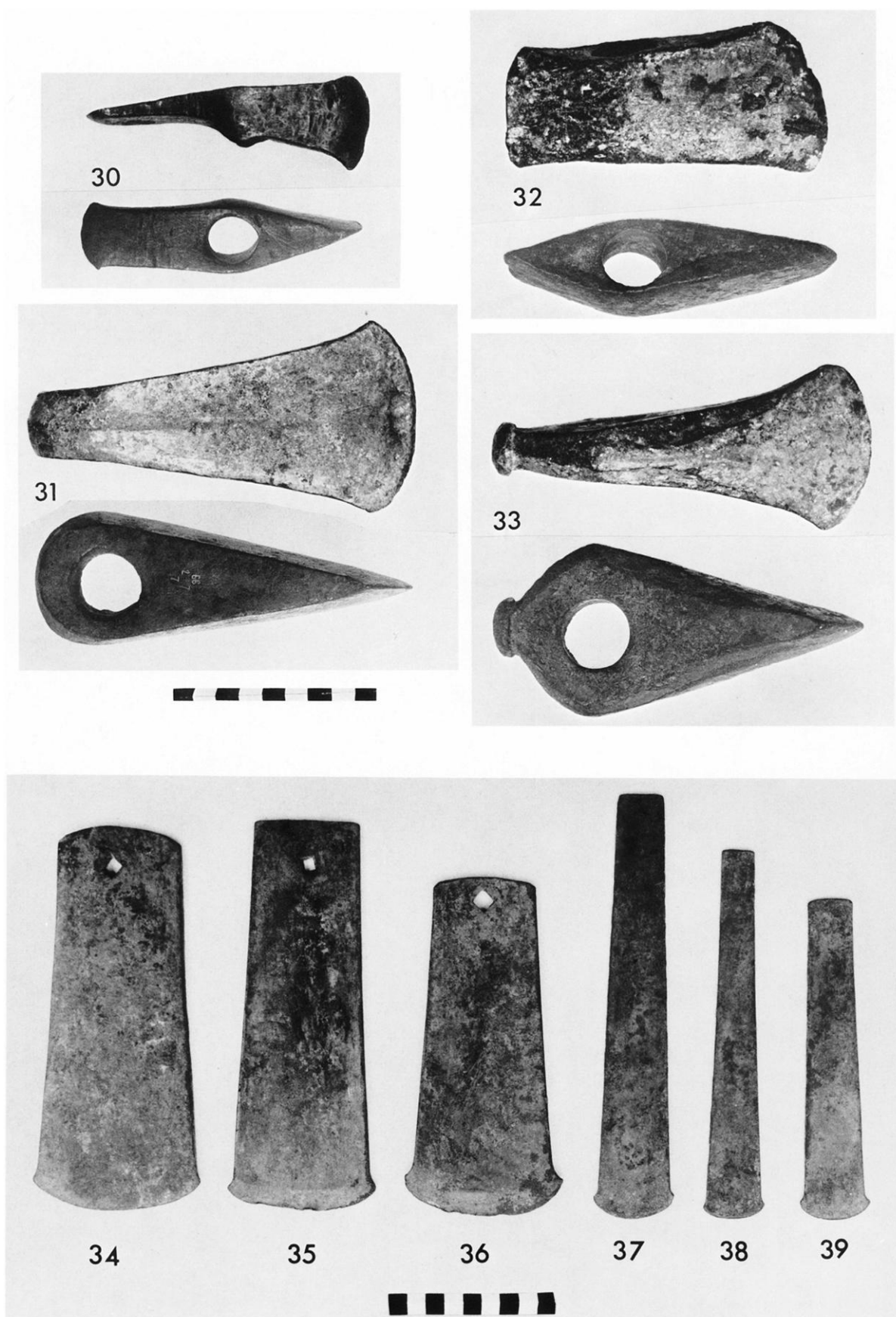
Lead boat models from Naxos, with associated marble figurines



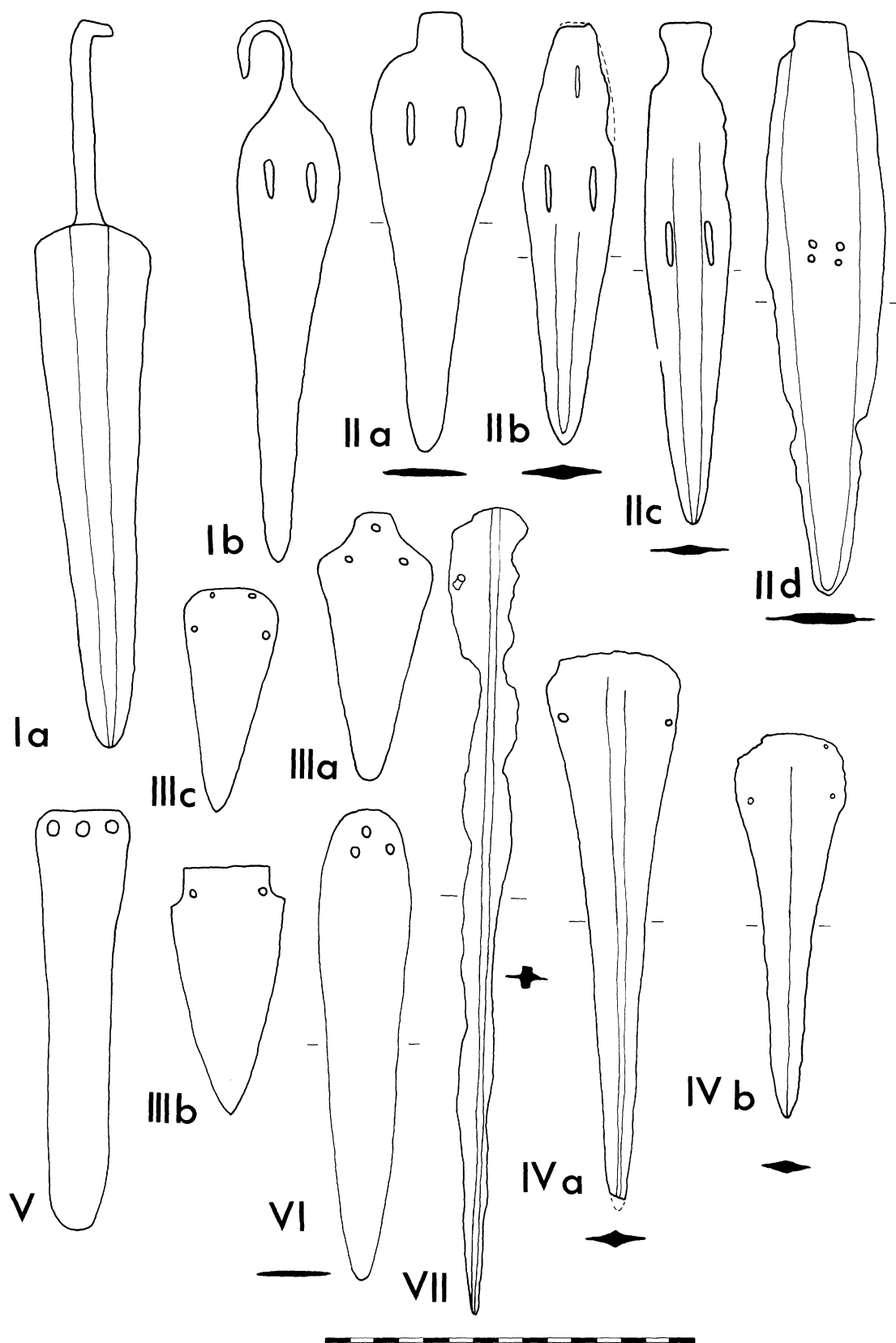
Finds from cist-grave D at Kapros in Amorgos (with silver bowl no. 17, pls. 1 and 10)



Tools from the Kythnos hoard and Cycladic weapons. See catalogue. Scale ca. 2:5



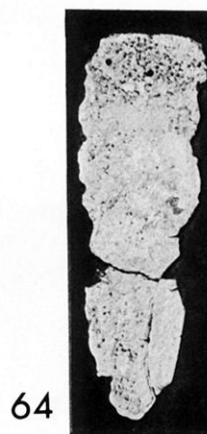
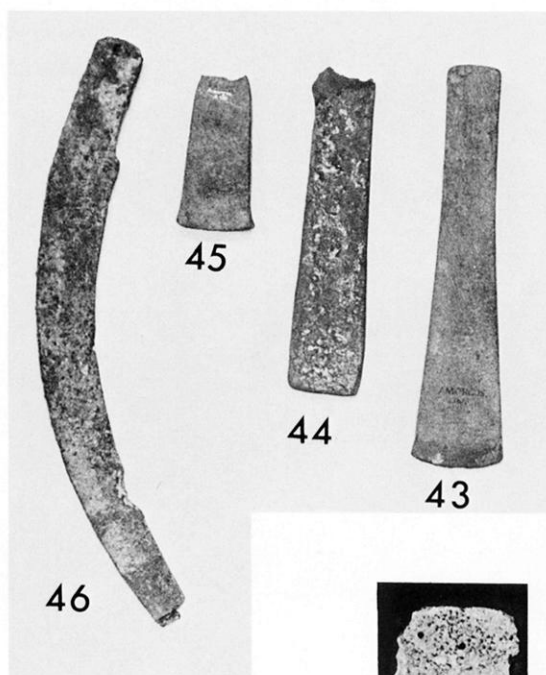
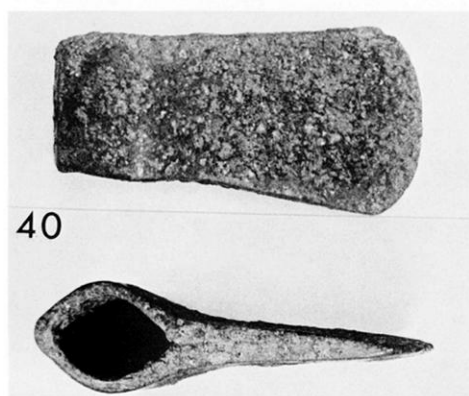
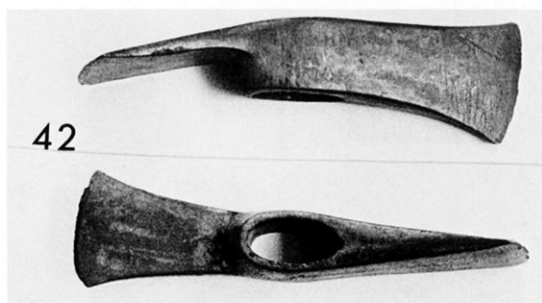
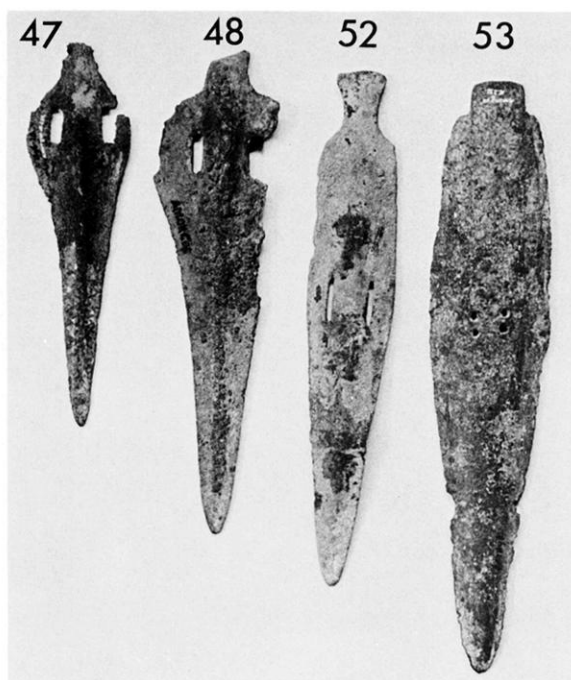
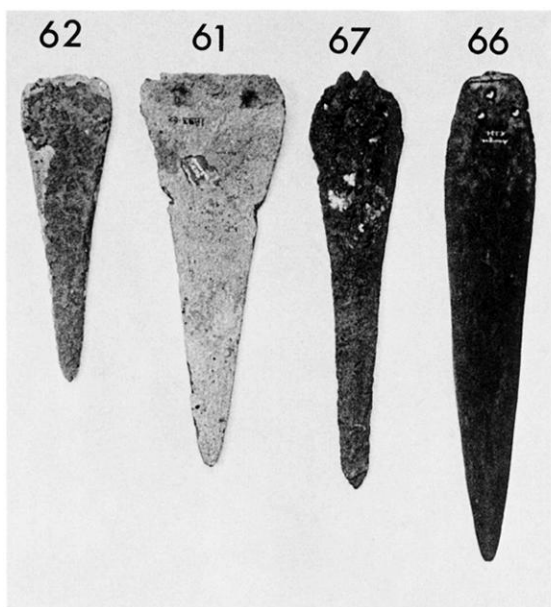
The Kythnos hoard (courtesy Trustees of the British Museum)



Classification of Aegean daggers. Ia: (Cyprus); Ib: (Dokathismata in Amorgos); IIa:50 (Amorgos); IIb:51 (Amorgos); IIc:52 (Amorgos); IId:53 (Arkesine in Amorgos); IIIa: (Arkesine in Amorgos); IIIb: (Crete); IIIc: (Phokis); IVa:60 (Amorgos); IVb:63 (Amorgos); V: (Sesklo); VI:66 (Amorgos); VII:69 (Amorgos). Scale ca. 2:5



Daggers and swords (Classes IV and VII) from Amorgos. Scale 1:3



Cycladic tools and daggers. Scale 1:3



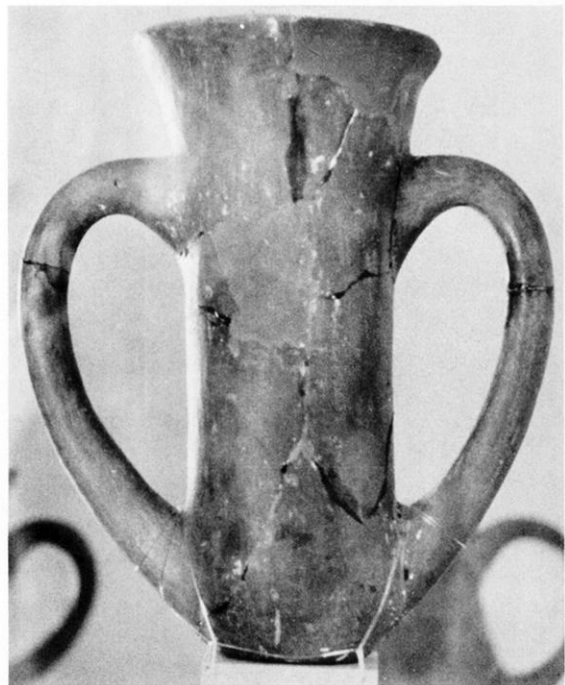
a



b



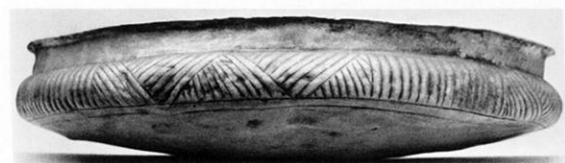
c



d

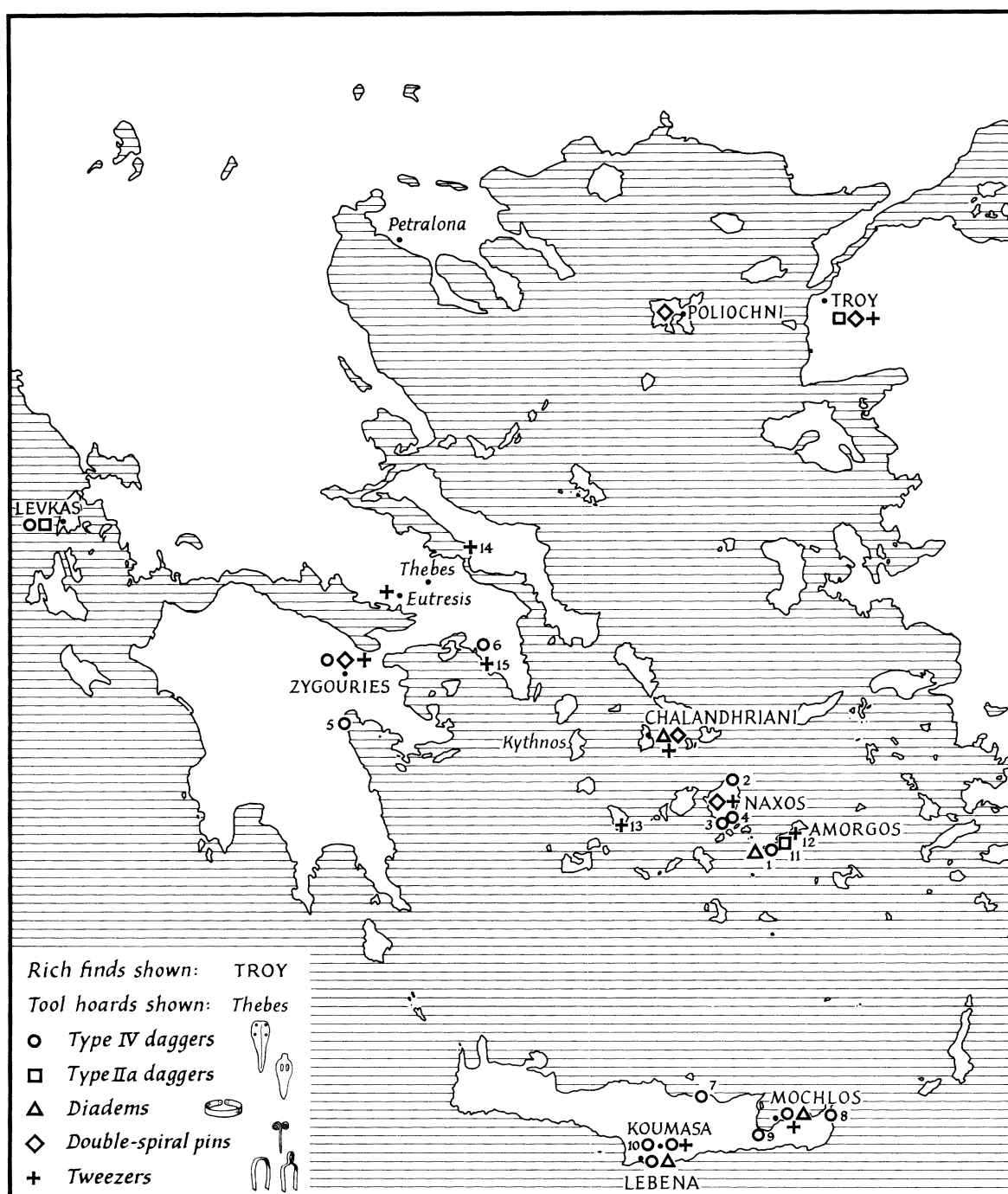


17

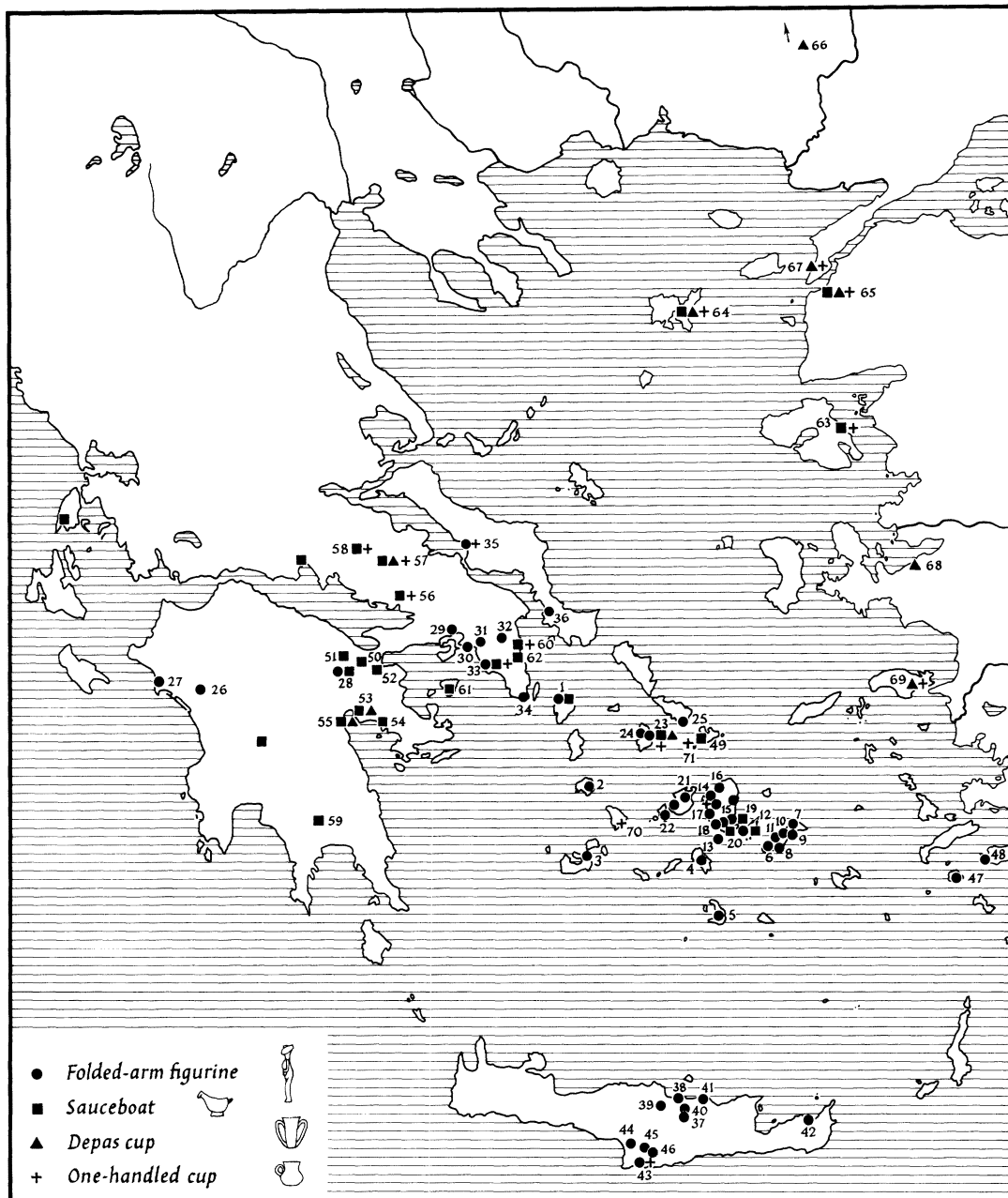


e

Early Aegean metal and pottery vessels. Sauceboats: a, gold (Arcadia); b, clay (Chalandriani). *Depas* cups: c, silver (Troad); d, clay (Troad, cf. Chalandriani). Bowls: e, silver (? Euboia); no. 17, silver (Kapros in Amorgos) (c and e, courtesy Trustees of the British Museum and of The Metropolitan Museum of Art)



Important metal finds of Aegean Early Bronze Age. 1: Dokathismata (Amorgos); 2: Ormos Apollona (Naxos); 3: Spedos (Naxos); 4: Panermos (Naxos); 5: Lerna; 6: Athens; 7: Pyrgos (Crete); 8: Palaikastro (Crete); 9: Gournia (Crete); 10: Platanos (Crete); 11: Stavros (Amorgos); 12: Kapsala (Amorgos); 13: Akrotiraki (Siphnos); 14: Manika; 15: Ay. Kosmas. The list of Class IV daggers in Crete is not complete



Local types and cultural continuum in E.B. 2 Aegean. 1: Ay. Irini (Kea); 2: Seriphos; 3: Phylakopi (Melos); 4: Ios; 5: Thera; 6: Dokathismata (Amorgos); 7: Aigiali (Amorgos); 8: Stavros (Amorgos); 9: Kapsala (Amorgos); 10: Kapros (Amorgos); 11: Kato Akrotiri (Amorgos); 12: Keros; 13: Herakleia; 14: Trymalia (Naxos); 15: Ay. Anargyroi (Naxos); 16: Akrotiri (Naxos); 17: Kastraki (Naxos); 18: Karvounolakkoi (Naxos); 19: Panermos (Naxos); 20: Spedos (Naxos); 21: Paros; 22: Antiparos; 23: Chalandriani (Syros); 24: Pidima (Syros); 25: Tenos; 26: Neraida (Olympia); 27: Ay. Andreas (Messenia); 28: Zygouries; 29: Eleusis; 30: Piraeus; 31: Athens; 32: Brauron; 33: Ay. Kosmas; 34: Sounion; 35: Manika; 36: Styra; 37: Knossos; 38: Herakleion; 39: Tylissos; 40: Tekke; 41: Pyrgos; 42: Siteia; 43: Lebena; 44: Ay. Onouphrios; 45: Platanos; 46: Koumasa; 47: Nisyros; 48: Kap Krio; 49: Mykonos; 50: Corinth; 51: Korakou; 52: Gonia; 53: Tiryns; 54: Asine; 55: Lerna; 56: Eutresis; 57: Orchomenos; 58: Ay. Marina; 59: Amyklai; 60: Raphina; 61: Aegina; 62: Askitario; 63: Thermi; 64: Troy; 65: Poliochni; 66: Michailitch; 67: Protesilaos; 68: Bayrakli; 69: Heraion; 70: Akrotiraki (Siphnos); 71: Delos. Many further sites with finds of sauceboats are known from the Greek Mainland. There are many southern and inland Anatolian sites with finds of *depas* cups