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from Ian Whitbread

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COLLECTION DE L'ÉCOLE FRANÇAISE DE ROME

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sup. 262

Discussion with I.W.

MÉTHODES CLASSIQUES ET MÉTHODES FORMELLES DANS L'ÉTUDE DES AMPHORES

(ACTES DU COLLOQUE DE ROME, 27-29 MAI 1974)

ÉCOLE FRANÇAISE DE ROME
PALAIS FARNÈSE

1977

DAVID P.S. PEACOCK

ROMAN AMPHORAE : TYPOLOGY, FABRIC AND ORIGINS

I - INTRODUCTION

In the last decade great advances have been made in the study of Roman amphorae: we now know much more about the place of origin, contents and date of these vessels, so that they are becoming of real value in understanding ancient economic history. Our increased knowledge is the result of careful attention to typology, alongside study of dipinto inscriptions, stamps, distributions and kiln material. There is little doubt that determination of the place of manufacture is still one of the most difficult problems; it is also one of the most fundamental, for when the origin is known, it can be possible to gauge contents and sometimes even an approximate date from archaeological and ancient literary information about the source region.

Difficulties arise because often amphora types are devoid of intelligible *tituli picti* or stamps. In other cases there is evidence to demonstrate that a single form was produced in a variety of places and it is hard to determine which of the alternatives applies to a vessel that has lost its inscription through unfavourable site conditions. For example, amphorae based on Greek prototypes from the island of Kos (Dressel forms 2-5) are known to have been made in Campania, in the territory of the Laetani and elsewhere, but it is at present difficult to distinguish the products of each region on the basis of typology¹.

A further problem is frequently encountered on the fringes of the Roman empire. Since amphorae have a much higher body/rim ratio than other types of coarse pottery, the majority of excavated finds will consist of featureless body sherds. In the Mediterranean region where amphorae abound it may be possible to extract meaningful statistics from a consideration of rims, handles and spikes, but in Britain, even the most extensive excavations can produce too few featured sherds for these to be of much value. Mr. Henry Hurst's recent excavations in the Roman town of Gloucester produced about 300 amphora sherds and of these only 19 had typological features, including one illegible stamp². Had the body sherds been thrown away, several types of amphora would have been missed altogether, giving a distorted picture of imports to the Roman town. If we are to extract the maximum economic information from excavated material we must be able to identify types (hence origins and likely contents) from small fragments, as Elizabeth Ettlinger suggests.

Determination of amphora origins is thus a problem with several facets lying beyond the scope of normal typological investigations. However, the points I have raised are amenable to further elucidation by careful attention to amphora fabrics, a little studied aspect, which can be vital in understanding these vessels. In this paper I propose to give examples illustrating some of the ways in which scientific study of materials can assist, firstly in assessing the origin

¹ A. Tchernia and F. Zevi, *Amphores Vinaires de Campanie et de Tarraconaise à Ostie*, in *Coll. Ecole Franç. de Rome* 10, (1972), 35-37. F. Zevi, *Appunti sulle anfore romane*, in *Arch. Classica*, 18, (1966), 214.

² H. R. Hurst *Excavations at Gloucester, 1968-1971: First Interim Report*, in *Ant. J.*, 52, (1972), 68.

of little known types, secondly, in the study of diverse production centres for a single form and finally in the identification of small and often featureless sherds. It will be apparent that these techniques do not supersede existing methods, but must be carefully integrated with typological, epigraphic and other considerations.

II - METHODS AND PREVIOUS APPLICATIONS

Ceramic fabrics can be analysed either by examining their chemical content or by studying the composition and properties of included rock and mineral fragments. Chemical analysis has found wide application in discriminating pottery of different origins, since it is to be expected that raw materials will vary in chemical composition. All clays have much the same content of major components and thus we can assume amphorae to have a roughly similar tenor of silica, alumina, iron oxide and lime regardless of origin, a point clearly verified by Maréchal's analyses³. However, raw materials can differ in their trace element composition and study of this, using techniques such as neutron activation, emission or X-ray spectroscopy, is much more promising, though little work has yet been done on amphorae⁴. Using neutron activation, Sayre and Dodson were able to demonstrate differences in the manganese/sodium ratio of stamped Greek amphorae from Rhodes and Knidos⁵. Presumably this led Dr. Sayre to suggest that certain amphorae from Delos of Knidian type were made of Rhodian clay⁶. However, before accepting the conclusion that clay was transported from Rhodes to Knidos

it is worth noting that the two regions are geologically similar and petrological study of a Knidian amphora in Southampton Museum has shown much the same mineral composition as that of Rhodian amphorae, though in the former the inclusions are rather coarser-grained. Thus, an alternative suggestion might be that at certain periods Knidian potters exploited local clays similar to those commonly used on Rhodes.

Trace element analysis clearly has considerable potential in characterising amphorae made from different raw materials, but much more fundamental research is required since not all trace elements are of equal value. It seems probable that study of material from different production centres will show that some elements occur in similar proportions in many amphora types regardless of origin, while other elements will vary widely within a single clay formation, a point best investigated by analysing multiple samples of waste from individual kilns. It is well known that on some find-sites even samian ware can be reduced to the consistency of putty, a clear indication that chemical changes may be taking place after burial, and indeed, it has already been demonstrated that such changes can and do occur⁷. In the case of amphorae, possible effects of chemical solution and accretion in different soil environments could be investigated by sampling certain common types of stamped amphorae from a number of geologically contrasting sites. Until tests of this nature have been undertaken, chemical trace element analysis must be used with caution.

However, fortunately, amphorae are comparatively coarse textured and contain fragments of minerals and rocks, either as natural inclusions in the clay, or deliberately added as temper, and these afford an alternative means of assessing origins. The geology of the Mediterranean region is varied and hence it is reasonable to expect that each production region will have its own mineralogical peculiarities, or that these will be shared with few other regions. The overall mineralogical composition of pottery can be characterised using the property of crystalline substances to diffract X-rays at different angles dependent on composition. It is a simple matter to produce an X-ray diffraction pattern in the form of a

³ J.-R. Maréchal, *L'application des méthodes scientifiques...*, in *Mélanges d'Archéologie et d'Histoire offerts à André Piganiol*, 1, (1966), 123-154. C. Varoqueaux, *Fragment d'amphore pêché dans la Manche*, in *Ann. Normandie* 14, (1964), 264-6. E. Thévenot, *La marque d'amphore Sesti*, in *Rev. Arch. Est.*, 5, (1954) 234-43.

⁴ For brief discussion of methods and further references see D.P.S. Peacock, *The scientific analysis of ancient ceramics: a review*, in *World Arch.*, 1, (1970), 375-89.

⁵ E. V. Sayre and R. W. Dodson, *Neutron activation study of Mediterranean potsherds*, in *Am. J. Arch.*, 61, (1957), 35-41.

⁶ V. Grace and M. Savvatiannou-Pétropoulakou, *Les Timbres amphoriques grecs*, in *Délos*, fasc. 27, (1970), 319-20. I am indebted to Dr. Grace for this reference.

⁷ S. J. Freeth, *A chemical study of some Bronze Age pottery sherds*, in *Archaeometry*, 10, (1967), 104-19.

(It is a Rhodian amphora)

PP. 320, 321
He did not really need to say it
The point is not that the clay is different

graph or photograph which will summarise the essential crystalline composition of pottery fabrics and Young and Whitmore considered this to be an ideal way of 'finger-printing' pottery of different origins⁸. However, both the possibilities and limitations of this approach are illustrated by Périnet's work on amphorae from the Grand Congloué⁹. Dressel 1 vessels produced a distinctive diffraction pattern, but the Greco-Italic and Rhodian types had closely similar patterns because they are of similar materials. It certainly cannot be inferred that the two types were made in the same place, because there may be mineralogical differences undetected by this method, which records only constituents comprising more than about five per cent of the sample. Thus the technique could be useful in discriminating between amphorae of differing origins, but only if there is considerable contrast in mineralogical composition.

An alternative and more widely used method is examination in thin section under the petrological microscope¹⁰. A small sample, c. 10 mm × 10 mm in area is removed from the vessel, fixed to a glass microscope slide and ground to a thin transparent slice. Not only does this permit the mineralogical composition of the inclusions to be determined, but rock types can be identified and it is possible to study textures of both rock and mineral fragments, which can be important when it is necessary to distinguish amphorae of different origins containing inclusions of similar composition. Unfortunately, most published petrological descriptions of amphorae consist of brief notes largely restricted to Dressel form 1 and they are unanimous in confirming its Italian origin¹¹. Other forms have been studied to a more limited extent and detailed descriptions are now available for the products of the Cadiz and Algeciras kilns¹². Work on Greek amphorae may

also be relevant for it indicates the nature of inclusions in the source region and this information is potentially useful in assessing the origins of Roman vessels. The works of Farnsworth on Athenian and Corinthian pottery and that of Krug on the amphorae of the Cimmerian Bosphorus are worthy of note¹³.

Amphora fabrics rarely contain inclusions of pure quartz sand, which is fortunate because it can be difficult to say much about the origins of such simple material on the basis of thin sections. However, sandy wares can be investigated by crushing c. 10-20 gms of fabric, floating the powder on a heavy liquid such as bromoform (density 2.9) and collecting the minerals that sink because of their greater density (e.g. zircon, garnet, rutile)¹⁴. These are present in small quantities in nearly all sands and the assemblage obtained will be characteristic of the parent formation, serving to characterise amphorae of different origins. Heavy mineral analysis has been little used in the study of amphorae but it has been applied to certain southern Spanish types¹⁵.

There is thus a choice of methods, but in my view petrological study in thin section is an ideal method for the routine examination of amphora fabrics. Rock and mineral fragments are usually readily visible and these can often help diagnose or differentiate sources with some precision, as I hope to demonstrate in the following section.

In conclusion, it is worth noting the possibilities of organic analysis in the study of amphora technology and contents. This field has been little investigated but the information available shows great promise. Both Benoit and Jongkees have recorded the presence of mastic (from *Picea*) as internal coating, but recent work in

⁸ W. J. Young and F. E. Whitmore, *Analysis of oriental ceramic wares by non-destructive X-ray methods*, in *Far East Ceramic Bull.* 9, (1957), 1-27.

⁹ In F. Benoit, *L'épave du Grand Congloué à Marseille*, in *Gallia*, Suppl. 14, (1961), 28.

¹⁰ See D.P.S. Peacock, *op. cit.*, note 4.

¹¹ D.P.S. Peacock, *Roman Amphorae in pre-Roman Britain*. In M. Jesson and D. Hill (Eds) *The Iron Age and its Hill-forts* Southampton, (1971), 169-88, with further references.

¹² D.P.S. Peacock, *Amphorae and the Baetican fish industry*, in *Ant. J.*, 54, (1974). A petrological note on buff Ampho-

rae from Goldherring, Cornwall, appears in *Cornish Arch.*, 8, (1969), 28, although the suggested local origin seems to me untenable. D.P.S. Peacock, *op. cit.*, note 11. See also J. Frechen in Ph. Filtzinger *Novaesium V*, Berlin 1972.

¹³ M. Farnsworth, *Greek pottery: a mineralogical study*, in *Amer. J. Arch.* 68, (1964), 221-8. *Corinthian pottery: Technical studies*, in *Amer. J. Arch.* 74, (1970), 9-20. O. Yu. Krug, *Opticheskoe issledovanie bosporskoy Keramiki*. In I. B. Zeest, *Keramicheskaya Tara Bospora*, Moscow, (1960), 128-32.

¹⁴ D.P.S. Peacock, *The heavy mineral analysis of pottery: a preliminary report*, in *Archaeometry*, 10, (1967), 97-100.

¹⁵ D.P.S. Peacock, *op. cit.*, note 11.

the British Museum laboratory suggests the presence of rosin, which would be obtained from the pine tree¹⁶. Not all amphorae were coated and the fatty substance that oozed out of the pores of a globular amphora from Chester, had a chemical composition implying that the vessel may have held olive oil¹⁷. Discoveries of amphorae with stopper in place and contents preserved are great rarities, but one such vessel, of fourth century A.D. date, from Tiritaka in southern Russia was filled with crude petroleum oil, presumably destined for use in lamps¹⁸.

III - APPLICATIONS OF PETROLOGY TO AMPHORA STUDY

The object of this section is to give examples illustrating the role of fabric analysis in typological study, and in particular to demonstrate the potential of the petrological microscope. Although the problems overlap to a degree, they are essentially of a different nature, and concern material of various dates. The petrological side of the study has been restricted to amphorae found in Britain, but it is hoped that the findings will prove of wider interest and application.

1 - Two amphora types: an attempt to define production regions

One of the main advantages of the petrological over the chemical approach is that rock and mineral fragments can be studied directly and it is theoretically possible to relate these to geological information about the Mediterranean, enabling

production regions to be predicted. The precision attainable will depend on whether or not the rock and mineral inclusions are distinctive, with closely limited outcrops, and upon the detailed geological information available. This approach has already advanced our understanding of the Roman and pre-Roman pottery trade in Britain, but it must be stressed that the possible sources lie within a restricted region where rock comparanda are readily available; also, the geological survey of Britain is one of the most detailed in the world¹⁹. In the Mediterranean region, the problems of relating rock and mineral fragments to their parent formations can be formidable, but it is sometimes feasible to suggest source areas in general terms if the rock fragments are particularly distinctive, or if there is other evidence to limit the number of possible production regions.

Fig. 1, 1-4 shows an unusual type of amphora which is now known from seven sites in southern Britain: Exeter, Winchester, Silchester, London, Richborough, Verulamium and Puckeridge²⁰. On the pre-Roman site at Puckeridge, it occurs in Augustan-Claudian contexts, at Exeter the form is dated c. 50-70 A.D., while at Richborough it dates to the late 1st century A.D. The form is difficult to parallel with confidence, but it may be close to Dressel form 22 or Pompeii IV, for which Latin *tituli picti* suggest a source in Italy, possibly Campania or Lazio²¹. However, these forms do not have the knob base (Fig. 1, 4) and are usually in a finer fabric. The British vessels are typically greenish-grey (Munsell 5 Y. 7/2) in colour and extremely rough with numerous large rounded lumps of rock up to 5 mm across, many of which are rounded 'lapilli' of colourless volcanic glass or pieces of grey, black and red scoriaeous lava²². These fragments can be seen in

¹⁶ F. Benoit, *Amphores et céramique de l'épave de Marseille*, in *Gallia*, 12, (1954), 47, see also F. Benoit, *op. cit.*, note 9, 50. J. H. Jongkees, *L'enduit intérieur des amphores romaines*, in *Gallia*, 13, (1955), 88-9. W. A. Oddy and J. C. Bateman. In A. J. Parker, *The evidence provided by underwater archaeology for Roman trade in the western Mediterranean*. In D. Blackman (Ed.) *Marine Archaeology*, Colston Papers no. 23, London, (1973), 381.

¹⁷ R. Newstead, *Fatty matter in Roman amphoras*, in *J. Chester and N. Wales Arch. Soc.*, 33, (1939), 104-5.

¹⁸ V. A. Uspenskiy, *Issledovanie drevney amfory s neftyu naydennoy v Tiritake*, in *Mat. i. issled. po arkheol. S.S.S.R.*, 25, (1952), 415-21.

¹⁹ References in D.P.S. Peacock, *op. cit.*, note 4.

²⁰ T. May, *The pottery found at Silchester*, Reading, (1961), Pl. LXVII, top left. Here, fig. 1, 3. B. W. Cunliffe, *Richborough V*, London, (1968), Pl. LXXI, 527. Here fig. 1, 1. London; Plantation House, Fenchurch Street. Here fig. 1, 2. Verulamium: here fig. 1, 4. Courtesy Professor S. S. Frere. Exeter, Winchester and Puckeridge are unpublished; information courtesy M. Griffiths, J. Collis and C. Partidge.

²¹ F. Zevi, *Appunti sulle anfore romane*, in *Arch. Classica*, 18, (1966), 222.

²² Munsell soil colour numbers used throughout this paper indicate characteristic colour. There are of course variations

thin section accompanied by large (0.5-1.5 mm) shreds of volcanic glass, crystals of quartz, labradorite feldspar, augite, a little sanidine feldspar, occasional zeolites, fossil foraminifera and possibly algae (Fig. 2a). They are set in a matrix of grey optically isotropic fired clay with a scatter of these minerals c. 0.05 mm across. The dark rock fragments are predominantly of andesitic composition, but some of the lighter coloured ones have a trachytic or glassy texture. It is thus possible to define some of the requirements of the production region. The fossils in the ground-mass suggest that the clay was quarried from sedimentary rocks of marine origin, while the inclusions, presumably added as temper, imply that this was located in an area of recent vulcanism, for otherwise it would be difficult to account for the well-preserved volcanic glass. If we assume a Mediterranean origin, this implies a region such as Italy, Sardinia, the Aegean or Anatolia and if the analogy with Dressel 22 is valid, the eastern volcanoes would seem less probable. Certain possibilities in the Italy/Sardinia area can be eliminated, for the presence of marine fossils effectively rules out purely volcanic masses such as the Aeolian islands. Surprisingly, Campania also seems an unlikely source since there is no evidence in the fabric of the leucitic rocks that characterise the Somma/Vesuvius volcano, and furthermore study of the Campania Dressel I amphorae alongside brick samples from Pompeii and Cales shows a very different composition with marked quantities of sanidine rather than labradorite feldspar. Doubtless, with further study of the geological literature and examination of comparative material it would be possible to limit the source more precisely, but even this preliminary petrological investigation indicates that further research in the volcanic regions of the western Mediterranean might be profitable. It can be confidently asserted that Spain and North Africa are geologically much less likely, which is important because the form has points in common with certain North African Punic amphorae illustrated by Cintas²³.

even within a single vessel, though these tend to be of minor importance. I have preferred to use my own descriptive terms.

²³ P. Cintas, *Céramique punique*, Paris, (1950). Pl. XCII.

Another problem is presented by the amphora shown in Fig. 1, 5, one of five recovered from a barrow at Holborough in Kent, associated with a large cylindrical amphora (Fig. 1, 6), a late 2nd century coin, and coarse pottery assigned to the early 3rd century. The origin of these small vessels has long been problematical and an eastern Mediterranean source has been suggested, but Cristofani and Zevi figure a very similar amphora from Ostia attributed to the province of Mauretania Caesariensis and the form was possibly current from the early 3rd century A.D.²⁴. There are differences in that the rim and base do not compare precisely, but Panella illustrates very similar bases to the Holborough ones from Bougie and Algiers Museums and Baradez has published an undated fragment from Tipasa which has a similar rim to the British examples but with strongly ribbed handles²⁵. Thus, there are typological indications that the Holborough vessels might originate in Mauretania Caesariensis but it is difficult to be certain because precise published parallels are lacking.

In the hand specimen the fabric is grey-buff (10 YR. 6/2) in colour with prominent angular white inclusions up to 1mm across and an off-white slip on the outer surface. A thin section reveals rounded inclusions (c. 0.3-1.0 mm) of quartz, quartzite, quartz mica schist and occasional granite rock fragments, set in a matrix of optically isotropic brown fired clay containing fine quartz and mica (c. 0.05 mm). Occasional fossil algae, augite, plagioclase and orthoclase feldspar are present. This suggests an origin in an area of sedimentary rocks at no great distance from a crystalline massif, with occasional outcrops of basic or intermediate igneous rocks somewhere nearby to account for the augite. It is interesting to note that this is an almost precise description of the geology of North Africa between Algiers and Bône. Thus, the petrology

²⁴ R. F. Jessup, *Excavation of a Roman barrow at Holborough, Shodland*, in *Arch. Cantiana*, 68, (1954), 1-16. M. Cristofani and F. Zevi, *Su alcuni tipi di anfore Ostiensi*, in *Archeologia*, (1966, Jan-Feb), fig. 10. C. Panella, *Annotazioni in margine alle stratigrafie delle terme ostiensi del nuotatore*, in *Coll. Ecole Franç de Rome*, 10, (1972), 100.

²⁵ C. Panella, *op. cit.*, note 24, fig. 67-68. J. Baradez, *Nouvelles fouilles à Tipasa dans une nécropole païenne*, in *Libyca*, 5, (1957), Pl. IIA.

not only confirms that the source has been correctly deduced from the typological clues, but indicates that part of Mauretania Caesariensis in which production is most likely. Panella has already drawn attention to evidence suggesting that this region was an important producer of olive oil and within the area lies Tubusuctu, a town mentioned on amphora stamps²⁶.

2 - Rhodian style amphorae: a problem in differentiating sources

It has now been established that certain types of amphora were reproduced more or less precisely in various places. One might expect differences in typological detail, but in the case of Dressel forms 2-4 these remain elusive and the vessels made in Laetania and Campania are difficult to recognise on typology alone. However, the products of regions with contrasting geology should have characteristic fabrics, offering an alternative means of discrimination. Tchernia and Zevi have applied this approach to great effect in their excellent study of Dressel 2-4 amphorae from Ostia, using the presence of white specks ("points blancs") as diagnostic of a Spanish rather than an Italian source²⁷. Their work, based on careful examination of fractured sections, is convincing: attention to detail and supporting colour photographs strongly suggest that all the material may derive from a single source, correctly located in the granitic Barcelona region. However, it cannot be assumed that every amphora with such inclusions is of this origin because the white constituents, quartz and feldspar are common to all granitic terrains. There may be marked differences in texture visible in the hand specimen but if not, detailed petrological study will usually provide a means of discrimination. For example, the complete Koan style amphora from Heybridge, Essex (Fig. 1, 7) contains granitic inclusions but it does not compare microscopically with Catalan material, which has much less mica and a very different texture²⁸. Loeschcke's description of

Haltern form 66A leaves little doubt as to its granitic origin, but petrological analysis is required to ascertain whether it compares with the Heybridge amphora, with the Spanish material, or whether it represents yet another source²⁹.

However, this discussion concerns another Greco-Roman type, the Rhodian style amphora, with handles of a single rod of clay rising to a sharp peak. The form has been mentioned by a number of writers and although all are agreed that it is related to Greek Rhodian amphorae, opinion is divided on whether it is a product of Rhodes itself or whether an imitation made elsewhere, perhaps in Italy³⁰. Although the Roman vessels show some typological variation, this is not marked and they are essentially a homogeneous group (Fig. 3). However, thirty vessels of this type studied in thin section under the petrological microscope are divisible into six distinct fabric categories, resulting from the use of different raw materials. Some certainly indicate production in widely separated places, but others are best explained in terms of variation in locally available raw materials. Only the first two fabrics are quantitatively important, the remaining groups being represented by a few specimens each.

Fabric 1. This is fairly fine and has been recognised from ten sites in southern Britain³¹. It has a distinctive reddish pink colour (5 YR. 7/6) with a paler slip on the outer surface; rounded red-brown particles up to about 0.5 mm across are scattered sparsely throughout, but more prominent are occasional angular fragments (up to 3 mm) of fine white limestone which sometimes cause spalling when near the surface.

²⁹ S. Loeschcke, *Keramische Funde in Haltern*, in *Mitt. Alt.-Kom. für Westfalen*, 5, (1909), type 66A.

³⁰ A. Tchernia, *Recherches archéologiques sous-marines*, in *Gallia*, 27, (1969), 470. D.P.S. Peacock, *op. cit.*, note 11, 167. C. Panella, *op. cit.*, note 24, 73. P. Baldacci, *Le principali correnti del commercio di anfore romane nella Cisalpina*, in *I problemi della ceramica romana di Ravenna, della Valle padana e dell'alto Adriatico*, Bologna, (1972), 103-31.

³¹ Hod Hill (here fig. 3, 3), Waddon Hill (fig. 3, 9), Usk unpublished, Gloucester-Kingsholm (e.g. fig. 3, 1, 11), Exeter, unpublished (see A. Fox *Roman Exeter* in J. Wachter *Civitas Capitals of Roman Britain*, Leicester 1966, 37). Fishbourne (fig. 2, 10) and Threadneedle Street, London (fig. 2, 2). Sea Mills, unpublished; Verulamium unpublished, Leicester unpublished. For site bibliography see note 41.

²⁶ C. Panella, *op. cit.*, note 24, 100. M. H. Callender, *Roman Amphorae*, no. 1744.

²⁷ A. Tchernia and F. Zevi, *op. cit.*, note 1.

²⁸ C. F. C. Hawkes and M. R. Hull, *Camulodunum*, London, (1947) form 183B.

Thin sections reveal an optically isotropic matrix of fired clay with a sparse scatter of fine quartz up to 0.1 mm across, and in it are set numerous grains (c. 0.1-0.2 mm) of red, brown and yellow minerals, the optical determination of which proved extremely difficult (Fig. 2, b & c). The problem was solved by occasional larger grains in which all combined to form the typical *maschen-structur* of serpentine, and furthermore, experimental firing of green serpentine produced minerals with identical optical properties. Occasional grains of olivine, clinopyroxene, and more rarely enstatite are present in most sections and a few angular pieces of chert can always be seen. The limestone fragments, when encountered, are cryptocrystalline, completely unfossiliferous and often show bleached reaction rims with the surrounding clay.

The origin of this fabric can be established beyond reasonable doubt, because Dr. Virginia Grace very kindly arranged for me to section samples of Greek amphorae, bearing Rhodian stamps, found in the Athenian Agora. Not only are the samples similar in visual appearance, but they also match fabric 1 under the microscope: they too have red, brown and yellow serpentine minerals sometimes associated to form serpentine rock fragments and they also have limestone and chert fragments with identical properties. Olivine, clinopyroxene and enstatite are present: the latter is much more prominent in the Greek vessels, but this is the only substantial difference and it probably represents nothing more than the use of different quarries in the Greek and Roman periods. Although a Rhodian source seems assured for fabric 1, it is impossible to be certain that production was limited to Rhodes itself, rather than other islands of the Rhodian league such as Carpathos, Syme or Casos. However, Nisyros, the remaining island listed by Pliny as belonging to this group, is composed of volcanic materials and can be confidently eliminated³². Much of the Rhodian Peraea on the Turkish mainland is occupied by an ultrabasic massif, where one would not expect to find limestone inclusions but there are some localities that would be geologically

feasible, particularly parts of the Knidian and Loryma peninsulas.

An origin in the Rhodes region could also be argued on theoretical grounds. Pliny states that the Rhodian was like the Koan, a medicinal wine made with sea water, and thus, if it is accepted that vessels of the Rhodian form usually contained this wine, a coastal origin seems likely³³. A glance at the geological map of the Mediterranean shows that there are very few places where ophiolitic rocks (which include serpentine), outcrop near to the coast: in Liguria, in central Greece, on Lesbos, in the Rhodian Peraea, on the western side of the Gulf of Antalya and around the Bay of Iskenderun in eastern Turkey. Of these only the Rhodian region has produced evidence of the production of similar forms. Geological study of the Turkish mainland opposite Rhodes has shown that it has all the mineralogical components of the pottery: serpentine, olivine, clinopyroxene, enstatite, chert and limestone³⁴. This need not imply production on the mainland, for geological agencies could have distributed these minerals over the Rhodian area during Tertiary or recent eras, though most would be destroyed by more distant dispersion.

Fabric 2 is represented by numerous sherds from Gloucester and single pieces from Camulodunum and Verulamium³⁵. It is creamy white in colour (10 YR. 8/4) and characteristically soft and powdery, which is why it has yet to be recognised in a complete vessel. Occasional pieces of limestone up to 3 mm across are visible in the hand specimen, but these have usually dissolved out leaving voids. In thin section this fabric shows an optically anisotropic ground-mass with a sparse scatter of fine (c. 0.1 mm) quartz and frequent red, brown or yellow minerals apparently similar to those of fabric 1, though comparison is difficult because they are usually more altered. There are also numerous pieces of limestone (or voids with reaction rims) and fragments of chert. Accessory minerals include plagioclase feldspar, and minute grains of pyroxene.

³² Pliny H.N. XIV, 79.

³⁴ J-P. Bassaget, R. Michel and F. Richard, *Les rodingites et les opisphérites du massif ultrabasique de la province de Mugla...*, in *Trav. Lab. Géol. Grenoble*, 43, (1967), 23-40.

³⁵ All unpublished, here fig. 3, 12-16. Handle fragments from Camulodunum (Colchester Museum L. 58) and Verulamium (information S. S. Frere).

³² Pliny H.N., V, 133, 104. For discussion of the extent of the Rhodian Peraea see A.H.M. Jones, *Cities of the eastern Roman Provinces*, Oxford, (1971), 31-2, 49-50, 56, 77.

In view of similarities with fabric 1, this material is probably also of Rhodian origin, although this is not certain because the diagnostic brown minerals could not be identified with the same confidence. However, it is correct to class it as a separate fabric because there are significant differences. The whiter colour suggests the use of a different clay with less iron, no fragments of serpentine rock were seen, and minerals such as pyroxene are much rarer. To what extent firing and subsequent site conditions have affected this fabric is not clear.

Fabric 3 is represented by the complete type specimen Camulodunum 184 and by a handle fragment from Fishbourne³⁶. It is characterised by its distinct orange brown colour (2.5 YR. 6/8) and microscopically by the fineness of the paste which contains little but quartz (c. 0.05 mm across) and minute sherds of mica (Fig. 2, d). Very occasionally larger (c. 1 mm) inclusions of quartz, quartzite, biotite, potash feldspar, chert and lava fragments can be seen. The fabric cannot be confused with the previous two and was undoubtedly made from different raw materials. It is difficult, on the evidence available, to suggest where the source might lie.

Fabric 4 is represented by two fragments from Fishbourne and by a piece from the town of Gloucester³⁷. It is buff-brown in colour (2.5 YR. 6/6) and contains obvious glistening crystals about 0.5 mm across. In thin section most of these can be determined as andesine feldspar or quartz, some of which is remarkably free from effects of strain, implying an igneous origin (Fig. 2, e). A few lava fragments with a vitreous texture are also present. However, dark ferromagnesian minerals are comparatively scarce apart from occasional grains of clinopyroxene, brown hornblende and possibly olivine. The fine groundmass is red-brown and optically isotropic with a scatter of fine quartz grains (0.05 mm.).

The inclusions comprise what is best described as a crystal tuff of dacitic or andesitic com-

position. The Aegean might be an appropriate source for raw materials of this sort and in particular the volcanic island of Nisyros would be worthy of detailed attention³⁸. However, this is by no means the only possibility and careful geological study over a wide area would be needed to limit the source with confidence.

Fabric 5, characterised by a high tenor of pure quartz sand set in a buff-brown (5 YR. 6/6) matrix, has only been seen in a single peaked handle from Usk³⁹. In thin section the quartz grains, subrounded, well sorted, and about 0.2-0.3 mm across, can be seen in a clean brown matrix of optically anisotropic fired clay (Fig. 2, f). It is very different from the other fabrics but nothing can be said of its origins. Heavy mineral analysis was not attempted, since this is a small unique piece, and a rather large sample is required.

Fabric 6 occurs as an almost complete amphora from Old Broad Street, London, previously published by Wheeler⁴⁰. The paste is pale buff in colour (7.5 YR. 7/4) and contains obvious inclusions of mica, quartz and feldspar. The thin section has an unusual appearance, for the groundmass consists of pure clay almost free of fine detritus, in which are set large (1 mm) inclusions of granitic origin: quartz, potash and some plagioclase feldspar, mica and small rock fragments of granite itself (Fig. 2, g). In addition, there are grains of fossiliferous limestone, metamorphic quartzite and a piece of arkosic sandstone. This composition would be appropriate to the fringes of an essentially granitic massif. Granites are absent from the Rhodian Peraea and islands, hence this appears to be firm evidence that peaked handled amphorae were made outside this region. The nearest source would be in Caria, 130 kms north of Rhodes, or on the islands of Crete and Mykonos, but there is no reason why this vessel could not have been produced around other granitic masses of the Mediterranean such as those of Anatolia, northern Greece, southern Italy, Sardinia, Corsica and Elba, or the Maures

³⁶ C. F. C. Hawkes and M. R. Hull, *Camulodunum*, London, (1947), form 184, B. W. Cunliffe, *Excavations at Fishbourne 1961-1969*, London 1971, no. 149.

³⁷ Fishbourne: unpublished. Here fig 3, 5-6. The large fragment was found in the harbour area. Gloucester: associated with Neronian - early Flavian, south Gaulish samian. Unpublished, here fig. 3, 7.

³⁸ E. M. Davis, *Zur Geologie und Petrologie der Inseln Nisyros und Jali (Dodekanes)*, in *Practika akad. Ath.* 42, (1967), 235-52.

³⁹ Unpublished, from a level containing mainly Neronian pottery, here fig. 2, 17.

⁴⁰ R. E. M. Wheeler, *London in Roman times*, London (1930), Pl. LV, 1.

massif of southern France. However, it is very different from Catalan amphorae both microscopically and in the hand specimen, so this area can be eliminated with some confidence.

To summarise, the petrological evidence leaves little doubt that fabric 1 and probably fabric 2 are Rhodian and that fabric 6 was produced outside the area of Rhodian influence. The situation of the factories that produced fabrics 3, 4 and 5 cannot be determined, but fabric 4 might be Aegean.

The fabric subdivision helps to understand the minor variations in typology shown by this form. Fig. 3 shows a selection of the material studied:

Fabric 1 : Fig. 3, 1-3, 9-11

Fabric 2 : Fig. 3, 12-16

Fabric 3 : Fig. 3, 4

Fabric 4 : Fig. 3, 5-7

Fabric 5 : Fig. 3, 17

Fabric 6 : Fig. 3, 8

Most instructive are the complete amphorae or large fragments available for fabrics 1, 3, 4 and 6: each appears to have its own typological peculiarities though they are very slight and there are too few specimens to be sure that the differences are significant. However, the contrast between the vessel in fabric 1 and those in the other fabrics is very marked. The true Rhodian (Fig. 2, 1) is more bulbous, thinner walled and would have carried much more wine for its weight. No doubt its superior efficiency was the result of a long tradition of craftsmanship and development on Rhodes. Its refinement is a strong argument for suggesting that the other forms were cruder imitations produced well away from the influence of this tradition.

Interesting points arise from studies of distribution and dating. The form as a whole is particularly prevalent in the west in a band running from Italy through Germany to Britain (Fig. 4). Peaked handles first occur in Augustan contexts at Oberaden, Haltern and possibly August; they occur in Claudian or Neronian levels at Hofheim, Hod Hill, Waddon Hill, Gloucester-Kingsholm, Usk, Exeter, Fishbourne and Camulodunum, but production certainly persisted well into the Flavian period as shown by material from the town of Gloucester, Nijmegen, Ventimiglia, Pompeii, Herculaneum, Ostia and Caerleon: some of this material could be remnants of earlier importation

but certainly not all⁴¹. It seems significant that a very high proportion of the finds, particularly the pre-Flavian ones, come from military contexts and even some of those from civil sites (such as Fishbourne) could derive from an earlier military phase.

Its importance on early military sites in Britain is particularly striking and it is reasonable to claim that it is the commonest wine jar. Finds from Hod and probably Waddon Hill in Dorset, are Claudian in date and it is interesting that these two vessels are in fabric 1 of Rhodian origin. Further examples in the same fabric are known from the fort at Exeter dated c. 50-70 A.D. However, the only site which has produced large quantities of amphorae, is the pre-Flavian legionary fortress of Gloucester-Kingsholm. About thirty per cent

⁴¹ Dating evidence for Augst, Oberaden, Haltern, Colchester, Nijmegen and Ventimiglia, conveniently summarised with references by C. Panella, *Ostia II*, 139 (= *Studi Miscell* 16, 1970). Ostia: see also C. Panella, *op cit.*, note 24, 73. Hofheim: E. Ritterling, *Das Frühromische Lager bei Hofheim im Taunus. Ann. Verein für Nassauische Altertumskunde und Geschichtsforschung*, 40, (1913), form 74. Hod Hill: I. A. Richmond, *Hod Hill*, Vol. II, London, (1968), fig. 54. Waddon Hill: G. Webster, *Further investigations at Waddon Hill*, in *Proc. Dorset Nat. Hist. and Arch. Soc.*, 86, (1964), fig. 5, 1. Fishbourne: B. W. Cunliffe, *op cit.*, note 3. Pompeii: A. Mau, *CIL IV*, Suppl. form 42. Herculaneum: A. Maiuri, *La Casa del Menandro*, Rome, (1932) fig. 189. Caerleon: R. E. M. Wheeler and T. V. Wheeler, *The Roman Amphitheatre at Caerleon, Monmouthshire*, in *Archeologia*, 78, (1928), 186. Leicester: unpublished handle fragment, Leicester Museum. Sea Mills: unpublished handle fragment, Bristol Museum. Verulamium: unpublished, information courtesy, Prof. S. S. Frere. Usk: unpublished, information courtesy of W. H. Manning. Exeter: unpublished, information courtesy M. Griffiths. Gloucester: unpublished, information courtesy H. R. Hurst. Civil settlement in town and pre-Flavian fort at Gloucester-Kingsholm. Other sites include Xanten: J. Hagen, *Einzel funde von Vetera 1913/14*, in *Bonner Jb.*, 124, (1971), 160. London: R. E. M. Wheeler *op cit.* note 40. Neuss: Ph. Filtzinger, *Novesium V*, Berlin, 1972, Taf. 24, 9. Milan, Cremona: P. Baldacii, *op cit.*, note 30. St. Raphaël: A. Tchernia, *op cit.*, note 30. Aislingen: G. Ulbert, *Die römischen Donau-Kastelle Aislingen und Burghöfe*, Berlin 1959, taf. 11. Athens: V. Grace, *Amphorae and the Ancient Wine Trade*, Princeton (1961), fig. 62. Lyons: J. Lasfargues, J.-F. Reynaud and A. Desbat, *Fouilles de sauvetage à Lyon*, in *Archeologia*, 60, (1973), 74. Mainz: *Westd. Zeitsch.*, 20, Pl. XVII. Vindonissa: information courtesy E. Ettlinger. Luni: see S. Lusuardi Siena, this volume. Basel: R. Fellmann, *Basel in Römischer Zeit*, Basel (1955) Taf. 11, 9. Benghazi: information courtesy J. Riley. The related form Dressel 43 has been omitted from consideration here.

of the 250 sherds recovered are from Rhodian vessels, the only other potential wine jars being represented by two sherds from Koan style (Dressel 2-5) amphorae and fragments of the flat-bottomed Dressel form 30/Pélichet 47, which comprise about five per cent of the sherd total. The majority of the Rhodian style fragments are in fabrics 1 and 2, roughly in the proportion 1:2. The popularity of the form is curious as it contrasts with published information available for other sites. The Rhodian type appears to have been of considerably less importance on Augustan sites such as Oberaden or Haltern and the same applies to pre-and post-conquest Camulodunum as well as to the important new material from the pre-Roman site at Puckeridge⁴². Ritterling specifically remarked on the scarcity of the form at the Claudian fort of Hofheim. It thus seems reasonable to suggest that Rhodian style amphorae were *particularly* favoured on certain pre-Flavian forts in Britain and their pre-eminence may have begun soon after the Claudian conquest. Furthermore, as supplies came directly from Rhodes it is tempting to see a connection with events in that area, for between 44 and 53 A.D., Claudius rescinded the liberty of the Rhodians on a account of atrocities committed against the Romans⁴³. Could it not be that the popularity of Rhodian wine on British military sites, at least began with consignments exacted in tribute?

In comparison with fabrics 1 and 2, the remaining material is relatively unimportant as each fabric is represented by only a few examples. As more material comes to light it will be interesting to see whether these types show a concentration on civil rather than military sites and whether they are predominantly later in date. At present, the evidence is inadequate to assess such questions with certainty, but they do appear to be somewhat commoner on civil sites and production certainly goes back to c. 60 A.D. as the complete vessel Camulodunum 184 in fabric 3 demonstrates⁴⁴.

3 - Sherd identification: North African amphorae in Late Roman Britain

The identification of small fragments is an important aspect of the study of fabrics. Some types such as the common Spanish globular amphora (Dressel 20) can be readily recognised in the hand specimen, but in other cases it can be difficult to do this with absolute confidence. However, if a series of thin sections is prepared from complete vessels, small fragments can usually be identified by matching microscopic characteristics. Most forms occur in a limited range of fabrics and hence it can be possible to determine type with some precision, although if a single fabric is shared by a number of forms, a range of possible identifications is the best that can be hoped for. This technique has proved of considerable value in the study of Dressel 1 amphorae which are being found in increasing numbers on Iron Age sites in southern Britain⁴⁵. Thin section examination of complete vessels established the mineralogical nature of three distinct fabric types and it is now a simple matter to identify small featureless fragments by comparison with this body of data. Some confusion is possible because the same fabrics are occasionally found in Koan style (Dressel 2-5) amphorae, but the chronological contexts usually make this identification unlikely.

Another good example of this approach is the recent identification of North African cylindrical amphorae from late Romano-British contexts. A few years ago, excavations on the new Market Hall site at Gloucester produced fragments of the body of an amphora in a distinctive hard red fabric (2.5 YR. 5/6) with an off-white slip finished with vertical smoothing. Occasional rounded white particles (c. 1 mm) or voids and very rarely 2 mm particles of brown ferruginous sandstone could be seen. At the time, it could only be matched with two sherds from the post-Roman monastic site of Tintagel in Cornwall where they belong to Thomas' undecorated "Class Biii" amphorae⁴⁶. Thin section examination showed the sherds from the two sites to be closely similar but the petrology did not suggest a

⁴² Unpublished; information courtesy of C. Partridge.

⁴³ Cassius Dio LX, 24. Tacitus *Ann* XII, 58. Suetonius *Claudius*, 25, Nero, 7.

⁴⁴ C. F. C. Hawkes and M. R. Hull *Camulodunum*, London, (1947), 281.

⁴⁵ D. P. S. Peacock, *op cit*, note 11.

⁴⁶ A. C. Thomas, *Imported pottery in Dark-Age western Britain*, in *Med Arch*, 3, (1959), 89-111.

possible source. All that could be seen was a red optically isotropic matrix of fired clay with numerous grains of subangular quartz about 0.1-0.2 mm across, rounded fragments of limestone or voids with bleached reaction rims (indicating that limestone was once present) and small pieces of siltstone, often with quartz grains set in a lime rich matrix (cf. Fig. 2, i). None of the minerals is particularly distinctive, but despite the simple composition, it is an unusual fabric. The problem of origin was solved when a complete vessel from the barrow at Holborough in Kent, was examined⁴⁷. This amphora (Fig. 1, 6) was associated with a late second century coin, with early third century coarse pottery, and with five of the small amphorae discussed above, probably third century products of Mauretania Caesariensis. The large vessel is clearly of the cylindrical form discussed by Zevi and Tchernia, shown on the basis of stamps to originate in the Byzacena region of North Africa though Panella suggests that it may have been made elsewhere in small quantities as well⁴⁸. It belongs to Panella's Africana II, type D, dated to fourth century, although the evidence from the barrow implies that the form could also have been current rather earlier⁴⁹. The Holborough amphora bears a stamp reading TEP / SVRI and it is closely paralleled by an example from Rome. The fabric is brown rather than red, but it bears an off-white outer slip with the characteristic vertical smoothing and in thin section it shows all the characteristics of the vessels from Tintagel and Gloucester, leaving little doubt that these must also be imports from the Byzacena region (Fig. 2, h).

Further study has demonstrated that the type occurs on the eleven sites in southern Britain marked on fig. 5, and at least thirty different vessels are represented. Many pieces can now be recognised by their visual characteristics, but as most are body sherds, it is always useful to check identifications by thin section study and this is essential if the sherds come from part of the vessel that lacks the vertical smoothing or if

the fragments have deteriorated unduly in the soil. Unfortunately it is impossible to determine precisely which of Panella's or Beltrán's cylindrical forms are represented in this material, but it is nevertheless clear that the general North African cylindrical type is present in some quantity⁵⁰.

Some of the body sherds are particularly important because they occur in dated contexts. There is an important vessel from Caerleon dated c. 130-160 A.D., but as this now appears to be lost and as the fabric description is inadequate, I hesitate to base too much upon it⁵¹. There is, however, an unpublished sherd from the quay at Caerleon dated to before c. 210 A.D. which has a North African fabric. This and possibly the vessel from Holborough could imply importation as early as the third century. A rim from Clausentum (Southampton) is dated in the range of third century - 370 A.D., but the remaining material when stratified, comes from the very latest contexts of Roman Britain and is potentially of fifth century date, although this is very difficult to prove because of the scarcity of dateable artifacts of this period⁵². The sherd from the new Market Hall site in Gloucester came from the floor of a building which may have had a very late fourth century coin hoard hidden in the roof before collapse, and much of the remaining material from other sites in Gloucester was either recovered from Medieval levels or from a loam deposit dated to the broad period fourth to eleventh century⁵³. Sherds from Bush Lane, London, came from a dump of material believed to have been deposited in the fourth century or later and it was associated with shelly coarse pottery fabrics which J. Clark believes, persist into the fifth century⁵⁴. At Mucking, in Essex, a handle was recovered from a very late ditch and a further sherd came from the fill of a fourth century well

⁵⁰ C. Panella, *op. cit.*, note 24. M. Beltrán Lloris, *Las ánforas romanas en España*, Zaragoza, 1970, 546 ff.

⁵¹ R. E. M. and T. V. Wheeler, *The Roman Amphitheatre at Caerleon, Monmouthshire*, in *Archaeologia* 78, fig. 23, 81.

⁵² M. Cotton and P. Gathercole, *Excavations at Clausentum, Southampton 1951-1954*, London, (1958), fig. 26, 8.

⁵³ Information courtesy H. R. Hurst, J. Rhodes, M. Hassall.

⁵⁴ Information courtesy of P. Marsden and H. Chapman. For shelly wares see J. Clark. In A. C. Brodrick, A. R. Hands and D. Walker *Excavations at Shakenoak III*, Oxford, (1972), 142.

⁴⁷ R. F. Jessup, *op. cit.*, note 26.

⁴⁸ F. Zevi and A. Tchernia, *Amphores de Byzacène au Bas-Empire*, in *Ant. Africaines*, 3, (1969), 173-214.

⁴⁹ C. Panella, *op. cit.*, note 24, 84. C. Panella, *op. cit.*, note 24, 102.

sealed by a fifth century Saxon building⁵⁵. The finds from Tintagel might imply importation in the late fifth century or the early sixth century, for most of the other Mediterranean imports from the site are of that date, but this is not conclusive because late Romano-British pottery has been found there⁵⁶. African amphorae are curiously absent from the late third and fourth century Shore Forts that defended the southern and eastern coasts of Britain, although a few have now been excavated on some scale. No sherds of these vessels were found in a massive collection of pottery from either Portchester or Pevensey Castles or in the examination of a large sample of material recovered from Richborough and Burgh Castle⁵⁷.

In sum, the evidence available suggests that importation from Byzacena may have begun in the third century and possibly continued through the fourth, though on a very small scale, with few supplies destined for the military market. It is hard to escape the conclusion that the most important period for importation to Britain was in the very late fourth or more probably fifth century A.D. It would be rash to restrict this to the years before the Vandal invasion of Africa in 429 A.D. because Hayes has already suggested that North African fine-ware production was less affected than previously thought and Courtois has argued that agricultural activities survived the invasions more or less unscathed⁵⁸. However, the contexts in which the vessels are found and their absence from most of the post-Roman sites in south western Britain, implies that many were arriving earlier rather than later in the fifth century⁵⁹.

The study of British material suggests an economically viable trade. It is important to realise that most of the vessels are represented by body sherds only: had these been ignored, vital dating evidence would have been lost and the number of finds recorded would be very small indeed. It would have been tempting to explain them as casual importations by travellers rather than organised trade. The North African and European distribution of the cylindrical form is now heavily biased at the British end, as finds have not been recorded in the same detail elsewhere, but the new data help in understanding the general distribution pattern. The general type is found widely in the Mediterranean region, but there is a remarkable concentration of sites in an arc from Tarragona to Genoa (Fig. 6). At many places along this coast the imports were commonplace: countless sherds are to be seen on the site of the fifth century foundation of Ugium (St. Blaise) and they occur in quantity in early Christian cemeteries such as Tarragona, Barcelona, Ampurias or Narbonne. It is interesting to note that a similar site has come to light on the Atlantic coast at Bordeaux and that the two regions are connected by a spread of finds across inland France, principally along the Garonne⁶⁰. Individual pieces have yet to be closely dated, but it does seem that at certain periods material was transported across France to Bordeaux and presumably from this port it was shipped to Britain.

IV - CONCLUSIONS

I hope that these brief observations on scattered topics are sufficient to demonstrate that the analysis of fabrics is an aspect of amphora study with considerable potential, and that it can lead to information of direct historical interest. It will be clear from the way I have drawn on the works of others that the scientific analysis of

⁵⁵ Information courtesy Mrs. M. U. Jones & W. J. Rodwell.

⁵⁶ Information P. A. Rahtz. See A. C. Thomas, *op cit*, note 44. C. A. R. Radford, *Imported pottery found at Tintagel, Cornwall*, in D. B. Harden (Ed) *Dark Age Britain, Studies presented to E. T. Leeds*. The imitation Drag. 38 is probably a 3-4th century product of the Oxford potteries.

⁵⁷ For general account of Shore Forts see S. S. Frere *Britannia*, London, (1967), also B. W. Cunliffe, *op cit*, note 20. Dr. M. G. Fulford examined the collections of pottery and I refer to his findings with his kind permission.

⁵⁸ J. W. Hayes, *Late Roman Pottery*, London, (1972), 426. C. Courtois, *Les Vandales et l'Afrique*, Paris, (1955), 317.

⁵⁹ See A. C. Thomas, *op cit*, note 46. *Recent survey of post-Roman sites in L. Alcock, Arthur's Britain*, Harmondsworth, (1971).

⁶⁰ J. Coupry, *Circonscription d'Aquitaine, Bordeaux*, in *Gallia*, 27, 343. For other sites mentioned see M. Beltran Lloris, *Las ánforas romanas en España*, Zaragoza, (1970), 549 ff with full references. St. Blaise and Narbonne: personal observation on site.

materials does not replace existing methods, but it is merely one aspect of the broader field of typological study. All scientific techniques, including those I have not had occasion to mention, have a role in the examination of fabrics, but most amphorae are ideally suited to examination in thin section under the petrological microscope and this should be the routine approach to be applied in the first instance. Although it is a tool of proven value, it could be greatly sharpened by study of vessels bearing *tituli picti* and by recording the petrological characteristics of known kilns. These data would then provide reference standards against which unknown pieces could be checked.

However, scientific methods of analysis can never be applied to more than a small proportion of vessels recovered and the visual comparison of amphora fabrics will always be important. Fabric descriptions would be of considerably more value if we adopted a standard procedure. Colour, for example, could be recorded with reference to colour charts and it would be useful to note the approximate proportion, colour, shape and size of inclusions visible in a fresh fracture. This information would not be difficult to recover

and it would add greater precision to our work, for if detailed comparisons are to be valid, fabric as well as form should match.

V - ACKNOWLEDGEMENTS

I wish to thank the following for allowing me to examine material in their care and in some cases for generally permitting reference to discoveries in advance of their own publication.

Mr. G. Boon, Mr. H. Chapman, Mr. J. Clark, Mr. D.T.D. Clarke, Mr. J. Collis, Mr. H. L. Douch, Professor S. S. Frere, Dr. M. G. Fulford, Mr. M. Griffiths, Mr. M. Hassall, Mr. H. R. Hurst, Miss C. Johns, Mrs. M. U. Jones, Mr. D. Kelly, Miss J. Macdonald, Dr. W. H. Manning, Mr. P. Marsden, Mr. C. Partridge, Miss S. Pearce, Mr. R. Peers, Mr. M. Ponsford, Mr. J. Rhodes, Mr. J. Riley, Mr. W. J. Rodwell, Mrs. M. Rule.

I am indebted to Drs. Virginia Grace and T. Leslie Shear Jr. for arranging for me to examine stamped Greek Rhodian material from the Athenian Agora and for permitting reference to this material here. The Greek Department of Antiquities kindly authorised exportation of samples for petrological analysis.

November 1974

SUMMARY

This paper stresses the relevance of fabric studies in elucidating typological phenomena. After a survey of previous scientific work on amphora fabrics, examples are given to demonstrate the value of the petrological approach, firstly to suggest possible source regions for

little known types; secondly to study the diverse production centres of a single form which can lead to an explanation of typological variation, and thirdly to identify the types to which small and often featureless body sherds belong.

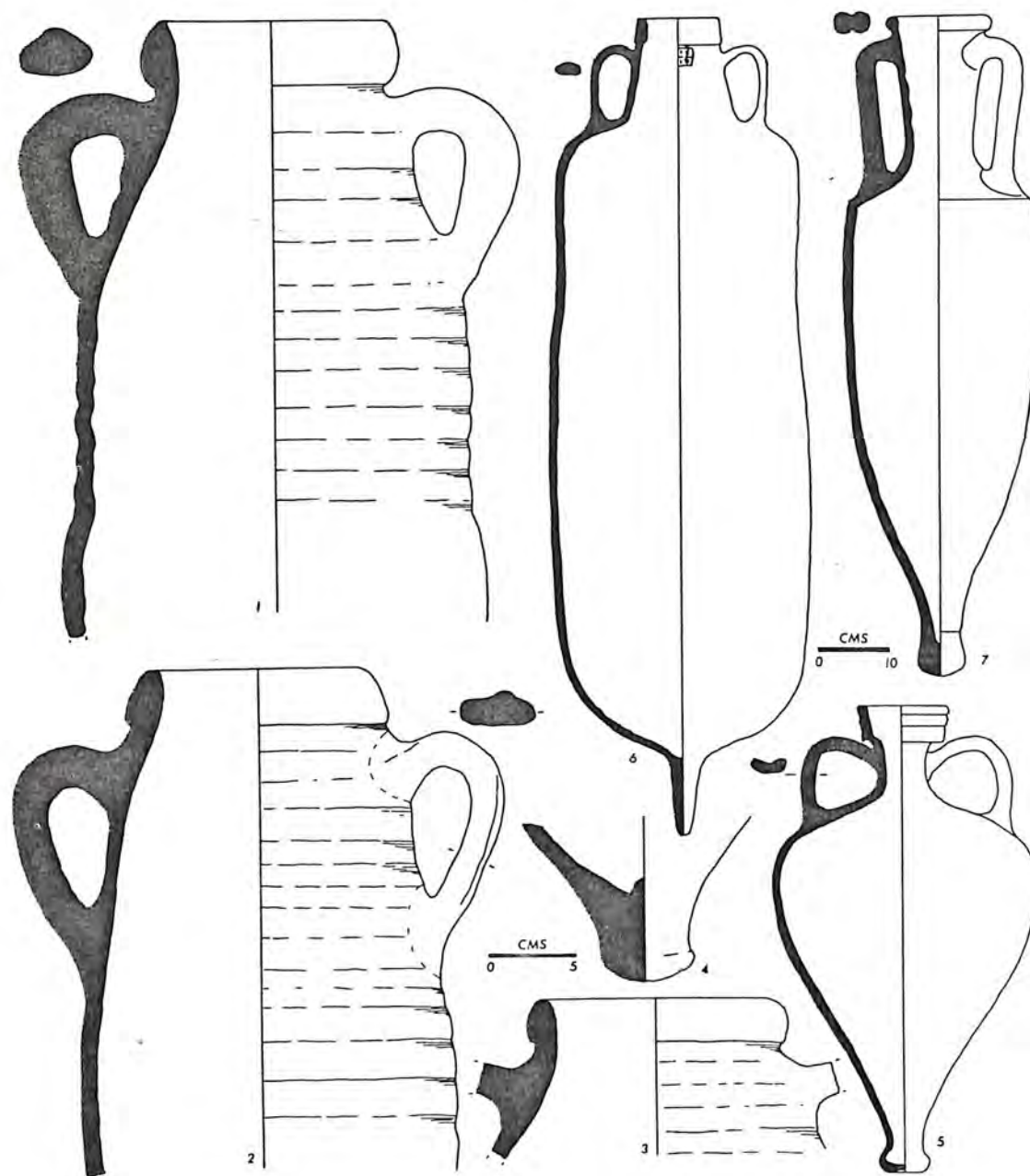
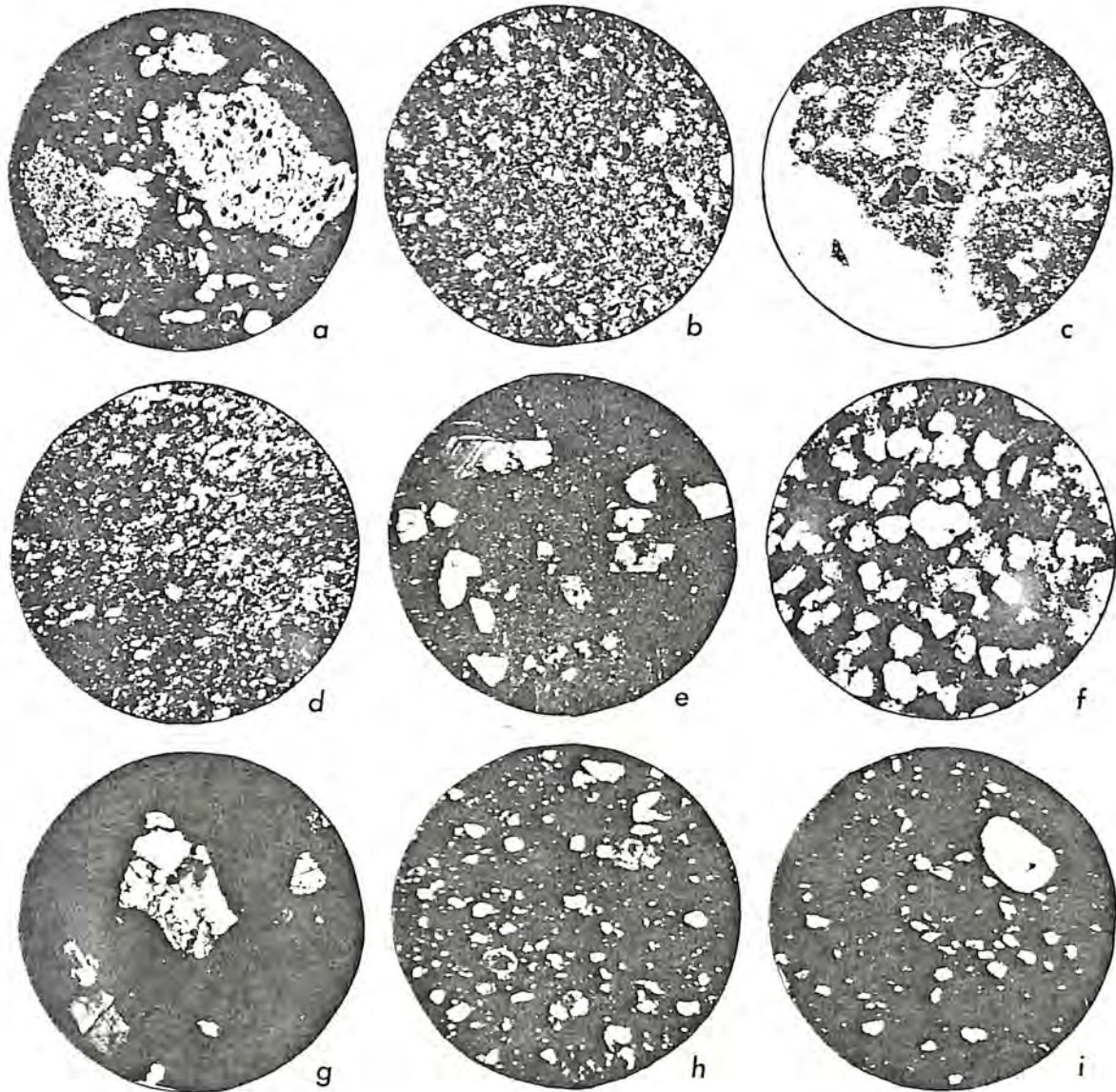


Fig. 1

- 1 - Richborough. After B. W. Cunliffe 'Fifth Report on the Excavations of the Roman Fort at Richborough, Kent' London 1968, No. 527.
- 2 - Plantation House, Fenchurch Street, London. Guildhall Museum, London.
- 3 - Silchester. Cf. T. May *The Pottery found at Silchester* Plate LXVII A top left.
- 4 - Verulamium. Courtesy Professor S. S. Frere.
- 5-6 - Holborough, Kent. After R. Jessup *Archaeologia Cantiana* 68 (1954).
- 7 - Heybridge, Essex. After C. F. C. Hawkes & M. R. Hull 'Camulodunum' type 183 B.

Fig. 2 - Photomicrographs ($\times 17$)

- a - Exeter, unpublished. Amphora of the type shown in fig. 1, 1-4. Volcanic rock fragment on left and large sherd of volcanic glass. Plane polarised light.
- b - Fabric 1, unpublished peaked handle from Fishbourne. Quartz and fired serpentine minerals (dark specks). Plane polarised light.
- c - Fabric 1. Waddon Hill, Dorset, here fig. 3, 9. Large grain of fired serpentine showing *maschen* structure. Plane polarised light.
- d - Fabric 3. Type specimen Camulodunum 184, here fig. 3, 4. Quartz and minute sherds of white mica. Plane polarised light.
- e - Fabric 4. Fishbourne, here fig. 3, 6. Angular grains of feldspar (grey) and quartz (white). Crossed nicols.
- f - Fabric 5. Usk, here fig. 3, 17. Rounded quartz sand. Plane polarised light.
- g - Fabric 6. Old Broad Street, London, here fig. 3, 8. Large fragment composed of quartz and potash feldspar, plagioclase feldspar to right. Crossed nicols.
- h - African amphora. Holborough, Kent, here fig. 1, 6. Quartz sand with limestone particles (cloudy) and limestone voids. Crossed nicols.
- i - Dorchester, Dorset. Body sherd of African amphora. Quartz grains of similar size and shape to h. Voids once containing limestone appear elsewhere in slide. Crossed nicols.

He does not illustrate his base for Fabric 1, i.e. The Agave stamped fragments. How shaped

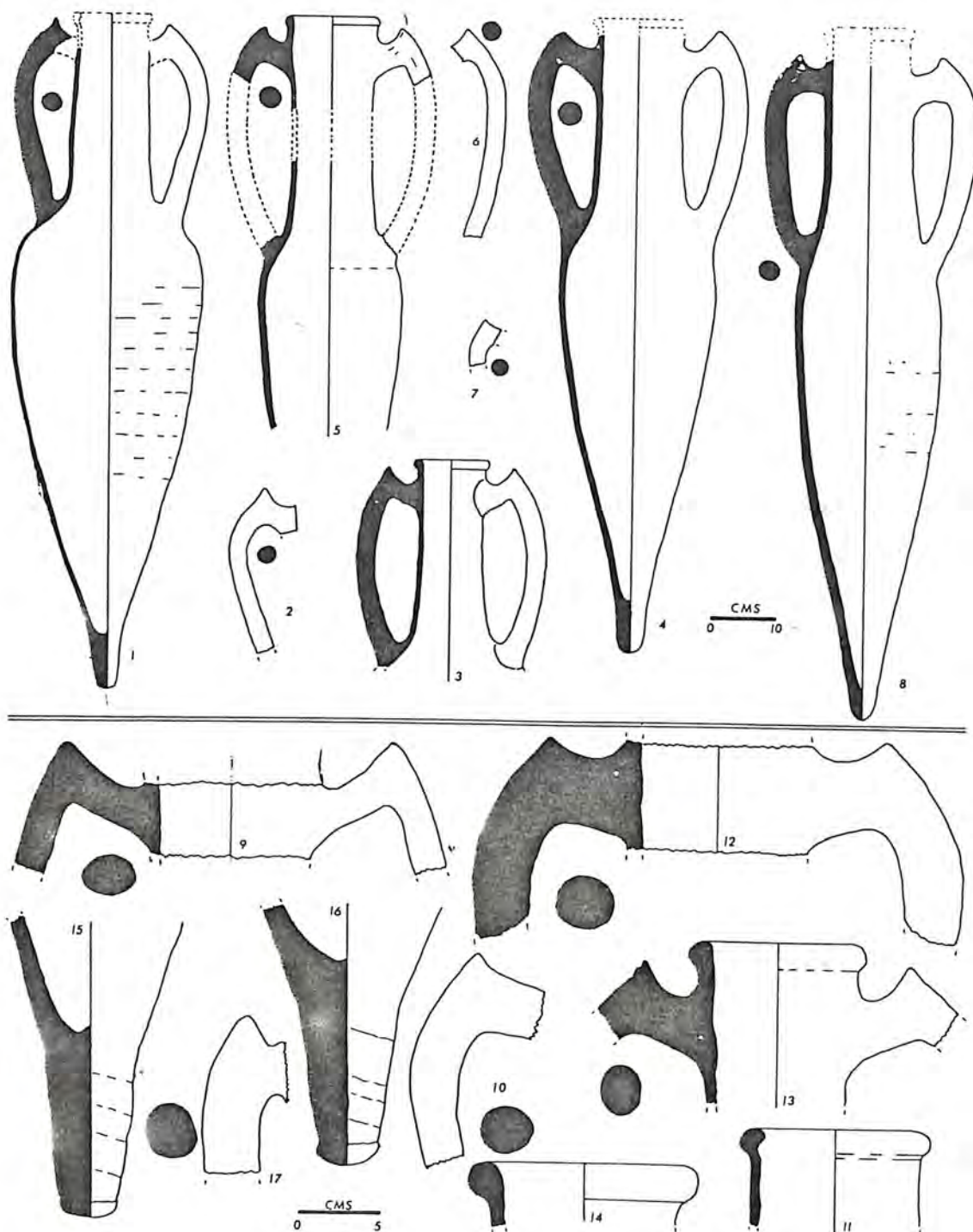


Fig. 3

- 1 - Gloucester-Kingsholm.
- 2 - Threadneedle Street, London. Cf. R.E.M. Wheeler *London in Roman Times* London, Pl. LVI, 1.
- 3 - Hod Hill. After I. A. Richmond *Hod Hill* Vol. II London (1968), fig. 54.
- 4 - Camulodunum. After C.F.C. Hawkes & M. R. Hull *Camulodunum* type 184.
- 5 - Fishbourne harbour area.
- 6 - Fishbourne.
- 7 - Gloucester.
- 8 - London, Old Broad Street, cf. R.E.M. Wheeler *London in Roman Times*, Pl. LV, 1.
- 9 - Waddon Hill, Dorset.
- 10 - Fishbourne Palace.
- 11-16 - Gloucester-Kingsholm.
- 17 - Usk.

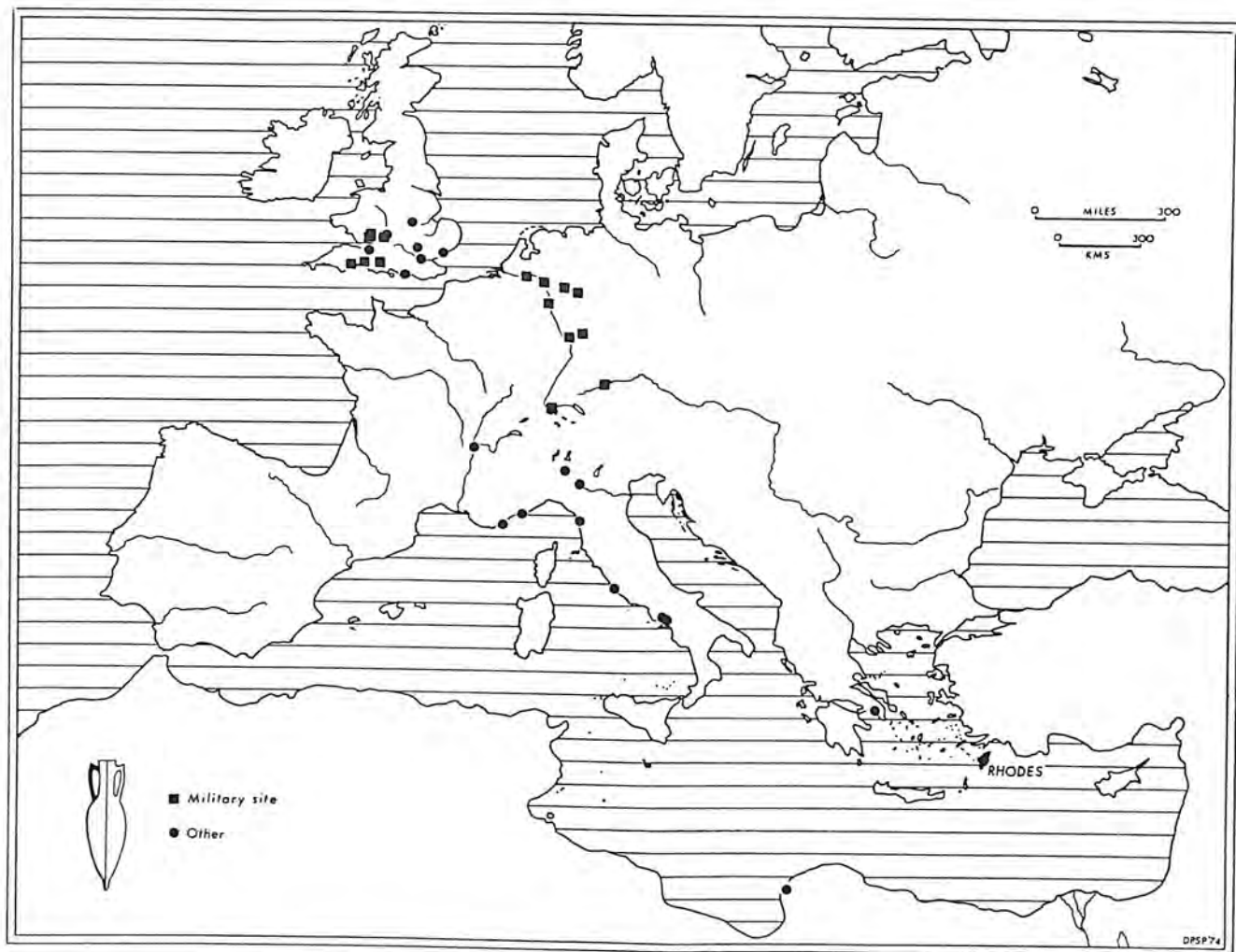


Fig. 4 - Distribution of peaked handled, Rhodian type amphorae.

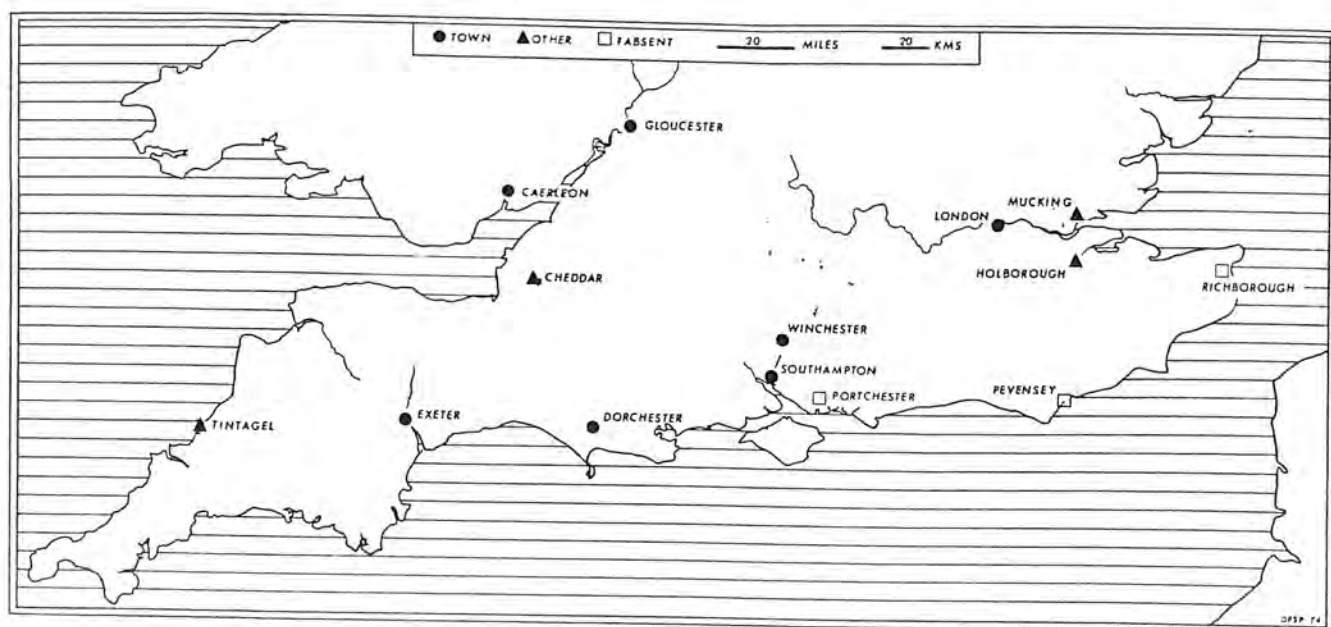


Fig. 5 - Distribution of African (Byzacena) cylindrical amphorae in southern Britain.

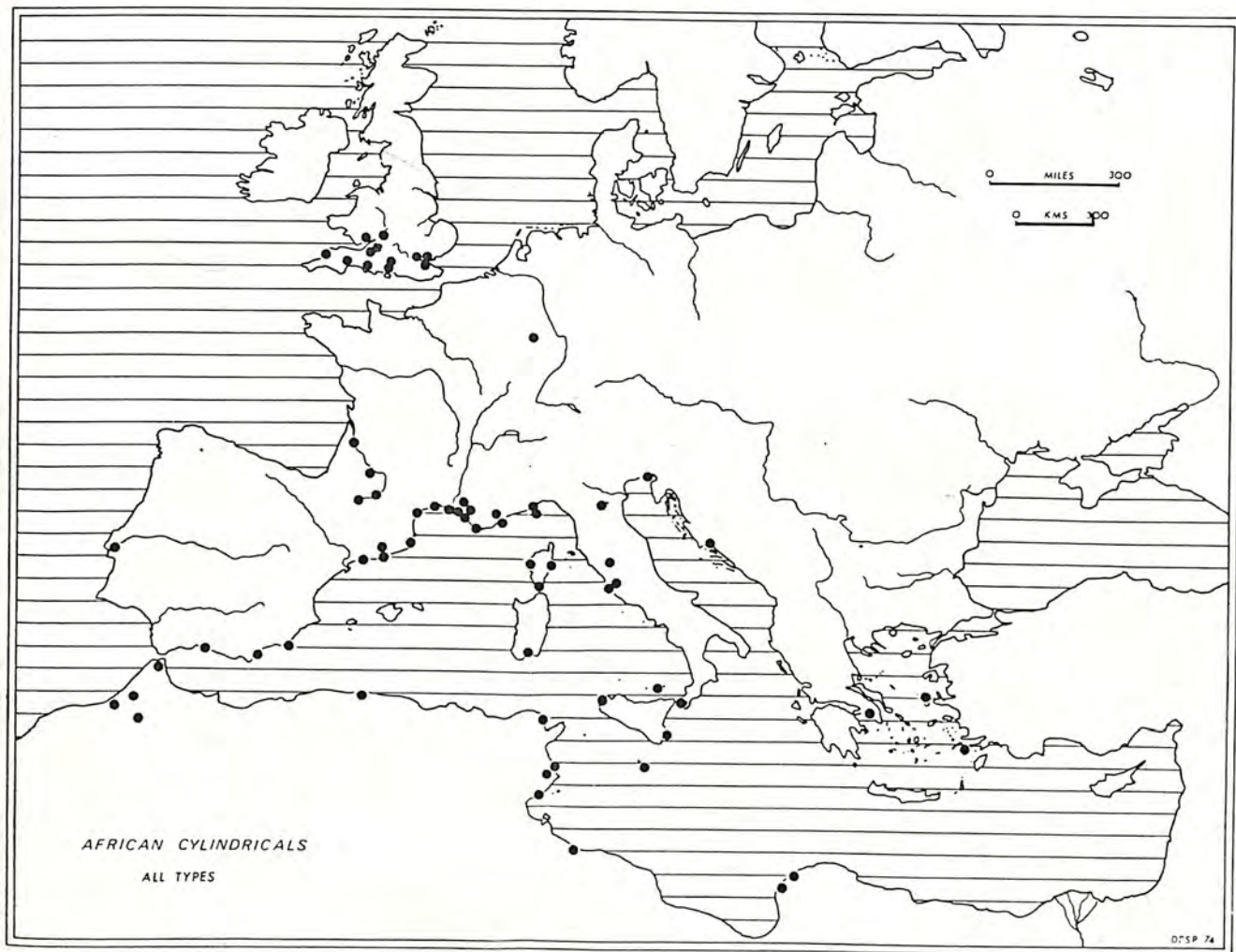


Fig. 6 - Distribution of African cylindrical amphorae.

DEPARTMENT OF ARCHAEOLOGY

TEL. SOUTHAMPTON 559122

TELEX 47661



UNIVERSITY
OF
SOUTHAMPTON
SO9 5NH

Professor A. C. Renfrew, M.A., PhD., F.S.A.

10th January, 1975

Dr. V.R. Grace,
American School,
54 Souedias Street,
ATHENS 140,
Greece.

Dear Dr. Grace,

I enclose herewith a copy of the paper I have recently submitted for publication by the French School at Rome, with many thanks for your help in its preparation. You will find the Rhodian problem discussed between pp 10-17, and I should be more than grateful for your comments. I did not press you for a list of Rhodian stamp readings for the pieces I sectioned, as I realised you were probably very busy with other things.

However, if you agree it would be useful to include these as an appendix to this paper, I could perhaps persuade the French School to add this between now and galley stage. In any case I would greatly value such a list for my own interest.

I have been reading your very instructive paper on "Samian amphoras" and would be grateful for an offprint if you have any to spare. I am intrigued by the gem stamps and wondered whether you knew of the gem stamp of rather later date from Vindonissa, of which I have a sample for microscopic examination. I enclose a xerox of the paper in which it is published and would value your observations on it.

Good wishes,

Yours sincerely,

A handwritten signature in dark ink, reading 'David P. S. Peacock'.

Dr. D.P.S. Peacock

ROMAN AMPHORAE: TYPOLOGY, FABRIC AND ORIGINS

D.P.S. Peacock

Department of Archaeology, University of Southampton, England.

I. INTRODUCTION

In the last decade great advances have been made in the study of Roman amphorae: we now know much more about the place of origin, contents and date of these vessels, so that they are becoming of real value in understanding ancient economic history. Our increased knowledge is the result of careful attention to typology, alongside study of dipinto inscriptions, stamps, distributions and kiln material. There is little doubt that determination of the place of manufacture is still one of the most difficult problems; it is also one of the most fundamental, for when the origin is known, it can be possible to gauge contents and sometimes even an approximate date from archaeological and ancient literary information about the source region.

Difficulties arise because often amphora types are devoid of intelligible tituli picti or stamps. In other cases there is evidence to demonstrate that a single form was produced in a variety of places and it is hard to determine which of the alternatives applies to a vessel that has lost its inscription through unfavourable site conditions. For example, amphorae based on Greek prototypes from the island of Kos (Dressel forms 2-5) are known to have been made in Campania, in the territory of the Laeetani and elsewhere, but it is at present difficult to distinguish the products of each region on the basis of typology (1).

A further problem is frequently encountered on the fringes of the Roman empire. Since amphorae have a much higher body/rim ratio than other types of coarse pottery, the majority of excavated finds will consist of featureless body sherds. In the Mediterranean region where amphorae

abound it may be possible to extract meaningful statistics from a consideration of rims, handles and spikes, but in Britain, even the most extensive excavations can produce too few featured sherds for these to be of much value. Mr. Henry Hurst's recent excavations in the Roman town of Gloucester produced about 300 amphora sherds and of these only 19 had typological features, including one illegible stamp (2). Had the body sherds been thrown away, several types of amphora would have been missed altogether, giving a distorted picture of imports to the Roman town. If we are to extract the maximum economic information from excavated material we must be able to identify types (hence origins and likely contents) from small fragments, as Elizabeth Ettlinger suggests.

Determination of amphora origins is thus a problem with several facets lying beyond the scope of normal typological investigations. However, the points I have raised are amenable to further elucidation by careful attention to amphora fabrics, a little studied aspect, which can be vital in understanding these vessels. In this paper I propose to give examples illustrating some of the ways in which scientific study of materials can assist, firstly in assessing the origin of little known types, secondly, in the study of diverse production centres for a single form and finally in the identification of small and often featureless sherds. It will be apparent that these techniques do not supersede existing methods, but must be carefully integrated with typological, epigraphic and other considerations.

II. METHODS AND PREVIOUS APPLICATIONS

Ceramic fabrics can be analysed either by examining their chemical content or by studying the composition and properties of included rock and mineral fragments. Chemical analysis has found wide application in discriminating pottery of different origins, since it is to be expected that raw materials will vary in chemical composition. All clays have much the

same content of major components and thus we can assume amphorae to have a roughly similar tenor of silica, alumina, iron oxide and lime regardless of origin, a point clearly verified by Maréchal's analyses (3). However, raw materials can differ in their trace element composition and study of this, using techniques such as neutron activation, emission or X-ray spectroscopy, is much more promising, though little work has yet been done on amphorae (4). Using neutron activation, Sayre and Dodson were able to demonstrate differences in the manganese/sodium ratio of stamped Greek amphorae and Knidos (5). Presumably this led Dr. Sayre to suggest that certain amphorae from Delos of Knidian type were made of Rhodian clay (6). However, before accepting the conclusion that clay was transported from Rhodes to Knidos it is worth noting that the two regions are geologically similar and petrological study of a Knidian amphora in Southampton Museum has shown much the same mineral composition as that of Rhodian amphorae, though in the former the inclusions are rather coarser-grained. Thus, an alternative suggestion might be that at certain periods Knidian potters exploited local clays similar to those commonly used on Rhodes.

Trace element analysis clearly has considerable potential in characterising amphorae made from different raw materials, but much more fundamental research is required since not all trace elements are of equal value. It seems probable that study of material from different production centres will show that some elements occur in similar proportions in many amphora types regardless of origin, while other elements will vary widely within a single clay formation, a point best investigated by analysing multiple samples of waste from individual kilns. It is well known that on some find-sites even samian ware can be reduced to the consistency of putty, a clear indication that chemical changes may be taking place after burial, and indeed, it has already been demonstrated that such changes can and do occur (7). In the case of amphorae, possible effects of chemical solution and accretion in different soil environments could be investigated by sampling certain common

types of stamped amphorae from a number of geologically contrasting sites. Until tests of this nature have been undertaken, chemical trace element analysis must be used with caution.

However, fortunately, amphorae are comparatively coarse textured and contain fragments of minerals and rocks, either as natural inclusions in the clay, or deliberately added as temper, and these afford an alternative means of assessing origins. The geology of the Mediterranean region is varied and hence it is reasonable to expect that each production region will have its own mineralogical peculiarities, or that these will be shared with few other regions. The overall mineralogical composition of pottery can be characterised using the property of crystalline substances to diffract X-rays at different angles dependent on composition. It is a simple matter to produce an X-ray diffraction pattern in the form of a graph or photograph which will summarise the essential crystalline composition of pottery fabrics and Young and Whitmore considered this to be an ideal way of 'finger-printing' pottery of different origins (8). However, both the possibilities and limitations of this approach are illustrated by Périnet's work on amphorae from the Grand Congloué (9). Dressel 1 vessels produced a distinctive diffraction pattern, but the Greco-Italic and Rhodian types had closely similar patterns because they are of similar materials. It certainly cannot be inferred that the two types were made in the same place, because there may be mineralogical differences undetected by this method, which records only constituents comprising more than about five per cent of the sample. Thus the technique could be useful in discriminating between amphorae of differing origins, but only if there is considerable contrast in mineralogical composition.

An alternative and more widely used method is examination in thin section under the petrological microscope (10). A small sample, c. 10mm x 10mm in area is removed from the vessel, fixed to a glass microscope slide and ground to a thin transparent slice. Not only does this permit the mineralogical composition of the inclusions to be determined, but rock types can be identified and it is possible to study textures of both rock and

mineral fragments, which can be important when it is necessary to distinguish amphorae of different origins containing inclusions of similar composition. Unfortunately, most published petrological descriptions of amphorae consist of brief notes largely restricted to Dressel form 1 and they are unanimous in confirming its Italian origin (11). Other forms have been studied to a more limited extent and detailed descriptions will soon be available for the products of the Cadiz and Alg ciras kilns (12). Work on Greek amphorae may also be relevant for it indicates the nature of inclusions in the source region and this information is potentially useful in assessing the origins of Roman vessels. The works of Farnsworth on Athenian and Corinthian pottery and that of Krug on the amphorae of the Cimmerian Bosphorus are worthy of note (13).

Amphora fabrics rarely contain inclusions of pure quartz sand, which is fortunate because it can be difficult to say much about the origins of such simple material on the basis of thin sections. However, sandy wares can be investigated by crushing c. 10-20gms of fabric, floating the powder on a heavy liquid such as bromoform (density 2.9) and collecting the minerals that sink because of their greater density (e.g. zircon, garnet, rutile) (14). These are present in small quantities in nearly all sands and the assemblage obtained will be characteristic of the parent formation, serving to characterise amphorae of different origins. Heavy mineral analysis has been little used in the study of amphorae but it has been applied to certain southern Spanish types (15).

There is thus a choice of methods, but in my view petrological study in thin section is an ideal method for the routine examination of amphora fabrics. Rock and mineral fragments are usually readily visible and these can often help diagnose or differentiate sources with some precision, as I hope to demonstrate in the following section.

In conclusion, it is worth noting the possibilities of organic analysis in the study of amphora technology and contents. This field has been little investigated but the information available shows great promise. Both Benoit

and Jongkees have recorded the presence of mastic (from Piceaea) as internal coating, but recent work in the British Museum laboratory suggests the presence of rosin, which would be obtained from the pine tree (16). Not all amphorae were coated and the fatty substance that oozed out of the pores of a globular amphora from Chester, had a chemical composition implying that the vessel may have held olive oil (17). Discoveries of amphorae with stopper in place and contents preserved are great rarities, but one such vessel, of fourth century A.D. date, from Tiritaka in southern Russia was filled with crude petroleum oil, presumably destined for use in lamps (18).

III. APPLICATIONS OF PETROLOGY TO AMPHORA STUDY

The object of this section is to give examples illustrating the role of fabric analysis in typological study, and in particular to demonstrate the potential of the petrological microscope. Although the problems overlap to a degree, they are essentially of a different nature, and concern material of various dates. The petrological side of the study has been restricted to amphorae found in Britain, but it is hoped that the findings will prove of wider interest and application.

1. Two amphora types : an attempt to define production regions

One of the main advantages of the petrological over the chemical approach is that rock and mineral fragments can be studied directly and it is theoretically possible to relate these to geological information about the Mediterranean, enabling production regions to be predicted. The precision attainable will depend on whether or not the rock and mineral inclusions are distinctive, with closely limited outcrops, and upon the detailed geological information available. This approach has already advanced our understanding of the Roman and pre-Roman pottery trade in Britain, but it must be stressed that the possible sources lie within a restricted region

where rock comparanda are readily available; also, the geological survey of Britain is one of the most detailed in the world (19). In the Mediterranean region, the problems of relating rock and mineral fragments to their parent formations can be formidable, but it is sometimes feasible to suggest source areas in general terms if the rock fragments are particularly distinctive, or if there is other evidence to limit the number of possible production regions.

Fig. 1, 1-4 shows an unusual type of amphora which is now known from seven sites in southern Britain: Exeter, Winchester, Silchester, London, Richborough, Verulamium and Puckeridge (20). On the pre-Roman site at Puckeridge, it occurs in Augustan-Claudian contexts, at Exeter the form is dated c. 50-70 A.D., while at Richborough it dates to the late 1st century A.D. The form is difficult to parallel with confidence, but it may be close to Dressel form 22 or Pompeii IV, for which latin tituli picti suggest a source in Italy, possibly Campania or Lazio (21). However, these forms do not have the knob base (fig. 1, 4) and are usually in a finer fabric. The British vessels are typically greenish-grey (Munsell 5 Y. 7/2) in colour and extremely rough with numerous large rounded lumps of rock up to 5 mm across, many of which are rounded 'lapilli' of colourless volcanic glass or pieces of grey black and red scoriaceous lava (22). These fragments can be seen in thin section accompanied by large (0.5 - 1.5 mm) shreds of volcanic glass, crystals of quartz, labradorite feldspar, augite, a little sanidine feldspar, occasional zeolites, fossil foraminifera and possibly algae (fig. 2a). They are set in a matrix of grey optically isotropic fired clay with a scatter of these minerals c. 0.05 mm across. The dark rock fragments are predominantly of andesitic composition, but some of the lighter coloured ones have a trachytic or glassy texture. It is thus possible to define some of the requirements of the production region. The fossils in the groundmass suggest that the clay was quarried from sedimentary rocks of marine origin, while the inclusions, presumably added as temper, imply that this was located in an area of recent vulcanism, for otherwise it would be difficult to account for the well-preserved volcanic glass. If we assume a Mediterranean origin, this implies a region such as

Italy, Sardinia, the Aegean or Anatolia and if the analogy with Dressel 22 is valid, the eastern volcanoes would seem less probable. Certain possibilities in the Italy/Sardinia area can be eliminated, for the presence of marine fossils effectively rules out purely volcanic masses such as the Aeolian islands. Surprisingly, Campania also seems an unlikely source since there is no evidence in the fabric of the leucitic rocks that characterise the Somma/Vesuvius volcano, and furthermore study of the Campania Dressel I amphorae alongside brick samples from Pompeii and Caesarea shows a very different composition with marked quantities of sanidine rather than labradorite feldspar. Doubtless, with further study of the geological literature and examination of comparative material it would be possible to limit the source more precisely, but even this preliminary petrological investigation indicates that further research in the volcanic regions of the western Mediterranean might be profitable. It can be confidently asserted that Spain and North Africa are geologically much less likely, which is important because the form has points in common with certain North African Punic amphorae illustrated by Cintas (23).

Another problem is presented by the amphora shown in Fig. 1, 5, one of five recovered from a barrow at Holborough in Kent, associated with a large cylindrical amphora (fig. 1, 6), a late 2nd century coin, and coarse pottery assigned to the early 3rd century. The origin of these small vessels has long been problematical and an eastern Mediterranean source has been suggested, but Cristofani and Zevi figure a very similar amphora from Ostia attributed to the province of Mauretania Caesariensis and the form was possibly current from the early 3rd century A.D. (24). There are differences in that the rim and base do not compare precisely, but Panella illustrates very similar bases to the Holborough ones from Bougie and Algiers Museums and Baradez has published an undated fragment from Tipasa which has a similar rim to the British examples but with strongly ribbed handles (25). Thus, there are typological indications that the Holborough vessels might originate in Mauretania Caesariensis but it is difficult to be certain because precise

published parallels are lacking.

In the hand specimen the fabric is grey-buff (10YR. 6/2) in colour with prominent angular white inclusions up to 1mm across and an off-white slip on the outer surface. A thin section reveals rounded inclusions (c. 0.3-1.0mm) of quartz, quartzite, quartz mica schist and occasional granite rock fragments, set in a matrix of optically isotropic brown fired clay containing fine quartz and mica (c. 0.05 mm). Occasional fossil algae, augite, plagioclase and orthoclase feldspar are present. This suggests an origin in an area of sedimentary rocks at no great distance from a crystalline massif, with occasional outcrops of basic or intermediate igneous rocks somewhere nearby to account for the augite. It is interesting to note that this is an almost precise description of the geology of North Africa between Algiers and Bône. Thus, the petrology not only confirms that the source has been correctly deduced from the typological clues, but indicates that part of Mauretania Caesariensis in which production is most likely. Panella has already drawn attention to evidence suggesting that this region was an important producer of olive oil and within the area lies Tubusuctu, a town mentioned on amphora stamps (26).

2. Rhodian style amphorae : a problem in differentiating sources

It has now been established that certain types of amphora were reproduced more or less precisely in various places. One might expect differences in typological detail, but in the case of Dressel forms 2 - 4 these remain elusive and the vessels made in Laeetania and Campania are difficult to recognise on typology alone. However, the products of regions with contrasting geology should have characteristic fabrics, offering an alternative means of discrimination. Tchernia and Zevi have applied this approach to great effect in their excellent study of Dressel 2 - 4 amphorae from Ostia, using the presence of white specks ('points blancs') as diagnostic of a Spanish rather than an Italian source (27). Their work,

based on careful examination of fractured sections, is convincing: attention to detail and supporting colour photographs strongly suggest that all the material may derive from a single source, correctly located in the granitic Barcelona region. However, it cannot be assumed that every amphora with such inclusions is of this origin because the white constituents, quartz and felspar are common to all granitic terrains. There may be marked differences in texture visible in the hand specimen but if not, detailed petrological study will usually provide a means of discrimination. For example, the complete Koan style amphora from Heybridge, Essex (fig. 1, 7) contains granitic inclusions but it does not compare microscopically with Catalan material, which has much less mica and a very different texture (28). Loeschcke's description of Haltern form 66A leaves little doubt as to its granitic origin, but petrological analysis is required to ascertain whether it compares with the Heybridge amphora, with the Spanish material, or whether it represents yet another source (29).

However, this discussion concerns another Greco-Roman type, the Rhodian style amphora, with handles of a single rod of clay rising to a sharp peak. The form has been mentioned by a number of writers and although all are agreed that it is related to Greek Rhodian amphorae, opinion is divided on whether it is a product of Rhodes itself or whether an imitation made elsewhere, perhaps in Italy (30). Although the Roman vessels show some typological variation, this is not marked and they are essentially a homogeneous group (fig. 3). However, thirty vessels of this type studied in thin section under the petrological microscope are divisible into six distinct fabric categories, resulting from the use of different raw materials. Some certainly indicate production in widely separated places, but others are best explained in terms of variation in locally available raw materials. Only the first two fabrics are quantitatively important, the remaining groups being represented by a few specimens each.

Fabric 1. This is fairly fine and has been recognised from ten sites in southern Britain (31). It has a distinctive reddish pink colour (5 YR/7/6) with a paler slip on the outer surface; rounded red-brown particles up to about 0.5 mm across are scattered sparsely throughout, but more prominent are occasional angular fragments (up to 3mm) of fine white limestone which sometimes cause spalling when near the surface.

Thin sections reveal an optically isotropic matrix of fired clay with a sparse scatter of fine quartz up to 0.1 mm across, and in it are set numerous grains (c. 0.1 - 0.2 mm) of red, brown and yellow minerals, the optical determination of which proved extremely difficult (fig. 2, b&c). The problem was solved by occasional larger grains in which all combined to form the typical maschen-structur of serpentine, and furthermore, experimental firing of green serpentine produced minerals with identical optical properties. Occasional grains of olivine, clinopyroxene, and more rarely enstatite are present in most sections and a few angular pieces of chert can always be seen. The limestone fragments, when encountered, are cryptocrystalline, completely unfossiliferous and often show bleached reaction rims with the surrounding clay.

The origin of this fabric can be established beyond reasonable doubt, because Dr. Virginia Grace very kindly arranged for me to section samples of Greek amphorae, bearing Rhodian stamps, found in the Athenian Agora. Not only are the samples similar in visual appearance, but they also match fabric 1 under the microscope: they too have red, brown and yellow serpentine minerals sometimes associated to form serpentine rock fragments and they also have limestone and chert fragments with identical properties. Olivine, clinopyroxene and enstatite are present: the latter is much more prominent in the Greek vessels, but this is the only substantial difference and it probably represents nothing more than the use of different quarries in the Greek and Roman periods. Although a Rhodian source seems assured for fabric 1, it is impossible to be certain that production was limited to Rhodes itself, rather than other islands of the Rhodian league such as Carpathos,

Syme or Casos. However, Nisyros, the remaining island listed by Pliny as belonging to this group, is composed of volcanic materials and can be confidently eliminated (32). Much of the Rhodian Peraea on the Turkish mainland is occupied by an ultrabasic massif, where one would not expect to find limestone inclusions but there are some localities that would be geologically feasible, particularly parts of the Knidian and Loryma peninsulas.

An origin in the Rhodes region could also be argued on theoretical grounds. Pliny states that the Rhodian was like the Koan, a medicinal wine made with sea water, and thus, if it is accepted that vessels of the Rhodian form usually contained this wine, a coastal origin seems likely (33). A glance at the geological map of the Mediterranean shows that there are very few places where ophiolitic rocks (which include serpentine), outcrop near to the coast: in Liguria, in central Greece, on Lesbos, in the Rhodian Peraea, on the western side of the Gulf of Antalya and around the Bay of Iskenderun in eastern Turkey. Of these only the Rhodian region has produced evidence of the production of similar forms. Geological study of the Turkish mainland opposite Rhodes has shown that it has all the mineralogical components of the pottery: serpentine, olivine, clinopyroxene, enstatite, chert and limestone (34). This need not imply production on the mainland, for geological agencies could have distributed these minerals over the Rhodian area during Tertiary or recent eras, though most would be destroyed by more distant dispersion.

Fabric 2 is represented by numerous sherds from Gloucester and single pieces from Camulodunum and Verulamium (35). It is creamy white in colour (10YR. 8/4) and characteristically soft and powdery, which is why it has yet to be recognised in a complete vessel. Occasional pieces of limestone up to 3mm across are visible in the hand specimen, but these have usually dissolved out leaving voids. In thin section this fabric shows an optically anisotropic ground-mass with a sparse scatter of fine (c. 0.1mm) quartz and frequent red, brown or yellow minerals apparently similar to

those of fabric 1, though comparison is difficult because they are usually more altered. There are also numerous pieces of limestone (or voids with reaction rims) and fragments of chert. Accessory minerals include plagioclase feldspar, and minute grains of pyroxene.

In view of similarities with fabric 1, this material is probably also of Rhodian origin, although this is not certain because the diagnostic brown minerals could not be identified with the same confidence. However, it is correct to class it as a separate fabric because there are significant differences. The whiter colour suggests the use of a different clay with less iron, no fragments of serpentine rock were seen, and minerals such as pyroxene are much rarer. To what extent firing and subsequent site conditions have affected this fabric is not clear.

Fabric 3 is represented by the complete type specimen Camulodunum 184 and by a handle fragment from Fishbourne (36). It is characterised by its distinct orange brown colour (2.5 YR. 6/8) and microscopically by the fineness of the paste which contains little but quartz (c. 0.05 mm across) and minute shreds of mica (fig. 2, d). Very occasionally larger (c. 1mm) inclusions of quartz, quartzite, biotite, potash feldspar, chert and lava fragments can be seen. The fabric cannot be confused with the previous two and was undoubtedly made from different raw materials. It is difficult, on the evidence available, to suggest where the source might lie.

Fabric 4 is represented by two fragments from Fishbourne and by a piece from the town of Gloucester (37). It is buff-brown in colour (2.5 YR. 6/6) and contains obvious glistening crystals about 0.5mm across. In thin section most of these can be determined as andesine feldspar or quartz, some of which is remarkably free from effects of strain, implying an igneous origin (fig. 2, e). A few lava fragments with a vitreous texture are also present. However, dark ferromagnesian minerals are comparatively scarce apart from occasional grains of clinopyroxene, brown hornblende and possibly olivine. The fine ground-mass is red-brown and optically isotropic with a scatter of fine quartz grains (0.05 mm).

The inclusions comprise what is best described as a crystal tuff of dacitic or andesitic composition. The Aegean might be an appropriate source for raw materials of this sort and in particular the volcanic island of Nisyros would be worthy of detailed attention (38). However, this is by no means the only possibility and careful geological study over a wide area would be needed to limit the source with confidence.

Fabric 5, characterised by a high tenor of pure quartz sand set in a buff-brown (5 YR. 6/6) matrix, has only been seen in a single peaked handle from Usk (39). In thin section the quartz grains, subrounded, well sorted, and about 0.2 - 0.3mm across, can be seen in a clean brown matrix of optically anisotropic fired clay (fig. 2, f). It is very different from the other fabrics but nothing can be said of its origins. Heavy mineral analysis was not attempted, since this is a small unique piece, and rather a large sample is required.

Fabric 6 occurs as an almost complete amphora from Old Broad Street, London, previously published by Wheeler (40). The paste is pale buff in colour (7.5 YR. 7/4) and contains obvious inclusions of mica, quartz and feldspar. The thin section has an unusual appearance, for the ground-mass consists of pure clay almost free of fine detritus in which are set large (1mm) inclusions of granitic origin: quartz, potash and some plagioclase feldspar, mica and small rock fragments of granite itself (fig. 2, g). In addition, there are grains of fossiliferous limestone, metamorphic quartzite and a piece of arkosic sandstone. This composition would be appropriate to the fringes of an essentially granitic massif. Granites are absent from the Rhodian Peraea and islands, hence this appears to be firm evidence that peaked handled amphorae were made outside this region. The nearest source would be in Caria, 130kms north of Rhodes, or on the islands of Crete and Mykonos, but there is no reason why this vessel could not have been produced around other granitic masses of the Mediterranean such as those of Anatolia, northern Greece, southern Italy, Sardinia, Corsica and Elba, or the Maures massif of southern France. However, it is very different

from Catalan amphorae both microscopically and in the hand specimen, so this area can be eliminated with some confidence.

To summarise, the petrological evidence leaves little doubt that fabric 1 and probably fabric 2 are Rhodian and that fabric 6 was produced outside the area of Rhodian influence. The situation of the factories that produced fabrics 3, 4 and 5 cannot be determined, but fabric 4 might be Aegean.

The fabric subdivision helps to understand the minor variations in typology shown by this form. Fig. 3 shows a selection of the material studied:

Fabric 1	:	fig. 3, 1-3, 9-11
Fabric 2	:	fig. 3, 12-16
Fabric 3	:	fig. 3, 4
Fabric 4	:	fig. 3, 5-7
Fabric 5	:	fig. 3, 17
Fabric 6	:	fig. 3, 8

Most instructive are the complete amphorae or large fragments available for fabrics 1, 3, 4 and 6 : each appears to have its own typological peculiarities though they are very slight and there are too few specimens to be sure that the differences are significant. However, the contrast between the vessel in fabric 1 and those in the other fabrics is very marked. The true Rhodian (fig. 2, 1) is more bulbous, thinner walled and would have carried much more wine for its weight. No doubt its superior efficiency was the result of a long tradition of craftsmanship and development on Rhodes. Its refinement is a strong argument for suggesting that the other forms were cruder imitations produced well away from the influence of this tradition.

Interesting points arise from studies of distribution and dating. The form as a whole is particularly prevalent in the west in a band running from Italy through Germany to Britain (fig. 4). Peaked handles first occur in Augustan contexts at Oberaden, Haltern and possibly Augst; they occur

in Claudian or Neronian levels at Hofheim, Hod Hill, Waddon Hill, Gloucester-Kingsholm, Usk, Exeter, Fishbourne and Camulodunum, but production certainly persisted well into the Flavian period as shown by material from the town of Gloucester, Nijmegen, Ventimiglia, Pompeii, Herculaneum, Ostia and Caerleon: some of this material could be remnants of earlier importation but certainly not all (41). It seems significant that a very high proportion of the finds, particularly the pre-Flavian ones, come from military contexts and even some of those from civil sites (such as Fishbourne) could derive from an earlier military phase.

Its importance on early military sites in Britain is particularly striking and it is reasonable to claim that it is the commonest wine jar. Finds from Hod and probably Waddon Hill in Dorset, are Claudian in date and it is interesting that these two vessels are in fabric 1 of Rhodian origin. Further examples in the same fabric are known from the fort at Exeter dated c. 50-70 A.D. However, the only site which has produced large quantities of amphorae, is the pre-Flavian legionary fortress of Gloucester-Kingsholm. About thirty per cent of the 250 sherds recovered are from Rhodian vessels, the only other potential wine jars being represented by two sherds from Koan style (Dressel 2-5) amphorae and fragments of the flat-bottomed Dressel form 30/Pélichet 47, which comprise about five per cent of the sherd total. The majority of the Rhodian style fragments are in fabrics 1 and 2, roughly in the proportion 1:2. The popularity of the form is curious as it contrasts with published information available for other sites. The Rhodian type appears to have been of considerable less importance on Augustan sites such as Oberaden or Haltern and the same applies to pre- and post-conquest Camulodunum as well as to the important new material from the pre-Roman site at Puckeridge (42). Ritterling specifically remarked on the scarcity of the form at the Claudian fort of Hofheim. It thus seems reasonable to suggest that Rhodian style amphorae were particularly favoured on certain pre-Flavian forts in Britain and their

pre-eminence may have begun soon after the Claudian conquest. Furthermore, as supplies came directly from Rhodes it is tempting to see a connection with events in that area, for between 44 and 53 A.D., Claudius rescinded the liberty of the Rhodians on account of atrocities committed against the Romans (43). Could it not be that the popularity of Rhodian wine on British military sites, at least began with consignments exacted in tribute ?

In comparison with fabrics 1 and 2, the remaining material is relatively unimportant as each fabric is represented by only a few examples. As more material comes to light it will be interesting to see whether these types show a concentration on civil rather than military sites and whether they are predominantly later in date. At present, the evidence is inadequate to assess such questions with certainty, but they do appear to be somewhat commoner on civil sites and production certainly goes back to c. 60 A.D. as the complete vessel Camulodunum 184 in fabric 3 demonstrates (44).

3. Sherd identification : North African amphorae in Late Roman Britain

The identification of small fragments is an important aspect of the study of fabrics. Some types such as the common Spanish globular amphora (Dressel 20) can be readily recognised in the hand specimen, but in other cases it can be difficult to do this with absolute confidence. However, if a series of thin sections is prepared from complete vessels, small fragments can usually be identified by matching microscopic characteristics. Most forms occur in a limited range of fabrics and hence it can be possible to determine type with some precision, although if a single fabric is shared by a number of forms, a range of possible identifications is the best that can be hoped for. This technique has proved of considerable value in the study of Dressel 1 amphorae which are being found in increasing numbers on Iron Age sites in southern Britain (45). Thin section examination of complete

vessels established the mineralogical nature of three distinct fabric types and it is now a simple matter to identify small featureless fragments by comparison with this body of data. Some confusion is possible because the same fabrics are occasionally found in Koan style (Dressel 2-5) amphorae, but the chronological contexts usually make this identification unlikely.

Another good example of this approach is the recent identification of North African cylindrical amphorae from late Romano-British contexts. A few years ago, excavations on the new Market Hall site at Gloucester produced fragments of the body of an amphora in a distinctive hard red fabric (2.5 YR. 5/6) with an off-white slip finished with vertical smoothing. Occasional rounded white particles (c. 1mm) or voids and very rarely 2mm particles of brown ferruginous sandstone could be seen. At the time, it could only be matched with two sherds from the post-Roman monastic site of Tintagel in Cornwall where they belong to Thomas' undecorated 'Class Biii' amphorae (46). Thin section examination showed the sherds from the two sites to be closely similar but the petrology did not suggest a possible source. All that could be seen was a red optically isotropic matrix of fired clay with numerous grains of subangular quartz about 0.1 - 0.2mm across, rounded fragments of limestone or voids with bleached reaction rims (indicating that limestones was once present) and small pieces of siltstone, often with quartz grains set in a lime rich matrix (cf fig. 2, i). None of the minerals is particularly distinctive, but despite the simple composition, it is an unusual fabric. The problem of origin was solved when a complete vessel from the barrow at Holborough in Kent, was examined. This amphora (fig. 1, 6) was associated with a late second century coin, with early third century coarse pottery, and with five of the small amphorae discussed above, probably third century products of Mauretania Caesariensis. The large vessel is clearly of the cylindrical form discussed by Zevi and Tchernia, shown on the basis of stamps to originate in the Byzacena region of North Africa though Panella suggests that it may have been made elsewhere in small

quantities as well (48). It belongs to Panella's Africana II, type D, dated to fourth century, although the evidence from the barrow implies that the form could also have been current rather earlier (49). The Holborough amphora bears a stamp reading TEP / SVRI and it is closely paralleled by an example from Rome. The fabric is brown rather than red, but it bears an off-white outer slip with the characteristic vertical smoothing and in thin section it shows all the characteristics of the vessels from Tintagel and Gloucester, leaving little doubt that these must also be imports from the Byzacena region (fig. 2, h).

Further study has demonstrated that the type occurs on the eleven sites in southern Britain marked on fig. 5, and at least thirty different vessels are represented. Many pieces can now be recognised by their visual characteristics, but as most are body sherds, it is always useful to check identifications by thin section study and this is essential if the sherds come from part of the vessel that lacks the vertical smoothing or if the fragments have deteriorated unduly in the soil. Unfortunately it is impossible to determine precisely which of Panella's or Beltran's cylindrical forms are represented in this material, but it is nevertheless clear that the general North African cylindrical type is present in some quantity (50).

Some of the body sherds are particularly important because they occur in dated contexts. There is an important vessel from Caerleon dated c. 130 - 160 A.D., but as this now appears to be lost and as the fabric description is inadequate, I hesitate to base too much upon it (51). There is, however, an unpublished sherd from the quay at Caerleon dated to before c. 210 A.D. which has a North African fabric. This and possibly the vessel from Holborough could imply importation as early as the third century. A rim from Clausentum (Southampton) is dated in the range of third century - 370 A.D., but the remaining material when stratified, comes from the very latest contexts of Roman Britain and is potentially of fifth century date, although this is very difficult to prove because of the scarcity of dateable artifacts of this period (52). The sherd from the new Market Hall

site in Gloucester came from the floor of a building which may have had a very late fourth century coin hoard hidden in the roof before collapse, and much of the remaining material from other sites in Gloucester was either recovered from Medieval levels or from a loam deposit dated to the broad period fourth to eleventh century (53). Sherds from Bush Lane, London, came from a dump of material believed to have been deposited in the fourth century or later and it was associated with shelly coarse pottery fabrics which J. Clark believes, persist into the fifth century (54). At Mucking, in Essex, a handle was recovered from a very late ditch and a further sherd came from the fill of a fourth century well sealed by a fifth century Saxon building (55). The finds from Tintagel might imply importation in the late fifth century or the early sixth century, for most of the other Mediterranean imports from the site are of that date, but this is not conclusive because late Romano-British pottery has been found there (56). African amphorae are curiously absent from the late third and fourth century Shore Forts that defended the southern and eastern coasts of Britain, although a few have now been excavated on some scale. No sherds of these vessels were found in a massive collection of pottery from either Portchester or Pevensey Castles or in the examination of a large sample of material recovered from Richborough and Burgh Castle (57).

In sum, the evidence available suggests that importation from Byzacena may have begun in the third century and possibly continued through the fourth, though on a very small scale, with few supplies destined for the military market. It is hard to escape the conclusion that the most important period for importation to Britain was in the very late fourth or more probably fifth century A.D. It would be rash to restrict this to the years before the Vandal invasion of Africa in 429 A.D. because Hayes has already suggested that North African fine-ware production was less affected than previously thought and Courtois has argued that agricultural activities survived the invasions more or less unscathed (58). However, the contexts in which the vessels are found and their absence from most of the post-Roman

sites in south western Britain, implies that many were arriving earlier rather than later in the fifth century (59).

The study of British material suggests an economically viable trade. It is important to realise that most of the vessels are represented by body sherds only : had these been ignored, vital dating evidence would have been lost and the number of finds recorded would be very small indeed. It would have been tempting to explain them as casual importations by travellers rather than organised trade. The North African and European distribution of the cylindrical form is now heavily biased at the British end, as finds have not been recorded in the same detail elsewhere, but the new data help in understanding the general distribution pattern. The general type is found widely in the Mediterranean region, but there is a remarkable concentration of sites in an arc from Tarragona to Genoa (fig. 6). At many places along this coast the imports were commonplace: countless sherds are to be seen on the site of the fifth century foundation of Ugium (St. Blaise) and they occur in quantity in early Christian cemeteries such as Tarragona, Barcelona, Ampurias or Narbonne. It is interesting to note that a similar site has come to light on the Atlantic coast at Bordeaux and that the two regions are connected by a spread of finds across inland France, principally along the Garonne (60). Individual pieces have yet to be closely dated, but it does seem that at certain periods material was transported across France to Bordeaux and presumably from this port it was shipped to Britain.

IV. CONCLUSIONS

I hope that these brief observations on scattered topics are sufficient to demonstrate that the analysis of fabrics is an aspect of amphora study with considerable potential, and that it can lead to information of direct historical interest. It will be clear from the way I have drawn on the works of others that the scientific analysis of materials does not replace existing methods, but it is merely one aspect of the broader field of typological study. All

scientific techniques, including those I have not had occasion to mention, have a role in the examination of fabrics, but most amphorae are ideally suited to examination in thin section under the petrological microscope and this should be the routine approach to be applied in the first instance. Although it is a tool of proven value, it could be greatly sharpened by study of vessels bearing tituli picti and by recording the petrological characteristics of known kilns. These data would then provide reference standards against which unknown pieces could be checked.

However, scientific methods of analysis can never be applied to more than a small proportion of vessels recovered and the visual comparison of amphora fabrics will always be important. Fabric descriptions would be of considerably more value if we adopted a standard procedure. Colour, for example, could be recorded with reference to colour charts and it would be useful to note the approximate proportion, colour, shape and size of inclusions visible in a fresh fracture. This information would not be difficult to recover and it would add greater precision to our work, for if detailed comparisons are to be valid, fabric as well as form should match.

V. ACKNOWLEDGEMENTS

I wish to thank the following for allowing me to examine material in their care and in some cases for generally permitting reference to discoveries in advance of their own publication.

Mr. G. Boon, Mr. H. Chapman, Mr. J. Clark, Mr. D.T-D. Clarke, Mr. J. Collis, Mr. H.L. Douch, Professor S.S. Frere, Mr. M.G. Fulford, Mr. M. Griffiths, Mr. M. Hassall, Mr. H.R. Hurst, Miss C. Johns, Mrs. M.V. Jones, Mr. D. Kelly, Miss J. Macdonald, Dr. W.H. Manning, Mr. P. Marsden, Mr. C. Partridge, Miss S. Pearce, Mr. R. Peers, Mr. M. Ponsford, Mr. J. Rhodes, Mr. J. Riley, Mr. W.J. Rodwell, Mrs. M. Rule.

I am indebted to Drs. Virginia Grace and T. Leslie Shear Jr. for arranging for me to examine stamped Greek Rhodian material from the Athenian Agora and for permitting reference to this material here. The Greek Department of Antiquities kindly authorised exportation of samples for petrological analysis.

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 Here fig. 1, 2. Verulamium: here fig. 1, 4. Courtesy Professor S. S. Frere. Exeter, Winchester and Puckeridge are unpublished: information courtesy M. Griffiths, J. Collis and C. Parttridge.
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Fig. 1

1. Richborough. After B. W. Cunliffe 'Fifth Report on the Excavations of the Roman Fort at Richborough, Kent' London 1968, No. 5 27..
2. Plantation House, Fenchurch Street, London. Guildhall Museum, London.
3. Silchester. Cf. T. May The Pottery found at Silchester Plate LXVII A top left.
4. Verulamium. Courtesy Professor S. S. Frere.
- 5-6. Holborough, Kent. After R. Jessup Archaeologia Cantiana 68 (1954).
7. Heybridge, Essex. After C. F. C. Hawkes & M. R. Hull 'Camulodunum' type 183B.

Fig. 2 Photomicrographs ($\times 17$)

- a. Exeter, unpublished. Amphora of the type shown in fig 1, 1-4. Volcanic rock fragment on left and large sherd of volcanic glass. Plane polarised light.
- b. Fabric 1, unpublished peaked handle from Fishbourne. Quartz and fired serpentine minerals (dark specks). Plane polarised light.
- c. Fabric 1. Waddon Hill, Dorset, here fig. 3, 9. Large grain of fired serpentine showing maschen structur. Plane polarised light.
- d. Fabric 3. Type specimen Camulodunum 184, here fig. 3, 4. Quartz and minute shreds of white mica. Plane polarised light.
- e. 8 Fabric 4. Fishbourne, here fig. 3, 6. Angular grains of felspar (grey) and quartz (white). Crossed nicols.
- f. Fabric 5. Usk, here fig. 3. 17. Rounded quartz sand. Plane polarised light.
- g. Fabric 6. Old Broad Street, London, here fig. 3, 8. Large fragment composed of quartz and potash felspar, plagioclase felspar to right. Crossed nicols.
- h. African amphora. Holborough, Kent, here fig. 1, 6. Quartz sand with limestone particles (cloudy) and limestone voids. Crossed nicols.
- i. Dorchester, Dorset. Body sherd of African amphora. Quartz grains of similar size and shape to h. Voids once containing limestone appear elsewhere in slide. Crossed nicols.

Fig. 3

1. Gloucester - Kingsholm.
2. Threadneedle Street, London. cf. R.E.M. Wheeler 'London in Roman Times' London, fig.
3. Hod Hill. After L.A. Richmond Hod Hill. Vol. II London (1968) fig. 54.
4. Camulodunum. After C.F.C. Hawkes & M.R. Hull 'Camulodunum' type 184
5. Fishbourne harbour area.
6. Fishbourne
7. Gloucester
8. London, Old Broad Street, cf. R.E.M. Wheeler 'London in Roman Times' fig.

Fig. 4 Distribution of peaked handled, Rhodian type amphorae.

Fig. 5 Distribution of African (Byzacena) cylindrical amphorae in southern Britain.

Fig. 6 Distribution of African cylindrical amphorae.

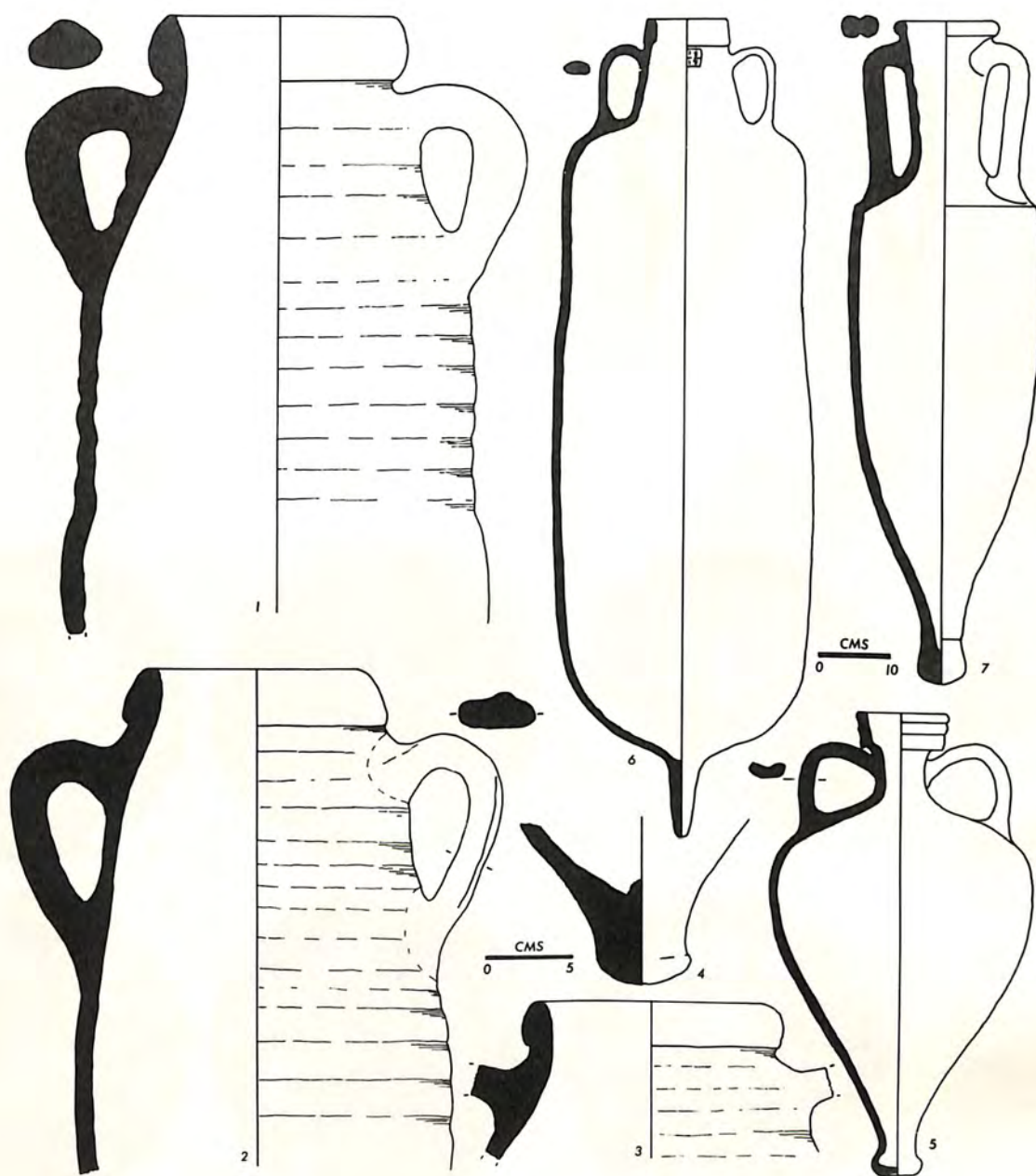


Fig.1

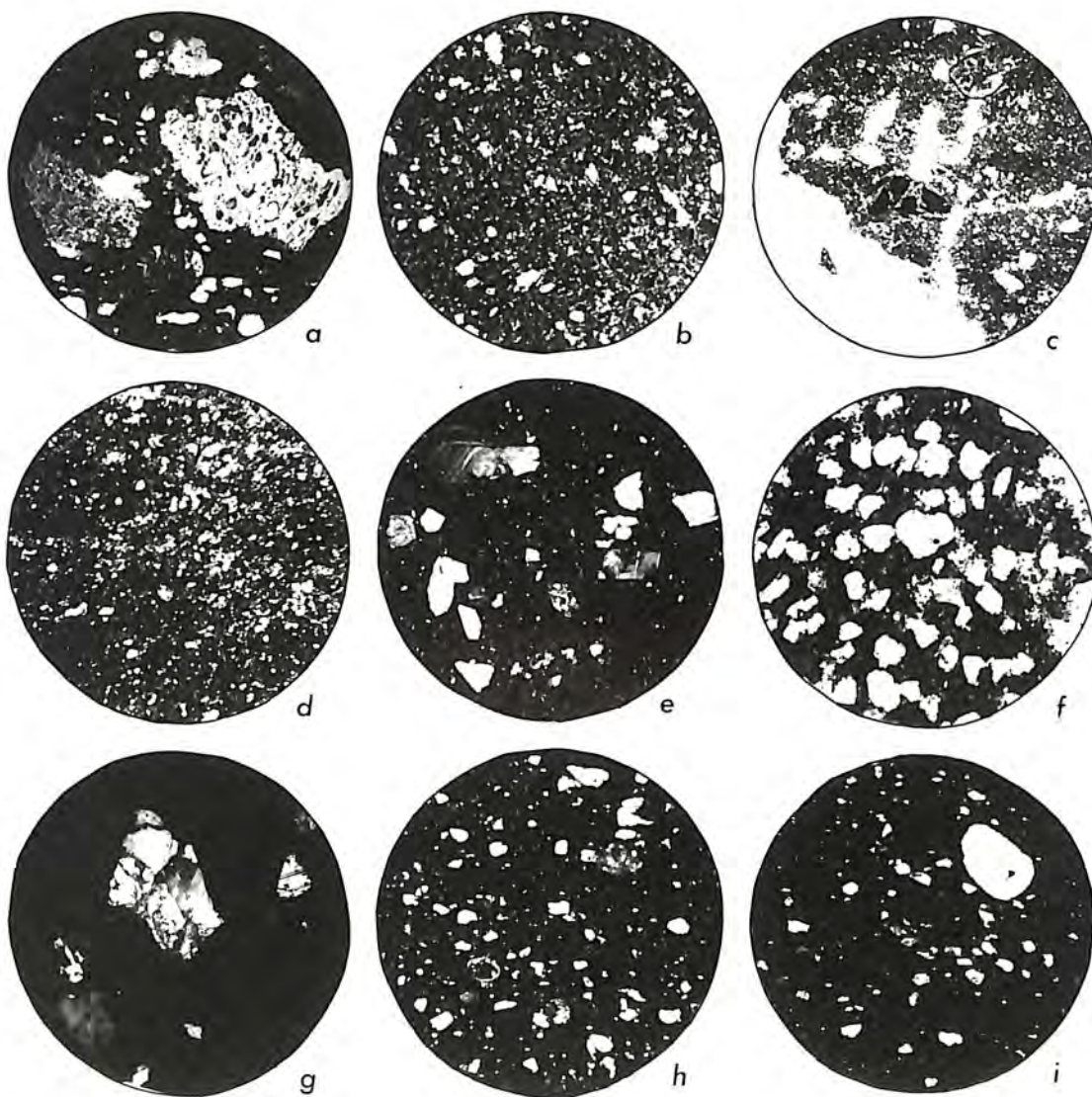


Fig. 2

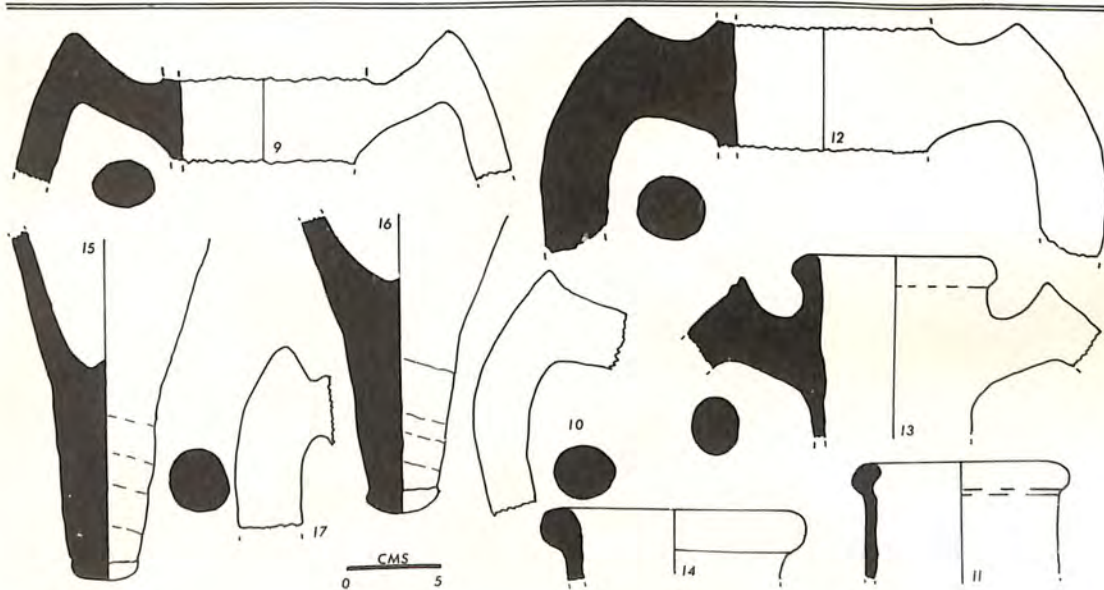
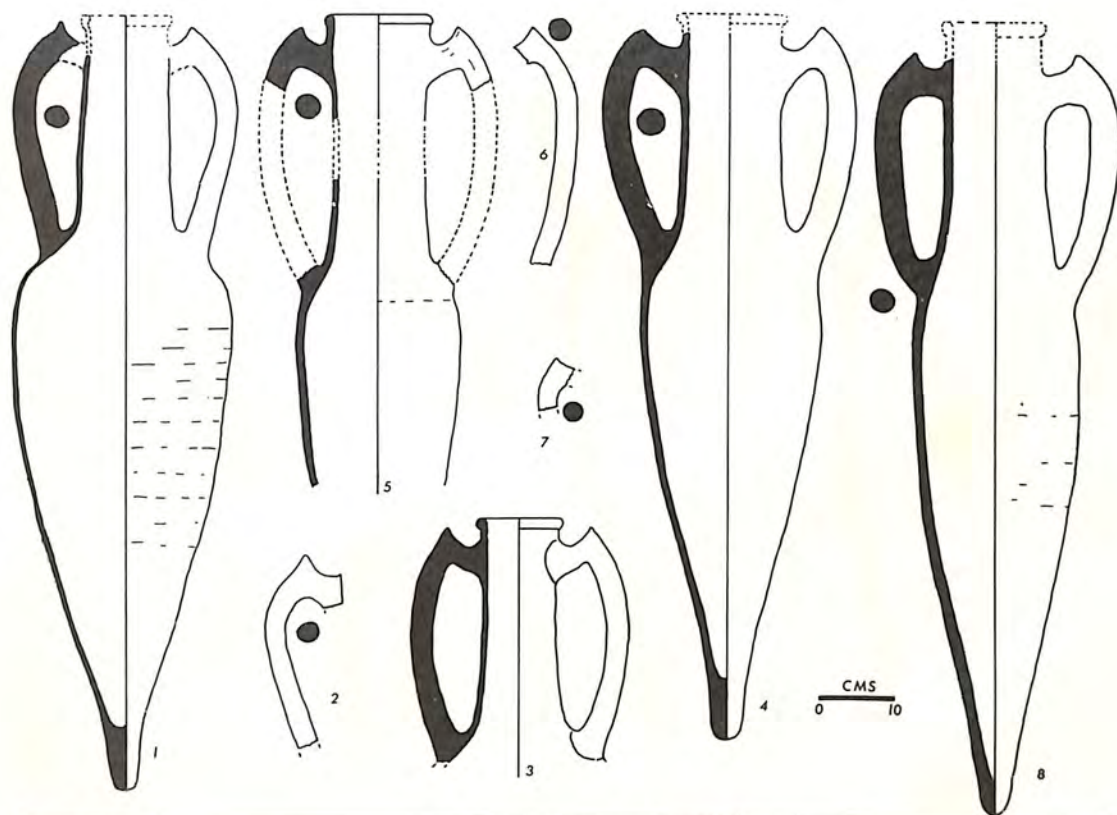


Fig.3

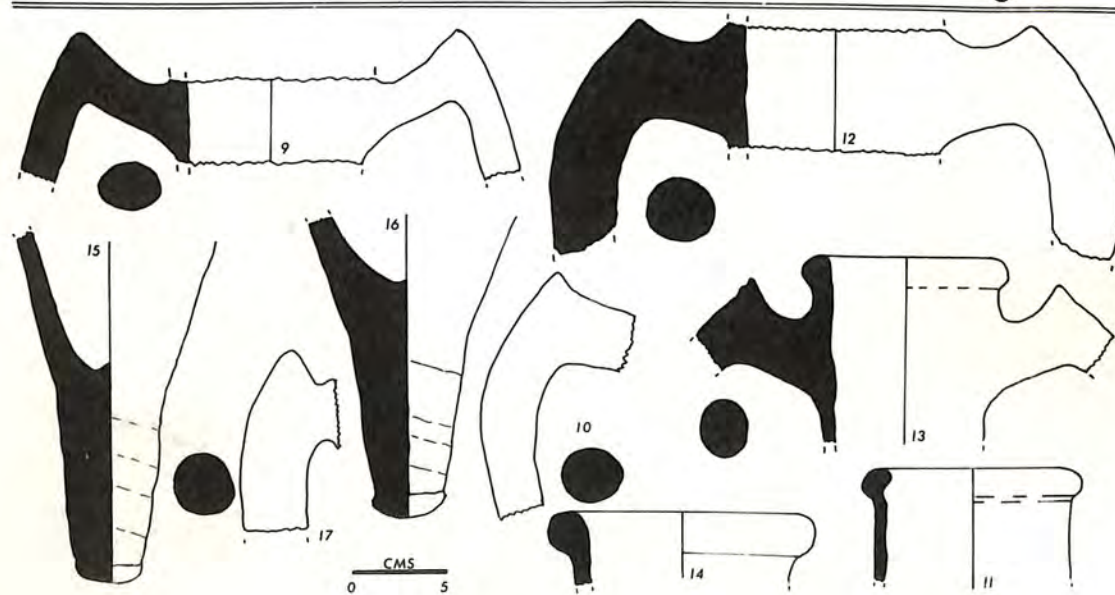
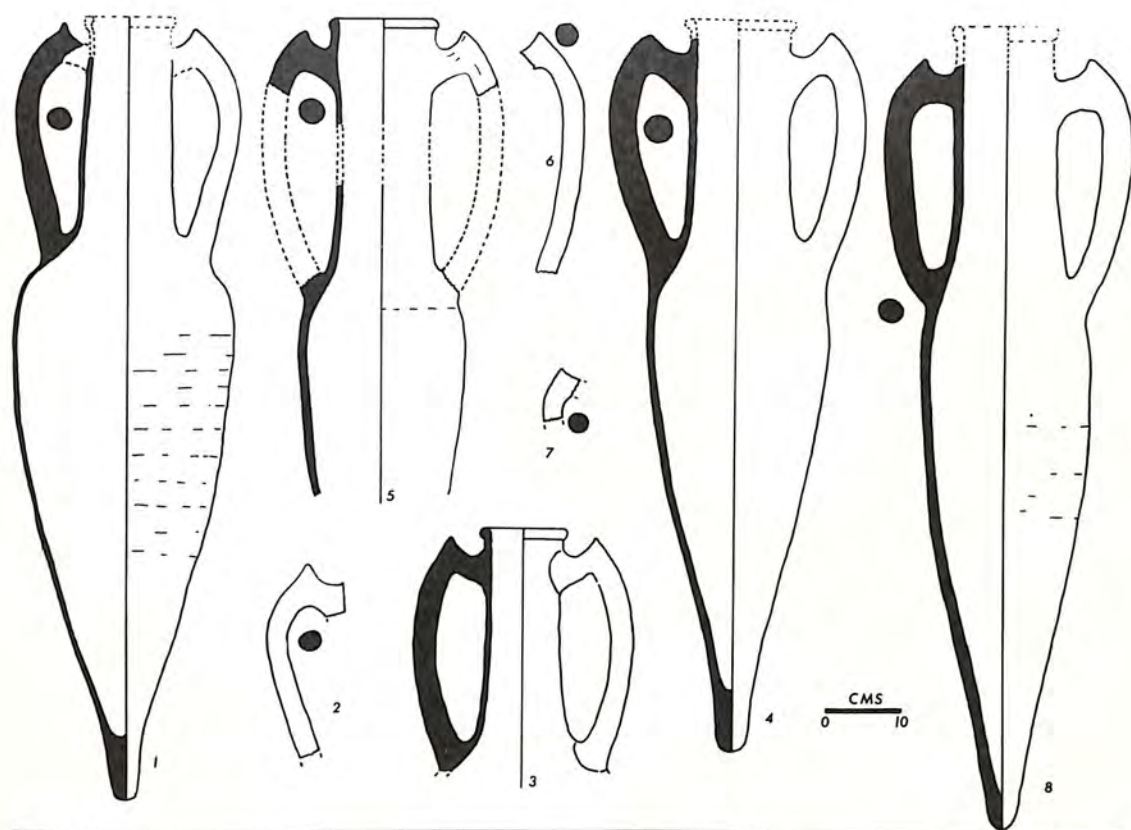


Fig. 3

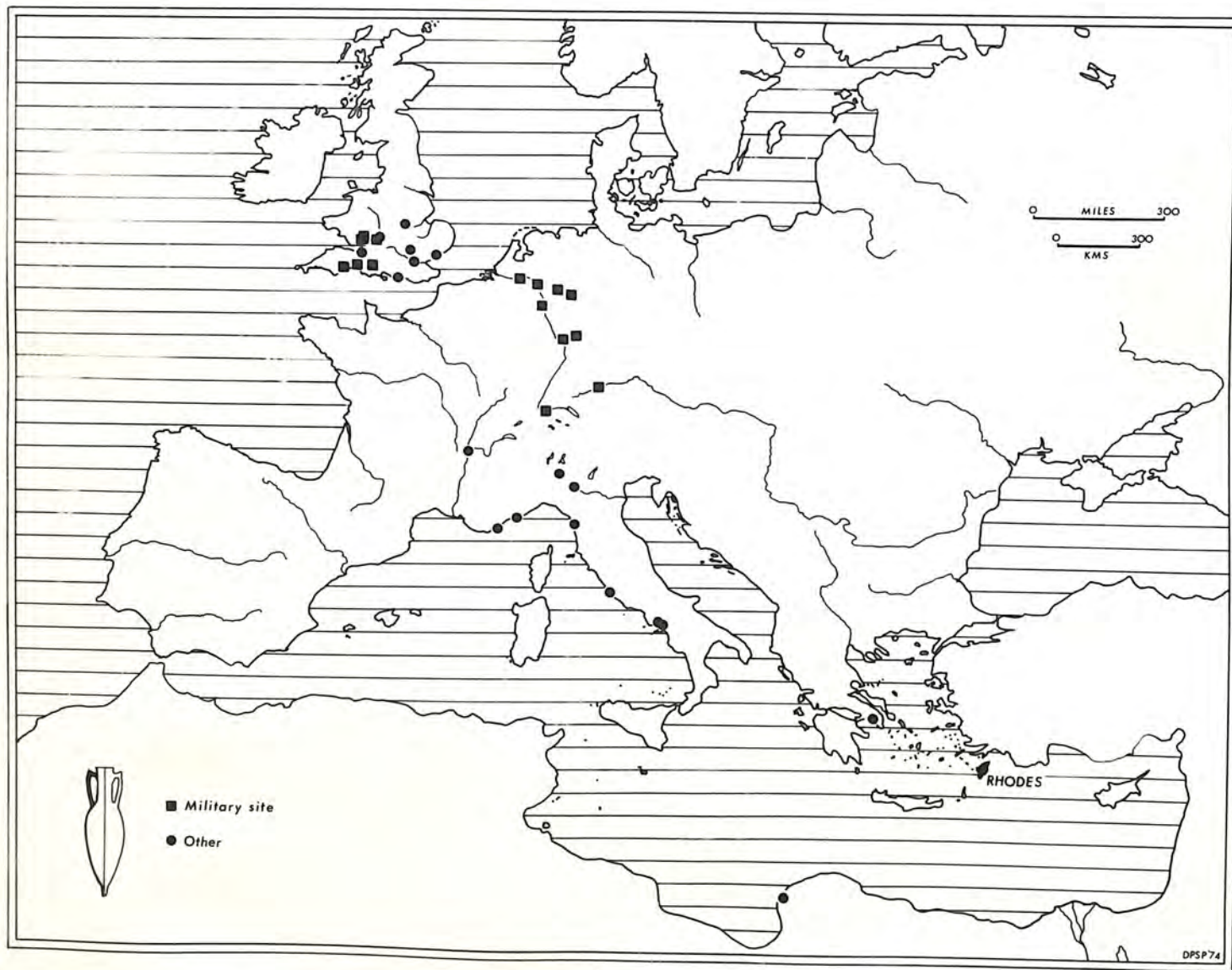


Fig. 4

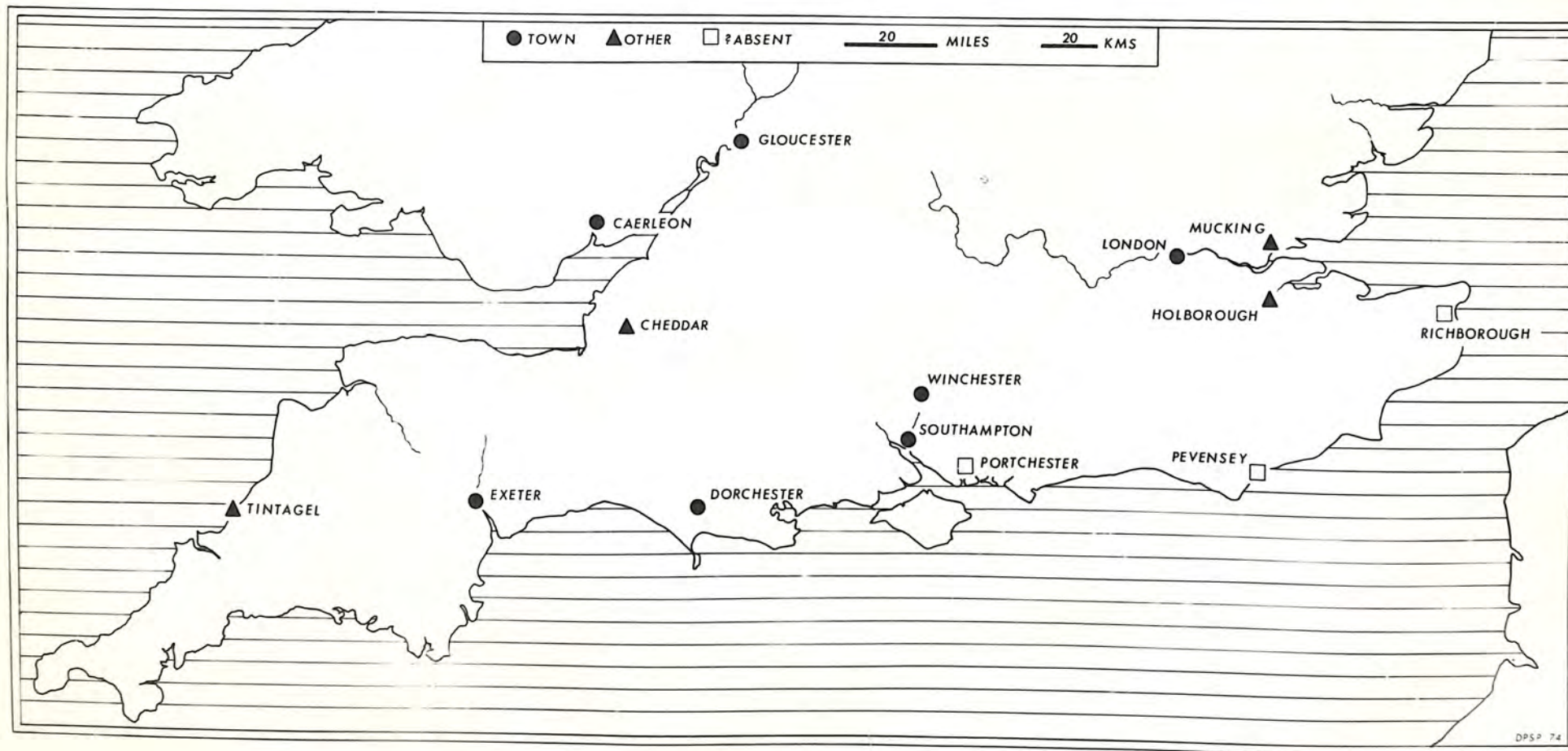


Fig. 5

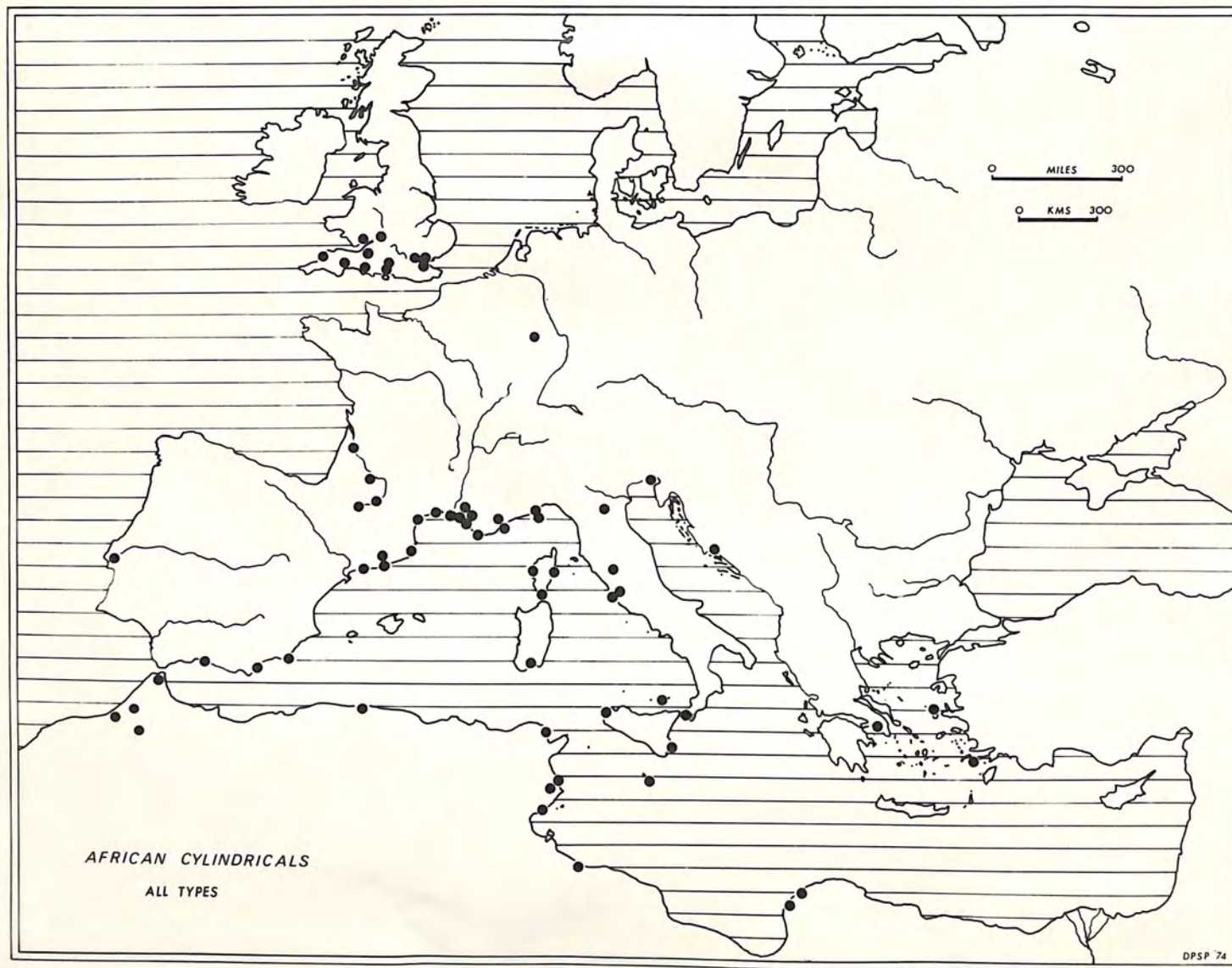


Fig. 6

25, II. 91

See if a card has been
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ROMAN; PEACOCK.

| Note - p. 262 - has
stupid mistakes.

| Note P. did not send me
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pp. (261) - 278

see p 268 on on fragments
Note he does not illustrate any
of them in his samples, fig. 2,
of his "Fabric 1".

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Eine Amphora mit Siegelbild

(Inv. Nr. 59:300)

Bei den im Jahre 1959 in Vindonissa durchgeführten Ausgrabungen ist eine Tonscherbe zum Vorschein gekommen, auf der das hier abgebildete Siegelbild (Abb. 13) zu sehen ist. Herr Professor R. Laur-Belart hatte die Freundlichkeit, mir die beilie-



Abb. 13. Vindonissa, Siegelbild auf Amphorenscherbe, größter Dm. 29 mm. Photo E. Schulz, Basel.

gende Photographie zuzuschicken und folgende Angaben zu vermitteln: Der Abdruck mißt in der Längsachse 29 mm und befindet sich neben dem Henkelansatz einer frühkaiserzeitlichen Amphora. Er muß von einer ziemlich großen, flach geschnittenen Gemme oder einem Metallring stammen. Darauf ist der nach links gerichtete Kopf eines jugendlichen Königs zu erkennen. Daß es ein König ist, dürfte aus der dünnen Diadembinde hervorgehen, welche in dem kurzgeschnittenen Haar liegt. Auffallend ist, daß dasselbe Bildnis auf einer kleinen, ebenfalls flach geschnittenen Gemme (Abb. 14) des Museo Archeologico di Aquileia¹ wieder vorkommt. Die Umriss- des Kop-



Abb. 14. Gemme aus Aquileja

fes und der Profilinie sind gleich. Beides sind handwerkliche Arbeiten, lassen aber gerade als solche charakteristische Eigentümlichkeiten erkennen: den eher länglichen Kopf, den vorstehenden Stirnknochen, den Einschnitt der Nasenwurzel und die vorn etwas zugespitzte lange Nase. Das Kinn ist gut ausgeprägt. Die Haare sind auch auf der Gemme mit kurzen, etwas unruhig bewegten Strichen wiedergegeben. Ein kurzer, vom Scheitel abstehender Strich darf wohl als Lotosblume gedeutet werden². Der Hals ist eher dünn und lang und die Schultern sind wie bei vielen hellenistischen Königsbildnissen von einer Chlamys bedeckt. Durch den vom Nacken abstehenden Caduceus ist der hier Abgebildete als Merkur charakterisiert. Darstellungen hellenistischer Könige als Merkur gibt es seit dem 3. vorchristlichen Jahrhundert³, sie können auch für Römer des 1. vorchristlichen Jahrhunderts⁴, für Augustus und kaiserliche Prinzen bezeugt werden. Auch auf der Tonscherbe scheint im Rücken unseres Dargestellten ein Gegenstand abzustehen. Ob es eine Lanzen spitze oder ein Caduceus⁵ ist, kann allerdings nicht mit Sicherheit gesagt werden. Die Lanzen spitze kommt gerade bei Bildnissen des jungen Octavian öfters vor⁶. Trotzdem dürfte es sich hier wohl kaum um sein Porträt handeln.

Professor A. Alföldi, welcher vor mir von der Scherbe Kenntnis genommen hat, wollte in dem Bildnis einen kleinasiatischen Herrscher erkennen. Unabhängig von ihm, war ich zur selben Auffassung gekommen. Die Lotusblume auf dem Gemmenbild würde zwar viel eher für Beziehungen zu Aegypten deuten. Es würde deshalb nicht im Rahmen des Unmöglichen liegen, wenn man im Dargestellten Juba II, den von 25 vor bis 23 n. Chr. in Mauretanien regierenden König, der mit Cleopatra Selene verheiratet war, erkennen wollte⁷. Aus stilistischen Gründen scheint das Bildnis aber viel eher nach Nordkleinasien zu gehören: Die großflächige Behandlung von Wange, Stirn und Hals, die kräftige Betonung von Braue und Lippe sowie die Linie

des Profils sprechen für eine Beziehung zu den pontischen Königsporträts. Eine gewisse Ähnlichkeit in der Profilinie weist sogar der viel lebensvollere, im Louvre befindliche Marmorkopf des Königs Mithridates VI. auf⁹. Zeitlich und stilistisch noch näher liegt ihm ein aus Kyzikos stammendes Porträt der Ny Carlsberg Glyptotek⁹. Betrachten wir die Münzbildnisse der Könige von Pontos aus der frühen Kaiserzeit, dann kann allerdings eine große Verwandtschaft, aber nicht eine totale Übereinstimmung festgestellt werden¹⁰. Das nur von einem einzigen Münztypus her bekannte Bildnis von Polemon I., der von 38 bis 8 v. Chr. regierte und ab 17 v. Chr. auch König über Bosphorus war, dürfte zwar für die Identifikation unzureichend sein¹¹. Viel zahlreicher sind die Bildnisse seines Enkels Polemon II., dessen Regierungszeit in die Jahre 37 bis 63 n. Chr. fällt. Sie variieren allerdings zu stark untereinander, als daß sie ein definitives Bild des Königs vermittelten. Einzelne von ihnen kommen aber unserem Bildnis ziemlich nahe, wenigstens näher als die übrigen uns bekannten Münzbildnisse der Zeit¹². Dabei ist hervorzuheben, daß die dünne Diadembinde und das kurz geschnittene Haar gerade ein Merkmal von Polemon II. war¹³.

Auch wenn unser Bildnis einstweilen noch nicht einwandfrei bestimmt werden kann, so darf doch folgendes gesagt werden: Es stellt einen König aus der 1. Hälfte des 1. nachchristlichen Jahrhunderts dar. Als Stempelbild einer Amphora fällt es somit aus dem Rahmen der übrigen Töpfer und Firmenstempel heraus. Es kann in einem gewissen Sinne mit jenen Tonabdrücken verglichen werden, die offenbar als billige Kopien von berühmten und kostbaren Silbergefäßen und Schalen nicht selten Bildnisse hellenistischer Könige und auch von Römern des 1. vorchristlichen Jahrhunderts wiedergeben¹⁴. Embleme mit Porträts auf Schalen und Bechern erfreuten sich in der hellenistischen und auch späteren Zeit einer großen Beliebtheit. Sie hatten aber meistens für ihre Besitzer einen affektiven Wert. So mag z. B. der hier abgebildete (Abb. 15) in venezianischen Privatbesitz befindliche Glaskelch, auf dem das Bildnis eines Philosophen — wohl des Zenon — erscheint, einem Stoiker gehört haben¹⁵.

Auch die beiden auf kleinen, in Sizilien gefundenen Tonväschen abgedruckten Gemmenbildnisse (Abb. 16) mögen eine persönliche Beziehung des Besitzers zum Dargestellten bekundet haben¹⁶. Bei einer Amphore dagegen, bei welcher der Inhalt für den Besitzer mehr Bedeutung hatte als der Krug, mag das Siegelbild viel eher zu dessen näherer Bezeichnung gedient haben: Das darin aufgespeicherte Öl mag von den Gütern des Königs stammen, der darauf abgebildet ist. Nicht nur die römischen Kaiser, sondern auch die hellenistischen Könige waren Großgrundbesitzer. Daß die von ihren Besitztümern in Umlauf gekommene Handelsware oder gar persönliche Schenkungen von Öl, Wein oder Getreide ihren Siegelstempel tragen konnten, ist selbstverständlich¹⁷.

Die Tatsache, daß eine Amphora mit dem Bildnis eines kleinasiatischen Königs nach Vindonissa gelangt ist, läßt von neuem die weltweiten Beziehungen erkennen, welche das Imperium Romanum und die Pax Augusta ermöglicht haben.

Marie-Louise Vollenweider

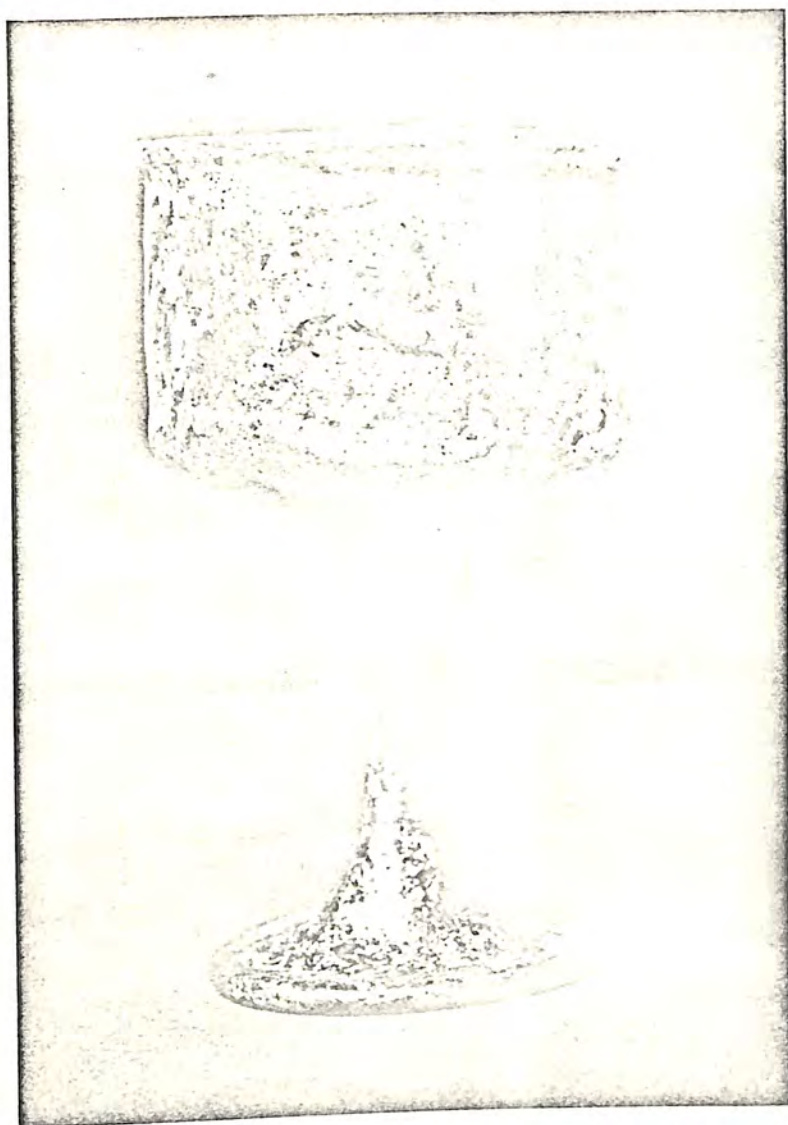


Abb. 15. Glaskelch mit Bildnis eines Philosophen. In venezianischem Privatbesitz



Abb. 16. Töpfchen mit Gemmenbildnis und Stempel aus Sizilien

Anmerkungen

- ¹ Weißgesprenkelter Onyx. Größe: $13,5 \times 10 \times 2$ mm. Frau Dr. B. Forlati-Tomaro und Frl. Dr. V. Scrinari möchte ich bei dieser Gelegenheit noch besonders danken, daß ich die Porträtgemmen von Aquileia eingehender studieren konnte. Sie werden gesammelt in einer kleinen Sonderpublikation erscheinen.
- ² Auch der Modius ist manchmal nur mit einem Strich angedeutet. Er schließt dann aber meistens oben mit einem Querstrich ab. Vgl. dazu Lady Helena Carnegie, Catalogue of the Collection of Antique Gems formed by James Ninth Earl of Southesk, Vol. I (1908) Nr. N 29. Hier handelt es sich wohl um den Kopfaufsatz, der für Harpokrates charakteristisch ist. Er kommt namentlich bei jugendlichen, schlecht geschnittenen Köpfen der Severerzeit mehrmals vor, auch auf einem roten noch nicht publizierten Jaspis des Museums von Aquileia.
- ³ Vgl. dazu Ptolemaios III Euergetes bei I. N. Svoronos, Τὰ νομισματικά τῶν βασιλέων τοῦ ΠΤΟΛΕΜΑΙΩΝ, Taf. 31, 34–36. Andere Beispiele wären noch mehr zu zitieren.
- ⁴ Für die römische Zeit verweise ich auf mein bald erscheinendes Buch über die republikanischen Gemmenporträts, für Augustus vgl. A. Furtwängler, Die antiken Gemmen, Taf. XXXVIII 30 ferner K. Scott, Mercury on the Bologna Altar, RM 50 (1935) 225 ff. und O. Brendel, Novus Mercurius, RM 50 (1935) 231 ff.
- ⁵ Prof. R. Laur-Belart hält einen Caduceus für möglich, wie er mir schriftlich mitteilt.
- ⁶ Dazu besonders noch unpubliziertes Material in meinem Anm. 4 zitierten Buch.
- ⁷ Auf seinen Münzen erscheinen mit Vorliebe ägyptische Symbole. Vgl. dazu Jean Mazard, Corpus Nummorum Numidiae Mauretaniaeque, Paris, 1955, Nr. 310 ff.
- ⁸ Vgl. dazu vor allem die Abbildung bei G. Hafner, Späthellenistische Bildnisplastik, Berlin, 1954, S. 45, Taf. 19, NK 1a.
- ⁹ Dasselbe Taf. 20, NK 2 und S. 48 und F. Poulsen, Catalogue. Nr. 461 und Billedtavler 34 sowie B. Schweitzer, Die Bildniskunst der römischen Republik, S. 49. E. Buschor, Das Hellenistische Bildnis, S. 59.
- ¹⁰ Am nächsten kommt die Darstellung BMC Pontus Pl. X 1 p. 46.
- ¹¹ Vgl. dazu die Abbildung bei J. Babelon, Le portrait dans l'Antiquité d'après les monnaies, Paris, 1950, Pl. XI 6.
- ¹² Vgl. auch das Bildnis von Rhescuporis I König von Bosporus, 14–42 n. Chr. Abb. bei J. Babelon, op. cit. Anm. II Pl. XI 7; ferner von Rhometalces I König von Thrakien von 11 v. bis 12 n. Chr. (Weber Collection Nr. 2743). Es wäre notwendig, alle die erhaltenen Bildnisse dieser erwähnten Könige – auch von Cotys IV und Rhometalces II und III von Thrakien – zusammenzustellen, was mir bis jetzt nicht möglich war. Vgl. auch E. H. Minns, Scythians and Greeks, 1913.

- ¹³ Die schmale Diadembinde findet sich auch bei dem viel diskutierten Porträt der Carlsbergglyptotek, welches G. Hafner, op. cit. S. 56 NK 16 als Polemon II zu identifizieren suchte.
- ¹⁴ Vgl. dazu, O. Rubensohn, Hellenistisches Silbergerät in antiken Gipsabgüssen, Berlin 1911, Taf. III 3, Taf. X 8, 12, 13, Taf. XI 32, Taf. XXI 14 und G.M.A. Richter, AJA 1958, Pl. 89, 6 und 7, ferner H. Winnefeld, Hellenistische Silberreliefs, 68. Berl. Winkelmannsprogramm, 1908, Taf. III 4-5, sowie 6-7.
- ¹⁵ Dem Besitzer möchte ich für das Recht der Publikation dieses wichtigen Glaskelches besonders danken. Leider sind die Einzelheiten des darauf wiedergegebenen Porträts zu sehr verwischt als daß der Dargestellte mit Sicherheit identifiziert werden könnte. Wie aus der Profilinie des bärtigen Kopfes hervorgeht handelt es sich mit größter Wahrscheinlichkeit um ein Bildnis von Zenon, dem Gründer der Stoa. Vgl. dazu K. Schefold, Die Bildnisse der antiken Dichter, Redner und Denker, S. 108-109. Wie aus der Büstenform hervorgeht, gehört das Bildnis und offenbar auch der Kelch in die zweite Hälfte des 2. Jh. - Wie beliebt auch die Bildnisse Epikurs auf Pokalen waren, geht auch aus der Aussage des Atticus bei Cicero, De finibus bonorum et malorum (5, 1, 3) hervor. Dazu Museum Helveticum XII (1955) S. 100.
- ¹⁶ G. Libertini, Vasetti sigillati, in Siculorum Gymnasium 1949. Libertini glaubt, daß es sich um Firmenstempel handle.
- ¹⁷ Unser Spiegelbild würde somit eine ähnliche Bedeutung haben wie die spätantiken Glastesserae, auf denen vielfach Kaiserbildnisse abgebildet sind. Die meisten von ihnen sind mit einem Bohrloch versehen und waren somit zum Aufhängen wohl an Krüge oder andere Gegenstände bestimmt. Nach M. Jungfleisch, Les empreintes sur verre, Congrès International de Numismatique, Paris, 1953, Actes, Vol. II 473 ff. waren diese Tesserae nur Vorläufer der byzantinischen und arabischen Fabrikmarken.

4. VI. 86

See recently corresp. with Ian
Whitbread, I think under later papers
on Colloquium article (Zwaan 1986)

8. VII. 86

Now filed under OTHER POTTERY TESTS

(67)

Hesper 37, 1968, ^{pp. 75-76} ~~p. 76~~ (Vanderpool);

Wid. p. 56, and cf. Agave XIV, p. 76, not
216 (Thompson). ^{August of} In 1972, E. Harrison

was inclined to accept the ident. for

SS I, partly for its ^{suitability} nearness & to

Fleming, to one of which she considered
^{somewhat} extends further north than had been supposed.

(68) On SS I,

Agave XIV, pp. 74-78; recently,

→ J. McK. Camp

Hesper

(69)

Carlton 1976, p. 11. q. Agave XIV, p. 93,

on the varied uses of the Stone Pots.

PEACOCK
inset

ROMAN + PEACOCK

With many thanks
best wishes
Daniel Peacock
[7]

COLLECTION DE L'ÉCOLE FRANÇAISE DE ROME

32

**MÉTHODES CLASSIQUES
ET MÉTHODES FORMELLES
DANS L'ÉTUDE DES AMPHORES**

(ACTES DU COLLOQUE DE ROME, 27-29 MAI 1974)

EXTRAIT

DAVID P. S. PEACOCK

ROMAN AMPHORAE : TYPOLOGY, FABRIC AND ORIGINS

ÉCOLE FRANÇAISE DE ROME
PALAIS FARNÈSE
1977

DAVID P.S. PEACOCK

ROMAN AMPHORAE : TYPOLOGY, FABRIC AND ORIGINS

I - INTRODUCTION

In the last decade great advances have been made in the study of Roman amphorae: we now know much more about the place of origin, contents and date of these vessels, so that they are becoming of real value in understanding ancient economic history. Our increased knowledge is the result of careful attention to typology, alongside study of dipinto inscriptions, stamps, distributions and kiln material. There is little doubt that determination of the place of manufacture is still one of the most difficult problems; it is also one of the most fundamental, for when the origin is known, it can be possible to gauge contents and sometimes even an approximate date from archaeological and ancient literary information about the source region.

Difficulties arise because often amphora types are devoid of intelligible *tituli picti* or stamps. In other cases there is evidence to demonstrate that a single form was produced in a variety of places and it is hard to determine which of the alternatives applies to a vessel that has lost its inscription through unfavourable site conditions. For example, amphorae based on Greek prototypes from the island of Kos (Dressel forms 2-5) are known to have been made in Campania, in the territory of the Laetani and elsewhere, but it is at present difficult to distinguish the products of each region on the basis of typology¹.

¹ A. Tchernia and F. Zevi, *Amphores Vinaires de Campanie et de Tarraconaise à Ostie*, in *Coll. Ecole Franç. de Rome* 10, (1972), 35-37. F. Zevi, *Appunti sulle anfore romane*, in *Arch. Classica*, 18, (1966), 214.

A further problem is frequently encountered on the fringes of the Roman empire. Since amphorae have a much higher body/rim ratio than other types of coarse pottery, the majority of excavated finds will consist of featureless body sherds. In the Mediterranean region where amphorae abound it may be possible to extract meaningful statistics from a consideration of rims, handles and spikes, but in Britain, even the most extensive excavations can produce too few featured sherds for these to be of much value. Mr. Henry Hurst's recent excavations in the Roman town of Gloucester produced about 300 amphora sherds and of these only 19 had typological features, including one illegible stamp². Had the body sherds been thrown away, several types of amphora would have been missed altogether, giving a distorted picture of imports to the Roman town. If we are to extract the maximum economic information from excavated material we must be able to identify types (hence origins and likely contents) from small fragments, as Elizabeth Ettlinger suggests.

Determination of amphora origins is thus a problem with several facets lying beyond the scope of normal typological investigations. However, the points I have raised are amenable to further elucidation by careful attention to amphora fabrics, a little studied aspect, which can be vital in understanding these vessels. In this paper I propose to give examples illustrating some of the ways in which scientific study of materials can assist, firstly in assessing the origin

² H. R. Hurst *Excavations at Gloucester, 1968-1971: First Interim Report*, in *Ant. J.*, 52, (1972), 68.

of little known types, secondly, in the study of diverse production centres for a single form and finally in the identification of small and often featureless sherds. It will be apparent that these techniques do not supersede existing methods, but must be carefully integrated with typological, epigraphic and other considerations.

II - METHODS AND PREVIOUS APPLICATIONS

Ceramic fabrics can be analysed either by examining their chemical content or by studying the composition and properties of included rock and mineral fragments. Chemical analysis has found wide application in discriminating pottery of different origins, since it is to be expected that raw materials will vary in chemical composition. All clays have much the same content of major components and thus we can assume amphorae to have a roughly similar tenor of silica, alumina, iron oxide and lime regardless of origin, a point clearly verified by Maréchal's analyses³. However, raw materials can differ in their trace element composition and study of this, using techniques such as neutron activation, emission or X-ray spectroscopy, is much more promising, though little work has yet been done on amphorae⁴. Using neutron activation, Sayre and Dodson were able to demonstrate differences in the manganese/sodium ratio of stamped Greek amphorae from Rhodes and Knidos⁵. Presumably this led Dr. Sayre to suggest that certain amphorae from Delos of Knidian type were made of Rhodian clay⁶. However, before accepting the conclusion that clay was transported from Rhodes to Knidos

it is worth noting that the two regions are geologically similar and petrological study of a Knidian amphora⁷ in Southampton Museum has shown much the same mineral composition as that of Rhodian amphorae, though in the former the inclusions are rather coarser-grained. Thus, an alternative suggestion might be that at certain periods Knidian potters exploited local clays similar to those commonly used on Rhodes.

Trace element analysis clearly has considerable potential in characterising amphorae made from different raw materials, but much more fundamental research is required since not all trace elements are of equal value. It seems probable that study of material from different production centres will show that some elements occur in similar proportions in many amphora types regardless of origin, while other elements will vary widely within a single clay formation, a point best investigated by analysing multiple samples of waste from individual kilns. It is well known that on some find-sites even samian ware can be reduced to the consistency of putty, a clear indication that chemical changes may be taking place after burial, and indeed, it has already been demonstrated that such changes can and do occur⁷. In the case of amphorae, possible effects of chemical solution and accretion in different soil environments could be investigated by sampling certain common types of stamped amphorae from a number of geologically contrasting sites. Until tests of this nature have been undertaken, chemical trace element analysis must be used with caution.

However, fortunately, amphorae are comparatively coarse textured and contain fragments of minerals and rocks, either as natural inclusions in the clay, or deliberately added as temper, and these afford an alternative means of assessing origins. The geology of the Mediterranean region is varied and hence it is reasonable to expect that each production region will have its own mineralogical peculiarities, or that these will be shared with few other regions. The overall mineralogical composition of pottery can be characterised using the property of crystalline substances to diffract X-rays at different angles dependent on composition. It is a simple matter to produce an X-ray diffraction pattern in the form of a

graph or photograph which will summarise the essential crystalline composition of pottery fabrics and Young and Whitmore considered this to be an ideal way of 'finger-printing' pottery of different origins⁸. However, both the possibilities and limitations of this approach are illustrated by Périnet's work on amphorae from the Grand Congloué⁹. Dressel 1 vessels produced a distinctive diffraction pattern, but the Greco-Italic and Rhodian types had closely similar patterns because they are of similar materials. It certainly cannot be inferred that the two types were made in the same place, because there may be mineralogical differences undetected by this method, which records only constituents comprising more than about five per cent of the sample. Thus the technique could be useful in discriminating between amphorae of differing origins, but only if there is considerable contrast in mineralogical composition.

An alternative and more widely used method is examination in thin section under the petrological microscope¹⁰. A small sample, c. 10 mm × 10 mm in area is removed from the vessel, fixed to a glass microscope slide and ground to a thin transparent slice. Not only does this permit the mineralogical composition of the inclusions to be determined, but rock types can be identified and it is possible to study textures of both rock and mineral fragments, which can be important when it is necessary to distinguish amphorae of different origins containing inclusions of similar composition. Unfortunately, most published petrological descriptions of amphorae consist of brief notes largely restricted to Dressel form 1 and they are unanimous in confirming its Italian origin¹¹. Other forms have been studied to a more limited extent and detailed descriptions are now available for the products of the Cadiz and Algeciras kilns¹². Work on Greek amphorae may

also be relevant for it indicates the nature of inclusions in the source region and this information is potentially useful in assessing the origins of Roman vessels. The works of Farnsworth on Athenian and Corinthian pottery and that of Krug on the amphorae of the Cimmerian Bosphorus are worthy of note¹³.

Amphora fabrics rarely contain inclusions of pure quartz sand, which is fortunate because it can be difficult to say much about the origins of such simple material on the basis of thin sections. However, sandy wares can be investigated by crushing c. 10-20 gms of fabric, floating the powder on a heavy liquid such as bromoform (density 2.9) and collecting the minerals that sink because of their greater density (e.g. zircon, garnet, rutile)¹⁴. These are present in small quantities in nearly all sands and the assemblage obtained will be characteristic of the parent formation, serving to characterise amphorae of different origins. Heavy mineral analysis has been little used in the study of amphorae but it has been applied to certain southern Spanish types¹⁵.

There is thus a choice of methods, but in my view petrological study in thin section is an ideal method for the routine examination of amphora fabrics. Rock and mineral fragments are usually readily visible and these can often help diagnose or differentiate sources with some precision, as I hope to demonstrate in the following section.

In conclusion, it is worth noting the possibilities of organic analysis in the study of amphora technology and contents. This field has been little investigated but the information available shows great promise. Both Benoit and Jongkees have recorded the presence of mastic (from *Picea*) as internal coating, but recent work in

³ J.-R. Maréchal, *L'application des méthodes scientifiques...*, in *Mémoires de l'Archéologie et d'Histoire offerts à André Piganiol*, 1, (1966), 123-154. C. Varoqueaux, *Fragment d'amphore pêche dans la Manche*, in *Ann. Normandie* 14, (1964), 264-6. E. Thevenot, *La marque d'amphore Sesti*, in *Rev. Arch. Est.*, 5, (1954) 234-43.

⁴ For brief discussion of methods and further references see D.P.S. Peacock, *The scientific analysis of ancient ceramics: a review*, in *World Arch.*, 1, (1970), 375-89.

⁵ E.V. Sayre and R.W. Dodson, *Neutron activation study of Mediterranean potsherds*, in *Am. J. Arch.*, 61, (1957), 35-41.

⁶ V. Grace and M. Savvatiannou-Pétropoulakou, *Les Timbres amphoriques grecs*, in *Délös*, fasc. 27, (1970), 319-20. I am indebted to Dr. Grace for this reference.

⁷ S. J. Freeth, *A chemical study of some Bronze Age pottery sherds*, in *Archaeometry*, 10, (1967), 104-19.

⁸ W. J. Young and F. E. Whitmore, *Analysis of oriental ceramic wares by non-destructive X-ray methods*, in *Far East Ceramic Bull.*, 9, (1957), 1-27.

⁹ In F. Benoit, *L'épave du Grand Congloué à Marseille*, in *Gallia*, Suppl. 14, (1961), 28.

¹⁰ See D.P.S. Peacock, *op. cit.*, note 4.

¹¹ D.P.S. Peacock, *Roman Amphorae in pre-Roman Britain*. In M. Jesson and D. Hill (Eds) *The Iron Age and its Hill-forts* Southampton, (1971), 169-88, with further references.

¹² D.P.S. Peacock, *Amphorae and the Baetican fish industry*, in *Ant. J.*, 54, (1974). A petrological note on buff Ampho-

rae from Goldherring, Cornwall, appears in *Cornish Arch.*, 8, (1969), 28, although the suggested local origin seems to me untenable. D.P.S. Peacock, *op. cit.*, note 11. See also J. Frechen in Ph. Filtzinger *Novaesium V*, Berlin 1972.

¹³ M. Farnsworth, *Greek pottery: a mineralogical study*, in *Amer. J. Arch.* 68, (1964), 221-8. *Corinthian pottery: Technical studies*, in *Amer. J. Arch.* 74, (1970), 9-20. O. Yu. Krug, *Opticheskoe issledovanie bosporskoy Keramiki*. In I. B. Zeest, *Keramicheskaya Tara Bospora*, Moscow, (1960), 128-32.

¹⁴ D.P.S. Peacock, *The heavy mineral analysis of pottery: a preliminary report*, in *Archaeometry*, 10, (1967), 97-100.

¹⁵ D.P.S. Peacock, *op. cit.*, note 11.

the British Museum laboratory suggests the presence of rosin, which would be obtained from the pine tree¹⁶. Not all amphorae were coated and the fatty substance that oozed out of the pores of a globular amphora from Chester, had a chemical composition implying that the vessel may have held olive oil¹⁷. Discoveries of amphorae with stopper in place and contents preserved are great rarities, but one such vessel, of fourth century A.D. date, from Tiritaka in southern Russia was filled with crude petroleum oil, presumably destined for use in lamps¹⁸.

III - APPLICATIONS OF PETROLOGY TO AMPHORA STUDY

The object of this section is to give examples illustrating the role of fabric analysis in typological study, and in particular to demonstrate the potential of the petrological microscope. Although the problems overlap to a degree, they are essentially of a different nature, and concern material of various dates. The petrological side of the study has been restricted to amphorae found in Britain, but it is hoped that the findings will prove of wider interest and application.

1 - Two amphora types: an attempt to define production regions

One of the main advantages of the petrological over the chemical approach is that rock and mineral fragments can be studied directly and it is theoretically possible to relate these to geological information about the Mediterranean, ena-

bling production regions to be predicted. The precision attainable will depend on whether or not the rock and mineral inclusions are distinctive, with closely limited outcrops, and upon the detailed geological information available. This approach has already advanced our understanding of the Roman and pre-Roman pottery trade in Britain, but it must be stressed that the possible sources lie within a restricted region where rock comparanda are readily available; also, the geological survey of Britain is one of the most detailed in the world¹⁹. In the Mediterranean region, the problems of relating rock and mineral fragments to their parent formations can be formidable, but it is sometimes feasible to suggest source areas in general terms if the rock fragments are particularly distinctive, or if there is other evidence to limit the number of possible production regions.

Fig. 1, 1-4 shows an unusual type of amphora which is now known from seven sites in southern Britain: Exeter, Winchester, Silchester, London, Richborough, Verulamium and Puckeridge²⁰. On the pre-Roman site at Puckeridge, it occurs in Augustan-Claudian contexts, at Exeter the form is dated c. 50-70 A.D., while at Richborough it dates to the late 1st century A.D. The form is difficult to parallel with confidence, but it may be close to Dressel form 22 or Pompeii IV, for which latin *tituli picti* suggest a source in Italy, possibly Campania or Lazio²¹. However, these forms do not have the knob base (Fig. 1, 4) and are usually in a finer fabric. The British vessels are typically greenish-grey (Munsell 5 Y. 7/2) in colour and extremely rough with numerous large rounded lumps of rock up to 5 mm across, many of which are rounded 'lapilli' of colourless volcanic glass or pieces of grey, black and red scoriaeous lava²². These fragments can be seen in

thin section accompanied by large (0.5-1.5 mm) shreds of volcanic glass, crystals of quartz, labradorite feldspar, augite, a little sanidine feldspar, occasional zeolites, fossil foraminifera and possibly algae (Fig. 2a). They are set in a matrix of grey optically isotropic fired clay with a scatter of these minerals c. 0.05 mm across. The dark rock fragments are predominantly of andesitic composition, but some of the lighter coloured ones have a trachytic or glassy texture. It is thus possible to define some of the requirements of the production region. The fossils in the ground-mass suggest that the clay was quarried from sedimentary rocks of marine origin, while the inclusions, presumably added as temper, imply that this was located in an area of recent vulcanism, for otherwise it would be difficult to account for the well-preserved volcanic glass. If we assume a Mediterranean origin, this implies a region such as Italy, Sardinia, the Aegean or Anatolia and if the analogy with Dressel 22 is valid, the eastern volcanoes would seem less probable. Certain possibilities in the Italy/Sardinia area can be eliminated, for the presence of marine fossils effectively rules out purely volcanic masses such as the Aeolian islands. Surprisingly, Campania also seems an unlikely source since there is no evidence in the fabric of the leucitic rocks that characterise the Somma/Vesuvius volcano, and furthermore study of the Campania Dressel I amphorae alongside brick samples from Pompeii and Cales shows a very different composition with marked quantities of sanidine rather than labradorite feldspar. Doubtless, with further study of the geological literature and examination of comparative material it would be possible to limit the source more precisely, but even this preliminary petrological investigation indicates that further research in the volcanic regions of the western Mediterranean might be profitable. It can be confidently asserted that Spain and North Africa are geologically much less likely, which is important because the form has points in common with certain North African Punic amphorae illustrated by Cintas²³.

even within a single vessel, though these tend to be of minor importance. I have preferred to use my own descriptive terms.

²³ P. Cintas, *Céramique punique*. Paris, (1950), Pl. XCII.

Another problem is presented by the amphora shown in Fig. 1, 5, one of five recovered from a barrow at Holborough in Kent, associated with a large cylindrical amphora (Fig. 1, 6), a late 2nd century coin, and coarse pottery assigned to the early 3rd century. The origin of these small vessels has long been problematical and an eastern Mediterranean source has been suggested, but Cristofani and Zevi figure a very similar amphora from Ostia attributed to the province of Mauretania Caesariensis and the form was possibly current from the early 3rd century A.D.²⁴. There are differences in that the rim and base do not compare precisely, but Panella illustrates very similar bases to the Holborough ones from Bougie and Algiers Museums and Baradez has published an undated fragment from Tipasa which has a similar rim to the British examples but with strongly ribbed handles²⁵. Thus, there are typological indications that the Holborough vessels might originate in Mauretania Caesariensis but it is difficult to be certain because precise published parallels are lacking.

In the hand specimen the fabric is grey-buff (10 YR. 6/2) in colour with prominent angular white inclusions up to 1mm across and an off-white slip on the outer surface. A thin section reveals rounded inclusions (c. 0.3-1.0 mm) of quartz, quartzite, quartz mica schist and occasional granite rock fragments, set in a matrix of optically isotropic brown fired clay containing fine quartz and mica (c. 0.05 mm). Occasional fossil algae, augite, plagioclase and orthoclase feldspar are present. This suggests an origin in an area of sedimentary rocks at no great distance from a crystalline massif, with occasional outcrops of basic or intermediate igneous rocks somewhere nearby to account for the augite. It is interesting to note that this is an almost precise description of the geology of North Africa between Algiers and Bône. Thus, the petrology

¹⁶ F. Benoit, *Amphores et céramique de l'épave de Marseille*, in *Gallia*, 12, (1954), 47, see also F. Benoit, *op. cit.*, note 9, 50. J. H. Jongkees, *L'enduit intérieur des amphores romaines*, in *Gallia*, 13, (1955), 88-9. W. A. Oddy and J. C. Bateman. In A. J. Parker, *The evidence provided by underwater archaeology for Roman trade in the western Mediterranean*. In D. Blackman (Ed.) *Marine Archaeology*, Colston Papers no. 23, London, (1973), 381.

¹⁷ R. Newstead, *Fatty matter in Roman amphoras*, in *J. Chester and N. Wales Arch. Soc.*, 33, (1939), 104-5.

¹⁸ V. A. Uspenskiy, *Issledovanie drevney amfory s neftyu naydennoy v Tiritake*, in *Mat. i. issled. po arkheol. S.S.S.R.*, 25, (1952), 415-21.

¹⁹ References in D.P.S. Peacock, *op. cit.*, note 4.

²⁰ T. May, *The pottery found at Silchester*, Reading, (1961), Pl. LXVII, top left. Here, fig. 1, 3. B. W. Cunliffe, *Richborough V*, London, (1968), Pl. LXXI, 527. Here fig. 1, 1. Verulamium: here fig. 1, 4. Courtesy Professor S. S. Frere. Exeter, Winchester and Puckeridge are unpublished: information courtesy M. Griffiths, J. Collis and C. Partiridge.

²¹ F. Zevi, *Appunti sulle anfore romane*, in *Arch. Classica*, 18, (1966), 222.

²² Munsell soil colour numbers used throughout this paper indicate characteristic colour. There are of course variations

²⁴ R. F. Jessup, *Excavation of a Roman barrow at Holborough, Swodland*, in *Arch. Cantiana*, 68, (1954), 1-16. M. Cristofani and F. Zevi, *Su alcuni tipi di anfore Ostiensi*, in *Archeologia*, (1966, Jan-Feb), fig. 10. C. Panella, *Annotazioni in margine alle stratigrafie delle terme ostiensi del nuotatore*, in *Coll. Ecole Franç. de Rome*, 10, (1972), 100.

²⁵ C. Panella, *op. cit.*, note 24, fig. 67-68. J. Baradez, *Nouvelles fouilles à Tipasa dans une nécropole païenne*, in *Libyca*, 5, (1957), Pl. IIA.

not only confirms that the source has been correctly deduced from the typological clues, but indicates that part of Mauretania Caesariensis in which production is most likely. Panella has already drawn attention to evidence suggesting that this region was an important producer of olive oil and within the area lies Tubusuctu, a town mentioned on amphora stamps²⁶.

2 - Rhodian style amphorae: a problem in differentiating sources

It has now been established that certain types of amphora were reproduced more or less precisely in various places. One might expect differences in typological detail, but in the case of Dressel forms 2-4 these remain elusive and the vessels made in Laeetania and Campania are difficult to recognise on typology alone. However, the products of regions with contrasting geology should have characteristic fabrics, offering an alternative means of discrimination. Tchernia and Zevi have applied this approach to great effect in their excellent study of Dressel 2-4 amphorae from Ostia, using the presence of white specks ("points blancs") as diagnostic of a Spanish rather than an Italian source²⁷. Their work, based on careful examination of fractured sections, is convincing: attention to detail and supporting colour photographs strongly suggest that all the material may derive from a single source, correctly located in the granitic Barcelona region. However, it cannot be assumed that every amphora with such inclusions is of this origin because the white constituents, quartz and feldspar are common to all granitic terrains. There may be marked differences in texture visible in the hand specimen but if not, detailed petrological study will usually provide a means of discrimination. For example, the complete Koan style amphora from Heybridge, Essex (Fig. 1, 7) contains granitic inclusions but it does not compare microscopically with Catalan material, which has much less mica and a very different texture²⁸. Loeschcke's description of

Haltern form 66A leaves little doubt as to its granitic origin, but petrological analysis is required to ascertain whether it compares with the Heybridge amphora, with the Spanish material, or whether it represents yet another source²⁹.

However, this discussion concerns another Greco-Roman type, the Rhodian style amphora, with handles of a single rod of clay rising to a sharp peak. The form has been mentioned by a number of writers and although all are agreed that it is related to Greek Rhodian amphorae, opinion is divided on whether it is a product of Rhodes itself or whether an imitation made elsewhere, perhaps in Italy³⁰. Although the Roman vessels show some typological variation, this is not marked and they are essentially a homogeneous group (Fig. 3). However, thirty vessels of this type studied in thin section under the petrological microscope are divisible into six distinct fabric categories, resulting from the use of different raw materials. Some certainly indicate production in widely separated places, but others are best explained in terms of variation in locally available raw materials. Only the first two fabrics are quantitatively important, the remaining groups being represented by a few specimens each.

Fabric 1. This is fairly fine and has been recognised from ten sites in southern Britain³¹. It has a distinctive reddish pink colour (5 YR. 7/6) with a paler slip on the outer surface; rounded red-brown particles up to about 0.5 mm across are scattered sparsely throughout, but more prominent are occasional angular fragments (up to 3 mm) of fine white limestone which sometimes cause spalling when near the surface.

²⁶ S. Loeschcke, *Keramische Funde in Haltern*, in *Mitt. Alt.-Kom. für Westfalen*, 5, (1909), type 66A.

²⁷ A. Tchernia, *Recherches archéologiques sous-marines*, in *Gallia*, 27, (1969), 470. D.P.S. Peacock, *op. cit.*, note 11, 167. C. Panella, *op. cit.*, note 24, 73. P. Baldacci, *Le principali correnti del commercio di anfore romane nella Cisalpina*, in *I problemi della ceramica romana di Ravenna, della Valle padana e dell'alto Adriatico*, Bologna, (1972), 103-31.

²⁸ Hod Hill (here fig. 3, 3), Waddon Hill (fig. 3, 9), Usk unpublished, Gloucester-Kingsholm (e.g. fig. 3, 1, 11), Exeter, unpublished (see A. Fox *Roman Exeter* in J. Wachter *Civitas Capitals of Roman Britain*, Leicester 1966, 37). Fishbourne (fig. 2, 10) and Threadneedle Street, London (fig. 2, 2). Sea Mills, unpublished; Verulamium unpublished, Leicester unpublished. For site bibliography see note 41.

²⁹ C. Panella, *op. cit.*, note 24, 100. M. H. Callender, *Roman Amphorae*, no. 1744.

³⁰ A. Tchernia and F. Zevi, *op. cit.*, note 1.

³¹ C. F. C. Hawkes and M. R. Hull, *Camulodunum*, London, (1947) form 183B.

Thin sections reveal an optically isotropic matrix of fired clay with a sparse scatter of fine quartz up to 0.1 mm across, and in it are set numerous grains (c. 0.1-0.2 mm) of red, brown and yellow minerals, the optical determination of which proved extremely difficult (Fig. 2, b & c). The problem was solved by occasional larger grains in which all combined to form the typical *maschen-structur* of serpentine, and furthermore, experimental firing of green serpentine produced minerals with identical optical properties. Occasional grains of olivine, clinopyroxene, and more rarely enstatite are present in most sections and a few angular pieces of chert can always be seen. The limestone fragments, when encountered, are cryptocrystalline, completely unfossiliferous and often show bleached reaction rims with the surrounding clay.

The origin of this fabric can be established beyond reasonable doubt, because Dr. Virginia Grace very kindly arranged for me to section samples of Greek amphorae, bearing Rhodian stamps, found in the Athenian Agora. Not only are the samples similar in visual appearance, but they also match fabric 1 under the microscope: they too have red, brown and yellow serpentine minerals sometimes associated to form serpentine rock fragments and they also have limestone and chert fragments with identical properties. Olivine, clinopyroxene and enstatite are present: the latter is much more prominent in the Greek vessels, but this is the only substantial difference and it probably represents nothing more than the use of different quarries in the Greek and Roman periods. Although a Rhodian source seems assured for fabric 1, it is impossible to be certain that production was limited to Rhodes itself, rather than other islands of the Rhodian league such as Carpathos, Syme or Casos. However, Nisyros, the remaining island listed by Pliny as belonging to this group, is composed of volcanic materials and can be confidently eliminated³². Much of the Rhodian Peraea on the Turkish mainland is occupied by an ultrabasic massif, where one would not expect to find limestone inclusions but there are some localities that would be geologically

feasible, particularly parts of the Knidian and Loryma peninsulas.

An origin in the Rhodes region could also be argued on theoretical grounds. Pliny states that the Rhodian was like the Koan, a medicinal wine made with sea water, and thus, if it is accepted that vessels of the Rhodian form usually contained this wine, a coastal origin seems likely³³. A glance at the geological map of the Mediterranean shows that there are very few places where ophiolitic rocks (which include serpentine), outcrop near to the coast: in Liguria, in central Greece, on Lesbos, in the Rhodian Peraea, on the western side of the Gulf of Antalya and around the Bay of Iskenderun in eastern Turkey. Of these only the Rhodian region has produced evidence of the production of similar forms. Geological study of the Turkish mainland opposite Rhodes has shown that it has all the mineralogical components of the pottery: serpentine, olivine, clinopyroxene, enstatite, chert and limestone³⁴. This need not imply production on the mainland, for geological agencies could have distributed these minerals over the Rhodian area during Tertiary or recent eras, though most would be destroyed by more distant dispersion.

Fabric 2 is represented by numerous sherds from Gloucester and single pieces from Camulodunum and Verulamium³⁵. It is creamy white in colour (10 YR. 8/4) and characteristically soft and powdery, which is why it has yet to be recognised in a complete vessel. Occasional pieces of limestone up to 3 mm across are visible in the hand specimen, but these have usually dissolved out leaving voids. In thin section this fabric shows an optically anisotropic ground-mass with a sparse scatter of fine (c. 0.1 mm) quartz and frequent red, brown or yellow minerals apparently similar to those of fabric 1, though comparison is difficult because they are usually more altered. There are also numerous pieces of limestone (or voids with reaction rims) and fragments of chert. Accessory minerals include plagioclase feldspar, and minute grains of pyroxene.

³² Pliny *H.N.* XIV, 79.

³³ J.-P. Bassaget, R. Michel and F. Richard, *Les rodingites et les opisphérites du massif ultrabasique de la province de Mugla*, in *Trav. Lab. Géol. Grenoble*, 43, (1967), 23-40.

³⁴ All unpublished, here fig. 3, 12-16. Handle fragments from Camulodunum (Colchester Museum L 58) and Verulamium (information S. S. Frere).

³⁵ Pliny *H.N.*, V, 133, 104. For discussion of the extent of the Rhodian Peraea see A. H. M. Jones, *Cities of the eastern Roman Provinces*, Oxford, (1971), 31-2, 49-50, 56, 77.

In view of similarities with fabric 1, this material is probably also of Rhodian origin, although this is not certain because the diagnostic brown minerals could not be identified with the same confidence. However, it is correct to class it as a separate fabric because there are significant differences. The whiter colour suggests the use of a different clay with less iron, no fragments of serpentine rock were seen, and minerals such as pyroxene are much rarer. To what extent firing and subsequent site conditions have affected this fabric is not clear.

Fabric 3 is represented by the complete type specimen Camulodunum 184 and by a handle fragment from Fishbourne³⁶. It is characterised by its distinct orange brown colour (2.5 YR. 6/8) and microscopically by the fineness of the paste which contains little but quartz (c. 0.05 mm across) and minute sherds of mica (Fig. 2, d). Very occasionally larger (c. 1 mm) inclusions of quartz, quartzite, biotite, potash feldspar, chert and lava fragments can be seen. The fabric cannot be confused with the previous two and was undoubtedly made from different raw materials. It is difficult, on the evidence available, to suggest where the source might lie.

Fabric 4 is represented by two fragments from Fishbourne and by a piece from the town of Gloucester³⁷. It is buff-brown in colour (2.5 YR. 6/6) and contains obvious glistening crystals about 0.5 mm across. In thin section most of these can be determined as andesine feldspar or quartz, some of which is remarkably free from effects of strain, implying an igneous origin (Fig. 2, e). A few lava fragments with a vitreous texture are also present. However, dark ferromagnesian minerals are comparatively scarce apart from occasional grains of clinopyroxene, brown hornblende and possibly olivine. The fine groundmass is red-brown and optically isotropic with a scatter of fine quartz grains (0.05 mm.).

The inclusions comprise what is best described as a crystal tuff of dacitic or andesitic com-

position. The Aegean might be an appropriate source for raw materials of this sort and in particular the volcanic island of Nisyros would be worthy of detailed attention³⁸. However, this is by no means the only possibility and careful geological study over a wide area would be needed to limit the source with confidence.

Fabric 5, characterised by a high tenor of pure quartz sand set in a buff-brown (5 YR. 6/6) matrix, has only been seen in a single peaked handle from Usk³⁹. In thin section the quartz grains, subrounded, well sorted, and about 0.2-0.3 mm across, can be seen in a clean brown matrix of optically anisotropic fired clay (Fig. 2, f). It is very different from the other fabrics but nothing can be said of its origins. Heavy mineral analysis was not attempted, since this is a small unique piece, and a rather large sample is required.

Fabric 6 occurs as an almost complete amphora from Old Broad Street, London, previously published by Wheeler⁴⁰. The paste is pale buff in colour (7.5 YR. 7/4) and contains obvious inclusions of mica, quartz and feldspar. The thin section has an unusual appearance, for the groundmass consists of pure clay almost free of fine detritus, in which are set large (1 mm) inclusions of granitic origin: quartz, potash and some plagioclase feldspar, mica and small rock fragments of granite itself (Fig. 2, g). In addition, there are grains of fossiliferous limestone, metamorphic quartzite and a piece of arkosic sandstone. This composition would be appropriate to the fringes of an essentially granitic massif. Granites are absent from the Rhodian Peraea and islands, hence this appears to be firm evidence that peaked handled amphorae were made outside this region. The nearest source would be in Caria, 130 kms north of Rhodes, or on the islands of Crete and Mykonos, but there is no reason why this vessel could not have been produced around other granitic masses of the Mediterranean such as those of Anatolia, northern Greece, southern Italy, Sardinia, Corsica and Elba, or the Maures

massif of southern France. However, it is very different from Catalan amphorae both microscopically and in the hand specimen, so this area can be eliminated with some confidence.

To summarise, the petrological evidence leaves little doubt that fabric 1 and probably fabric 2 are Rhodian and that fabric 6 was produced outside the area of Rhodian influence. The situation of the factories that produced fabrics 3, 4 and 5 cannot be determined, but fabric 4 might be Aegean.

The fabric subdivision helps to understand the minor variations in typology shown by this form. Fig. 3 shows a selection of the material studied:

Fabric 1 : Fig. 3, 1-3, 9-11

Fabric 2 : Fig. 3, 12-16

Fabric 3 : Fig. 3, 4

Fabric 4 : Fig. 3, 5-7

Fabric 5 : Fig. 3, 17

Fabric 6 : Fig. 3, 8

Most instructive are the complete amphorae or large fragments available for fabrics 1, 3, 4 and 6: each appears to have its own typological peculiarities though they are very slight and there are too few specimens to be sure that the differences are significant. However, the contrast between the vessel in fabric 1 and those in the other fabrics is very marked. The true Rhodian (Fig. 2, 1) is more bulbous, thinner walled and would have carried much more wine for its weight. No doubt its superior efficiency was the result of a long tradition of craftsmanship and development on Rhodes. Its refinement is a strong argument for suggesting that the other forms were cruder imitations produced well away from the influence of this tradition.

Interesting points arise from studies of distribution and dating. The form as a whole is particularly prevalent in the west in a band running from Italy through Germany to Britain (Fig. 4). Peaked handles first occur in Augustan contexts at Oberaden, Haltern and possibly August; they occur in Claudian or Neronian levels at Hofheim, Hod Hill, Waddon Hill, Gloucester-Kingsholm, Usk, Exeter, Fishbourne and Camulodunum, but production certainly persisted well into the Flavian period as shown by material from the town of Gloucester, Nijmegen, Ventimiglia, Pompeii, Herculaneum, Ostia and Caerleon: some of this material could be remnants of earlier importation

but certainly not all⁴¹. It seems significant that a very high proportion of the finds, particularly the pre-Flavian ones, come from military contexts and even some of those from civil sites (such as Fishbourne) could derive from an earlier military phase.

Its importance on early military sites in Britain is particularly striking and it is reasonable to claim that it is the commonest wine jar. Finds from Hod and probably Waddon Hill in Dorset, are Claudian in date and it is interesting that these two vessels are in fabric 1 of Rhodian origin. Further examples in the same fabric are known from the fort at Exeter dated c. 50-70 A.D. However, the only site which has produced large quantities of amphorae, is the pre-Flavian legionary fortress of Gloucester-Kingsholm. About thirty per cent

⁴¹ Dating evidence for Augst, Oberaden, Haltern, Colchester, Nijmegen and Ventimiglia, conveniently summarised with references by C. Panella, *Ostia II*, 139 (= *Studi Miscell.* 16, 1970). Ostia: see also C. Panella, *op. cit.*, note 24, 75. Hofheim: E. Ritterling, *Das Frühromische Lager bei Hofheim im Taunus. Ann. Verein für Nassauische Altertumskunde und Geschichtsforschung*, 40, (1915), form 74. Hod Hill: I. A. Richmond, *Hod Hill*, Vol. II, London, (1968), fig. 54. Waddon Hill: G. Webster, *Further investigations at Waddon Hill*, in *Proc. Dorset Nat. Hist. and Arch. Soc.*, 86, (1964), fig. 5, 1. Fishbourne: B. W. Cunliffe, *op. cit.*, note 5. Pompeii: A. Mau, *CIL IV*, Suppl. form 42. Herculaneum: A. Maiuri, *La Casa del Menandro*, Rome, (1952) fig. 189. Caerleon: R. E. M. Wheeler and T. V. Wheeler, *The Roman Amphitheatre at Caerleon, Monmouthshire*, in *Archeologia*, 78, (1928), 186. Leicester: unpublished handle fragment, Leicester Museum. Sea Mills: unpublished handle fragment, Bristol Museum. Verulamium: unpublished, information courtesy Prof. S. S. Frere. Usk: unpublished, information courtesy of W. H. Manning. Exeter: unpublished, information courtesy M. Griffiths. Gloucester: unpublished, information courtesy H. R. Hurst. Civil settlement in town and pre-Flavian fort at Gloucester-Kingsholm. Other sites include Xanten: J. Hagen, *Einzelfunde von Vetera 1913/14*, in *Bonner Jb.*, 124, (1971), 160. London: R. E. M. Wheeler *op. cit.* note 40. Neuss: Ph. Filtzinger, *Neussium V*, Berlin, 1972, Taf. 24, 9. Milan, Cremona: P. Baldacci, *op. cit.*, note 30. St. Raphaël: A. Tchernia, *op. cit.*, note 30. Aislingen: G. Ulbert, *Die römischen Donau-Kastelle Aislingen und Burghöfe*, Berlin 1959, taff. 11. Athens: V. Grace, *Amphorae and the Ancient Wine Trade*, Princeton (1961), fig. 62. Lyons: J. Lasfargues, J.-F. Revnaud and A. Desbat, *Fouilles de sauvetage à Lyon*, in *Archeologia*, 60, (1973), 74. Mainz: *Westd. Zeitsch.*, 20, Pl. XVII. Vindonissa: information courtesy E. Ettlinger. Lunz: see S. Lusuardi Siena, this volume. Basel: R. Fellmann, *Basel in Römischer Zeit*, Basel (1955) Taf. 11, 9. Benghazi: information courtesy J. Riley. The related form Dressel 45 has been omitted from consideration here.

³⁶ C. F. C. Hawkes and M. R. Hull, *Camulodunum*, London, (1947), form 184, B. W. Cunliffe, *Excavations at Fishbourne 1961-1969*, London 1971, no. 149.

³⁷ Fishbourne: unpublished. Here fig. 3, 5-6. The large fragment was found in the harbour area. Gloucester: associated with Neronian - early Flavian, south Gaulish samian. Unpublished, here fig. 3, 7.

³⁸ E. M. Davis, *Zur Geologie und Petrologie der Inseln Nisyros und Iali (Dodekanes)*, in *Practika akad. Ath.*, 42, (1967), 235-52.

³⁹ Unpublished, from a level containing mainly Neronian pottery, here fig. 2, 17.

⁴⁰ R. E. M. Wheeler, *London in Roman times*, London (1930), Pl. LV, 1.

of the 250 sherds recovered are from Rhodian vessels, the only other potential wine jars being represented by two sherds from Koan style (Dressel 2-5) amphorae and fragments of the flat-bottomed Dressel form 30/Pélichet 47, which comprise about five per cent of the sherd total. The majority of the Rhodian style fragments are in fabrics 1 and 2, roughly in the proportion 1:2. The popularity of the form is curious as it contrasts with published information available for other sites. The Rhodian type appears to have been of considerably less importance on Augustan sites such as Oberaden or Haltern and the same applies to pre-and post-conquest Camulodunum as well as to the important new material from the pre-Roman site at Puckeridge⁴². Ritterling specifically remarked on the scarcity of the form at the Claudian fort of Hofheim. It thus seems reasonable to suggest that Rhodian style amphorae were *particularly* favoured on certain pre-Flavian forts in Britain and their pre-eminence may have begun soon after the Claudian conquest. Furthermore, as supplies came directly from Rhodes it is tempting to see a connection with events in that area, for between 44 and 53 A.D., Claudius rescinded the liberty of the Rhodians on a account of atrocities committed against the Romans⁴³. Could it not be that the popularity of Rhodian wine on British military sites, at least began with consignments exacted in tribute?

In comparison with fabrics 1 and 2, the remaining material is relatively unimportant as each fabric is represented by only a few examples. As more material comes to light it will be interesting to see whether these types show a concentration on civil rather than military sites and whether they are predominantly later in date. At present, the evidence is inadequate to assess such questions with certainty, but they do appear to be somewhat commoner on civil sites and production certainly goes back to c. 60 A.D. as the complete vessel Camulodunum 184 in fabric 3 demonstrates⁴⁴.

3 - Sherd identification: North African amphorae in Late Roman Britain

The identification of small fragments is an important aspect of the study of fabrics. Some types such as the common Spanish globular amphora (Dressel 20) can be readily recognised in the hand specimen, but in other cases it can be difficult to do this with absolute confidence. However, if a series of thin sections is prepared from complete vessels, small fragments can usually be identified by matching microscopic characteristics. Most forms occur in a limited range of fabrics and hence it can be possible to determine type with some precision, although if a single fabric is shared by a number of forms, a range of possible identifications is the best that can be hoped for. This technique has proved of considerable value in the study of Dressel 1 amphorae which are being found in increasing numbers on Iron Age sites in southern Britain⁴⁵. Thin section examination of complete vessels established the mineralogical nature of three distinct fabric types and it is now a simple matter to identify small featureless fragments by comparison with this body of data. Some confusion is possible because the same fabrics are occasionally found in Koan style (Dressel 2-5) amphorae, but the chronological contexts usually make this identification unlikely.

Another good example of this approach is the recent identification of North African cylindrical amphorae from late Romano-British contexts. A few years ago, excavations on the new Market Hall site at Gloucester produced fragments of the body of an amphora in a distinctive hard red fabric (2.5 YR. 5/6) with an off-white slip finished with vertical smoothing. Occasional rounded white particles (c. 1 mm) or voids and very rarely 2 mm particles of brown ferruginous sandstone could be seen. At the time, it could only be matched with two sherds from the post-Roman monastic site of Tintagel in Cornwall where they belong to Thomas' undecorated "Class Biii" amphorae⁴⁶. Thin section examination showed the sherds from the two sites to be closely similar but the petrology did not suggest a

possible source. All that could be seen was a red optically isotropic matrix of fired clay with numerous grains of subangular quartz about 0.1-0.2 mm across, rounded fragments of limestone or voids with bleached reaction rims (indicating that limestone was once present) and small pieces of siltstone, often with quartz grains set in a lime rich matrix (cf. Fig. 2, i). None of the minerals is particularly distinctive, but despite the simple composition, it is an unusual fabric. The problem of origin was solved when a complete vessel from the barrow at Holborough in Kent, was examined⁴⁷. This amphora (Fig. 1, 6) was associated with a late second century coin, with early third century coarse pottery, and with five of the small amphorae discussed above, probably third century products of Mauretania Caesariensis. The large vessel is clearly of the cylindrical form discussed by Zevi and Tchernia, shown on the basis of stamps to originate in the Byzacena region of North Africa though Panella suggests that it may have been made elsewhere in small quantities as well⁴⁸. It belongs to Panella's Africana II, type D, dated to fourth century, although the evidence from the barrow implies that the form could also have been current rather earlier⁴⁹. The Holborough amphora bears a stamp reading TEP / SVRI and it is closely paralleled by an example from Rome. The fabric is brown rather than red, but it bears an off-white outer slip with the characteristic vertical smoothing and in thin section it shows all the characteristics of the vessels from Tintagel and Gloucester, leaving little doubt that these must also be imports from the Byzacena region (Fig. 2, h).

Further study has demonstrated that the type occurs on the eleven sites in southern Britain marked on fig. 5, and at least thirty different vessels are represented. Many pieces can now be recognised by their visual characteristics, but as most are body sherds, it is always useful to check identifications by thin section study and this is essential if the sherds come from part of the vessel that lacks the vertical smoothing or if

the fragments have deteriorated unduly in the soil. Unfortunately it is impossible to determine precisely which of Panella's or Beltrán's cylindrical forms are represented in this material, but it is nevertheless clear that the general North African cylindrical type is present in some quantity⁵⁰.

Some of the body sherds are particularly important because they occur in dated contexts. There is an important vessel from Caerleon dated c. 130-160 A.D., but as this now appears to be lost and as the fabric description is inadequate, I hesitate to base too much upon it⁵¹. There is, however, an unpublished sherd from the quay at Caerleon dated to before c. 210 A.D. which has a North African fabric. This and possibly the vessel from Holborough could imply importation as early as the third century. A rim from Clausentum (Southampton) is dated in the range of third century - 370 A.D., but the remaining material when stratified, comes from the very latest contexts of Roman Britain and is potentially of fifth century date, although this is very difficult to prove because of the scarcity of dateable artifacts of this period⁵². The sherd from the new Market Hall site in Gloucester came from the floor of a building which may have had a very late fourth century coin hoard hidden in the roof before collapse, and much of the remaining material from other sites in Gloucester was either recovered from Medieval levels or from a loam deposit dated to the broad period fourth to eleventh century⁵³. Sherds from Bush Lane, London, came from a dump of material believed to have been deposited in the fourth century or later and it was associated with shelly coarse pottery fabrics which J. Clark believes, persist into the fifth century⁵⁴. At Mucking, in Essex, a handle was recovered from a very late ditch and a further sherd came from the fill of a fourth century well

⁴² C. Panella, *op. cit.*, note 24. M. Beltrán Lloris, *Las ánforas romanas en España*, Zaragoza, 1970, 546 ff.

⁴³ R. E. M. and T. V. Wheeler, *The Roman Amphitheatre at Caerleon, Monmouthshire*, in *Archaeologia* 78, fig. 23, 81.

⁴⁴ M. Cotton and P. Gathercole, *Excavations at Clausentum, Southampton 1951-1954*, London, (1958), fig. 26, 8.

⁴⁵ Information courtesy H. R. Hurst, J. Rhodes, M. Hassall.

⁴⁶ Information courtesy of P. Marsden and H. Chapman. For shelly wares see J. Clark. In A. C. Brodrick, A. R. Hands and D. Walker *Excavations at Shakenoak III*, Oxford, (1972), 142.

⁴² Unpublished: information courtesy of C. Partridge.

⁴³ Cassius Dio LX, 24. Tacitus *Ann* XII, 58. Suetonius *Claudius*, 25, Nero, 7.

⁴⁴ C. F. C. Hawkes and M. R. Hull *Camulodunum*, London, (1947), 281.

⁴⁵ D. P. S. Peacock, *op. cit.*, note 11.

⁴⁶ A. C. Thomas, *Imported pottery in Dark-Age western Britain*, in *Med. Arch.*, 3, (1959), 89-111.

⁴⁷ R. F. Jessup, *op. cit.*, note 26.

⁴⁸ F. Zevi and A. Tchernia, *Amphores de Byzacène au Bas-Empire*, in *Ant. Africaines*, 3, (1969), 173-214.

⁴⁹ C. Panella, *op. cit.*, note 24, 84. C. Panella, *op. cit.*, note 24, 102.

sealed by a fifth century Saxon building⁵⁵. The finds from Tintagel might imply importation in the late fifth century or the early sixth century, for most of the other Mediterranean imports from the site are of that date, but this is not conclusive because late Romano-British pottery has been found there⁵⁶. African amphorae are curiously absent from the late third and fourth century Shore Forts that defended the southern and eastern coasts of Britain, although a few have now been excavated on some scale. No sherds of these vessels were found in a massive collection of pottery from either Portchester or Pevensey Castles or in the examination of a large sample of material recovered from Richborough and Burgh Castle⁵⁷.

In sum, the evidence available suggests that importation from Byzacena may have begun in the third century and possibly continued through the fourth, though on a very small scale, with few supplies destined for the military market. It is hard to escape the conclusion that the most important period for importation to Britain was in the very late fourth or more probably fifth century A.D. It would be rash to restrict this to the years before the Vandal invasion of Africa in 429 A.D. because Hayes has already suggested that North African fine-ware production was less affected than previously thought and Courtois has argued that agricultural activities survived the invasions more or less unscathed⁵⁸. However, the contexts in which the vessels are found and their absence from most of the post-Roman sites in south western Britain, implies that many were arriving earlier rather than later in the fifth century⁵⁹.

⁵⁵ Information courtesy Mrs. M. U. Jones & W. J. Rodwell.

⁵⁶ Information P. A. Rahtz. See A. C. Thomas, *op cit.*, note 44. C. A. R. Radford, *Imported pottery found at Tintagel, Cornwall*, in D. B. Harden (Ed) *Dark Age Britain, Studies presented to E. T. Leeds*. The imitation Drag 38 is probably a 3-4th century product of the Oxford potteries.

For general account of Shore Forts see S. S. Frere *Britannia*, London, (1967), also B. W. Cunliffe, *op cit.*, note 20. Dr. M. G. Fulford examined the collections of pottery and I refer to his findings with his kind permission.

⁵⁷ J. W. Hayes, *Late Roman Pottery*, London, (1972), 426. C. Courtois, *Les Vandales et l'Afrique*, Paris, (1955), 317.

⁵⁸ See A. C. Thomas, *op cit.*, note 46. *Recent survey of post-Roman sites in L. Alcock, Arthur's Britain*, Harmondsworth, (1971).

The study of British material suggests an economically viable trade. It is important to realise that most of the vessels are represented by body sherds only: had these been ignored, vital dating evidence would have been lost and the number of finds recorded would be very small indeed. It would have been tempting to explain them as casual importations by travellers rather than organised trade. The North African and European distribution of the cylindrical form is now heavily biased at the British end, as finds have not been recorded in the same detail elsewhere, but the new data help in understanding the general distribution pattern. The general type is found widely in the Mediterranean region, but there is a remarkable concentration of sites in an arc from Tarragona to Genoa (Fig. 6). At many places along this coast the imports were commonplace: countless sherds are to be seen on the site of the fifth century foundation of Ugium (St. Blaise) and they occur in quantity in early Christian cemeteries such as Tarragona, Barcelona, Ampurias or Narbonne. It is interesting to note that a similar site has come to light on the Atlantic coast at Bordeaux and that the two regions are connected by a spread of finds across inland France, principally along the Garonne⁶⁰. Individual pieces have yet to be closely dated, but it does seem that at certain periods material was transported across France to Bordeaux and presumably from this port it was shipped to Britain.

IV - CONCLUSIONS

I hope that these brief observations on scattered topics are sufficient to demonstrate that the analysis of fabrics is an aspect of amphora study with considerable potential, and that it can lead to information of direct historical interest. It will be clear from the way I have drawn on the works of others that the scientific analysis of

⁶⁰ J. Coupry, *Circonscription d'Aquitaine, Bordeaux*, in *Gallia*, 27, 345. For other sites mentioned see M. Beltran Lloris, *Las ánforas romanas en España*, Zaragoza, (1970), 549 ff with full references. St. Blaise and Narbonne: personal observation on site.

materials does not replace existing methods, but it is merely one aspect of the broader field of typological study. All scientific techniques, including those I have not had occasion to mention, have a role in the examination of fabrics, but most amphorae are ideally suited to examination in thin section under the petrological microscope and this should be the routine approach to be applied in the first instance. Although it is a tool of proven value, it could be greatly sharpened by study of vessels bearing *tituli picti* and by recording the petrological characteristics of known kilns. These data would then provide reference standards against which unknown pieces could be checked.

However, scientific methods of analysis can never be applied to more than a small proportion of vessels recovered and the visual comparison of amphora fabrics will always be important. Fabric descriptions would be of considerably more value if we adopted a standard procedure. Colour, for example, could be recorded with reference to colour charts and it would be useful to note the approximate proportion, colour, shape and size of inclusions visible in a fresh fracture. This information would not be difficult to recover

and it would add greater precision to our work, for if detailed comparisons are to be valid, fabric as well as form should match.

V - ACKNOWLEDGEMENTS

I wish to thank the following for allowing me to examine material in their care and in some cases for generally permitting reference to discoveries in advance of their own publication.

Mr. G. Boon, Mr. H. Chapman, Mr. J. Clark, Mr. D.T.D. Clarke, Mr. J. Collis, Mr. H. L. Douch, Professor S. S. Frere, Dr. M. G. Fulford, Mr. M. Griffiths, Mr. M. Hassall, Mr. H. R. Hurst, Miss C. Johns, Mrs. M. U. Jones, Mr. D. Kelly, Miss J. Macdonald, Dr. W. H. Manning, Mr. P. Marsden, Mr. C. Partridge, Miss S. Pearce, Mr. R. Peers, Mr. M. Ponsford, Mr. J. Rhodes, Mr. J. Riley, Mr. W. J. Rodwell, Mrs. M. Rule.

I am indebted to Drs. Virginia Grace and T. Leslie Shear Jr. for arranging for me to examine stamped Greek Rhodian material from the Athenian Agora and for permitting reference to this material here. The Greek Department of Antiquities kindly authorised exportation of samples for petrological analysis.

November 1974

SUMMARY

This paper stresses the relevance of fabric studies in elucidating typological phenomena. After a survey of previous scientific work on amphora fabrics, examples are given to demonstrate the value of the petrological approach, firstly to suggest possible source regions for

little known types; secondly to study the diverse production centres of a single form which can lead to an explanation of typological variation, and thirdly to identify the types to which small and often featureless body sherds belong.

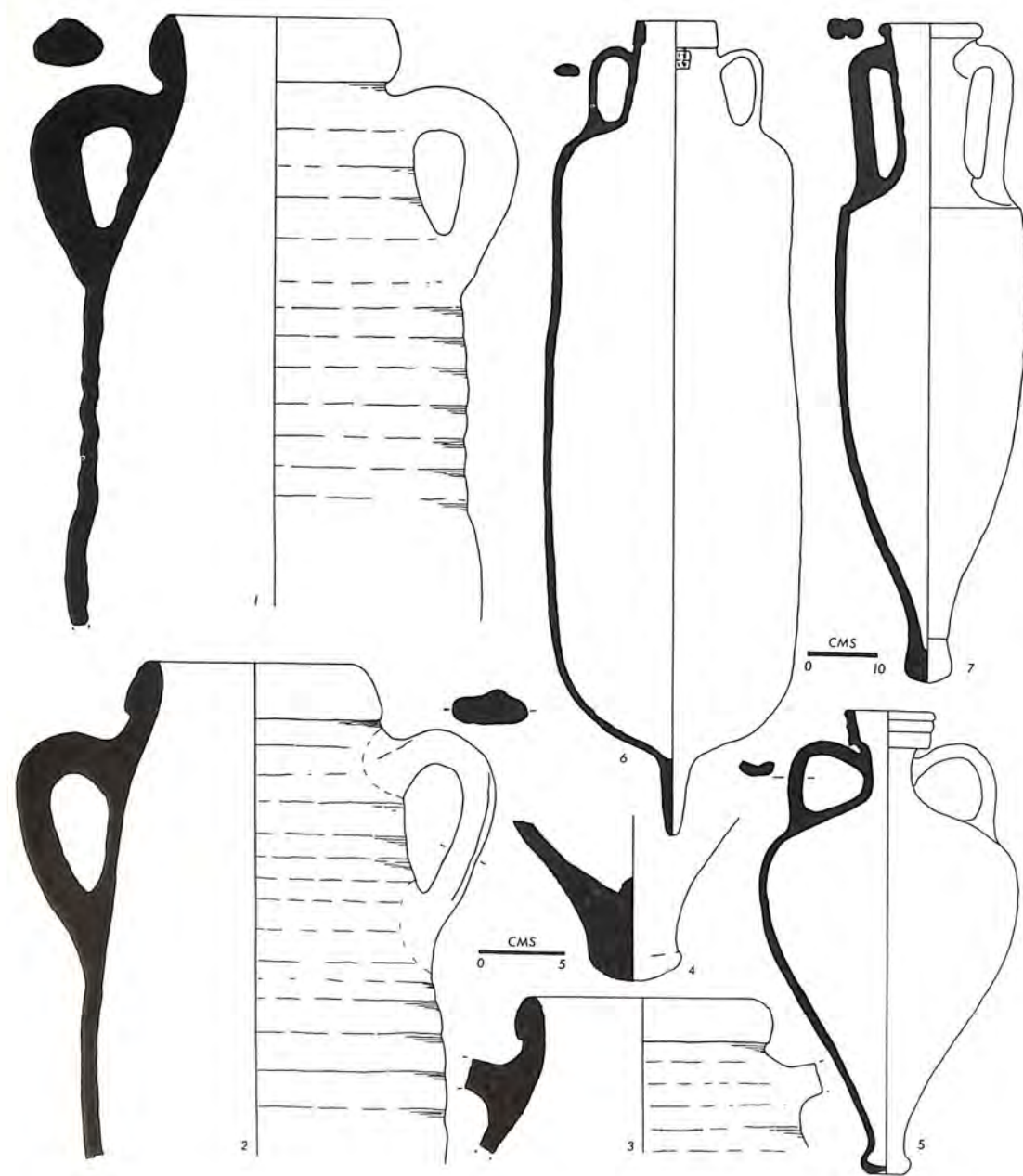
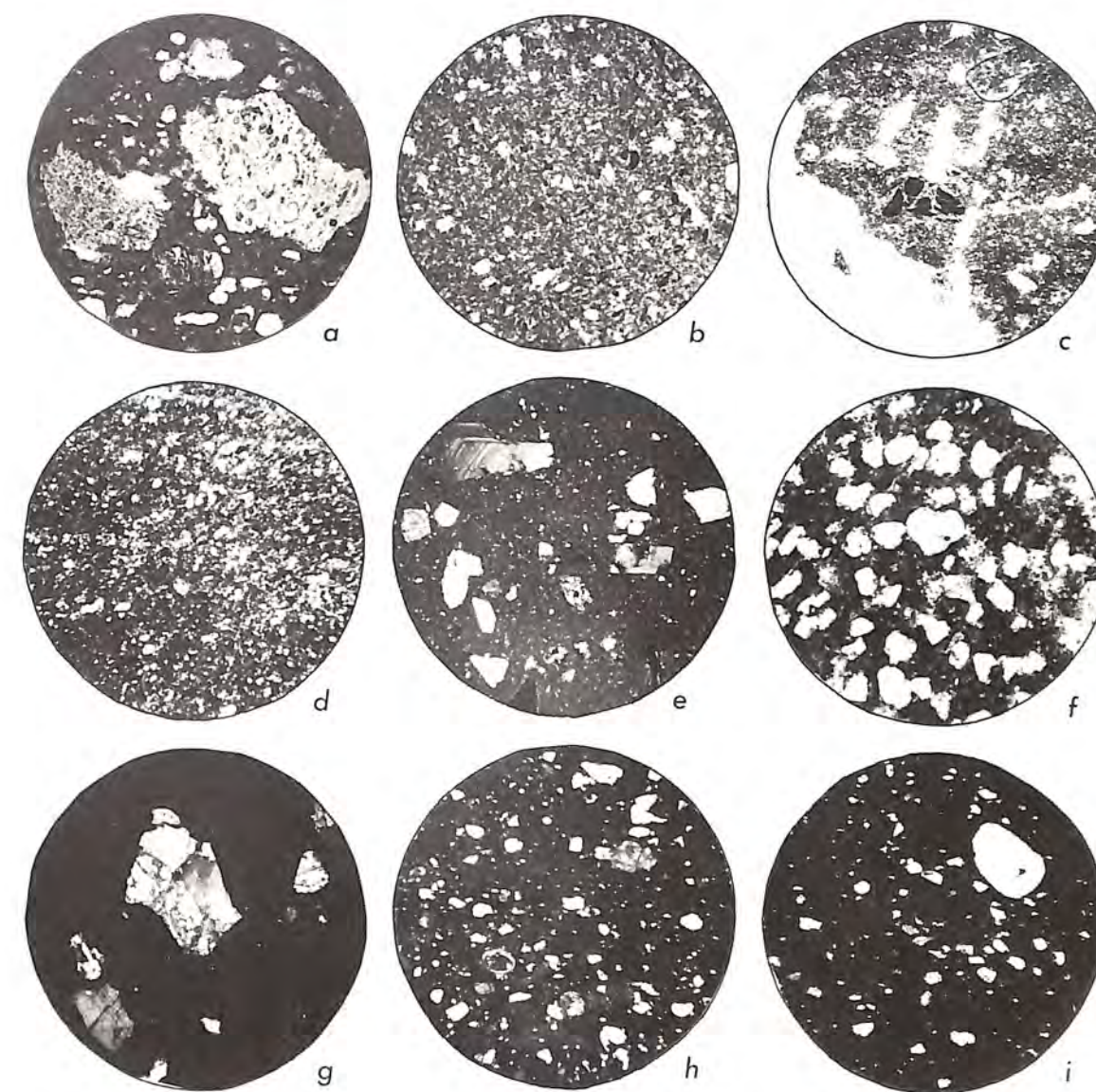


Fig. 1

- 1 - Richborough. After B. W. Cunliffe 'Fifth Report on the Excavations of the Roman Fort at Richborough, Kent' London 1968, No. 527.
- 2 - Plantation House, Fenchurch Street, London. Guildhall Museum, London.
- 3 - Silchester. Cf. T. May *The Pottery found at Silchester* Plate LXVII A top left.
- 4 - Verulamium. Courtesy Professor S. S. Frere.
- 5-6 - Holborough, Kent. After R. Jessup *Archaeologia Cantiana* 68 (1954).
- 7 - Heybridge, Essex. After C. F. C. Hawkes & M. R. Hull 'Camulodunum' type 183B.

Fig. 2 - Photomicrographs ($\times 17$)

- a - Exeter, unpublished. Amphora of the type shown in fig. 1, 1-4. Volcanic rock fragment on left and large sherd of volcanic glass. Plane polarised light.
- b - Fabric 1, unpublished peaked handle from Fishbourne. Quartz and fired serpentine minerals (dark specks). Plane polarised light.
- c - Fabric 1. Waddon Hill, Dorset, here fig. 3, 9. Large grain of fired serpentine showing *maschen* structure. Plane polarised light.
- d - Fabric 3. Type specimen Camulodunum 184, here fig. 3, 4. Quartz and minute sherds of white mica. Plane polarised light.
- e - Fabric 4. Fishbourne, here fig. 3, 6. Angular grains of felspar (grey) and quartz (white). Crossed nicols.
- f - Fabric 5. Usk, here fig. 3, 17. Rounded quartz sand. Plane polarised light.
- g - Fabric 6. Old Broad Street, London, here fig. 3, 8. Large fragment composed of quartz and potash felspar, plagioclase felspar to right. Crossed nicols.
- h - African amphora. Holborough, Kent, here fig. 1, 6. Quartz sand with limestone particles (cloudy) and limestone voids. Crossed nicols.
- i - Dorchester, Dorset. Body sherd of African amphora. Quartz grains of similar size and shape to h. Voids once containing limestone appear elsewhere in slide. Crossed nicols.

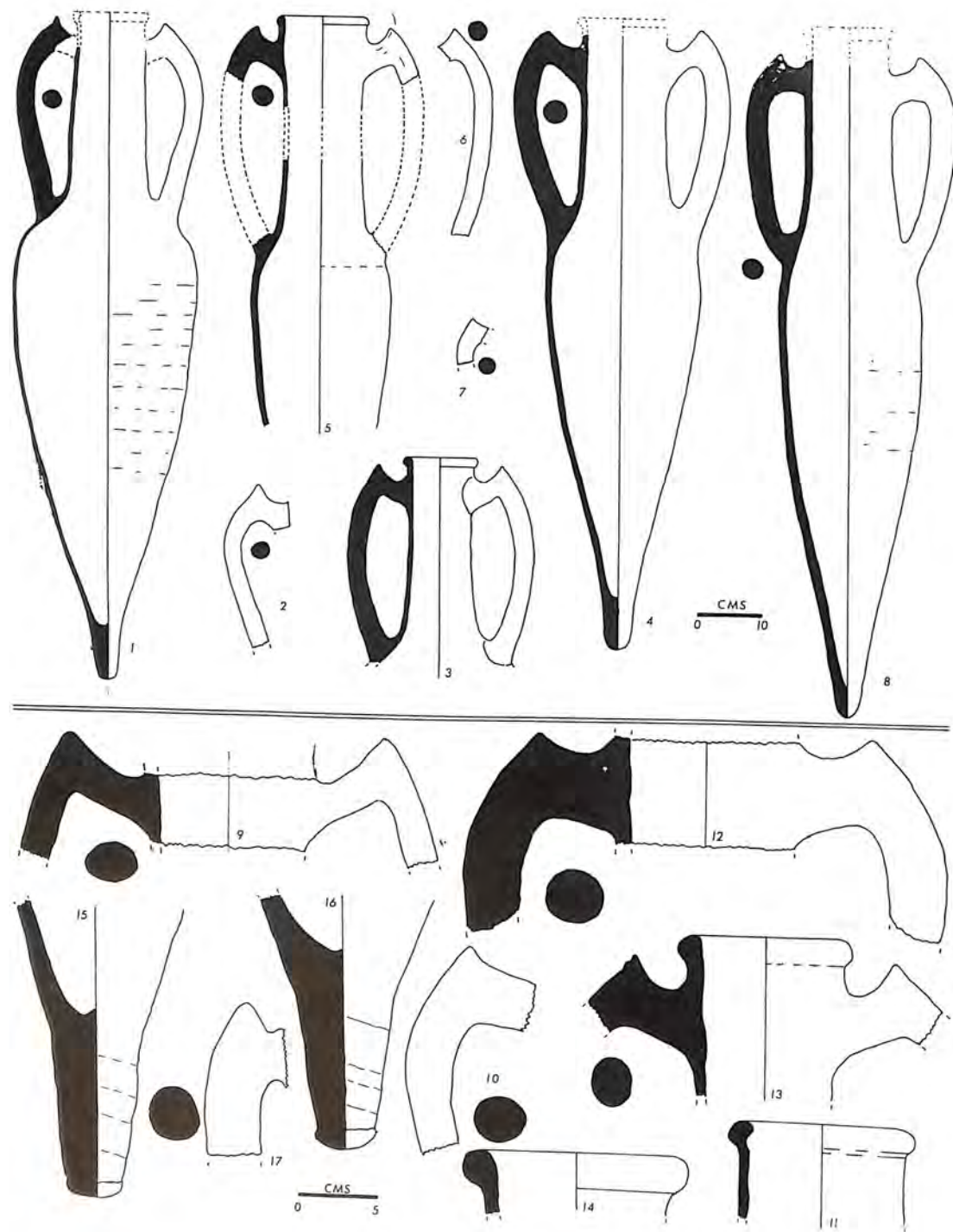


Fig. 3

- 1 - Gloucester-Kingsholm.
- 2 - Threadneedle Street, London. Cf. R.E.M. Wheeler *London in Roman Times* London, Pl. LVI, 1.
- 3 - Hod Hill. After I. A. Richmond *Hod Hill* Vol. II London (1968), fig. 54.
- 4 - Camulodunum. After C.F.C. Hawkes & M. R. Hull *Camulodunum* type 184.
- 5 - Fishbourne harbour area.
- 6 - Fishbourne.
- 7 - Gloucester.
- 8 - London, Old Broad Street, cf. R.E.M. Wheeler *London in Roman Times*, Pl. LV, 1.
- 9 - Waddon Hill, Dorset.
- 10 - Fishbourne Palace.
- 11-16 - Gloucester-Kingsholm.
- 17 - Usk.

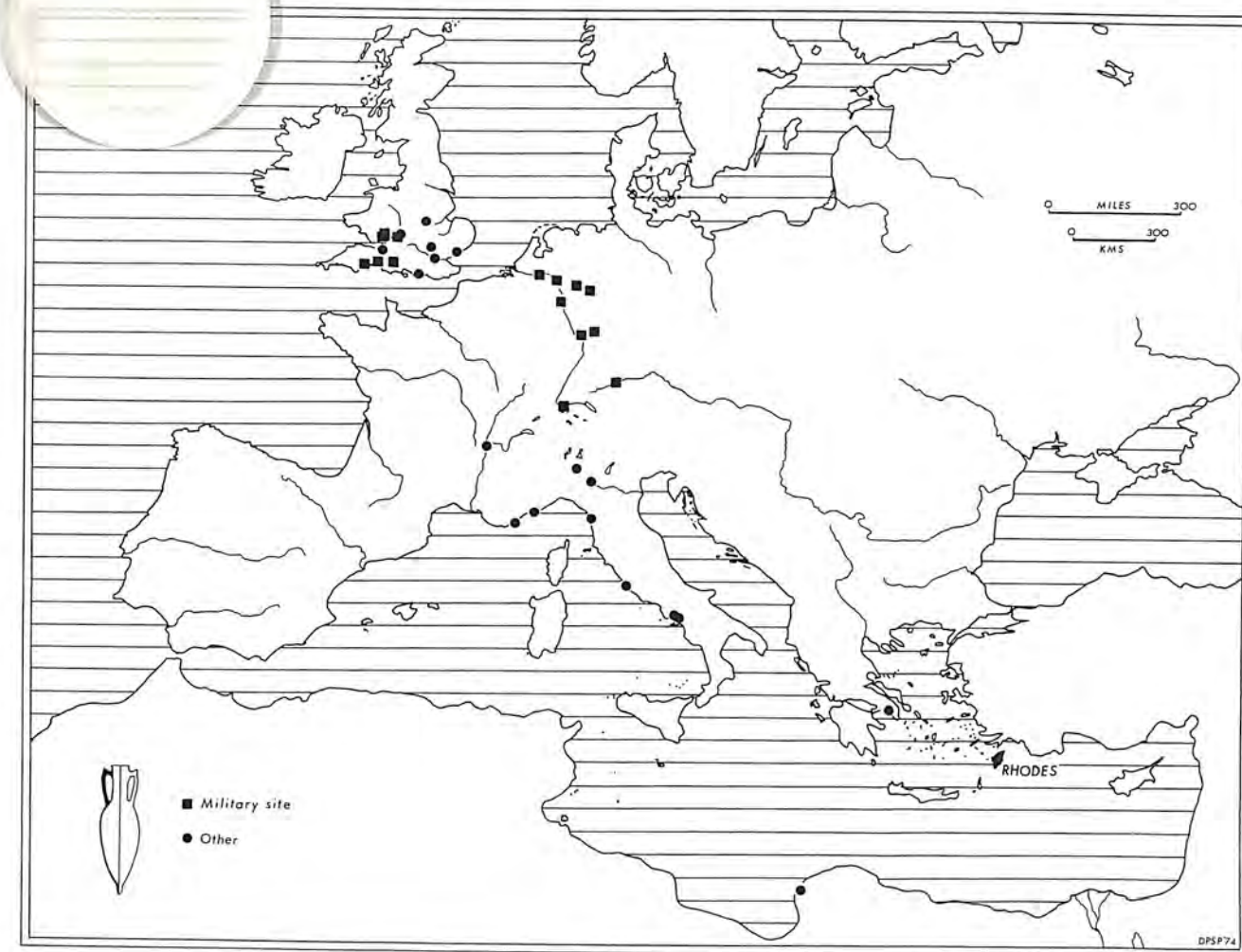


Fig. 4 - Distribution of peaked handled, Rhodian type amphorae.

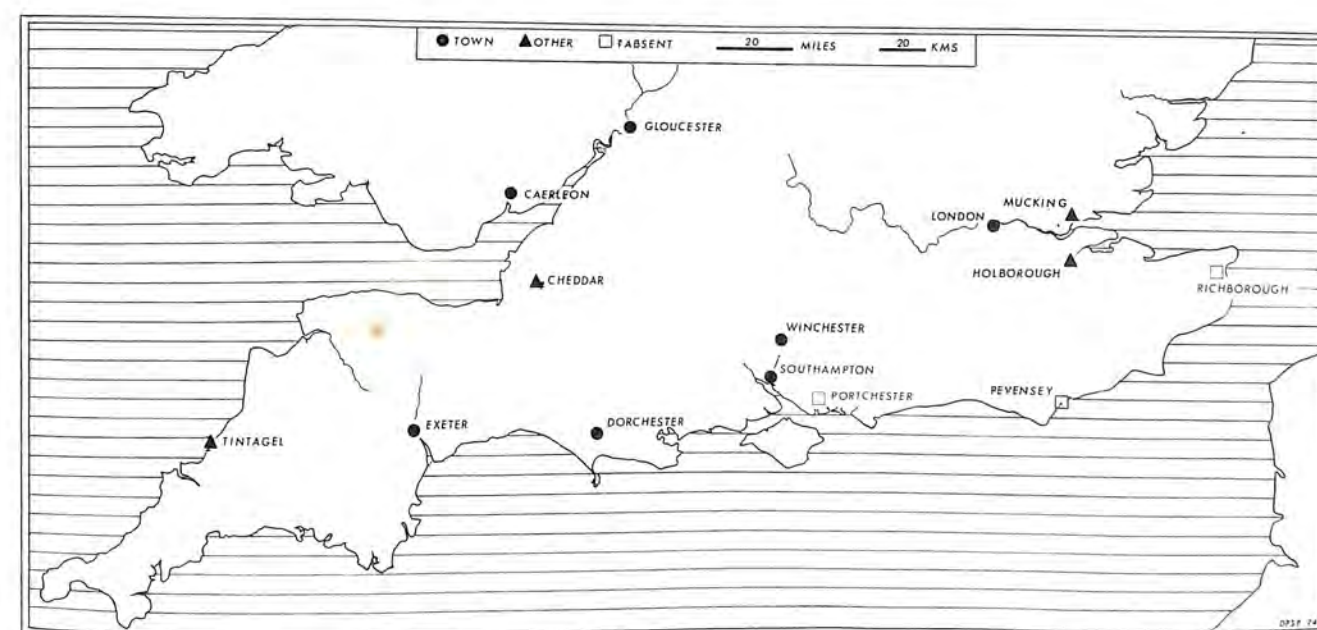


Fig. 5 - Distribution of African (Byzacena) cylindrical amphorae in southern Britain.

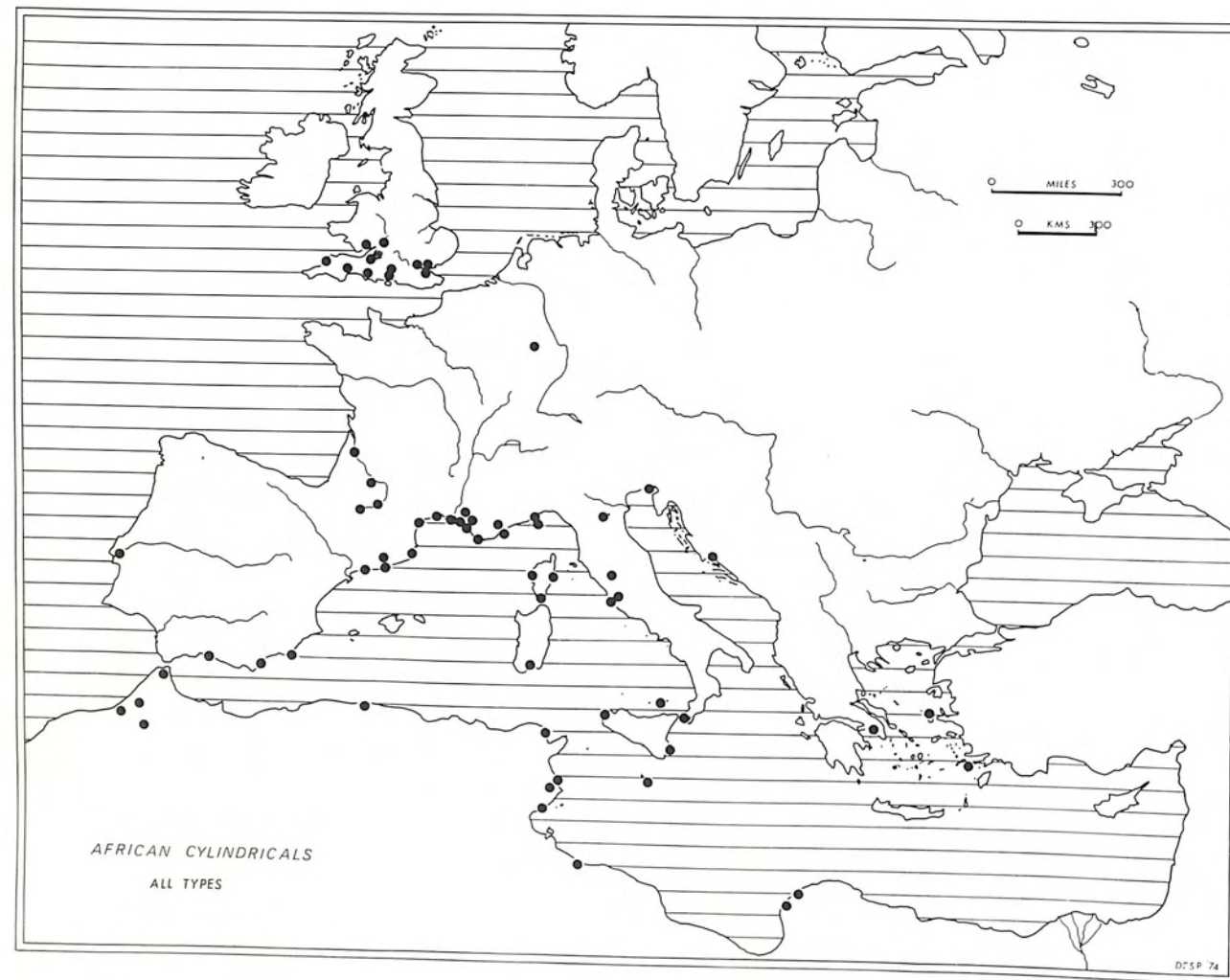


Fig. 6 - Distribution of African cylindrical amphorae.

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TEL. 72 17 482

March 9

Dear Miss Grace,

Thank you very much for the delicious and enjoyable lunch the other Sunday.

Last year you kindly gave me dates of the Rhodian amphorae in the Agora which Peacock analysed. I have a query over SS 7932 which I wrote down as 1st. cent. BC to c. 70 BC; should this be 70 AD?

I am due to sample the remaining Roman amphorae on March 19.

Yours sincerely Richard Jones

THE ROMAN AMPHORA TRADE WITH
LATE IRON AGE BRITAIN

D. F. Williams

Introduction

The majority of traded commodities in the ancient world, many of them perishables, have rarely left traces behind for the archaeologist or historian interested in the trade-routes and commerce of antiquity. However, certain valued items of trade such as wine, olive-oil and fish products were commonly transported long distances in large pottery amphorae, tightly sealed and sturdily built to stand up to the buffeting of the journey. Sherds of these vessels are often found on a variety of sites during the Greco-Roman and Byzantine era. A detailed study of such amphorae can sometimes provide invaluable evidence of economic activity not readily available from most other classes of pottery. These large two-handled jars were specifically intended as containers for bulk carrying of goods, and unlike the majority of other pottery types, it was the contents that were prized rather than the vessel itself. From this it follows that an appreciation of the goods carried in amphorae and their origin can furnish us with information on the ancient economy, the trade routes employed and the relative importance of the centres of exportation and importation. Additionally, it may throw some light on the lifestyle of the people who chose to import the best Italian wine or acquired a taste for Spanish fish sauces.

Despite the fact that amphorae were apparently produced in large quantities, and might well be broken up on receipt of their contents, there is a high degree of standardization within each category of form. The various producing centres appear to have had their own particular amphorae shapes, perhaps for easy recognition of the contents, although similar types were sometimes made in diverse areas. Fortunately, an appreciation of the fabrics involved, largely through the application of petrological studies, is beginning to allow certain amphorae types to be confidently allocated to the exporting centres involved in this trade. Of equal importance, formless bodysherds can now often be attributed to particular types. These last two points are especially relevant for late iron age studies in southern Britain. A detailed examination of the forms and fabrics of Roman amphorae in pre-Roman Britain by Peacock (1971) some ten years ago, considerably advanced our understanding of the trade contacts, chronology and political events of the British La Tène III period. In this paper, it is the purpose of the writer briefly to re-examine this material in the light of recent amphorae discoveries in southern Britain during this period.

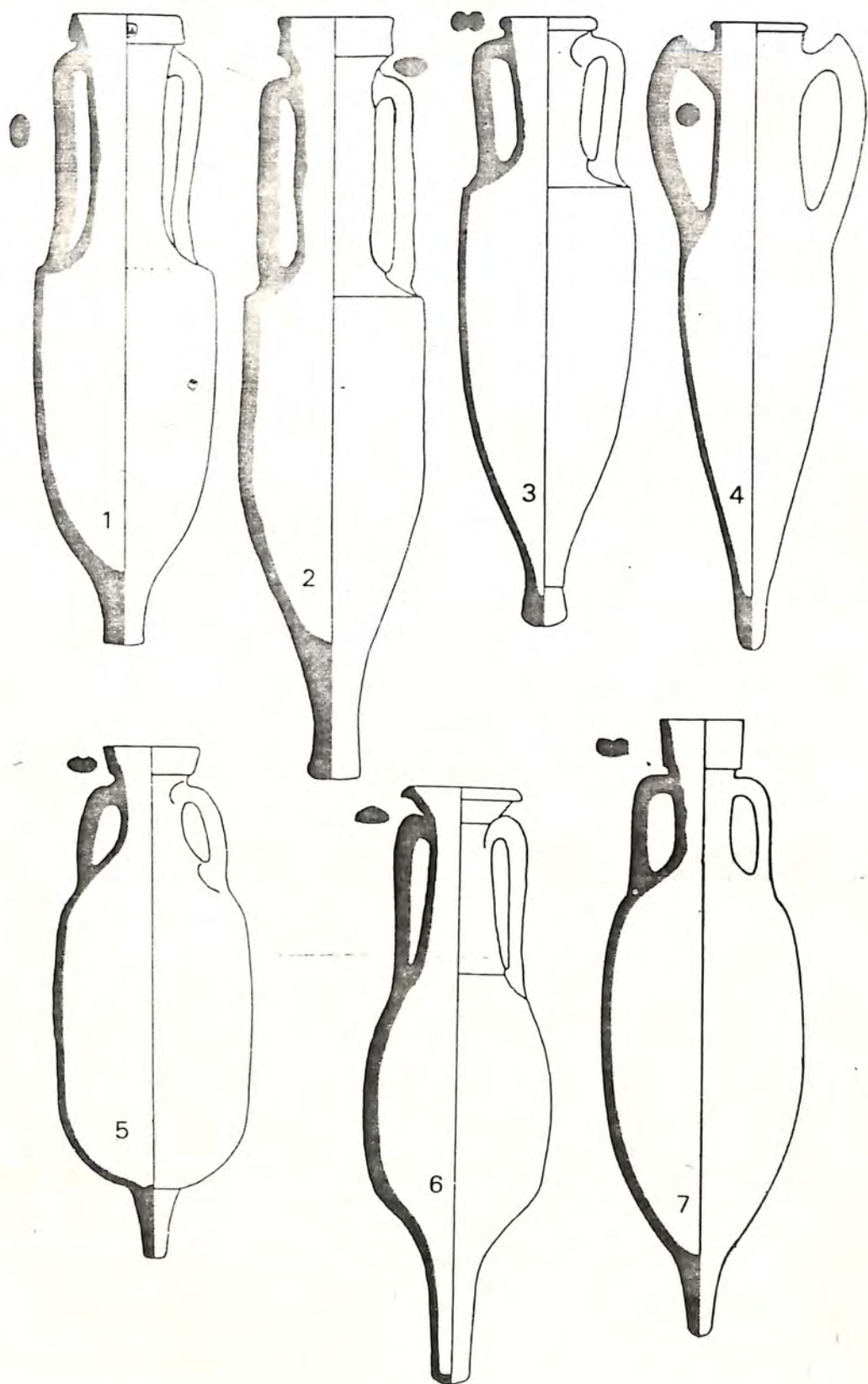


Fig. 7:1. Amphorae types: 1. Dressel 1A, 2. Dressel 1B, 3. Dressel 2-4, 4. Rhodian style, 5. Southern Spanish, Cam. 185A, 6. Southern Spanish, Cam. 186A, 7. Dressel 1-Pascual 1. 1-6 after Peacock (1971), 7 after Tchernia (1971). Scale 1/10.

Roman amphorae in late iron age Britain

In his study of amphorae in British pre-Roman iron age contexts, Peacock (1971) drew attention to the variety of sources from which these vessels had originated. He was able to demonstrate, for example, that the important second and first century B.C. Dressel form 1 wine amphora (Fig. 7:1, 1 and 2) was made principally in Campania and Latium (later extended to include Etruria: Peacock, 1978). Moreover, the Dressel 1A type with its jutting triangular-rim (Fig. 7:1, 1) and the 1B variety with a near vertical collar-rim (Fig. 7:1, 2), turned out to be petrologically similar, both containing characteristic inclusions of green augite and volcanic rock, and therefore did not represent the products of two distinct areas as had been previously suggested (Ettlinger, 1960).

The distribution pattern in Britain of these two amphorae types is revealing (Peacock, 1971, fig. 36). The earlier Dressel 1A form, dating from at least the mid-second century to about the mid-first century B.C., is present in some numbers at Hengistbury Head in the south of the country, with outliers as far away as Carn Euny, Cornwall (Williams, 1978) and Mushrooms Farm, Braughing, Hertfordshire. Finds of the later Dressel 1B form are concentrated in the south-east of the country, more especially the Hertfordshire-Essex region. The two distribution patterns seem to reflect historically known events: (a) the uprising of the Gaulish Veneti in 56 B.C., disrupting Roman trade with Hengistbury Head, and (b) the friendship of Rome with the Trinovantes in the east of the country following Caesar's expedition to Britain in 55 and 54 B.C. Both of these events appear roughly to coincide with the typological change in amphora form from Dressel 1A to 1B.

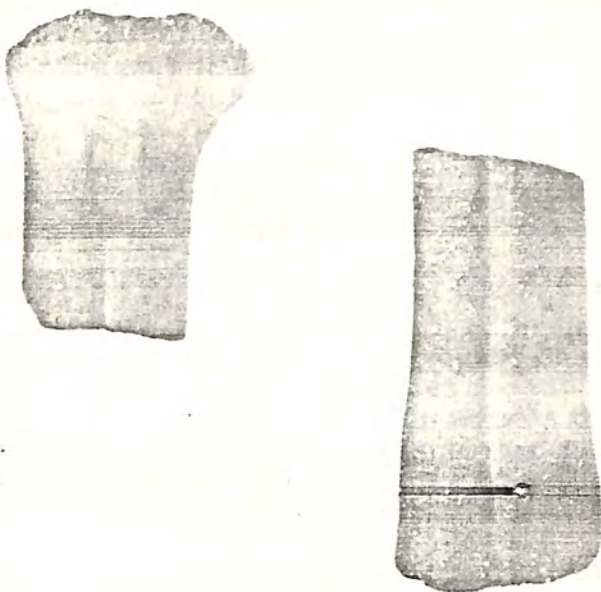
The appearance of the Dressel 1 amphora in Britain can perhaps be summed up as follows. Importations of the 1A variety arrived at Hengistbury Head during the period from the second half of the second century to just before the middle of the first century B.C. A small number of the Dressel 1B form also occur at Hengistbury Head. This suggests that the shift of Dressel 1 amphorae supplies from Hengistbury Head took place at the very time of the change in form. Unfortunately this typological change cannot be precisely dated, but sometime around the middle of the first century B.C. would be in keeping with the continental evidence (Peacock, 1971). The Dressel 1A type was essentially a wine amphora, and the British finds appear to have come mainly from Campania, Latium and probably Etruria (Peacock, 1971; 1978). According to Peacock, the trade-route to Britain is likely to have been via Narbonensis and the Garonne Waterway, and then around the coast of Brittany into the English Channel. The Dressel 1B type, which appears predominantly in the Hertfordshire-Essex region, seems to have been coming in the main from the same producing areas and may have followed the same trade-route as its 1A predecessor.

The writer has supplemented Peacock's thin section analyses on both variants of the Dressel 1 form, in the hope of working out the proportions of vessels which were sent from the various Italian centres to Britain. With one fabric exception, the results have proved disappointing, as it has been difficult to achieve clear-cut geological groupings. This is undoubtedly due to the fact that the three main producing centres of Campania, Latium and Etruria are all covered by fairly similar volcanic tracts. In addition, any slight nuances of fabric may well be accounted for in the manufacture of the amphorae on different farming estates within a given region, rather than seeing them as diverse products of large 'factory-type' concerns (Peacock, 1971, 164). The one exception to this is the 'black sand' fabric associated with the Dressel 1B form in British contexts. An origin in the Latium region has been suggested for this distinctive fabric, easily picked out in the hand specimen, on the basis of the occurrence of yellow garnet in thin section (Courtois and Velde, 1978). However, yellow-brown garnet is also a feature of the sands further south, and a Campanian origin, in particular the augite rich black sand area around Pompeii and Herculaneum, has been more convincingly argued by Peacock (1977a, 153).

Dressel 1B appears unaccompanied by other forms of amphorae in the rich Welwyn-type burials which have been dated independently by the associated metalwork 50 - 10 B.C. (Stead, 1967). The earliest appearance of new amphorae forms in eastern Britain is at the Lexden Tumulus near Colchester, where ten Dressel 2-4 types and one Rhodian style were buried together with four Dressel 1B vessels (Laver, 1927). The Greco-Roman Dressel 2-4 form with simple beaded rim and bifid handles (Fig. 7:1, 3) and the Rhodian style with sharp peaked rod handles (Fig. 7:1, 4), both seem to have been produced from the last ten to fifteen years of the first century B.C. The former superseded the Dressel 1B, which stopped being made around this time. A date within the last fifteen years of the first century B.C. would thus see the arrival in eastern Britain of the Dressel 2-4 and Rhodian types, although the latter form is probably more characteristic of post-Claudian contexts.

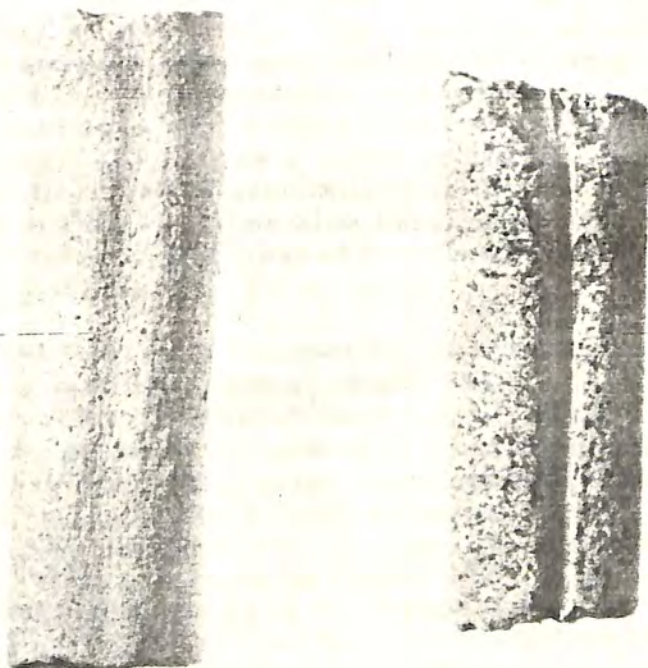
Selective thin section examination of the Lexden Dressel 2-4 amphorae shows that these types were initially coming from Italy. The Lexden tumulus is also revealing in that no Spanish amphorae forms are present in what is a relatively large group of vessels. This suggests that at this time Spain took at best a very minor part in the amphorae trade to eastern Britain. As the Greco-Roman amphorae types are well represented in the Rhineland during this period (Ettlinger, 1977), the main trade-route to Britain was probably via the Rhône-Rhine waterways. Gallo-Belgic pottery, for example, starts to appear in Britain at this time, or shortly after, and may have accompanied the amphorae via the Rhine.

Small amounts of southern Spanish and Baetican amphorae appear in Period 1 (A.D. 10-43) levels at Camulodunum in the form of Camulodunum 185A with its characteristic grooved handles (Fig. 7:1, 5), the bell-mouthed Camulodunum 186A



cm
inch

Pl. 7:1. Two handles of Dressel 1-Pascual 1 type, Fabric 1 (Cleavel Point, Dorset).



Pl. 7:2. Two handles of Dressel 1-Pascual 1 type, Fabric 2 (Cleavel Point, Dorset).

(Fig. 7:1, 6) and the globular Dressel 20 (Hawkes and Hull, 1947). These early Spanish forms also appear in some numbers in the Rhineland (Ettlinger, 1977), which suggests that their arrival in eastern Britain was again via the Rhône and Rhine.

The late iron age tribes of the central south coast area of Britain do not appear to have obtained much in the way of the Spanish fish products which seem to have been the major contents of the southern Spanish amphorae, or the Italian wine associated with the Dressel 2-4 types, both of which were enjoyed in increasing numbers by the Belgic tribes in the south-east of the country. However, the view that amphorae are very thin on the ground in the former area from about the middle of the first century B.C. until the Conquest, now needs to be radically altered following recent excavations at two coastal sites within the Durotrigian region: Cleavel Point, Ower and Hengistbury Head.

Both Cleavel Point and Hengistbury Head have produced a number of examples of a distinctive amphora made in the Catalan region of northern Spain. Stratification details are at present awaited for Hengistbury Head, but at Cleavel Point these amphorae were associated with Tiberian imitation Gallo-Belgic forms, together with pottery from the Aquitaine region of France which could be early Augustan in date (information from Jane Timby). The amphora in question is Dressel 1 - Pascual 1 (Fig. 7:1, 7), which was based on the Italian Dressel 1B type, and which has a high vertical rim, cylindrical neck, ovoid body and rounded handles with a distinctive longitudinal groove (Pascual, 1962). This amphora form probably held wine, as the Layetanian area where kilns producing this type have been found (Pascual, 1977), was praised by Martial (xiii, 118) as having a quality of wine second only to that of Campania. Production of this form has also been claimed in south-west France at Aspiran, just west of Montpellier (Genty, 1975; Fontes et al., 1981).

Two fabrics of Dressel 1 - Pascual 1 are represented at Cleavel Point and Hengistbury Head. Fabric 1 is in a hard, rough, dark red to reddish-brown fabric (Munsell 10R 4/4 to 4/6), with large white inclusions of quartz and feldspar, golden mica and fragments of granite scattered throughout (Pl. 7:1). Fabric 2 is in a slightly softer, smoother, creamy-white fabric (between 7.5YR 8/2 and 7/4), lacking the mica but containing the quartz and feldspar present in Fabric 1 (Pl. 7:2). Both fabrics appear to have been made in the Barcelona region (Pascual, 1977), but Fabric 2 may also have been produced a little further south down the coast of Spain.

Dressel 1 - Pascual 1 types are present on the continent in contexts ranging from late Republican/early Augustan at Vieille-Toulouse to A.D. 79 at Pompeii (Tchernia, 1971, 52-54), though the main export thrust was probably well over before this latter date. Outside Spain, the majority of dateable finds of Dressel 1 - Pascual 1 tend to be Augustan in date (Hesnard, 1980; Deniaux, 1980; Thill, 1967; Fontes et al., 1981; Tchernia, 1971).

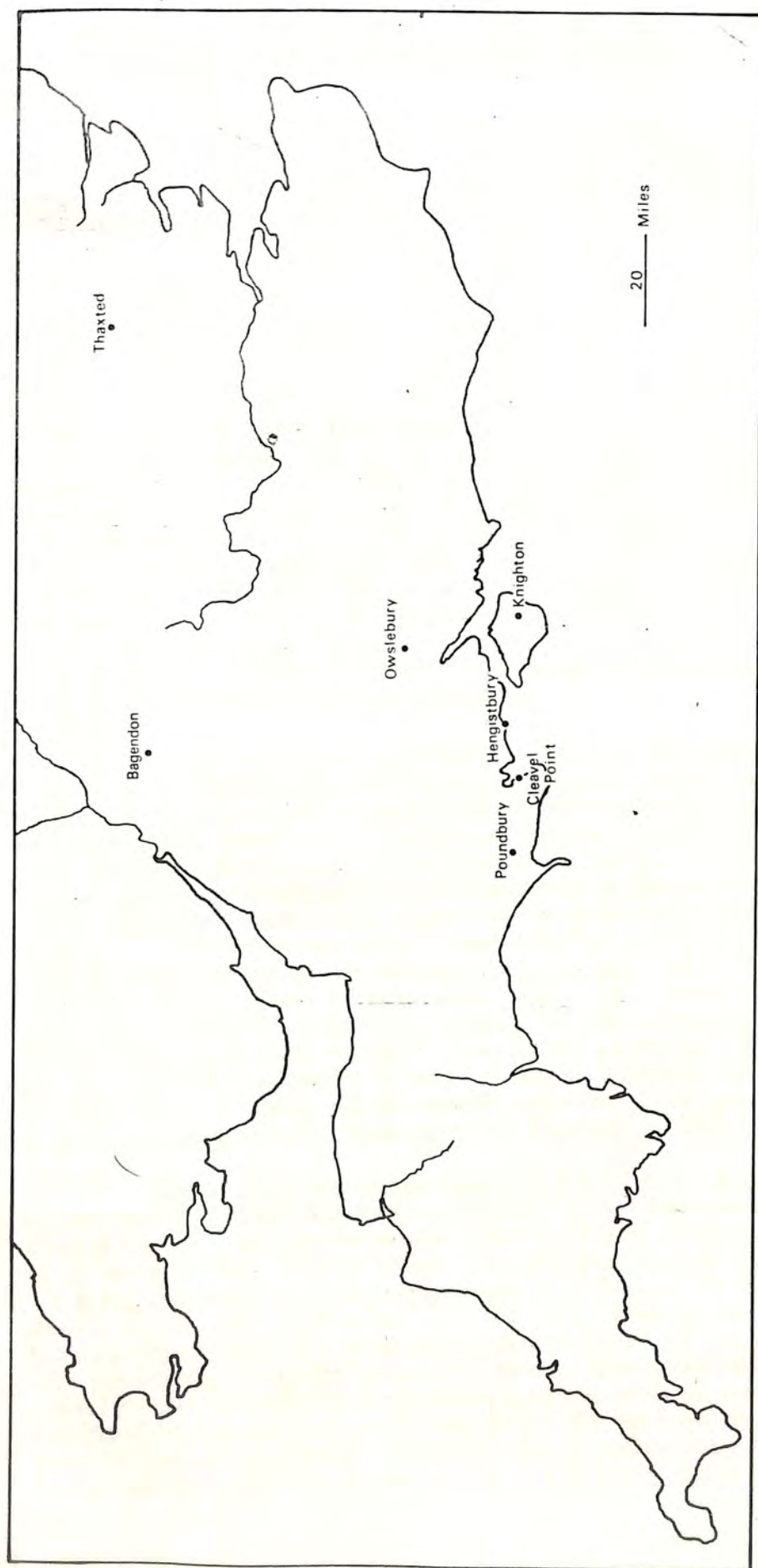


Fig. 7:2. Distribution of Dressel 1 - Pascual 1 amphorae in southern Britain.

An Augustan, or possibly Tiberian, date for the Dressel 1 - Pascual 1 finds from Cleavel Point would thus fit in very well with the continental evidence.

The main distribution area for Dressel 1 - Pascual 1 appears to have been Narbonensis and Aquitania (Parker, 1977), though small numbers are to be found in Italy (Hesnard, 1980), Germany (Tchernia, 1971, 56-57; Thill, 1967, nos. 11 and 52) and Lower Normandy (Deniaux, 1980). In Britain, in addition to the finds from Cleavel Point and Hengistbury Head, sherds from likely Dressel 1 - Pascual 1 vessels have recently been recognised at Bagendon, Gloucestershire (site dated A.D. 20-50), Knighton, Isle of Wight (unstratified), Poundbury, Dorset (unstratified), Owslebury, Hampshire (stratification details awaited), Thaxted, Essex (possibly associated with a Dressel 1B amphora-burial) and perhaps at Colchester, Essex (Hawkes and Hull, 1947, fig. 45, no. 2 - unstratified). On the present evidence, the distribution of Dressel 1 - Pascual 1 in Britain shows a distinct southerly bias, more especially in the suspected territory of the Durotriges. Given the comparative paucity of Dressel 1 - Pascual 1 finds in the Rhineland (Parker, 1977, 37), and only one pre-Conquest occurrence in eastern Britain, it seems likely that supplies of this amphora came from northern Spain via the Narbonensis-Garonne route around the coast of Brittany. The use of this route would also more easily explain the presence at Cleavel Point of early Augustan pottery from Aquitania.

It may be significant that no southern Spanish fish-paste amphorae or Italian Dressel 2-4 types appear in the early first century A.D. levels at either Cleavel Point or Hengistbury Head, although these forms are found in some numbers in the eastern part of the country at this date (Peacock, 1971). A possible explanation may be some form of regional differentiation of amphorae deliveries to the later iron age tribes of pre-Conquest Britain. The south-eastern tribes may have received southern Spanish fish products and Italian wine via the Rhône-Rhine route, while the tribes of the Durotrigian region and surrounding areas possibly obtained Catalan wine by way of the Garonne waterway. If the Durotriges particularly wanted fish products, these could perhaps be obtained from a source closer at hand, namely a number of sites along the Brittany coast which specialised in producing garum, etc. (Sanquer and Galliou, 1972).

Quite what the appearance of Dressel 1 - Pascual 1 amphorae in British iron age contexts means in terms of regional distribution is not immediately clear. More work obviously needs to be done in this area of research, but the possibility exists that what we are seeing in the amphorae distribution is some form of social and economic division, in terms of long distance products, between the tribes of the south-east and those of the central south. The presence in the Durotrigian area of late first century B.C. - early first century A.D. Roman amphorae at Cleavel Point and Hengistbury Head, suggests that the tribe may not have been anti-Roman at this time, whatever the position may have been in the immediate pre-Conquest period (Wheeler, 1943, 63).

Acknowledgements

I should like to thank the following for allowing me to examine amphorae from their sites: Prof. Barry Cunliffe (Hengistbury Head), Dr. John Collis (Owslebury), Peter Woodward (Cleavel Point), Clive Partridge (Braughing), Chris Going (Thaxted) and Chris Green (Poundbury). Dr. David Peacock kindly read a draft of this paper, though the writer must alone take responsibility for the views expressed.

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On Pearson's Letter

Further discussion on them, & their method, with Richard Jones today.

He was here to take further Kovan samples for testing. He said Pearson's thin sections will be available, and can be checked for other problems. (E.g. to see if there is a difference between earlier & later etc.)

DEPARTMENT OF ARCHAEOLOGY

TEL. SOUTHAMPTON 559122

TELEX 47661



UNIVERSITY
OF
SOUTHAMPTON
SO9 5NH

Professor A. C. Renfrew, M.A., PhD., Sc.D., F.S.A.

DPSP/AE

8th November, 1978

Dr. Virginia Grace,
American School of Classical Studies,
54 Souedias Street,
Athens 140, Greece.

Dear Dr. Grace,

Many thanks for your very prompt reply to my letter and for forwarding the further information about the linings inside amphorae. It is very useful to have this.

Good wishes,

Yours sincerely,

Dr. D.P.S. Peacock

*36 written again
ask him for a photo
of him "Pencil" amphora*

ROMAN : PEACOCK

12

another copy
field and
TECHNIQUE: 3 MEASURING

American School of Classical Studies
54 Swedias Street, Athens 140, Greece

October 17, 1978

Dr. D.S.S. Peacock
Department of Archeology
University of Southampton
SO9 5NH England

Dear Dr. Peacock:

About the smearing of the insides of ancient amphoras, I enclose a photocopy of part of a letter of 1970 from me to R. H. Brill, which contains some references. You might write to Mr. Brill, who may have gone further with this investigation. Ancient mentions of the practice, see Hesperia 1953, p. 261 and ibid. 1958, p. 173, on a passage in the Atti Stelai. There are mentions in papyri, cf. Cairo Zen 59741, which lists unsmeared (smaller) containers.

The Knidian-shaped and Knidian-marked handle of Rhodian clay cited in EAD 27, 319-320, belongs to a period of probable Rhodian administration of Knides. I do not know of any large number of such pieces. Perhaps the few that were made were actually made in Rhodes. For your Southampton amphora to take its place as evidence, we need some kind of ~~xxxx~~ identification, an illustration by which we can see it for ourselves in your publication, and perhaps estimate its date, or at least an inventory number by which we can ask to see it when paying a visit.

I am pretty sure you would have no trouble ~~ix~~ in getting permission to take some more samples from some of the ^{Agera} pieces tested by Sayre. This time you would probably have to do the chores yourself, or possibly arrange to have it done by one of your students? It does take some time to get the needed permission from the Archeological Service, possibly even three months, I have heard.

Yours sincerely,

No
with
this
which
8.11.78

DEPARTMENT OF ARCHAEOLOGY

TEL. SOUTHAMPTON 559122

TELEX 47661

UNIVERSITY
OF
SOUTHAMPTON
SO9 5NH

Professor A. C. Renfrew, M.A., PhD., Sc.D., F.S.A.

DPSP/SS

Dr. V. R. Grace,
American School of Classical Studies,
54 Souidias Street,
Athens 140,
GREECE

6th October 1978

Dear Dr. Grace,

Many thanks for your letter which was awaiting my return from Italy. I am sorry you have had to wait so long for a reply. It was very good of you to send the readings and I will now look again at my slides to see if I can say anything further.

I was very glad to have your comments on my paper and am happy to send you my reactions. It was good of you to enclose Dr. Sayre's unpublished work and I agree that the contrast between his Rhodian and Knidian samples is striking. However I did manage to read your reference and do feel that I understand the picture clearly. My text after all refers to amphorae and not to a single amphora. I feel that Dr. Sayre's results demonstrate that there is a contrast in the clays normally used by Rhodian and Knidian potters. However I still think it possible that there might be clay beds on the Knidian peninsula, similar to those used by the Rhodian potters and that these might occasionally have been used for the production of amphorae. This would resolve the problem of my Southampton amphora and it would solve the question of clay transport from Rhodes to Knidos. It seems to me a somewhat strange thing to do when admirable clays are available on Knidos anyway. Clearly further research is required to resolve this matter and one approach might be to make further geological investigations into the clays of Knidos. Alternatively it might be resolved if I were to examine petrologically some of the samples already studied by Dr. Sayre or if he could analyse chemically my problem amphora.

With regard to the Southampton amphora I fear my paper mentions no reference because it is unpublished and alas it is devoid of an inventory number. I will certainly send you a photograph of it when I have got one printed but the stem ^{handle} is alas encrusted with sea accretions and the curator is not at all keen to have these removed.

-2-

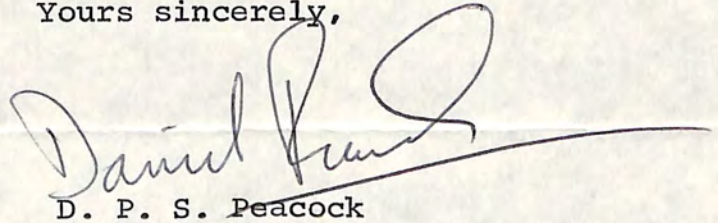
We have discussed Dressel 1 and the Grand Congloué before and I certainly accept your dating. In my paper I was merely trying to show that X-ray diffraction could bring out the differences that we already knew to be present.

q. 18 263-4
this which
Finally I shall be very grateful indeed for any extra bibliography concerned with materials from the interior of amphorae. I realised my list was by no means complete but thought it worthwhile to mention the examples I had come across.

It is very good of you to take the trouble to write and I am very glad to have your comments. I hope that you will find my replies satisfying.

With good wishes.

Yours sincerely,



D. P. S. Peacock

American School of Classical Studies
54 Swedias Street, Athens 140, Greece
August
July 2, 1978

Dr. D. P. S. Peacock
Department of Archeology
University of Southampton
SO9 5NH England

Dear Dr. Peacock:

Thank you for the offprint of your contribution to the Colloquium of May 1974, now published in 1977 by the French School in Rome. By this time you will have too flattering an impression of my promptness in reacting to offprints received, but I fear it is only yours that I read quickly, or manage to write about. In this case also, I realized that I had promised you readings and comments on the stamps, especially dates. This takes a fairly long time, and had waited (with a lot of ^{cards} ~~cards~~, etc., held out of place for the job that kept being postponed). Now I enclose both readings and comments, in case you can still make use of them. I have also some comments on the text of your paper, and would like your reaction on these points.

In the first place, you have not got the picture of Sayre's investigations and discoveries about the contrast between Rhodian and Knidian clay samples. In your note 6 you cite the reference I gave you on these investigations and their results, with a courteous acknowledgment. But perhaps you were not able to consult my text yourself. Sayre's opinion there given was not based on the single Knidian and single Rhodian handle (not from the Agora excavations) on which he reports in his article AJA 1957, pp. 35-41. He sent us copies of a long report that included comment on the stamped handles from the Agora. I enclose photocopies of some of the diagrams he sent ^{with his report} which show the contrast between the Rhodian and the Knidian clay. Unfortunately as far as I know he has not published on this material, but he saw and approved my text in the Delos volume before it was printed. The contrast between these graphs of 4 Rhodian and 11 Knidian handles is surely striking.

X referrer
entirely used

1) Brooklyn

2) Collect
Southampton

3) Grand
coul-

4) Smeary

1) Perseus

⊗ Sayre's
figs 1,
2, and 3

2 Jar
in South-
ampton
On p. 262, you mention having made a petrological study of a Knidian amphora in the Southampton Museum, without mention of a publication reference or an inventory number. I do not have any record of this jar. In exchange for samples and information given to you in the past, please send me photographs of this amphora and its stamps, and/or rubbings of its stamps. I can then date it for you.

3 Gr. Congl.
On your p.263, you contrast the diffraction patterns as between Dressel I on the one hand, and Greco-Italic and Rhodian on the other, all from the Marseille wreck complex. Should perhaps bear in mind that the Greco-Italic and Rhodian ^{of Gr. Congl.} date from the same place at about the end of the 3rd century B.C., while the Dressel I - you should be able to date better than I can, but surely not before the last quarter of the 2nd.

4. Smears
As to smears in side jars, I could give you more bibliography if you wanted it. Robert Brill of Corning Glass has tested a number of samples. I have not seen as yet a publication of his results. Some of the work was done in 1970.

I think it very worthwhile that you continue to make your tests that supplement the others done by a different method.

Yours sincerely,

Virginia R. Grace

*Another copy has been
circulated for a proofreading card.*

Stamped Rhodian fragments tested by D.P.S. Peacock; VG comment on stamps

1. SS 1577. Top of jar of ENIKPATHE with cornucopia~~is~~, term of HAYEANIAE 3rd. Second quarter of 2nd century B.C. On three Rhodian eponyms HAYEANIAE, see EAD (Delos final vols.) 27, under E 12; this ["neck of a jar of ENIKPATHE" is mentioned there with reference to a previous publication. of this piece.
2. SS 1901. Handle from jar of AAMOKPATHE with rose stamp.
Late 3rd - early 2nd century B.C. One of the most productive potters of his period. On this AAMOKPATHE, see my note in Pergamon XI, 1, p. 175 under no. 2 (written but not proofread by VG). Cf. also EAD 27 (see index).
3. SS 2018. Handle ^{of} MAPEYAE with much of vertical part preserved; test fragment taken from this part. First half, probably first quarter, of 2nd century B.C. Cf. EAD 27, p. 314 under E 37, on late types (second quarter) of the same man or firm.
4. SS 3793. Top of jar of AAMOZENHE, term of KAAAIKPATHE 1st. 3rd century, third quarter. From Agora deposit N 10 : 2. On the deposit, about contemporary with H.A. Thompson's Hellenistic Group B, see VG in Hesperia 1963, p. 326, note 16; mention of KAAAIKPATHE 1st here and op. cit. p. 324, note 12. But correct absolute date of Group B and related from ca. 275 B.C. to ca. 240, cf. VG in Ath. Mitth. 1974, pp. 193-200.
5. SS 3798. Neck with one stamped handle preserved, from jar dated in the term of HAYEANIAE 1st. 3rd century, third quarter. From

deposit N 10 : 2, see above under no. 4. On this ΠΑΥΞΑΝΙΑΣ, see again EAD 27 under E 12.

6. SS 3784 plus 3811. Top of jar of ΖΗΝΩΝ in the term of ΣΩΚΑΡΗΣ. 3rd century, third quarter. ~~From~~ From deposit N 10 : 2, see above under no. 4. On ΣΩΚΑΡΗΣ, see EAD 27, p. 293, where he is listed among eponyms close in date to Group B (dated now ca. 240 rather than ca. 275 B.C., see above).

7. SS 7932. Top of jar bearing two rose stamps; no names have been identified. 1st century B.C., to ca. 70 B.C. From Agora cistern N 20 : 4, bottom filling; on the cistern, see summary EAD 27, under E 106. SS 7932 was found with a coin dated 85-70 B.C. by J. H. Kroll. Profile of neck and handle, cf. Rhodian jars from Antikythera, dated 80-70 B.C., see Trans. Amer. Phil. Society 55, 1965, p.11 on date, and fig.2 for shape.

Copy of the
is given in the
deposit card for
N 20 : 4.

8. SS 10071. Top of jar of ΣΩΕΙΚΑΗΣ, term of ΑΡΙΣΤΟΘΟΑΙΣ. 2nd century B.C., probably early in the last quarter. The eponym is referred to in EAD 27, p. 312, under E 33. Whole jar of ΣΩΕΙΚΑΗΣ, term of ΑΛΕΞΙΝΑΣ, see Colt and others, Excavation at Nessana, pl. XXXIX, cf. p.112.

9. SS 11470. Handle with stamp of ΑΡΙΣΤΑΡΧΟΣ, with asterisks in the corners. Ca. first quarter of 2nd century B.C. Gentili (~~pp~~ p. 35, nos. 9 and 10) reports two amphoras of this potter dated in the term of the eponym ΣΥΜΜΑΧΟΣ; on the eponym, cf. EAD 27, p.295, note 1. Full title of Gentili's publ., see EAD 27, p. 287.

10. SS 12325. Stamped handle naming the dating official
ΑΘΑΝΟΔΟΤΟΣ. From the construction filling of the Middle
Stoa in Athens (a possibly disturbed part). Early 2nd
century B.C.
11. SS 12874. Stamped handle from jar of ΑΙΝΕΑΣ with month in
rose stamp (circular). From the construction filling of the
Middle Stoa in Athens. Early 2nd century B.C. On rose stamps
of ΑΙΝΕΑΣ, see J. Bouzek and others, Anatolian Collection of
Charles University, [Kyme I], Prague 1974, pp.93-94. Similar-
ity of types suggests that the matching stamp on the other
handle of the jar ^{of SS 12874} named the eponym ΚΑΑΑΙΚΡΑΤΙΔΑΣ 2nd, on whom
cf. EAD 27, p.295, note 1.

Stamped Rhodian fragments tested by R.P.S. Peacecock: readings of stamps

- SS 1577 a) 'Επὶ Πausan[
(1) α Πανάμου
- b) 'Επὶ κρᾶ cornu-
τε[υς] copia
(pair)
- 1901 Δαμοκράτευς
(2) rose
- 2018 Μαρσύα
(3) 'Υακινθίου
- 3793 a) Καλλι
(4) κρ[άτης]
- b) Δαμοσ
θένευς
- 3798 'Επὶ Πau
(5) σαν[α]
- 3811 + a) Σωχ
3784 ἀρης
(6)
- b) Ζη
νων
- 7932 a,b) 2 illegible rose stamps
(7)
- 10071 a) 'Επὶ 'Αριστο
(8) πόλιος
Δαλίου
- b) Σωσιπλεῦς
caduceus r.
- 11470 *
(9) 'Αριστάρχου *
- 12325 'Επὶ 'Αθαν[
(10) δότου
Πανάμου

SS 12874
(11)

rose
Αίνεα 'Αγραμύρ[ου]

on duty, Donald, Jim
at Gr. Cong.

ROMAN: DEACON (12. viii 77)
1. viii 73 Take
this up
most time [15.01]
with
Sun p. 2

Dear Dr. Percod
\$ w 87

Thank you for your Bulletin on the
project: list of Pluckin and Pluckin (?)
clay. ^{When} ~~When~~ you get them done,
the results will, ^{certainly} be of considerable interest.
~~Don't forget to consider~~ ~~Percod's~~

In your letter of 11. viii 72, you
said you had seen "mention of the possibility
of two woods [at the Gr. Cong. site] in certain
books on underwater archaeology". If and
when these passages, or any of them, come
to your mind, I would ^{be glad} like to have reference
to them, which ^{perhaps I will} ~~then~~ cite in publication
(and would of course ask your assistance)

I enjoyed quite much our visit to you and
about the relative dates of the Dressel I
coins at Gr. Cong.

I cannot quite make out, if you read
both, whether you see any stylistic
(and hence chronological)
difference bet. the Dr. T. at G. Coult.
and the Agn. gr., Amphipr. fig 38,
esp. in l. To me they look very
similar. The last of the Agn. deposit,
C 9:70 is the last head of L Ind. cur.
(according to the jms, which is ^{very} late).
Others are days into the bur.

of any context. For the closing of the
shape, I do not know the context
that is earlier than this &
last decade of the century.

For your closely similar to Amphibius fig. 38,
 except that, and its parallel for the G.C.
 words, I do not know ^{any} context earlier
 than C 9:7. Do you? When one
 gets back ^{even} to the middle of the 2nd cent., one
 has something rather typical, e.g. Amphibius

(3)

Fig. 31, from 5 to right.

Pottery and Early Commerce

Characterization and Trade in Roman and Later Ceramics

edited by D.P.S. Peacock

*Department of Archaeology
University of Southampton
Southampton, England*

August/September 1977, xvi+340 pp. £12.80/\$ 25.00
0.12.547850.X

The value of pottery with regard to the study of trade and economic archaeology has only recently begun to be fully appreciated. In this book, contributors explore possibilities, define problems and suggest further areas of research on this theme. The rapidly expanding study of pottery used during the historic period has been directed mainly towards establishing chronology, with the ultimate goal of integrating archaeological discoveries within an existing historical framework. As a result of this bias, little attention has been paid to the economic aspects of pottery production and marketing, an imbalance which is remedied here. While the book concentrates on Roman and later material from Britain, the problems tackled and the approaches adopted are widely applicable.

Many of the papers presented in this volume utilize the results of scientific fabric analysis. Despite improvements in methods of characterization, these techniques have not figured extensively in archaeological thinking. The relevance of scientific work in this field is demonstrated not by theoretical argument but by the use of scientific data in order to reinterpret archaeological and historical information. Petrological techniques, first fully exploited in Anna Shepard's classic works, are used to elucidate sources and their importance is stressed.

This introduction to the scientific and economic study of coarse pottery will prove to be of great interest to Roman and medieval archaeologists, to archaeology students and archaeological scientists. Prehistorians and ceramicists will also find it stimulating.

Contents

Colin Renfrew: Introduction: production and exchange in early state societies, the evidence of pottery

D.P.S. Peacock: Ceramics in Roman and medieval archaeology

Michael Fulford: Pottery and Britain's foreign trade in the later Roman period

N. Loughlin: Dales ware: a contribution to the study of Roman coarse pottery

D.P.S. Peacock: Pompeian red ware

D.F. Williams: The Romano-British black-burnished industry: an essay on characterization by heavy mineral analysis

David A. Hinton: "Rudely made earthen vessels" of the twelfth to fifteenth centuries A.D.

Richard Hodges: Some early medieval French wares in the British Isles: an archaeological assessment of the early French wine trade with Britain

Alan Vince: The medieval and post medieval ceramic industry of the Malvern region: the study of a ware and its distribution

David A. Hinton: Fashions in floor-tiles

C.J. Arnold: The clay tobacco-pipe industry: an economic study

Index



Fish Remains in Archaeology

and Paleo-environmental Studies

Richard W. Casteel

Simon Fraser University, Burnaby, British Columbia, Canada

1977, x+170pp., £6.80/\$ 14.75

0.12.163850.2

This book provides both a comprehensive introduction to the concepts and potentials involved with the study of fish remains, and the most complete reference source of bibliographical data yet to appear on the subject.

Soil Science and Archaeology

Susan Limbrey

University of Birmingham, England

1975, xvi+342pp., £10.50/\$ 21.75

0.12.785477.0

"Dr Limbrey has produced an authoritative text which deserves a wider audience than its title might imply. The usefulness of soil science to archaeology is very well demonstrated, and the potential contribution of archaeology to our understanding of soil evolution is equally stressed."

Donald A. Davidson in Nature

Ancient Skins

Parchments and Leathers

R. Reed

The University of Leeds, England

1973, x+332pp., £9.60/\$ 15.50

0.12.785727.3

"A learned but highly readable work surveying the development of techniques of processing animal skin products, especially leather and parchment, from Egyptian times, in the light of modern scientific analysis."

History of Science

Methods of Physical Examination in Archaeology

M.S. Tite

University of Essex, Colchester, Essex, England

1973, xxviii+390pp., £8.50/\$ 21.75

0.12.785830.X

"The book covers a broad spectrum: techniques for locating archaeological sites, age determination and methods for analysing the composition of artefacts. Within each of these fields, Dr Tite carefully and lucidly describes nearly all the methods of proven value, including very recent developments, and in each case he gives useful examples showing how the techniques have been applied in archaeology."

D.P.S. Peacock in Nature

Land Snails in Archaeology

J.G. Evans

Department of Archaeology, University College, Cardiff, Wales

1973, xii+436pp., £12.50/\$ 25.75

0.12.785215.8

"This is probably the best available account of any aspect of research into the character of past human environments. It is authoritative and comprehensive, interestingly written, well structured and well illustrated."

British Book News

The Study of Animal Bones from Archaeological Sites

R.E. Chaplin

Anatomy School, Cambridge, England

1971, x+170pp., £5.50/\$ 8.50

0.12.785114.4

"This carefully produced and reasonably priced volume is the first in a series concerning the application of sciences to archaeology. The book is sensibly planned and....will be of interest to many excavators faced with practical problems of dealing with osteological material in the field."

Antiquity

Pottery and Early Commerce

Characterization and Trade in Roman and Later Ceramics

edited by D.P.S. Peacock

Academic Press

London New York San Francisco

A Subsidiary of Harcourt Brace Jovanovich, Publishers

24-28 Oval Road, London NW1, England

111 Fifth Avenue, New York, NY 10003, USA

Australian office: PO Box 300, North Ryde, NSW 2113, Australia

Printed in England



493L/77/08



Academic Press

London New York San Francisco

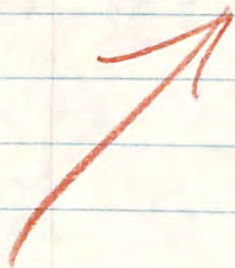
A Subsidiary of Harcourt Brace Jovanovich, Publishers

Visit here of ^{P.S.} D. Percech

He arrived at the Stoa actually yesterday, also his colleague Dr. Fulford. ~~also~~ Last evening they had a drink at 33.

Today I showed him photos of long jugs, especially those from Madaia and Marseille wares. Though he would not give a very narrow date, he thought 150 B.C. was definitely too early (and 50 too late).

He would like to know the Phoenician readings of the samples sent to him) and date with any not necessarily at all narrow.



18.01

DEPARTMENT OF ARCHAEOLOGY
TEL. SOUTHAMPTON 559122
TELEX 47661



UNIVERSITY
OF
SOUTHAMPTON
SO9 5NH

Professor A. C. Renfrew, M.A., Ph.D., F.S.A.

DPSP/JH

23rd July, 1975

Dr. V. Grace,
American School of Archaeology,
54 Souedias Street,
ATHENS 140,
Greece.

rec'd + shown to B. Johnson (with previous corresp.) 30. VII. 75

not yet ack'd

Dear Dr. Grace,

Thank you so much for your letter. I am delighted to learn that you expect to be in Athens in early September and look forward to meeting you and also Dr. Johnson.

With regard to the points you raise:

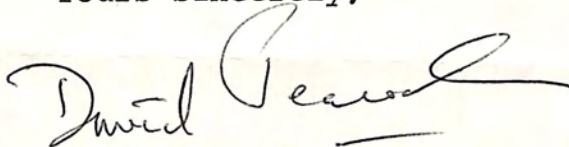
1. The only works of Marie Farnsworth that I know are published in Amer. J. Arch. 1970 and 1964. I find these quite useful as they provide data for petrological comparisons.
2. Most of the dating evidence for Dressel 1 that I know of is in my paper on "Roman Amphorae in Pre Roman Britain", though it is worth adding the Punta Scaletta wreck which has coins dating Dressel 1A to the mid 2nd century BC (Riv Stud Liguri 1964, 229-57). Also Panella has now produced a very full bibliography of Dressel 1 which can be found in Ostia III. I am sure you are right in suggesting that there are at least 2 wrecks in the Grand Conglomerate and I very much look forward to seeing this argued in print. I believe George Bass raises this point in Archaeology under Water but only briefly in passing.
3. With regard to the Rhodian problem, I found that there were no significant petrological variations within the samples you kindly sent. It would appear that similar sources were in use over a long period of time. I should very much like to see your list of readings and to have your comments on the chronology of the samples. Also it would be good to publish this as an appendix at the end of my paper, if you are agreeable and think it a good idea. The manuscript went off some time ago, but I could almost certainly arrange for an insert in proof. I sent you a draft in January, but I wonder whether you ever got this?

Does not answer my simple question: what date would be given? is likely to have Dressel 1 in G. 1. 60/61

- 2 -

Thank you again for your letter. I look forward to seeing you in September.

Yours sincerely,

A handwritten signature in dark ink, appearing to read "David P. S. Peacock". The signature is fluid and cursive, with a large, sweeping initial "D" and a long, horizontal flourish extending to the right.

Dr. D. P. S. Peacock

Have you published the results of the Rhodian tests? You know we have prepared readings of the stamps.

Yours sincerely,

Virginia H. Grace

July 17, 1975

Dr. D.P.S. Peacock
Department of Archaeology
University of Southampton
SO9 5NH
England

Dear Dr. Peacock:

Thank you for your letter of July 10. I do expect to be in Athens between 4th - 7th September, and it will be nice to meet you. You were right ~~xxxxxx~~ to write to Mrs. Sakellarakis about working on our Roman material. You will also be able to discuss it with Barbara Johnson, who is publishing our Roman coarse ware: Dr. Johnson is now in Israel, but I think she will be here by then.

It sounds to me as if you would not have much time during this visit, but there do remain with me various queries not yet fully answered by you
1)
I think, which perhaps could be taken up, e.g.: how would you date the Dressel I Grand Congloue jars without any help from context, that is, by their place in the stylistic sequence? 2) was there any observable difference between the various ~~xxxxxx~~ samples I sent you of stamped amphora handles of Rhodes, - they were of various dates, and I would like to know if you observed any "clustering", as I think the computer people call it, and 3) can you give me useful references to published comments on Corinthian and Athenian wares by M. Farnsworth? On (1) above: I would be grateful for references anywhere in print to the possibility of there having been more than one wreck at Grand Congloue. I am sure that there were two (if not more), and find it important to point it out; and hope to manage to do it, either in a small separate article, or in the course of for instance an article about Rhodian chronology I am trying to pull together.

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TEL. SOUTHAMPTON 559122

TELEX 47661



UNIVERSITY
OF
SOUTHAMPTON
SO9 5NH

Professor A. C. Renfrew, M.A., PhD., F.S.A.

DPSP/JH

10th July, 1975

Dr. V. Grace,
American School of Archaeology,
54 Souedias Street,
ATHENS 140,
Greece.

Dear Dr. Grace,

Last year I wrote about the possibility of our meeting during a visit to Greece, but unfortunately (and unnecessarily as it happens) cancelled my trip due to the crisis. I now hope to come this summer and propose to be in Athens between 4th - 7th September: I wondered whether you would be available during this period?

The main object of my visit is to look at material of 5th - 6th Centuries AD, as together with Dr. M. G. Fulford, I am writing the pottery report for the current British Excavation at Carthage and we have a wealth of material of this period. I have written to Dr. Sakellarakis about this at Brian Sparkes' suggestion. However, it would be good to see earlier material as well and to discuss some of the matters on which we have previously corresponded.

With good wishes.

Yours sincerely,

A handwritten signature in dark ink, appearing to read 'David Peacock'.

Dr. D. P. S. Peacock

DEPARTMENT OF ARCHAEOLOGY

TEL. SOUTHAMPTON 559122
TELEX 47661

Professor A. C. Renfrew, M.A., PhD., F.S.A.



UNIVERSITY
OF
SOUTHAMPTON
SO9 5NH

not at all

31 July, 1974

Dear Dr. Grace,

In previous correspondence I asked if it would be possible to see you this summer and suggested that I come to the Agora at the end of August. However, in view of the uncertain situation in Greece at the moment I thought it may be better if I postponed my trip, probably until 1975. I imagine there will be little problem in getting to Athens satisfactorily, but I should also like to take the opportunity of my stay to visit the Islands and I understand there is virtually no boat service running at the moment.

I am very sorry about this change in plan. I very much hope that it will not inconvenience you in any way and that we shall have an opportunity to meet in 1975.

All good wishes,

Yours sincerely,

A handwritten signature in blue ink, appearing to read 'D.P.S. Peacock'.

D.P.S. Peacock

Dr. V.R. Grace,
American School of Classical Studies,
54 Swedias Street,
Athens 140,
GREECE.

DEPARTMENT OF ARCHAEOLOGY
TEL. SOUTHAMPTON 559122
TELEX 47661



UNIVERSITY
OF
SOUTHAMPTON
SO9 5NH

Professor A. C. Renfrew, M.A., PhD., F.S.A.

DPSP/AE

5th July, 1974

Dr. V. Grace,
American School of Classical Studies,
54, Odos Souedias,
ATHENS 140,
Greece.

Dear Dr. Grace,

As I mentioned in previous correspondence, I am planning to come to Athens this summer. I very much look forward to meeting you and discussing the possibility of further petrological work on Greek and Late Roman material. I would in any case welcome a chance to look at some of the Agora material.

I shall be leaving here on 1st August and travelling by car: it is thus difficult to estimate my precise arrival time, but I would hope to be in Athens at least by 21st August and could call at any time suitable to you in the week or so after that. I very much hope that this will be a convenient period for you. If not, perhaps you would be so kind as to let me know and if possible, I will try and rearrange my trip accordingly.

All good wishes,

Yours sincerely,

D.P.S. Peacock

DEPARTMENT OF ARCHAEOLOGY

TEL. SOUTHAMPTON 559122

TELEX 47661

UNIVERSITY
OF
SOUTHAMPTON
SO9 5NH

Professor A. C. Renfrew, M.A., PhD., F.S.A.

DPSP/AHT

30 April, 1974

Dear Dr. Grace,

Thank you so much for your letter. I am very glad to learn that it will be in order to publish reference to your material and that you will be sending readings and dates. While I was working through my thin sections of your material I kept an eye open for likely subdivisions, but could see nothing that seemed significant. Since receiving your letter I have had another look, but only one sherd (SS 3811) stands out! This has the same mineral suite as the rest, but is slightly coarser-grained. Otherwise all the material seems to my homogeneous and I would expect it to be made from similar raw materials.

I very much look forward to meeting you in the summer and discussing the possibilities of further petrological work. I hope to arrive in Athens during the last week in August or the first in September. I will try and give more precise timing later, but I wondered if you were likely to be there then? I wondered also whether we could include in our discussions some of the later Roman Amphorae from the Agora, as well as the Greek material ^{mentioned} in my previous letter? I am anxious to examine some of the former under the microscope, ~~to~~ help identify small sherds that are turning up in late Romano-British contexts: I suspect that some could be eastern Mediterranean, but the typology of our small pieces is often very inconclusive.

When I mentioned Marie Farnsworth's work, I was referring to her papers in AJA 1970, and 1964. She does not say much about the macroscopic appearance of the pottery, but her microscopic data and particularly her photomicrographs would, I think, enable these wares to be recognised under the microscope.

With many thanks for your help. All good wishes,

Yours sincerely,

D.P.S. Peacock

Dr. V. Grace,
American School of Classical Studies,
54 Swedias Street,
Athens 140,
GREECE.

28. III. 74

24

AD

& please get ~~out~~ these objects
and their cards. (Maggie get them out.)

a careful check of the
readings, including
dots and brackets

the whole series to be
typed with a
carbon

29. III. 74

But maybe they should
be seen concerned - So don't
type up readings - have got

16.4.74

They are on the table in the back of the
storeroom Maggie

April 3, 1974

Dear Dr. Peacock,

Thank you for your letter of March 6th, which I received after my return from America on the 12th. It is certainly very interesting that you can identify amphoras found in Britain as actually made in Rhodes; and can provide for them an historical explanation. Here at the Agora also we have some of those peaked-handled jars that do not look to be made of real Rhodian clay, and you must look at them when you come in the summer.

You do not mention whether our samples were all closely similar in clay. I would be interested to know whether they sorted themselves into groups; as they are not all close to each other in date. It would be interesting to get this reply before you know, so to speak, what it ought to be.

Then I will send you readings and notes on dates. ~~These~~ It will be in order for you to publish reference to our material; you should acknowledge permission from T. Leslie Shear, Jr., our Field Director. (I have shown him your letter.) For my part I shall be glad to have you present your very interesting findings in the way you suggest.

When you come to the Agora, we can talk about further possible work in this line. Stephen Miller, now at Berkeley, is interested in setting up some such framework for study of material from his future excavations at Nemea - they begin digging this summer I believe.

I would like to know what you have seen of Miss Farnsworth's work, that is, can you give me a reference to a published description by her of Corinthian and Athenian clay. I should be glad to have such a reference.

Your sincere
 friend
 Victor
 5 days later
 April 8. Stop this for a while - I am going to the

DEPARTMENT OF ARCHAEOLOGY

TEL. SOUTHAMPTON 559122

TELEX 47661

Professor A. C. Renfrew, M.A., Ph.D., F.S.A.



UNIVERSITY
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SO9 5NH

DPSP/AE

26.01
6th March, 1974

*as listed
in St. Hill
counter for
LATE
RHODIAN*

Dr. V.R. Grace,
American School of Archaeology,
54, Souedias Street,
Athens 140,
Greece.

Dear Dr. Grace,

*Actually -
Nov. 1972*

At long last I have managed to make a full examination of the petrology of the Agora Rhodian samples you kindly sent just over a year ago. Many apologies for the delay: the main problem was in amassing a suitable body of material for analysis from this end, but I have now sectioned about 25 vessels of the Rhodian form from various sites in southern Britain. My conclusions fall somewhere between your suggestion that all peaked handled vessels may have originated on Rhodes and my suggestion that they came from a number of different places. I still get six distinct fabric groups, and one of them contains granite which does not occur in the Rhodian region: thus this seems good evidence to suggest that some of these vessels may have originated elsewhere.

One of the remaining groups is characterised by inclusion from an andesitic tuff: the Aegean and possibly the island of Nisyros would be geologically feasible as source. Two further groups provide no evidence of source though they are obviously different. However, my two final groups are probably related and seem to contain serpentine and other minerals that are normally associated. One of these groups compares very closely indeed with the Rhodian samples you sent me and I have no doubt that it comes from the same region.

It is particularly interesting to note that the two fabrics, probably of Rhodian origin, are by far the most important on pre-Flavian military sites in Britain and some of the earliest vessels such as the ~~neck~~ from Claudian Hod Hill or a handle from Waddon Hill, Dorset, compare closely with your Rhodian samples under the microscope. I thus wonder whether this popularity of Rhodian could have at least started with consignments exacted in tribute after Claudius had rescinded the Liberties of the Rhodians in 44 (e.g. Cassius Dio LX, 24).

As far as I can see the typology now seems to split into two distinct lines, corresponding to the petrology. There are not many near-complete vessels available, but it does seem that the true Rhodians are thin walled and more bulbous. The non-Rhodian fabrics are much more clumsy and less efficient - the type specimen Camulodunum 184 is typical.

I thus feel that you were right in emphasising the importance of Rhodes, but there is subsidiary production elsewhere, though I can find no evidence to substantiate my suggestion of a source in Italy.

contd....

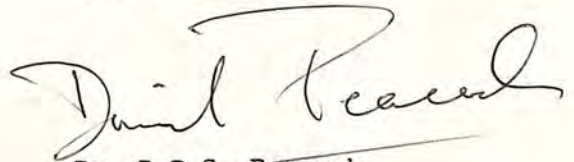
I should very much like to present these findings at the Rome Colloquy and wondered whether it would be in order to publish reference to your material when the proceedings eventually go to press? I think it would be very valuable to have a list of stamp readings as an appendix in your name if you thought this useful and a good idea: people would then have a clear statement on the material I am talking about petrologically. However, this is not essential if you would rather not, or have no time.

(X) Ask him where these discs are published

The material you sent has proved so very useful and conclusive, I feel it would be profitable to extend petrological work to other types of Greek amphora: the Koan is obviously another contender, but it would be nice to do all the principal types (except the Athenian and Corinthian which Marie Farnsworth has described) so that the fabrics could be recognised if they crop up in Roman contents. At the same time, it may be possible to offer a service to you in return, if you had pieces of uncertain origin that you wanted identifying by petrological means. Naturally I would not wish to pursue this if there were plans for it to be done by someone else or if you felt it was going to put you to a lot of trouble, but I would be interested to have your reactions. There is no immediate hurry, however, as I would not be able to get on with it at once. I had hoped to visit Athens in the summer and thus if you thought it feasible perhaps we could discuss the proposition then and select samples for analysis. However, even if you do not regard it as possible for one reason or another, I should ^{still} very much like the opportunity of meeting you.

Many thanks once again for your help which has proved most valuable in following up these peaked handled vessels.

Yours sincerely,



Dr. D.P.S. Peacock

UNIVERSITY
OF
SOUTHAMPTON
SO9 5NH

DPSP / AHT

26 July, 1973

Dear Dr. Grace,

Many thanks for your latest letter. I collected the Rhodian samples you kindly sent and should have written long ago to let you know of their safe arrival. I have had thin sections made of all of them, but have not yet had time to examine them in detail, owing to a host of lecturing and other commitments. However, I am now collecting more comparative material so that I have a good body of Rhodian-type vessels from Britain, and I very much hope to reach some preliminary conclusions in the next few weeks. If I get further delayed, I may have to postpone examination until the autumn because I shall be away from the middle of August to the end of September. However, I will most certainly drop you a line as soon as I have made any progress.

With regard to the dating of Dressel 1 vessels, this is very difficult. They were certainly being produced in the 2nd century, as you know from the Agora, but also Lamboglia reported a Dressel 1 wreck associated with a coin hoard (Riv. Studi Liguri 1964, 229-257), although I am now very dubious of the Entremont evidence as there may be a case for occupation later than Benoit suggests. However, Dressel 1A certainly persists from some time in the second century (and perhaps even the early part) up to c 70 B.C. I would thus be fairly happy to see the Grand Congloué vessels in the second century, though it is unfortunate that the standard of excavation does not permit one to be certain of their association with your Rhodian amphs. The only evidence I could find for the change over from Dressel 1A to Dressel 1B is Lamboglia's sequence at Ventimiglia, and such evidence as I have for the end of the sequence is outlined in my paper. I would like to think that more precise dating will some day be possible, but at the moment I think we just have to be content with broad dates for the A and B forms.

Thanks again for your letter.

Yours sincerely,

Dr. D.P.S. Peacock

Dr. V. Grace,
Agora Excavations,
American School of Classical Studies,
ATHENS,
Greece.

July 6, 1973

11. VII. 66
 being see - hosted
 (fought & stayed
 it!)

Dr. D.P.S. Peacock
 Department of Archeology
 University of Southampton
 SO9 5NH
 England

Dear Dr. Peacock:

I am wondering whether you have extracted any interesting information from those fragments of stamped Rhodian handles turned over to you last November by Hector Catling. See our correspondence beginning last July and ending with your letter of October 31; and Hector told me that he had been able to deliver the pieces to you, as planned.

It would be useful to know whether the "Rhodian type" amphoras found in Britain turned out to have clay similar to that of any of the fragments we sent from the Agora; and indeed whether ^{ours} ~~they~~ matched each other or showed differences that might yield a pattern.

I have been reminded of our investigation by hearing lately from Marie Farnsworth on the question of Corinthian clay.

To return to another question: I would be glad to know some time how you would date the Grand Congloué jars of Dressel I type apart from their context, i.e. just from their place in the general type-sequence of their class. E.g., earlier or later than the jar of this kind in fig. 38 of my Picture Book of 1961.

Yours sincerely,

Virginia R. Grace

DEPARTMENT OF ARCHAEOLOGY

TEL. SOUTHAMPTON 59122
TELEX 47661



UNIVERSITY
OF
SOUTHAMPTON
SO9 5NH

~~PROFESSOR R.W. GUNLIFFE M.A. PhD. F.S.A.~~
Professor A.C. Renfrew

Ref: DPSP/AHT

31 October, 1972

Dear Dr. Grace,

Many thanks indeed for your letter of 21 October. I am delighted to learn that permission has now been received to export the Rhodian amphoras fragments. I will write to Mr. Catling at once and make arrangements to pick up the material in England. I think the rendezvous at the Hellenic Society, Gordon Square, would be excellent.

Many thanks indeed for your help with this.

Yours sincerely,

D.P.S. Peacock

Dr. V.R. Grace,
American School of Classical Studies,
54 Swedias Street,
Athens 140,
Greece.

See letter VG to TLS Jr. of 23.X.72, filed under DELOS : CENTENARY ARTICLE for material also having reference to the following:

AGORA affairs

PAMPHYLIAN class

THASIAN corpus

ROMAN, Peacock, on bits of Rhodian stamped handles for petrographic analysis in connection with late Rhodian (?) jars found in Roman Britain

From deagut ↓

31-a

You may remember that, before you left, Fred Matson was kind enough to detach pieces from Rhodian stamped fragments here, to be sent to Dr. DPS Peacock at Southampton, to check whether the jars of late Rhodian appearance sometimes found in Britain (some published by him recently) are really from Rhodes. ^{He wants to do} ~~existing~~ this by petrographic analysis, i.e. of the real Rhodian in comparison with the doubtful.

I made a selection of ^{various} ~~various~~ dates, 11 items in all, of our stamped Rhodian. Jim applied for an export permit, which eventually was granted, and Hector Catling said he would take the bits to England; *he goes about Nov. 16,*

You may remember that, before you left, Fred Matson was kind enough to detach pieces from Rhodian stamped fragments here, to be sent to Dr. DPS Peacock at Southampton, to check whether the jars of late Rhodian appearance sometimes found in Britain (some published by him recently) are really from Rhodes. ^{He wants to do} ~~xxxxxxing~~ this by petrographic analysis, i.e. of the real Rhodian in comparison with the doubtful.

^{unlike 7}
I made a selection of ^{various} ~~various~~ dates, 11 items in all, of our stamped Rhodian. Jim applied for an export permit, which eventually was granted, and Hector Catling said he would take the bits to England; *he goes about Nov. 16,*

31-6

on question as to whether Mr. V.
for 5 Dels St., 7 Ph. ^{step}
would ~~on~~ ^{with} ~~the~~ ^{the} firming.

so I discussed with H. ^{possibly} ~~the~~ ^{substitute}

8) ~~the~~ Pamphlet article, and he saw

that it might be necessary, ~~either~~ ^{then}

~~notes~~ Agnes prints are all old ones.

Still, I would be glad to work for you

ROMAN - PEACOCK

October 21, 1972

Dr. D.P.S. Peacock
Department of Archeology
University of Southampton
SO9 5NH
England

Dear Dr. Peacock:

With regard to 11 small samples for petrographic analysis detached for you by Fred Matson from larger fragments of Rhodian stamped ~~xxx~~ amphoras, detachment having taken place here at the Agora Excavations on August ~~22~~ 30, 1972: the American School has received an affirmative reply to J.R. McCredie's application for permission to export these samples, the Archeological Council allows them to be exported. I enclose photocopies of the application of 5.IX.72 by McCredie (Director of the American School), and of the reply of 30.IX.72 from the YIOYPTIION HOAITIEMOY KAI EHLIETHMON.

Miss Sheila Evans had left Greece before the permission was available. ^{agreed} Hector Catling, Director of the British School, has very kindly ~~agreed~~ to take ~~xxx~~ the samples to England, with the original of the letter of permission dated 30.IX.72, in case it is needed when he leaves Greece. There is a small possibility of a holdup in that the permit allows export by D.P.S. Peacock, instead of for him. Mr. Catling does not expect any problems, but he would be glad to have a note from you authorizing him to bring them for you, or asking him to, which he could show if necessary. He expects to come to England on Nov.16. When you write, you should tell him with whom, in London, to leave the parcel, perhaps at the Hellenic Society, Gordon Square, where he will be going in any case.

Yours sincerely,

V. R. Grace

You already have the list of Agora Excavations inventory numbers of the fragments from which the samples were taken. Readings and dates can be sent to you later, if wanted.

copy to Mr. Catling

DEPARTMENT OF ARCHAEOLOGY

TEL. SOUTHAMPTON 59122
TELEX 47661UNIVERSITY
OF
SOUTHAMPTON
SO9 5NH

~~PROFESSOR B. W. CUNLIFFE, M.A., PH.D., F.S.A.~~
Professor A. C. Renfrew, M.A., PH D, FSA

Ref: D.P.S.P/AHT

26 September, 1972

Dear Miss Grace,

Many thanks for your two letters, one of the 17th August, the other of the 2nd September, and my apologies for not replying sooner. They were in the Department awaiting my return from the Continent.

I am delighted to learn that you are able to supply samples of ~~Roman~~ ^{Adrian} Amphorae, and have great hopes that these will solve the problem about the origins of the later vessels. I very much hope that the export permission is forthcoming from the Greek Authorities and I will contact the Vice-Chancellor's secretary to see if she has been able to bring them out with her. It is a pity that I missed meeting Professor Matson while he was in England.

Many thanks indeed for your help in this. When I get the samples I will try and examine them as soon as possible and let you know my findings.

Best wishes,

Yours sincerely,

D.P.S. Peacock

Miss V. R. Grace,
American School of Classical Studies,
Athens,
Greece.

10.10.72

① This lady has now left
Greece, now having been
able to make us by
telex.
We must find another
courier.

Original to be taken to England
with a fragment

Ε.Ρ.



Βαθμός Ασφαλείας

ΒΑΣΙΛΕΙΟΝ ΤΗΣ ΕΛΛΑΔΟΣ

ΥΠΟΥΡΓΕΙΟΝ ΠΟΛΙΤΙΣΜΟΥ & ΘΡΗΣΚΕΥΜΑΤΩΝ
ΓΕΝΙΚΗ ΔΙΕΥΘΥΝΣΙΣ ΑΡΧ/ΤΩΝ & ΑΝΑΣΤΗΛ.

Εν Αθήναις

τῇ 30 Σεπτεμβρίου 1972

ΔΙΕΥΘΥΝΣΙΣ ΕΞΕΤΑΣΕΩΝ ΣΧΟΛΩΝ & ΠΟΛΙΤΙΣΤΙΚΩΝ
ΤΜΗΜΑ ΚΩΝ ΣΧΕΣΕΩΝ

Αριθ. πρωτ.

Βαθμός προτεραιότητας

Οίκοθ. 27155

Ταχ. Δ/σεις : 'Αριστείδου 14

ΠΡΟΣ:

Πληροφορίες:

Τήν 'Αμερικανικὴν Σχολήν

Τηλέφωνον : 3228-664

Κλασσικῶν Σπουδῶν

Λουηδίας 54. - Ένταῦθα T.T. 140

ΘΕΜΑ: Χορήγησις ἀδείας δι' ἐξαγωγὴν
δειγμάτων πρὸς πετρολογικὴν
ἀνάλυσιν.

ΣΧΕΤ. 'Υμέτερον ὑπ' ἀριθμ. 1682

ἀπὸ 5 Σεπτεμβρίου 1972.-

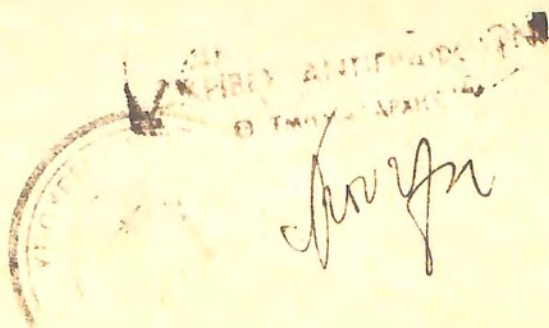
Εἰς ἀπάντησιν πρὸς τὸ ὑπερθεῖν ὑμέτερον ἔγγραφον καὶ σὺν τῇ ἐπιστροφῇ
τῶν δειγμάτων, ἔχομεν τὴν τιμὴν νὰ σᾶς γνωρίσωμεν ὅτι τὸ 'Αρχαιολογικὸν
Συμβούλιον διὰ τῆς ὑπ' ἀριθμ. 35/19-9-72 πράξεώς του χορηγεῖ εἰς τὸν DR.
D. P.S. REACOCK τὴν ἄδειαν ἐξαγωγῆς ἑνδεκα (11) μικρῶν δειγμάτων πηλοῦ
εἰς SOUTHAMPTON 'Αγγλίας ἐπὶ τῇ σκοπῇ πετρολογικῆς ἐξετάσεως αὐτῶν.-

Έντολῇ Ὑπουργοῦ

Ὁ Διευθυντής

Γρηγόριος Ζητρίδης

Συνημμένα: II δείγματα



ROMAN -
Greece

AMERICAN SCHOOL OF CLASSICAL STUDIES
54 SOUIDIAS STREET, ATHENS, 140
CABLES: AMSCHOOL ATHENS



ΑΜΕΡΙΚΑΝΙΚΗ ΣΧΟΛΗ ΚΛΑΣΙΚΩΝ ΣΠΟΥΔΩΝ
ΟΔΟΣ ΣΟΥΔΙΑΣ 54, ΑΘΗΝΑΙ. 140
ΤΗΛ. 710-971

Αριθ. Πρωτ. 1682

Εν Αθήναις τῇ 5ῃ Σεπτεμβρίου 1972

Πρὸς τὸ

Υπουργεῖον Πολιτισμοῦ καὶ Ἐπιστημῶν,
Γενικὴν Διεύθυνσιν Ἀρχαιοτήτων καὶ Ἀνασθηλώσεως
Διεύθυνσιν Εἰκόνων καὶ Πολιτιστικῶν Σχέσεων

Θέμα: Ἐξαγωγή Δειγμάτων διὰ Πετρολογικὴν Ἀνάλυσιν.

Ἐχομεν τὴν τιμὴν νὰ σᾶς πληροφρήσωμεν ὅτι ὁ δόκτωρ D.P.S. PEACOCK τοῦ Τμήματος Ἀρχαιολογίας τοῦ Πανεπιστημίου Σαουθάμπτον τῆς Ἀγγλίας, σκοπεύει, νὰ γάνῃ τὴν ἀνάλυσιν 11 πολὺ μικρῶν δειγμάτων πηλοῦ, προερχομένων ἐκ τῶν χειρο- λαβῶν ἐνσφραγίστων ἀμφορέων τῆς Ἀρχαίας Ἀγορᾶς Ἀθηνῶν, μὲ σκοπὸν νὰ ἀνακαλύψῃ τὴν προέλευσιν των, εἰ δυνατόν.

Τὰ δείγματα δύνανται νὰ μεταφερθοῦν εἰς Ἀγγλίαν ἀερο- πορικῶς περίπου τὴν 16 Σεπτεμβρίου ὑπὸ τῆς δεσποινίδος SHEILA EVANS, γραμματέως τοῦ Κοσμήτορος τοῦ Πανεπιστημίου Σαουθάμπτον.

Ἐπειδὴ τὰ δείγματα εἶναι ἄνευ ἀρχαιολογικῆς ἢ χρηματικῆς ἀξίας παρακαλοῦμεν ὅπως ἐγκρίνητε τὴν ἐξαγωγὴν των.

Μετὰ πλείστης τιμῆς,
Ο Διευθυντὴς

Τζέϊμς Ρ. Μαν Κρίντι

Ἐσώκλειστα:

- 1) Κατάστασις
- 2) 11 Δείγματα

71871
of the ...
to the ...

Rhodian stamped fragments at the Athenian Agora from
which pieces have been taken for petrological analysis

Dr. D.P.S. Peacock of the University of Southampton has asked if it would be possible to have small samples taken from stamped fragments of Rhodian amphoras of Greek period, so that petrological analyses could be made by him (in England), for purposes of comparison with samples taken from amphoras of Rhodian shape found in ~~wrecks~~ excavations in Britain of the Roman period. He has supposed that the "Rhodian" jars in these ~~wrecks~~ excavations may be simply type of Rhodes, made elsewhere.

Professor F. Matson of Pennsylvania State University, who has experience in making these tests, has been kind enough to take samples for me from the following Agora fragments:

1. SS 1577
2. " 1901
3. " 2018
4. " 3793
5. " 3798
6. " 3811
7. " 7932
- ~~8. SS 10071~~
8. SS 10071
9. " 11470
10. " 12325
11. " 12874

I hope that these samples may be taken to Dr. Peacock.

19

4.IX.72

*return 5/59
to
addresser*

Reman

To J. R. McCredie, in Rhodian samples for Dr. Peacock..

Enclosed are papers, listing some Rhodian stamped fragments from which bits have been knocked or pinched off to send to Dr. Peacock at Southampton for petrological analysis, and showing how this job came to be done (list of 2.IX.72, correspondence of 11.VII, 11.VIII, 17.VIII., and 2.IX). Enclosed are also 11 small envelopes containing the small pieces which we wish to export.

Could you be so kind as to apply for permission for us to export these small pieces? Effie Sakellaraki telephoned to Mr. Vavritsas about this matter, and he told her it would have to come before the Symvoulion, but that if the School makes the application, the whole thing may be done in a few days, since the Symvoulion now meets several times a week (I understood her to say).

I suppose they will return the small envelopes with the pieces all sealed up in a parcel so nothing can be added. I hope they will not mix them up.

The Vice Chancellor's secretary (of the U. of Southampton) is due here about Sept. 16, a Miss Sheila Evans.

Please return the correspondence enclosed here at your convenience. The list of 2.IX is for use in the application. Many thanks for your help, as offered over the telephone this a.m.

VG

15 5/7
4.IX.72

To J. R. McCredie, in Rhodian samples for Dr. Peacock..

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Please return the correspondence enclosed here at your convenience. The list of 2.IX is for use in the application. Many thanks for your help, as offered over the telephone this a.m.

VG

4.11.72 still
I gave the envelopes to George Hutton & take to the house

September 2, 1972

Dear Dr. Peacock,

Although you did not reply more precisely as to samples needed, I had a visit from Fred Matson, and he said he knew what size pieces you needed, and was willing to take them for me, i.e. remove them from the inventoried fragments. He was also willing to be the courier, as he left yesterday (?) for London. But I considered that for future reference in publications it is nice to be able to say that ^{even such small bits} ~~the samples~~ were exported with permission, and there was not time to apply for this before he left. I enclose ^{here} a copy of the list I have made to be used in our application for permission to export. ^{small} The fragments also will be submitted. Each one is in a separate little envelope, also I have written on the bits their serial numbers in this list, so I hope they will not get mixed up. But if they do, they are anyhow all stamped Rhodian, of various dates in the 3rd, 2nd, and 1st centuries B.C.

Professor Matson would enjoy meeting you while he is in England. His addresses: Sept. 2-9, Hotel Russell, Russell Sq., WC 1; Sept. 9-16 at St. Edmond's College, Oxford.

If we get the permission, perhaps your Vice Chancellor's secretary would be willing to take you the samples, as she is visiting here later this month according to Brian Sparkes.

Yours sincerely,

Oct 3 Sept 16

with the
two copy
of the
original
list

2.IX.72

file

Rhodian stamped fragments at the Athenian Agora from
which pieces have been taken for petrological analysis

Dr. D.P.S. Peacock of the University of Southampton has asked if it would be possible to have small samples taken from stamped fragments of Rhodian amphoras of Greek period, so that petrological analyses could be made by him (in England), for purposes of comparison with samples taken from amphoras of excavations in Britain Rhodian shape found in ~~xxxxx~~ of the Roman period. He has supposed that the excavations "Rhodian" jars in these ~~xxxxx~~ may be simply type of Rhodes, made elsewhere.

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1. SS 1577
2. " 1901
3. " 2018
4. " 3793
5. " 3798
6. " 3811
7. " 7932
- ~~xxxxx11971x~~
8. SS 10071
9. " 11470
10. " 12325
11. " 12874

I hope that these samples may be taken to Dr. Peacock.

✓

Note the TUS in.
 gave his blessing to
 the enterprise, on 31. VII. 72

28. VIII. 72 [38.01]

Rhodium samples for Dr. Peacock

Νηφ III, p. 302 33 1577 (1)	Ἐπὶ Πανδανία α Πανδανίου	3	Ἐπὶ κρᾶ τῆς cornu copia pair	TV
1901 (2) ✓	Δημοκράτης νότι			II - III
2018 (3) ✓	Μαρσία Υακύνθου			III - IV
3793 (4) ✓	Καλλι Κρατῆς		Δημος Θένους	IIa (D, E)
3798 (5) ✓	Ἐπὶ Πανδανία	(1)		IIa (E)
3811 + 3784 (6) ✓	Σωκ ἀγῆς (3784)		Ζη ναυ (3811)	IIa (D)
7932 (7) ✓	(2 illeg. rose stamps)			VI or VII (N 2014) (see Delb 77, L. in E 106 on N 2014)

5510071

(8) ✓

Ἐπὶ Ἀριότο
πόδιος
Δαλίου

Σωκράτους

cadmus n.

V

311470

(9) ✓

* *
Ἀρισταρχίου
* *

III

(Pug. 20; MSB, 107)

12325

(10) ✓

Ἐπὶ Ἀθανάτου
ἑοῦτος
Πανδύου

III ("189 B.C.")

12874

(11) ✓

Aίρια ^{rose} Ἀγαπίου

III (186 B.C.)

? with up 1000 B.C.

30. VII. 72.

Pieces were brushed off the above items this afternoon by Fred Malone, using sometimes a sand
of dust and hammer, and sometimes pinners.

He leaves Friday (1. IX) for England, where he
will be in London at the Hotel Russell, Russell Sq. WC1
for Sept. 2 - 9

and in Oxford at St. Edmund College (?) Sept. 9 - 16.

Write to Peradde. Tell him ^{also} we are getting a
permit, and hope that the Vin Chamelle society will
bring to Southampton.

ROMAN

August 17, 1972

Dr. D.P.S. Peacock
 Department of Archeology
 University of Southampton
 SO9 5NH
 England

Dear Dr. Peacock:

The address I have for Mrs. ^(S.F.) Will is

Care of Professor S. F. Will
 Department of Comparative Literature
 University of Massachusetts
 Amherst, Massachusetts, USA

It would be kind of you to send her a copy of your article, "Roman Amphorae in pre-Roman Britain." But I am not sure letters so addressed actually reach her, as I have never had any response to information copies so addressed to her. I am again sending her a copy of this letter; so, ^{her} if the address works, she can write to you herself and ask for the article. It seems a pity to send an offprint into the void.

For the Grand Conglue Dressel I jars, how would you date them apart from their context?

About samples of Rhodian for analysis, tell me a little more what you would need. You say "about 10mm x 10mm" but do you really mean just a square centimeter? Or would it have to be as much as a cubic centimeter? If the first, pieces can readily be knocked off the thin part of the handle ^{wall} attachment, i.e. really from the body of the jar, which is not more than 5mm thick. Otherwise we have to hack out of the thick part of the handle. How many would you want? Some spectographic tests have been made by the Brookhaven people of Rhodian handles among others: see Delos 27, pp.319-

320, with note 1 on p. 320. They sent us interesting graphs based on relative presence of trace elements (magnesium, zirconium, nickel, cobalt, chromium, iron, aluminum). Some of the earlier Rhodian jars have clay that certainly looks very different from what came to be the usual clay at later times. I took it that in earlier times the jars were produced in the old separate districts (they have special shapes) though all name the same dating officials, i.e. presumably the eponymous priest of Halios.

Yours sincerely,

Virginia R. Grace

DEPARTMENT OF ARCHAEOLOGY

TEL. SOUTHAMPTON 59122
TELEX 47661



UNIVERSITY
OF
SOUTHAMPTON
SO9 5NH

PROFESSOR B.W. CUNLIFFE, M.A., PhD., F.S.A.

Miss V. Grace,
Agora Excavations,
American School of Classical Studies,
Athens, 140,
GREECE.

11th August 1972.

Dear Miss Grace,

Thank you so much for your letter. I was very glad to have your comments on my paper. I have not in fact sent a copy to Mrs. Will but would like to do so if you could let me have her address sometime.

With regard to the Grand Congloué, I have seen occasional mention of the possibility of two wrecks in certain books on underwater archaeology and so avoided this evidence for dating Dressel I amphorae.

I was particularly interested in your comments on the "Rhodian type" amphorae. The evidence for suggesting several sources lies in the petrology. From what little I know of the geology of Rhodes it seemed unlikely that the Island would produce a ~~great~~ variety of clay types and in particular some sherds had inclusions which I would not expect to find on Rhodes. However, it would be interesting to take this further and one approach might be to compare the clays of Roman period sherds, with earlier stamped sherds of known Rhodian origin. I wondered whether there was any possibility of your being able to provide small samples of the latter for analysis - I should need pieces about 10mm x 10mm. It would be truly splendid from my point of view if this were possible, though perhaps Greek regulations would preclude exportation of even this humble material, and also I would not wish to put you to a lot of trouble.

Many thanks again for your letter.

Yours sincerely,

Dr. D.P.S. Peacock.

ROMAN

July 11, 1972

D.P.S. Peacock, Esq.
 Department of Archeology
 University of Southampton
 SO9 5NH
 England

Dear Mr. Peacock:

Thank you for your article, "Roman Amphorae in pre-Roman Britain," from The Iron Age and its Hill-Forts, the Mortimer Wheeler festschrift. I agree with you as to the interest attached to ascribing types as far as possible to their production centers; one can then try to follow their shape-development, when examples are dated by context. For your "Greco-Roman amphorae (Koan Type)" and ditto, Rhodian Type: there seem to me to exist easily distinguishable pseudo-Koan jars, maybe several series; but I am not convinced that your "Rhodian Type" amphorae are not just Rhodian. The rest of your classes are more in the field of my friend Mrs. Elizabeth Will, and I am sending her a copy of this letter in case you may not have sent her the article. It is very interesting that there is this evidence for such early trade-connection with Britain.

One thing that does particularly interest me is, how are you dating the amphorae from the Grand Congloué wreck, I mean the Dressel I examples? From a rather hasty review of your article, I am not sure. ^{It should be remarked} ~~that the Rhodian and Knidian from Grand Congloué are about 200 B.C. or a bit earlier. They have nothing to do with the so-called "deck cargo" of Dressel I jars, which must be the cargo of a later wreck. The fact that there were two different ships in Cousteau's wreckage there is apparently generally accepted now by underwater archeologists; but I don't know of a publication that makes the statement.~~

Yours sincerely,

PEACOCK

42

ROMAN AMPHORAE
IN PRE-ROMAN BRITAIN

By

D. P. S. Peacock

acknowledged

28, vol 74

Has been sent to B. Jolene
and returned by her.

ROMAN AMPHORAE IN PRE-ROMAN BRITAIN

By D. P. S. PEACOCK

SUMMARY

This paper is an attempt to assess certain economic and chronological aspects of the later British Iron Age from amphora evidence. During the first half of the first century and perhaps as early as the latter part of the second century B.C., amphorae of best southern Italian wine were received at Hengistbury Head, Hampshire. During and after the pacification of Gaul in the mid-first century B.C., it is probable that southern Britain became regarded as hostile territory and trade was diverted to the east, where the initial recipients may have been the Trinovantes, with whom Rome made an alliance.

In the last decade B.C. the scope of importation to eastern Britain was increased to include quantities of fish sauce and later olive oil from the Spanish province of Baetica as well as wines from Italy and other areas in the Mediterranean. This commerce, the Baetican in particular, increased in importance and eventually figured significantly in the economic life of Roman Britain.

INTRODUCTION

Amphorae, used for transporting perishable commodities such as wine, olive oil, fish sauce (e.g. *garum*) and salted products, were an important form of trade-packaging in the Mediterranean Roman world. The distribution of these containers stretches along the eastern fringes of the Atlantic Ocean from Scotland to the Canary Islands and thence across parts of three continents to the Coromandel coast of India, as Sir Mortimer Wheeler (1946) has shown. This impressive span, approaching 6,000 miles, is a vivid testimony not only to the acumen of Roman merchants but also to the demand for Mediterranean luxury foodstuffs well beyond the Imperial frontiers.

Study of amphorae thus provides an opportunity to assess certain external contributions to the economies of barbarian peoples and to establish chronological horizons, for amphora forms varied with the passage of time as a result of both typological evolution and the ascendancy and decline of different production regions. With regard to amphorae as chronological indices, I share neither the pessimism of Callender (1965) nor the excessive optimism of Uenze (1958), for whom they were an ideal dating medium. It is true that these vessels appear to have evolved slowly and undoubtedly the individual amphora might have had a long life serving other functions when its primary purpose had been fulfilled. However, under favourable conditions of preservation amphorae have been found with painted inscriptions (*tituli picti*) indicating the date and often the provenance of the contents. They are thus a unique class of ceramics, certain types having precise written evidence of chronology and origin. Used with care and preferably in quantity, the amphora can I believe, be an invaluable source of information.

At present the main drawback in interpreting amphora evidence is our very rudimentary knowledge of these vessels. André Tchernia (1967: 234) remarked that of the numerous types known, only two could be ascribed with certainty to their source region.

Although this situation has improved, due largely to the researches of Fausto Zevi and Tchernia himself, the statement remains true in essence. This paper is thus a preliminary and very tentative attempt to assess certain chronological and economic aspects of the later British Iron Age from amphora evidence. I have drawn heavily upon the works of others, but have included notes on my recent petrological work which serve to amplify the data. This study continues and full publication of the new evidence will be delayed until a larger sample of amphorae has been examined.

PART I

AMPHORA TYPOLOGY, CHRONOLOGY AND PROVENANCE:
A REVIEW OF THE EVIDENCE

In this section I propose to review what is known of the typology, chronology and origin of the principal amphora types exported to Britain before the Roman conquest, *viz.* mainly Camulodunum forms 181-7 (Hawkes and Hull, 1947). However, form 187, the globular amphora, will not be discussed in detail since in Britain it is *par excellence* the amphora of the second century A.D., and best left until pertinent to review all the evidence.

The classification of amphorae

Amphora classification is fraught with difficulties. The most widely accepted system is that of Dressel (1899), but as Zevi (1966:214) has pointed out, this was intended not so much as an absolute classification of universal application, as a sketch to accompany a corpus of amphora inscriptions from Rome. It has nevertheless formed the basis of most subsequent classifications (e.g. Pélichet, 1946; Lamboglia, 1955). Callender's (1965) scheme has little to commend it since it is excessively conflated and the divisions are not always logical, while the recent work of Joncheray (1970) is intended as a guide to assist under-water archaeologists in preliminary identification.¹ In Britain we are fortunate in having the excellent Camulodunum type series, but this does not cover all the variations known from other British Iron Age sites and it is confusing to use an insular nomenclature when relating to continental material. I have attempted to overcome these difficulties by listing some of the alternative terminology at the beginning of each section.

1. ITALIAN TYPE AMPHORAE

(Dressel 1, Callender 1, Camulodunum 181, Républicaine III (Benoit, 1957))

(a) *Typology*

This type (fig. 35, 1-2) is characterised by a heavy spindle-shaped body and paste which is thick and reddish often with whiter surfaces. The collar rim and long flattened rod-like handles are characteristic.

Loeschke (1942:84) indicated two distinct varieties, while Lamboglia (1955) isolated three, two of which (Dressel 1A and B) are of interest to us in Britain. Dressel

¹ See now, however, the useful work by M. Beltrán Lloris (1970), *Las ánforas romanas en España*, Zaragoza.

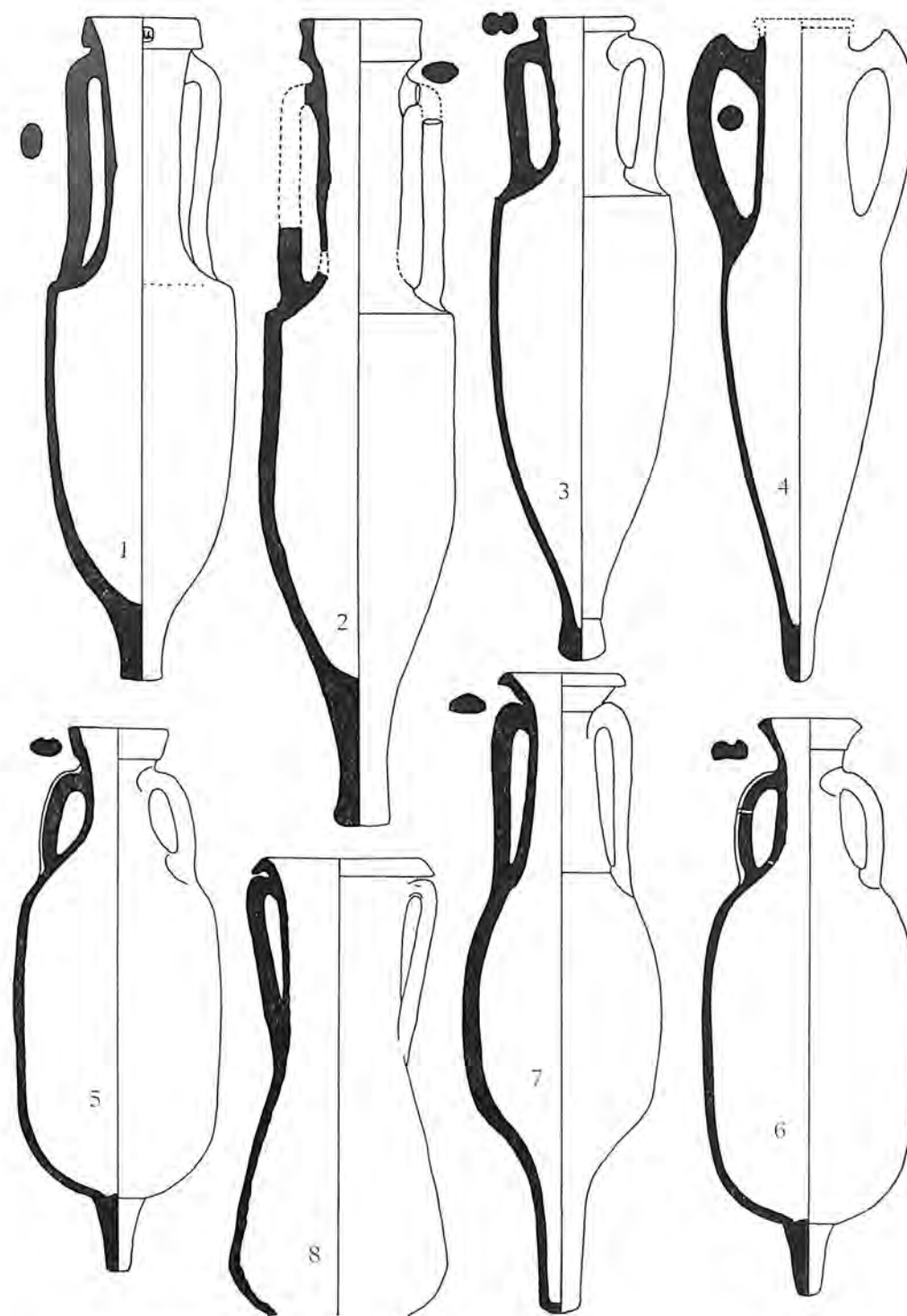


Fig. 35. Amphora types (scale 1/10). No. 1, Grand Congloué, Marseilles (after Benoit, 1961); No. 2, Hertford Heath (after Holmes and Frend, 1957); Nos. 3-7, Camulodunum (after Hawkes and Hull, 1947); No. 8, Caerleon (after Wheeler and Wheeler, 1928).

type 1A (fig. 35, 1) is smaller, characterised by a short jutting rim triangular in cross-section, a rounded shoulder angle and a stumpy base. The B variety (fig. 35, 2) is larger with a near vertical collar rim, a sharper shoulder angle and a longer basal spike often slightly expanded at the extremity.

(b) *Provenance and petrology*

The provenance of most of these vessels is securely tied by *tituli picti* to the Caecuban and Falernian wine-producing regions of Italy (Zevi, 1966:214), situated west of Terracina and east of Capua respectively.

Petrologically three principal fabric varieties can be distinguished, of which fabric 1 is predominant and fabric 3 rare.

Fabric 1. Frequent inclusions of quartz (discrete and polycrystalline grains), potash feldspar (including sanidine), volcanic rock and glass fragments, some green or occasionally colourless augite, a little plagioclase feldspar and accessory garnet.

Fabric 2. Abundant large crystals of green or colourless augite, yellow-brown garnet, quartz, sanidine, volcanic rock fragments and a little basaltic hornblende. Easily recognisable in the hand-specimen as the fabric appears to contain black sand.

Fabric 3. Quartz, potash and some plagioclase feldspar, biotite, granite fragments. Distinguished in the hand-specimen by glistening flecks of mica.

The existence of so few variations is surprising, suggesting amphora factories. It appears that the precept of Varro (*De Re Rustica*, I, 22.1) recommending that everything possible should be made on the estate may not have been adhered to in this respect.

Fabrics 1 and 2 are found in both the A and B forms, although no examples of Dressel 1A in fabric 2 have yet been found in Britain. Elizabeth Ettlinger's (1960) suggestion that the two forms originated in different production regions is thus invalid. Nor is it possible to correlate the two fabrics with the Caecuban and Falernian districts respectively. A group of sherds collected from Uenze's (1958:7) site at Mondragone in the heart of the Falernian region contained both fabrics, suggesting indiscriminate use of the two products.

Various attempts have been made to limit the provenance of these vessels petrologically. Collot (1918) and later Lais (1943) drew attention to the presence of volcanic materials in the fabric indicating an Italian source. Bouscaras (1954) erroneously reasoned that a vessel from the sea off Agde (Hérault) originated at either Capo di Bovo (Latium) or Monte Somma (Campania) on an association of leucite and augite in the fabric. Maréchal (1966:124) has rightly drawn attention to the wide Italian distribution of green augite, a persistent feature of fabrics 1 and 2, but his suggestion of an origin on the Island of Ischia in the bay of Naples, although very feasible for fabric 2, remains unverified as no petrological description of the supposed raw materials or of kiln waste has been published.

Fabric 3 which occurs rarely in form B, is characterised by inclusions of granitic origin. Since it can be difficult to distinguish one granite from another, the group may include vessels from a number of sources. However, such material is unlikely to have

come from the Caecuban and Falernian regions, and if production of this form is restricted to Italy, a source in the southern toe of the country is more probable. The wine-producing localities of Thurii and Consentia (Frank, 1940:136, 147) lie on the fringes of a granite massif. Zevi (1966:214) reminds us of an uncertain *titulus pictus* from Rome implying contents of wine from Rhegium, the ancient Reggio-Calabria, which lends support to a southern Italian source.

(c) *Contents*

The principal contents of these vessels were undoubtedly Caecuban and Falernian wine, ranked by Pliny (*Nat. Hist.*, XIV, 8) among the finest. However, a vessel recovered from the sea off the Archipel de Riou, Provence, contained *Spondylus* shells suggesting occasional use for other commodities (Benoit, 1962:164).

(d) *Chronology*

Zevi (1966:212) lists nine dates between 102 and 13 B.C. and another possibly of 129 B.C. Production as early as the last quarter of the second century B.C. is however, confirmed by finds from Entremont, destroyed in 123 B.C. (Benoit, 1968). The termination of production, of particular relevance to Britain, is unfortunately difficult to assess with accuracy. Despite the fact that four of the nine dates listed by Zevi are Augustan, there can be little doubt that production was falling during this period. Where these vessels have been found in Mediterranean wrecks carrying fine ceramics the association is invariably with Campanian ware *not* Arretine, suggesting attenuation of trade during the ascendancy of the latter. Associations of Dressel 1B with Campanian ware are known from the following wrecks: Albenga (Lamboglia, 1952), Ile Maire 4 (Benoit, 1962), Drammont A (Benoit, 1960), Point de l'Ermitage (Tchernia, 1969). A decline in popularity during the Augustan period is also confirmed by excavations of Rhenish forts. Oberaden (12-8 B.C.) produced fragments of nine vessels (Loeschcke, 1942), Haltern (11 B.C.-A.D. 9) yielded only one (Stieren, 1932), while none are recorded from Augsburg-Oberhausen approximately contemporary with Haltern (Ulbert, 1960). The evidence thus points to a termination of production early in the last decade B.C. and there is certainly no indisputable case for the continuation of this form after the end of the first century B.C. It should be noted that the Stanfordbury amphorae (p. 182), dating to the second quarter of the first century A.D., were erroneously attributed to this form by Callender (1965:8).

Relative dates for types A and B were suggested by Lamboglia's (1955) excavations at Ventimiglia on the Italian-French border. Dressel 1A was predominant in the earliest levels while increasing quantities of Dressel 1B appeared after about 70 B.C. On the basis of this work Uenze (1958) constructed a scheme for the typological evolution and chronology of Dressel 1 amphorae with which he attempted to date certain late La Tène sites north of the Alps. However, as Elizabeth Ettlinger (1960) has pointed out, he has in some instances impressed upon the material far greater chronological precision than the evidence warrants.

At present it seems safe to regard Dressel 1A as characteristic of the first half of the first century B.C., Dressel 1B appearing about 70-50 B.C. As Zevi (1966:214) has noted

Dressel was obviously aware of the differences, referring to amphorae of the first half of the first century as *formae 1 similis*.

2. GRECO-ROMAN AMPHORAE (KOAN TYPE)

(Dressel 2-4, Callender 2, Camulodunum 182-3, République II (Benoit, 1957))

(a) Typology

This amphora group, produced or distributed in Italy and the west, was based upon prototypes from the Greek Island of Kos (*cf.* Grace, 1961: figs. 57-60).

Vessels of this type (fig. 35, 3) can be distinguished by their simple beaded rim and bifid handles which are often angular or rise to a peak before joining the neck just below the rim. Hawkes and Hull (1947) recognised two forms each with sub-categories, but this group is so variable that detailed taxonomy is somewhat arbitrary, dependent upon the criteria selected. The typological diversity often makes it difficult to assign individual pieces to a precise place in Dressel's classification.

The paste is usually reddish with paler surfaces, but many varieties occur.

(b) Provenance and Petrology

Zevi (1966:216) regards the evidence of provenance derived from *tituli picti* as confused and inadequate. Diverse sources are indicated, principally in Campania and Southern Italy, but wines from Spain (the Lauronense) and the Provincia (the Baeterense from ancient Béziers) also appear to have been carried. The forms Dressel 2 and 3 both contained the Baeterense, Lauronense and Amineum (Campanian) wines which is surprising as one might have expected the two forms to be characteristic of different regions.

However petrology clarifies the matter to a certain extent. The 21 examples sectioned can be divided into eight fabric types. Although in some cases raw materials for the fabrics might have been found within a short distance of one another, the geological differences are often so great that a wide geographical origin is implied, although it is not yet possible to pin-point any one source with certainty.

Fabrics 1-3 continued in use suggesting that the factories which had produced Dressel 1 amphorae continued, although the style of their products had radically changed. The general picture appears to be one of an expanding wine industry: Dressel 1A exists in two fabrics, Dressel 1B in three and with the advent of Greco-Roman types at least eight fabrics are indicated.

The geographical diversity of production sites probably accounts for the many typological variations, although it is not yet possible to correlate differences in fabric and form.

(c) Contents

There is no evidence to suggest that the contents of these vessels was other than wine.

(d) Chronology

Zevi (1966) records 14 *tituli picti* ranging between 16 B.C. and A.D. 146, but the

majority fall in the first half of the first century A.D. This accords well with the archaeological evidence as the form is ubiquitous on sites dating from the last decade of the first century B.C. to the early second century, e.g. Oberaden (Loeschcke, 1942), Haltern (Loeschcke, 1909), Hofheim (Ritterling, 1913), Caerleon (Wheeler and Wheeler, 1928).

In view of the diversity of production sites it is futile to erect an evolutionary scheme for the development of this type: each centre must be isolated and studied independently. Similar forms may have been produced at different times in different centres, while no doubt in some cases a variety of typological traits were in vogue contemporaneously.

Zevi ascribes consular dates to the typological variations distinguished by Dressel, but each has too few dates for even tentative conclusions to be drawn.

3. GRECO-ROMAN AMPHORAE (RHODIAN TYPE)

(Camulodunum 184, Callender 7)

(a) Typology

This type of amphora, which is much less common than the preceding, is based upon prototypes from the Island of Rhodes (Grace, 1961: fig. 62).

The characteristics (fig. 35, 4) are the simple beaded rim and the long single rod handles which rise to a sharp peak. It is a highly distinctive type which is close to Dressel forms 5 and 43, although not accurately represented in his scheme.

The fabric is variable in colour, ranging from buff or reddish with paler surfaces, to, in rare instances, off-white.

(b) Provenance and Petrology

Unfortunately little is known of the *tituli picti* on this type. The evidence listed by Callender (1965:16) refers to Pompeii form VIII, which though related, is not the same.

Tchernia (1969:470) has suggested that these amphorae may have been made on Rhodes itself. While the petrology does not preclude this possibility, a wide variety of sources is again indicated. The 13 sherds sectioned can be conveniently divided into six groups of differing origin. The Rhodian type thus exhibits similar diversity of origin to the Koan, but since most of the fabrics are different there appears to have been little overlap of the two styles.

(c) Contents

The contents of this type are unknown, but presumably wine was carried.

(d) Chronology

Although this form is frequently found on sites of the mid-first century A.D. (e.g. Claudian Hofheim (Ritterling, 1913) and Hod Hill (Richmond, 1968)) occurrences at Oberaden (Loeschcke, 1942: type 79) and Haltern (Loeschcke, 1909: type 67) suggests that it was established by the last decade of the first century B.C., while that from Caerleon may indicate production after c. A.D. 75 (Wheeler and Wheeler, 1928: 186).

4. SOUTHERN SPANISH AMPHORA TYPES

(Dressel 7-11, 38, Camulodunum 185-6, Callender 6, 8, 9, Pélichet 46)

(a) *Typology*

This group comprises types of diverse character which nevertheless form part of a variable related series.

The commoner forms found in Britain are illustrated in fig. 35, 5-8. Fig. 35, 5 and 6 show Camulodunum forms 185A and B, a characteristic feature of which is the vertical groove down the handle, while fig. 35, 7 and 8 are Camulodunum form 186 distinguished by the hollow spike and long flattened recurved handles. This type exists in a number of varieties of which the rim is generally characteristic. Fig. 35, 7 is Camulodunum 186A with slender body and bell mouth, while fig. 35, 8 shows the typical broad neck and hooked rim of form 186C. Form 186B is intermediate, having a broad neck and short everted rim (Hawkes and Hull, 1947).

Camulodunum 185A (fig. 35, 5) occurs in a hard buff fabric with numerous inclusions, while the remainder are generally finer, off-white in colour, sometimes pink or with a reddish core, the surface usually bearing a pale, fine, off-white slip.

(b) *Provenance and Petrology*

Although *tituli picti* occur frequently on amphorae of this class, the information they bear is of a different nature, providing little direct evidence of source. In an excellent analysis Zevi (1966: 229-46) has demonstrated the inscriptions to be similar in style to those on globular amphorae (Dressel 20). The work of Bonsor (1931) and Clark-Maxwell (1899) has shown the latter to be a characteristic product of the valley of the Guadalquivir between Seville and Cordoba in Spain, and thus a source in Baetica is also implied for the group under consideration. Since these amphorae usually contained marine products rather than wine or oil, an origin along the Baetican coast is implied and sea-food factories are frequent here (Ponsich and Tarradell, 1965: fig. 1). A source in this region is confirmed by the discovery of kilns near Cadiz (Jiménez-Cisneros, 1958) and at Algeciras (Sotomayor, 1969).

Callender (1965, 15) tentatively suggested an Italian source for his form 6 (*cf.* fig. 35, 8) on the basis of an inscription apparently referring to Vesuvian wine and the large number occurring at Pompeii. However, Schoene (1871) from whom Callender's information is derived, may have wrongly attributed some of the *tituli picti* ascribed to this form. I have petrologically examined two examples of this type from Verulamium, one of which is illustrated by Callender (1965: pl. 1c). The vessels contain no volcanic matter diagnostic of an Italian source, but have a composition indistinguishable from the fabrics of Camulodunum 185B/186.

The fabric of Camulodunum 185A (fig. 35, 5) resembles that of globular amphorae, tentatively implying that this type had an inland origin and thus may not have contained sea-food. The fabrics of the remainder are similar in that thin sections reveal little but quartz and baked clay, but there are textural differences implying diverse origins. Variations can sometimes be distinguished in the hand-specimen: for example, occasional coarser wares with large quartz grains (up to 2 mm. across) exist in Camulodunum 186.

The heavy mineral analyses (Peacock, 1967) tabulated below help to clarify the situation.

TABLE I

No.	Type	Zircon	Rutile	Tourmaline	Apatite	Epidote	Garnet	Andalusite	Kyanite	Staurolite	Anatase	Topaz	Sillimanite	Amphibole	Augite	No. grains counted
1.	Globular	13.7	4.3	0.9	0.9	3.3	66.1	6.4	0.5	—	0.2	0.3	0.3	2.8	0.3	578
2.	Camulodunum 185A	22.5	2.6	4.4	3.4	1.8	44.4	13.1	—	1.3	—	—	2.6	3.1	0.8	383
3.	Camulodunum 185B	39.0	3.9	0.5	3.1	23.5	13.3	13.3	0.5	—	—	0.3	0.3	2.4	—	413
4.	Camulodunum 186 sp.	70.6	13.3	—	0.9	0.1	6.2	5.3	0.3	—	0.6	1.3	0.4	0.7	0.1	677
5.	Camulodunum 186 sp.	47.9	4.2	—	21.6	1.6	19.5	—	—	—	—	—	—	4.7	0.5	190

The globular amphora (stamped ARAXI EM) from Roman Dorchester contains a very high percentage of garnet like other vessels of this type I have analysed. This may thus be a characteristic of the deposits in the Guadalquivir drainage basin. Since the second analysis of Camulodunum 185A also contains much garnet, a Guadalquivir origin appears to be confirmed, although a source around the mouth of the river cannot be eliminated on this evidence.

The third analysis (Camulodunum 185B, type specimen) has a high tenor of epidote, a mineral which Mabasoone (1963) has shown to be abundant in the Guadalete drainage area. An origin around Cadiz is likely though again it is impossible to decide mineralogically between a littoral and inland origin.

Analyses 4 and 5 are of finer and coarser fabrics of Camulodunum 186 sp. The former shows a high zircon content, the latter a high apatite. Although the sources cannot yet be determined, they are different from one another and from the other three analyses.

Further work is obviously necessary and this will undoubtedly amplify the number of fabric types. However, the general implications are clear: the amphorae were made along a considerable stretch of the southern Spanish coast and the diversity of production centres is probably one of the more important factors influencing typological variation.

(c) *Contents*

Tituli picti indicate that the principal contents of these vessels were fish-based products such as *garum*, *muria* and *liquamen* (Zevi, 1966: 231).

(d) Chronology

This group was at the height of popularity during the first century A.D., but as Zevi (1966: 239) has stated, its precise range and particularly that of the typological variants is difficult to establish with certainty. However, the industry was exporting before Oberaden (12-8 B.C.) and persisted until at least the first quarter of the second century A.D., as shown by examples from Caerleon (Wheeler and Wheeler, 1928: fig. 23, 78), Leicester (Kenyon, 1948: fig. 33, 1) and Tarsus (Goldman, 1950: fig. 790).

That Camulodunum forms 185 and 186B are at least partly contemporaneous is demonstrated by the frequent association of these types at, for example, Snailwell (Lethbridge, 1953), Camulodunum, and in the wreck off La Tour Sainte-Marie, Corsica (Tchernia, 1969: 489).

Little can be added to Hawkes' and Hull's (1947: 252) chronology of the individual types. However, it should be noted that a form close to 185, usually though not invariably, pre-Claudian, was found at Augustan Oberaden which extends the range (Loeschcke, 1942: type 82). Numerous variations of form 186 exist and although the distinctions A, B and C are often useful it can be difficult to place individual pieces. The possibility of geographically diverse origins influencing the typology releases us from the need to arrange these vessels in a strict evolutionary sequence and thus permits slight revision of the dating. The example from Haltern (Loeschcke, 1909: type 69) attributed to form 186A was held as evidence for the priority of this class. However, it is in reality intermediate between A and B, and forms related to 186B occur at Oberaden (Loeschcke, 1942: type 80-1). Thus amphorae on the 186A/B theme appear to have been current from before c. 10 B.C. to the late first century A.D. Form 186C is common in deposits of the early second century A.D., but its presence at Pompeii (Schoene, 1871: form VII) attests an origin before A.D. 79.

5. THE GLOBULAR AMPHORA (Dressel 20)

This form, which occurs in pre-Roman contexts at Camulodunum, has been discussed extensively by Callender (1965).

The work of Bonsor (1931) and Clark-Maxwell (1899) indicates a source along the Guadalquivir between Seville and Cordoba. Olive oil may have been the principal commodity transported (Tchernia, 1964).

Callender (1965) claims that the form altered little typologically throughout its long life, but Tchernia (1967) has put forward an acceptable scheme for the evolution of the rim.

6. SUMMARY

The evidence outlined above forms the basis for assessing the significance of amphorae in pre-Roman Britain. Table II summarises the salient points.

TABLE II

Type	Provenance	Contents	Chronology
Italian (Dressel 1)	Campania and southern Italy	Fine quality wine	c. 129 B.C. - c. 1 B.C.
Greco-Roman Koan	Many areas, probably mainly Italy	Wine	c. 16 B.C. - c. A.D. 149
Rhodian	Many areas, probably mainly Italy	Probably wine	c. 10 B.C. - late 1st century A.D.
South Spanish	Coast between Cadiz and Malaga	Garum and marine products	c. 10 B.C. - early 2nd century A.D.
Globular	Guadalquivir between Seville and Cordoba	Olive oil	Predominantly 2nd century in Britain, but common in 1st century A.D. and present in early levels at Camulodunum.

PART II

AMPHORAE AND THE LATER IRON AGE IN BRITAIN

A catalogue of pre-Roman sites producing amphorae constitutes the appendix, in which details of individual pieces and find-spots are given. In this section I propose to attempt a tentative synthesis of the evidence. The emphasis will rest upon Dressel 1 types since these are the most informative at present.

That Dressel 1 is common in Gaul is demonstrated by figure 36, constructed largely from information recorded in the literature. The distribution naturally shows a predilection for the Mediterranean coast and the Provincia, but a scatter of finds occurs up to about 150 miles (250 kms.) north of the frontier. The spread seems to be fairly even, but when the productivity of individual sites is taken into account, the most prolific lie in a well-defined area stretching from the present day Burgundy to the frontier of the Provincia. This is hardly surprising for the Aedui and their dependents, whose territory this was, were more or less constant friends and allies of Rome after a treaty of 121 B.C.

In Britain, Dressel 1 amphorae are tightly concentrated in an area north of the Thames constituting present day Hertfordshire and Essex, but there is a thin scatter in southern counties (fig. 36), particularly in Hampshire and the Isle of Wight.

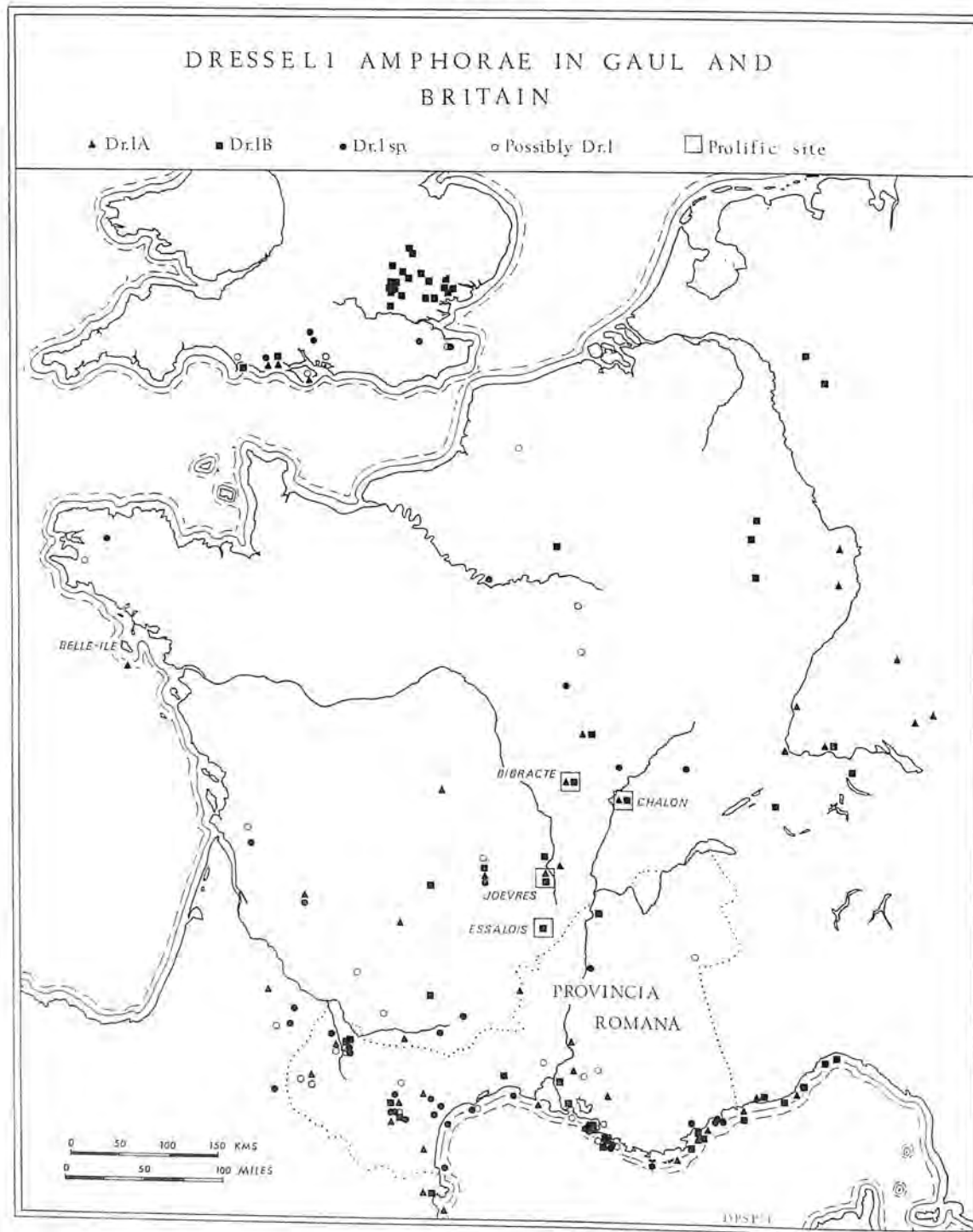


Fig. 36. Distribution of Dressel I amphorae in Gaul and Britain.

1. SOUTHERN SITES PRODUCING DRESSSEL I AMPHORAE

None of these is prolific with the notable exception of Hengistbury Head, which also has the distinction of being the only British site to produce quantities of Dressel 1A, although a single sherd, possibly of this type was found on neighbouring Green Island in Poole Harbour and a few more were recovered from Knighton, near Brading, Isle of Wight. The evidence thus suggests that Hengistbury was receiving amphorae of best southern Italian wine during the first half of the first century and perhaps even the latter part of the second century B.C. The typological variation shown by the rim sherds (fig. 37) is more than can be expected from a single or even a few cargoes and thus trade over a considerable period is implied. The change from Dressel 1A to the B form cannot be precisely dated and thus the few Dressel 1B sherds could have arrived just before the middle of the first century, though equally they could imply continuation of trading into the latter part of the century on a greatly reduced scale.

Caesar (*B.G.* III, 8) records Venetic ships sailing to Britain and thus there is a possibility that the goods were delivered by Armorican intermediaries. Certainly Hengistbury shows good evidence of contact with Armorica. It has produced more graphite coated ware than any other British site and Bushe-Fox's (1915) Class B cordoned ware which is present in quantity, would also be at home across the Channel (Wheeler and Richardson, 1957: 47). The fabric of this pottery contains much mica, a mineral which is scarce in the raw materials available around Hengistbury, although a common feature of Breton Iron Age pottery (Giot, 1960: 190).

However, if wine was received through the Veneti very little appears to have been retained in Armorica as Dressel I amphorae are scarce (see fig. 36). It thus seems reasonable to postulate a direct trade link between Italy and Hengistbury, albeit with due tributes paid to the Veneti, since Caesar (*B.G.* III, 8) indicates that they were masters of the English Channel. The wreck or wrecks off Belle Ile, Morbihan, bearing Dressel 1A amphorae (André, 1959, 1961) could have been bound for Britain as feasibly as Armorica.

Since the amphora evidence from Hengistbury suggests disruption or at least severe attenuation of trade about the middle of the first century, it is tempting to see a connection with the disastrous Venetic uprising of 56 B.C. Had the commerce been in the hands of the Veneti it would certainly have suffered, though equally Rome is unlikely to have encouraged direct trade with southern Britain after this date in view of the support given to the Veneti. In any case, during and after the conquest of Gaul, Britain, the next in line, would have been regarded as hostile territory.

The remaining material from southern Britain is sparse and fragmentary and thus little can be added to the information given in the appendix.

2. DRESSSEL I AMPHORAE IN EAST ANGLIA

The distribution of Dressel I amphorae in eastern Britain is given in fig. 36 and in more detail in fig. 38. Where species is determinate all vessels are of the B form and hence most probably belong to the second half of the first century B.C. Again, derivation from Continental tribes is unlikely because of the scarcity of amphorae in neighbouring territories across the Channel (fig. 36).

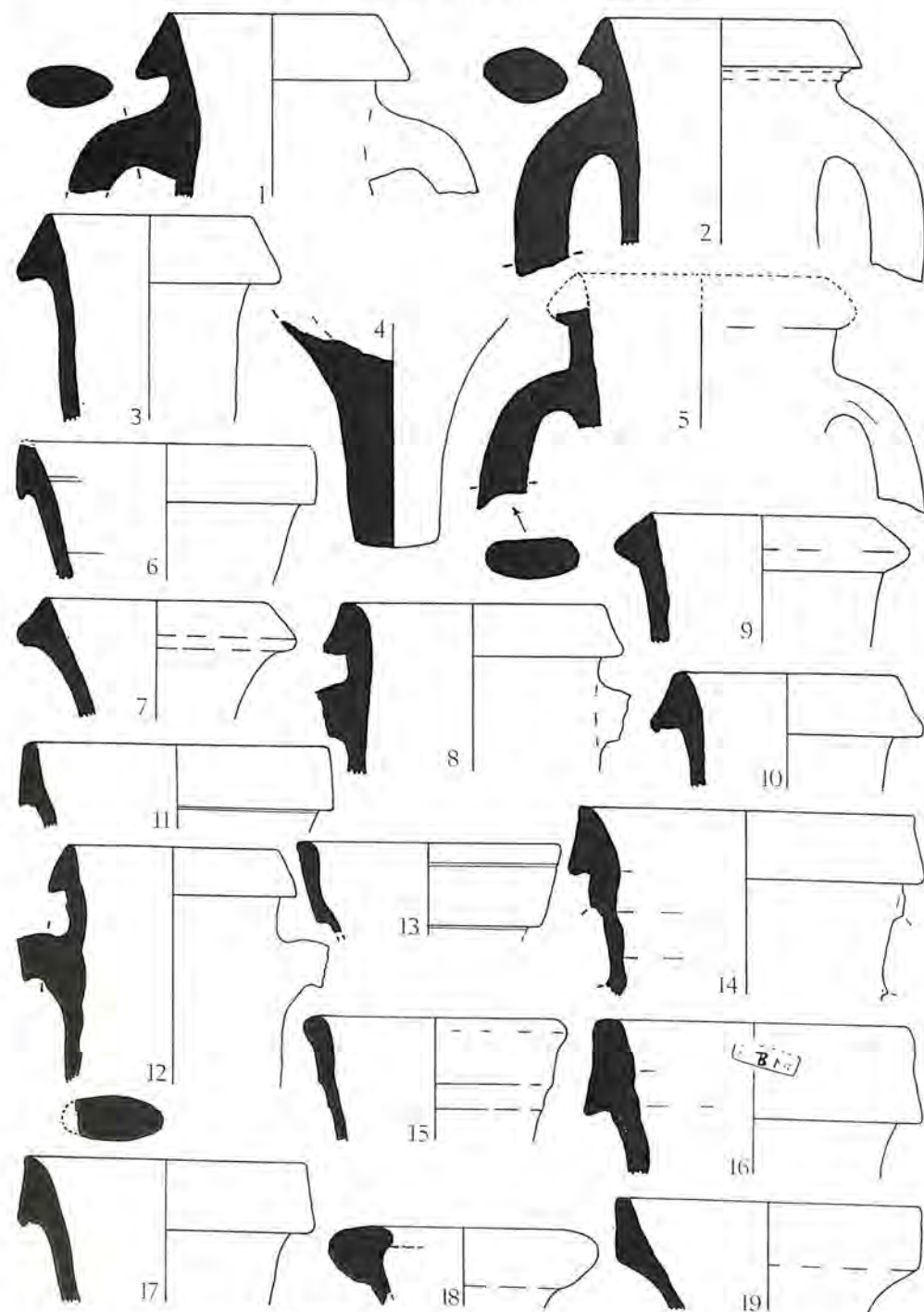


Fig. 37. Amphorae from Hengistbury Head, Hampshire. Scale 1/4.

It is remarkable that most of the amphorae from eastern Britain are complete or practically so. The reason is that they almost certainly come from graves, as it is difficult to account for their preservation otherwise. Stead (1967) has shown that amphorae are a feature of the rich flat graves he has designated the 'Welwyn type'. The sites of the complete vessels shown on the map (fig. 38) may thus mark Welwyn type graves of which they are the only surviving evidence. The distributional correspondence supports this.

Dressel 1 amphorae and Welwyn type graves containing them are concentrated in a belt stretching from the Essex coast to central Hertfordshire, but they do not reach the Verulamium and Wheathampstead region (fig. 38). The area defined may thus have acted as both a cultural and an economic unit and hence could be a tribal territory.

It has been customary to equate the rich Hertfordshire graves with the Catuvellauni, but this must now be questioned on chronological grounds. Stead (1967) has suggested that Welwyn type burials containing Dressel 1 amphorae and no other types, date (on the basis of associated metal-work) between about 50 and 10 B.C. and with this the amphora evidence is in complete accord. Graves such as Welwyn A and Hertford Heath could date from the decade or so after Caesar's invasion while the others may be a little later. The burial from Mount Bures, north of Colchester, is certainly later than those from Hertfordshire since the Dressel 1 amphora was associated with a number of Dressel 10 vessels and Gallo-Belgic pottery. It is probable that the burial took place towards the end of the last decade B.C. (p. 184). A similar, although perhaps slightly earlier date applies to the Lexden tumulus (p. 183) which can perhaps be regarded as a Welwyn type grave over which special circumstances warranted the erection of a barrow. However, the Dressel 1 amphora from Park Field, Lexden, and particularly the pair from Danbury, west of Maldon, could represent graves on the eastern fringe of the distribution contemporary with those in Hertfordshire. Thus during the period 50-10 B.C. Welwyn type graves containing Dressel 1 amphorae may have been constructed over the whole of the area in question. The distribution clearly antedates the eastwards expansion of the Catuvellauni under Cunobelin and probably even the temporary incursion of Tasciovanus suggested by rare coins with a Camulodunum mint mark (Allen, 1944: 15), although in any case this would have been too brief to be of significance here. Since eastern Essex at least was probably in Trinovantian hands during this period it is reasonable to suggest that the Dressel 1/Welwyn type grave distribution maps out the territory of the Trinovantes.

Further evidence can be advanced to support this hypothesis. No Dressel 1 amphorae are recorded from the Wheelers' (1936) extensive excavation at the Catuvellaunian stronghold of Verulamium, or its probable precursor at Wheathampstead, although in contrast small scale rescue work on a settlement at Crookhams, Welwyn Garden City, five miles or so to the east, produced sherds of at least two vessels (Rook, 1968). The evidence is slight but would well accord with a tribal frontier economically separating the two regions. Alternatively we must ascribe the Crookhams find to chance and assume that the Catuvellaunian aristocracy were provided in death with luxuries not enjoyed to any extent by the living. However, it is noteworthy that no Welwyn type graves were discovered in the Verulamium cemetery (Stead, 1969). There is of course, nothing new in suggesting a political boundary in this region for the Wheelers (1936:

20-3) interpreted the Beech Bottom Dyke, between Verulamium and Wheathampstead as a frontier work.

The hypothesis also satisfies the literary evidence. Rice-Holmes (1907: 702) long ago deduced that the stronghold of Cassivellaunus was near to the frontier with the Trinovantes which implies that their territory stretched as far west as Hertfordshire, since his oppidum must lie somewhere in this region even if a better contender than Wheathampstead eventually comes to light. Extensive territories stretching across Essex and Hertfordshire would befit a tribe described by Caesar (*B.G.* V, 21) as perhaps the strongest in these parts. The contents of the graves are also significant for they blatantly accord with a tribe befriended by Rome: I have already alluded to an analogous concentration of amphorae in the territory of the Aedui (p. 171).

Coin evidence offers another approach, though unfortunately the only coins that can be ascribed with certainty to the Trinovantes are those of Addedomarus, approximately contemporary with Tasciovanus and hence comparatively late. However, these roughly cover the area in question (Allen, 1944: map IV), but extend further to the west and north, as a result of trade or perhaps temporary fluctuation of the kingdom. The scarcity of finds in the central Essex-Hertfordshire region may be fortuitous. However, it is interesting that none of the graves from the Welwyn region date from after c. 10 B.C. and this might indicate that the centre of Trinovantian power was moved to the east, at or before this time, perhaps as a result of Catuvellaunian encroachment of the western marches.

Not all Welwyn type graves contain Dressel 1 amphorae: southern Spanish types were found in the Snailwell burial, while those from Stanfordsbury contained an anomalous type of uncertain origin. A burial at Maulden Moor contained an amphora of unknown class. Complete examples of the Koan type were recovered from Woburn, Stanmore, Stratford St. Mary, Heybridge and Colchester, while a number of complete southern Spanish amphorae have been found around Colchester and another at Wavendon near Bletchley. All probably came from graves.

The distribution of these amphorae or of Welwyn type graves containing them covers much the same ground as Dressel 1 amphorae, but they are found beyond the limits of the latter (fig. 38). Their date is difficult to fix with precision but they are undoubtedly later than Dressel 1 and this is often confirmed by their grave goods: Gallo-Belgic pottery is not infrequently associated, whereas it is never found in graves containing just Dressel 1 amphorae. A date after Cunobelin's expansion eastwards is certain for the Stanfordsbury and Maulden Moor burials which contained Samian. The graves may thus represent a dissemination of the Trinovantes or of Trinovantian ideas in the new enlarged Catuvellaunian kingdom. This suggestion is however, very tentative: the graves with Samian could post-date the Roman Conquest, while there is no associated dating evidence for many of the other amphorae. Some might be as early as Addedomarus or Dubnovellaunus or could again be post-conquest.

More work is needed to confirm this identification of the Trinovantes. The scientific excavation of Welwyn type graves in Essex would clarify the eastern end of the distribution, while in Hertfordshire, petrological comparison of coarse pottery on either side of the frontier might indicate whether different production centres were involved.

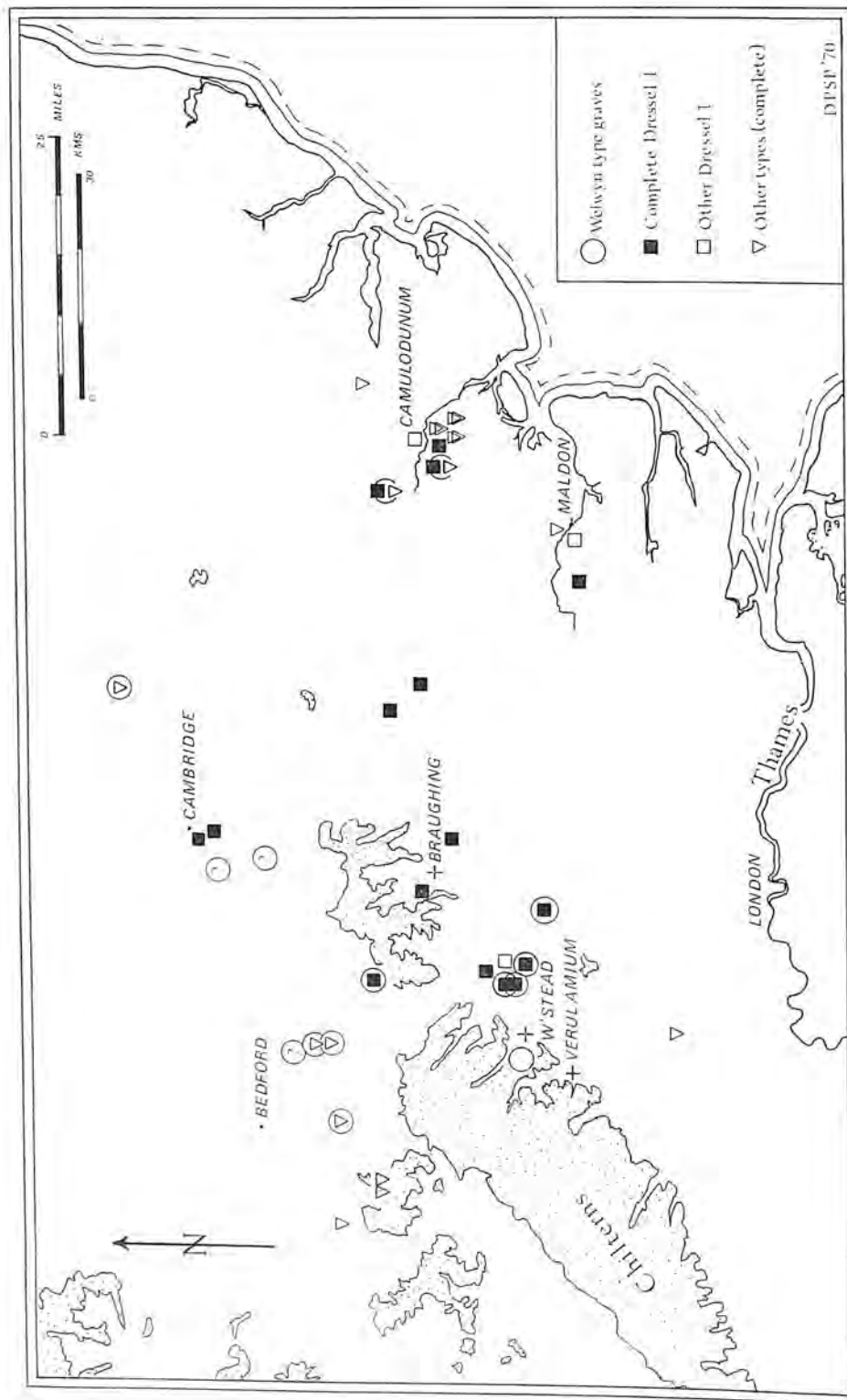


Fig. 38. Amphorae and Welwyn type graves in East Anglia.

However, if my reasoning is correct, this historical tribe begins at last to emerge more fully into the archaeological record.

3. CAMULODUNUM: CHRONOLOGICAL AND ECONOMIC CONSIDERATIONS

Although the majority of Dressel 1 amphorae from Welwyn type graves fall within the date range 50–10 B.C., they are also present at Camulodunum, apparently in somewhat later contexts. The form Camulodunum 181 (Dressel 1) comprises a full 10 per cent of all the early amphorae from the Sheepen site, which coin evidence suggests to be contemporary with Cunobelin (Hawkes and Hull, 1947).

If we take the conventional date of A.D. 10 for the foundation of Camulodunum, it is necessary to extend the date range of Dressel 1 at least a quarter of a century beyond the latest *titulus pictus* of 13 B.C. to account for the Sheepen material. This is possible but difficult to understand. From sometime around 16 B.C., Hellenising influences began to transform the Italian amphora industry and since the Dressel 1 factories were involved in this, it is unlikely that the form would be available in quantity at such a late date (see p. 165). Furthermore if production persisted, it is surprising that more evidence was not found at, for example, Haltern. Arretine ware, was of course imported into Britain after it had ceased to be used by the army on the Rhine (Hawkes and Hull, 1947: 190) but it is difficult to imagine that amphorae containing best Falernian and Caecuban wine would be disposed of in a similar manner.

This apparent chronological conflict can be resolved in one of three ways.

1. Dressel 1 amphorae could have had a longer life than at present seems likely.
2. The eastwards expansion under Cunobelin and the foundation of Camulodunum could have taken place before A.D. 10. This however, would create other difficulties as Cunobelin's already lengthy reign would be extended to something over 40 years and there would be less time in which to fit the preceding reigns of Dubnovellaunus and Addedomarus.
3. The material could be rubbish survival from an earlier and hence Trinovantian occupation of the site.

Of these possibilities the third is to be preferred. Professor Hawkes has kindly drawn my attention to the thin occupation deposit found beneath the remains of a Period I rampart on the Sheepen site (Hawkes and Hull, 1947: 60). The sparse material from this layer was originally ascribed to Period I: 'no serious occupation of this area need be allowed for before the advent of the dyke-builders, to whom in fact these few leaving may well be assigned'. However, the amphora evidence implies that this deposit may have been a relict of much more extensive occupation of the site under the Trinovantes.

The Lexden tumulus (Laver, 1927), previously supposed to be that of Cunobelin himself, would also present a chronological difficulty if this attribution were correct. The amphorae comprise an association of Dressel 1B and Greco-Roman types, so the grave should date to the period of overlap of these forms in the last 15 years B.C. This agrees well with Ann Birchall's (1965: 254) independent suggestion of a date in the latter part of the first century B.C. on metal evidence, and with a *terminus post quem* of 17 B.C. provided by the medallion of Augustus (Laver, 1927: 251). The tumulus could antedate Cunobelin's arrival at Camulodunum, but its contents would be archaic

indeed if the grave was constructed after about A.D. 40, the probable date of his death. If it is possible to name the occupant of the tomb, I would favour Addedomarus.

The economic standing of Cunobelin's kingdom is reflected in both the number and variety of amphorae from Camulodunum. Although some of the material is residual, much must be contemporary with Cunobelin and the quantity recovered contrasts markedly with the sparse fragments from the Dobunnian oppidum of Bagenodon or from Atrebatian Silchester (see pp. 180, 181). The bulk of Roman trade with Britain appears to have been concentrated in the east, which lends support to Frere's (1967: 44) suggestion that Cunobelin was not anti-Roman in policy.

Finds from Mount Bures and the Lexden tumulus, suggest that Greco-Roman and South Spanish types were being imported before Cunobelin, but there can be little doubt that trade flourished after his accession. Of particular note was the commerce with the Spanish province of Baetica, from whence came fish sauces and olive oil. A vital trade link had been established and Baetican trade was to figure significantly in the economic life of Roman Britain.

* * * *

As one whose work is frequently concentrated on museum collections I am acutely aware of the debt I owe to others. It is quite literally the spade-work of my predecessors which has made this study possible, and my great debt to Sir Mortimer can be gauged from the number of times I have had occasion to refer to his published works. It is thus a particular pleasure to offer this essay, imperfect though it is, as a contribution to mark his eightieth birthday.

Acknowledgements

This work would have been very difficult without the help of the many museum curators and individuals who gave me information or facilities to study material in their care. I should like to offer sincere thanks to Mr. K. J. Barton (Portsmouth), Mr. M. Biddle, Mr. J. W. Brailsford and Miss C. John (British Museum), Mr. D. T-D. Clark (Colchester), Mr. J. R. Collis, Miss M. Craster (Cambridge University), Mr. A. G. Davies (Hertford), Mr. D. G. Davies (Verulamium), Dr. G. C. Dunning, Mr. L. R. Fennelly, Professor S. S. Frere (Cirencester), Mr. D. Gwatkin and Mrs. J. Greenaway (Reading), Mr. R. A. Hills, Mr. D. Kelly (Maidstone), Mr. J. Lavender (Christchurch), Sir George Meyrick, Miss L. Millard (Canterbury), Mr. R. N. Peers (Dorchester).

I am also greatly indebted to Professor B. W. Cunliffe and Mr. A. J. Parker for improving criticism of a draft of this paper.

APPENDIX

NOTES ON BRITISH IRON AGE SITES WITH AMPHORAE

I. Counties south of the Thames

CORNWALL

St. Mawgan in Pydar (Truro museum)

Fragments from huts dating from ? before the mid first century A.D. (Hut A) to the first half of the second century A.D. (Hut Z). Two of the sherds illustrated (Murray-Thriepland, 1956: fig. 31, 138) have been wrongly reconstructed. The handle (unstratified) is of Camulodunum 185 and hence southern Spanish, dating perhaps to roughly the first half of the first century A.D. The rim and also nos. 139 and 140 are of a type unknown in pre-Roman Britain and probably date from the latter part of the first century A.D.

DORSET

Maiden Castle (Dorchester museum)

A few small fragments of amphora body were associated with Iron C and occasionally B pottery (Wheeler, 1943: 103, 116). Four sherds from site D were sectioned. Three were similar to fabric 2 (p. 164) but contained rare shell fragments, while the fourth was of fabric 3. The vessels may have been of Dressel 1, since although the same fabrics occur in the Koan form, such vessels are rare.

Weymouth Bay

Body of a Dressel 1B amphora dredged from the sea-bed. Stamped P (Damon, 1890).

Green Island, Poole Harbour (Christchurch museum)

A rim sherd, possibly Dressel 1A and a body sherd both in fabric 1. They were associated with Iron Age pottery (mainly bead rim bowls) and shale working debris (Calkin, 1953: 53).

Hamworthy, Poole (Poole museum)

A large unstratified collection of Iron Age and Roman pottery includes six Dressel 1 handle fragments, two of which are in an atypical streaky, creamy-buff fabric. Less certainly pre-conquest are five fragments of Koan type amphorae (three bases, one shoulder, and one handle fragment) and globular amphorae, represented by four rim sherds and five handles, all unstamped.

GLOUCESTERSHIRE

Bagendon (Cirencester museum)

This site, dated between c. A.D. 20 and 50, yielded a rich collection of pottery amongst which were a few amphora sherds. The following have been examined.

1. Clifford, 1961: no. 76B. A fabric similar to that used for Camulodunum 185A, but softer and yellowish. Probably south Spanish. Two further body sherds are also present in this fabric and at least two vessels are represented in all.
2. Clifford, 1961: no. 76A. Thin sectioning reveals volcanic glass and sanidine felspar fragments suggestive of an Italian origin. This amphora was erroneously compared (Clifford, 1961: 230) with Camulodunum form 185B, which is of south Spanish origin (p. 169).

3. Five body sherds, possibly all from the same vessel, in a fine pink fabric with whiter surfaces. They are superficially similar to the finer south Spanish fabrics, but heavy mineral separation produced a flood of opaque grains making analysis difficult. It is not the same as the known south Spanish material.
4. Three body sherds possibly from the same vessel in a coarse red fabric with granitic inclusions.

HAMPSHIRE AND ISLE OF WIGHT

Hengistbury Head (Christchurch museum, British Museum, Private Possession)

All extant rim sherds are illustrated in fig. 37. Nos. 1-3, 5-12, 14 and 17 are of Dressel 1A in fabric 1 (p. 164). No. 19 is Dressel 1B in the same fabric, while nos. 13 and 15 are of the B form in fabric 3 (p. 164). No. 16, with an almost illegible stamp is intermediate between the A and B forms. Microscopically the fabric is anomalous with a 'pisolitic'-type structure. One Dressel 1A base in fabric 1 is illustrated (no. 4).

No. 18 is from a Spanish globular amphora perhaps of the first century A.D.

Further unillustrated material in the Red House Museum, Christchurch, comprises 11 Dressel 1 handle fragments or stubs, one grooved handle of south Spanish type (Camulodunum 185) and three handles from globular amphorae, one stamped ROMNI (Callender, 1965: no. 1541), another perhaps BELLICNA'PAGAEN (cf. Callender, 1965: no. 185D). The latter are probably of the second century A.D. A further six bases are present, three of Dressel 1, three conical. All the material is unstratified. It includes sherds from excavations by Bushe-Fox (1915), H. St. George Gray and stray finds.

Three more stamps are recorded by Bushe-Fox (1915: 53).

Owslebury

One Dressel 1 sp. handle fragment associated with saucepan pots. (Information J. R. Collis.)

Horndean (Portsmouth museum)

One Dressel 1 sp. shoulder fragment in fabric 1 associated with Iron Age pottery (Cunliffe, 1961: no. 8).

Winchester (Assize Courts)

One Dressel 1 sp. handle stub from the lower filling of a ditch. Associated with Iron Age pottery belonging perhaps to a late phase of the saucepan pot tradition. (Information M. Biddle.)

Silchester (Reading museum)

None of the amphorae from recent excavations at Silchester is certainly pre-conquest (Boon, 1969). A fragment like Camulodunum form 186 and a globular amphora rim from Claudio-Flavian levels (layer Aii) could be rubbish survivals from the earlier occupation. Another piece which may be early is a globular amphora body sherd dating from before A.D. 60. An unstratified handle of form Camulodunum 185 was also recovered.

The amphorae figured by May (1916, pl. LXVII) comprise globular vessels, Greco-Roman and one example of Camulodunum 186c, all of which may be post-conquest. One potential Dressel 1B rim is illustrated but this is unconfirmed as the specimen was not available for inspection.

Knighton, nr. Brading, Isle of Wight

Four Dressel 1A rims, two handle fragments and many body sherds associated with Iron Age pottery. (Information L. R. Fennelly.)

Gills Cliff, Ventnor, Isle of Wight (Carisbrooke Castle museum)

Amphora sherds, possibly Dressel 1, associated with Iron Age pottery including bead rim bowls (Benson, 1953).

KENT

Quarry Wood, Loose, near Maidstone (Maidstone museum)

A quantity of Iron Age pottery was recovered together with a single amphora body sherd, which bears a clear stamp EB. It is almost certainly of Dressel 1. (Information D. Kelly.)

Rose Lane, Canterbury (Canterbury museum)

The Belgic group from this site (Frere, 1954) includes three fragments in fabric 1, probably from different vessels. Although Greco-Roman vessels occur rarely in fabric 1, it would be unusual to find three of the same type associated and thus they are probably Dressel 1.

This group has been assigned to the years immediately preceding the Claudian conquest, but if Dressel 1 amphorae are present, it may date, at least in part, to before the latter years of the first century B.C.

Bridge Hill, Canterbury (Canterbury Museum)

A Dressel 1 handle and two body sherds in fabric 1, from a site producing Iron Age pottery, brooches, beads, speculum coin etc (Watson, 1963).

SOMERSET

Camerton (Taunton museum)

Amphorae occurred frequently in pre-Conquest levels. Wedlake (1958, nos. 273, 273A, 274, 275) illustrates examples, all of which appear to be of the globular type, although no. 273A is an unusual elongated variant.

II. Counties north of the Thames

BEDFORDSHIRE

Maulden Moor

Amphora found in 1798 together with 'several urns of different forms and sizes containing bones and ashes and fragments of the red pottery enriched with figures and other ornaments' (Lysons and Lysons, 1813: 24).

Woburn

Two Koan type Greco-Roman amphorae found at different times in the grounds of Woburn Abbey (Bedford, 1834). These are wrongly listed as Dressel 1 by Stead (1967: 60).

Stanfordbury (Cambridge University museum)

Two burials originally containing amphorae, but only one (from burial A, (Stead, 1967: 55)) now remains. This a small anomalous type which is difficult to place, but the petrology suggests a Spanish source. Dated to about the time of the Claudian conquest on associated Samian (Stead, 1967: 47; Dryden, 1845).

BUCKINGHAMSHIRE

Wavendon Heath, near Bletchley

South Spanish amphora with one handle missing (cf. Dressel, 9-11). Illustrated by Lysons and Lysons (1813: 24).

CAMBRIDGESHIRE

Jesus Lane, Cambridge (Cambridge University, Museum of Archaeology and Ethnology)

Body of Dressel 1 amphora. No details (Fox, 1923: 101).

Dam Hill, Trumpington (Cambridge University museum)

Dressel 1B amphora with rim and neck missing. No details (Fox, 1923: 101).

Snailwell (Cambridge University museum)

Welwyn type burial. Camulodunum 185A and two 186B amphorae associated with Gallo-Belgic imports (Lethbridge, 1953).

ESSEX

Camulodunum - Sheepen site (Colchester museum)

Dressel 1B amphorae (Camulodunum form 181) comprised 10 per cent of all amphorae from Periods I-III, but probably derive from earlier Trinovantian occupation of the site (see p. 178). Greco-Roman and south Spanish types were plentiful and may date largely from occupation during the reign of Cunobelin (Period I) though the possibility of some being residual cannot be disregarded.

Complete amphorae from the Sheepen region have not been plotted on fig. 38 as they may not have come from burials. They include the type specimens Camulodunum 186A, 182A (Colchester museum, 96.32, 97.32), another form 186A (Colchester museum, 212.30) and the type specimen Camulodunum 184 (Hawkes and Hull, 1947).

Lexden Tumulus (Colchester museum)

Amphorae from the burial are fragmentary, but as the sherds come from an area in the northern part of the grave, disturbed by an ancient opening (Laver, 1927) it is reasonable to suggest that the vessels were broken at a date subsequent to the interment. For this reason they are shown complete on fig. 38. The minimum number of vessels is as follows:

Dressel 1B	4 (fabrics 1 and 2)
Greco-Roman	
Koan	10
Rhodian	1

The association of Dressel 1B and Greco-Roman amphorae suggests a date in about the last 15 years B.C. The absence of south Spanish vessels may be significant in a collection of this size. A possible explanation could be that the grave dates from before the establishment of contacts with Baetica. If correct it should be slightly earlier than the Mount Bures burial (p. 184).

The four Dressel 1B rims were sectioned: two were in fabric 1 and two in fabric 2.

Park Field, Lexden (Colchester museum PC. 700)

A Dressel 1B amphora with rim missing, illustrated by Hawkes and Hull (1947) as the type specimen of Camulodunum form 181. Found 1823. See Hull (1958: 252).

Lexden Park, Colchester (Colchester museum)

Two amphorae of form 186 (Hull, 1958: 252), one (Colchester museum, PC. 702) with rim and base missing.

Fitzwaller Road, Colchester (Colchester museum, 6.1964)

An almost complete amphora discovered in 1964 (Ann. Rep. Colchester and Essex museum, 1963-4). No details. The form is not accurately represented in the Camulodunum series, but it is a south Spanish vessel, close to Dressel types 9-11.

St. Clare Road, Colchester (Colchester museum 2058.31)

The type specimen Camulodunum 185A (this paper fig. 35, 5) found in a garden in St. Clare Road associated with a pedestal beaker and terra rubra. A Dressel 1B rim sherd (Colchester museum 2059.31) stamped HI [E]? recorded by Hawkes and Hull (1947: 214) comes from the same locality.

Colchester region – no provenance (Colchester museum)

A complete amphora of form Camulodunum 185A; also the type specimen Camulodunum 183A (Hawkes and Hull, 1947).

Danbury, Maldon (Colchester museum)

A pair of Dressel 1B amphorae in fabric 1 found together. No details.

Lindsell (Saffron Waldon museum)

A Dressel 1B amphora in fabric 1 with rim missing. Associated with a cremation (Fox, 1923: 101).

Thaxted (Saffron Waldon museum)

A Dressel 1B amphora in fabric 1 with rim missing. No details (Fox, 1923: 101).

Maldon (Colchester museum 2668.13)

A Dressel 1B rim in fabric 1 with traces of pitch. Stamped PE.

Heybridge (Colchester museum, PC.699)

Koan type amphora in fabric 3 (*cf.* Dressel 1). Type specimen Camulodunum 183B (this paper, fig. 35, 3). No details.

Stratford St. Mary (Colchester museum, 437.32)

Koan type amphora in fabric 1 (*cf.* Dressel 1). Type specimen Camulodunum 183C. No details.

Mount Bures

Welwyn type grave containing a Dressel 1B body and four south Spanish amphorae similar to Dressel 9–11, associated with a variety of grave goods including Gallo-Belgic pottery. The grave was probably only partially excavated (Smith, 1852). The association of Gallo-Belgic pottery and Dressel 1B body suggests a date in the last 15 years B.C. A pre-Cunobelin date might also explain why the south Spanish amphorae cannot be precisely matched in the Camulodunum type series, if Smith's drawing is accurate. Like the Lexden tumulus, the burial dates somewhere between roughly 15 and 1 B.C. The differences between the two graves could be explained by assuming that the Lexden tumulus belongs to the earlier part of the period while Mount Bures is later.

HERTFORDSHIRE

Crookhams, Welwyn Garden City

Sherds of at least two Dressel 1 amphorae found associated with coarse and Gallo-Belgic pottery. In a gully discovered in a rescue excavation (Rook, 1968).

Verulamium (Verulamium museum)

Wheeler and Wheeler (1936, fig. 13, 29) illustrate the rim and neck of an amphora in a buff fabric close to that used for globular amphorae. This type, which occurs at Oberaden (Loeschcke, 1942: type 84) and Haltern (Loeschcke, 1909: type 71), may be the ancestor of the globular amphora.

Welwyn, Mardlebury (Hertford museum)

Body of a Dressel 1B amphora in fabric 1. No details.

Welwyn (British Museum)

Burial A:

Dressel 1B amphora in fabric 1, stamped SOS on collar (British Museum, 1911, 12–8.1). Associated with rich metal work and pottery. See Smith (1912) for details.

Burial B:

Five Dressel 1B amphorae, one stamped AA on collar (British Museum, 1911, 12–8, 15–19). Associated with rich metalwork and pottery. See Smith (1912) for details. Three of the unstamped amphorae were sectioned (nos. 17–19) and are of fabric 1.

Welwyn Garden City (British Museum)

Five Dressel 1B amphorae from a rich burial. See Stead (1967) for details. Four vessels examined. Stead, 1967: fig. 5, 1, 4 and 5 are in fabric 1, while fig. 5, 3 is in fabric 3.

Hertford Heath (British Museum)

One Dressel 1B amphora (this paper fig. 35, 2) from a rich burial. Also another rim and neck found nearby. See Holmes and Frend (1957) for details.

Little Hadham

Dressel 1 amphora now lost. See Stead (1967: 60).

Westmill

Three amphorae possibly Dressel 1. See Stead (1967: 60).

Baldock

Dressel 1 amphora in Welwyn type grave (Stead, 1968).

MIDDLESEX

Stanmore Park (British Museum)

Complete Koan type amphora with stamp MAR OF on spike. The fabric is identical with Dressel 1 fabric 2 (see p. 164) (Brailsford, 1964: fig. 17, 11).

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THE IRON AGE AND ITS HILL-FORTS

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The Iron Age and its Hill-forts Papers presented to
Sir Mortimer Wheeler on the occasion of his Eightieth Year.

Southampton University Archaeological Society 1971.

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727